Resource Report 2 – Water Use and Quality
AES Sparrows Point LNG Terminal & Mid-Atlantic Express Pipeline

SUMMARY OF REQUIRED FERC REPORT INFORMATION		
TOPIC	FERC Reference	Report Reference or Not Applicable
1. Identify all perennial surface waterbodies crossed by the proposed project and their water quality classification. • Identify by milepost • Indicate if potable water intakes are within 3 miles downstream of the crossing.	§ 380.12(d)(1)	Section 2.4 Table 2.4-1 Table 2.4-3
2. Identify all waterbody crossings that may have contaminated waters or sediments. • Identify by milepost • Include offshore sediments.	§ 380.12(d)(1)	Section 2.4.1, 2.4.7 Table 2.4-1
3. Identify watershed areas, designated surface water protection areas, sensitive waterbodies crossed by the proposed project. • Identify by milepost.	§ 380.12(d)(1)	Section 2.4.4, 2.4.7 Figure 2.4-4 Table 2.4-3
4. Provide a table (based on NWI maps if delineations have not been done) identifying all wetlands, by milepost and length, crossed by the proposed project (including abandoned pipeline), and the total acreage of each wetland type that would be affected by construction.	§ 380.12(d)(1&4)	Section 2.5 and Appendix 2D Tables 2.5-1, 2.5.2-1
5. Discuss construction and restoration methods proposed for crossing wetlands, and compare them to staff's Wetland and Waterbody Construction and Mitigation Procedures.	§ 380.12(d)(2)	Section 2.5.2
6. Describe the proposed waterbody construction, impact mitigation, and restoration methods to be used to cross surface waters and compare to the staff's Wetland and Waterbody Construction and Mitigation Procedures. • Although the Procedures do not apply offshore, the first part of this requirement does apply. Be sure to include effects of sedimentation, etc. This information is needed on a mile by mile basis and will require completion of geophysical and other surveys before filing. (See also Resource Report 3)	§ 380.12(d)(2)	Section 2.4.8
7. Provide original National Wetlands Inventory (NWI) maps or appropriate state wetland maps, if NWI maps are not available, that show all proposed facilities and include milepost locations for proposed pipeline routes.	§ 380.12(d)(4)	Appendix 2D
8. Identify all U.S. Environmental Protection Agency (EPA) – or state –designated aquifers crossed. • Identify the location of known public and private groundwater supply wells or springs within 150 feet of construction.	§ 380.12(d)(9)	Section 2.3.4, 2.3.5, 2.4.4 Table 2.3-1

Additional Information

Identify proposed mitigation for impacts on groundwater resources	N/A
Discuss the potential for blasting to affect water wells, springs, and wetlands, and associated mitigation.	Sections 2.3.6, 2.5.2.1, 2.5.3
Identify all sources of hydrostatic test water, the quantity of water required, methods for withdrawal, and treatment of discharge, and any waste products generated.	Section 2.4.5
If underground storage of natural gas is proposed, identify how water produced from the storage field will be disposed.	N/A
If salt caverns are proposed for storage of natural gas, identify the source locations, the quantity required, the method and rate of water withdrawal, and disposal methods.	N/A
For each waterbody greater than 100-feet wide, provide site-specific construction mitigation and restoration plans.	TDB
Indicate mitigation measures to be undertaken to ensure that public or private water supplies are returned to their former capacity in the event of damage resulting from construction.	Section 2.4.8
Describe typical staging area requirements at waterbody and wetland crossings.	Section 2.4.1
If wetlands would be filled or permanently lost, describe proposed measures to compensate for permanent wetland losses.	Section 2.5.3
If forested wetlands would be affected, describe proposed measures to restore forested wetlands following construction.	Section 2.5.3
Describe techniques to be used to minimize turbidity and sedimentation impacts associated with offshore trenching, if any	Section 2.4.3

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Term	Description
"	inches
°F	degree Fahrenheit
bbl	barrels
bbl/h	barrels per hour
AMSC	Area Maritime Security Committee
ANSI	American National Standards Institute
AOR	Area of Responsibility
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ATWS	Additional Temporary Workspace
BIA	Bureau of Indian Affairs
BIBI	Benthetic index of biotic integrity
BMP	Best Management Practice
BMS	Burner Management System
BOG	boiloff gas
Bscfd / bscfd	billion standard cubic feet per day
Btu	British thermal unit
Btu/(ft^2hr)	British thermal unit per feet squared per hour
C5 plus	pentane plus
CCTV	closed circuit television
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
COE	U.S. Army Corps of Engineers
COMAR	Code of Maryland Regulations
COTP	Coast Guard Captains of the Port
CROW	Construction right-of-way
CWA	Clean Water Act
cy	cubic yard
CZMA	Coastal Zone Management Act of 1972
DB&B	double block and bleed
DCS	distributed control system
DMRF	Dredge Material Recycling Facility
Dth/day	Dekatherms per day
EA	Environmental Assessment
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EPC	Engineering, Procurement and Construction
ER	Environmental Report
ERC	emergency release coupling
ESA	Endangered Species Act of 1973

Term	Description
ESD	emergency shutdown
ESD-1	Pier Emergency Shutdown
ESD-1-1	Activation of the unloading arm/vapor return arm ERCs on Berth 1 and Berth 2
ESD-2	Total Terminal Emergency Shutdown
FAA	Federal Aviation Administration
FBE	Fusion-Bonded Epoxy
FEED	Front End Engineering Design
FERC	Federal Energy Regulatory Commission
FERC's Plan	FERC's Upland Erosion Control, Revegetation, and Maintenance Plan
FERC's Procedures	FERC's Wetland and Waterbody Construction and Mitigation Procedures
FM	Factory Mutual
fps	feet per second
ft	feet
gpm	gallons per minute
h	hour(s)
H&MB	heat and material balance
HAZID	Hazard Identification
HAZOP	Hazard And Operability
HDD	Horizontal Direction Drilling
HDMS	Hazard Detection and Mitigation System
HHV	higher heating value
HID	High Intensity Discharge
HIPPS	High Integrity Pipeline Protection System
Hp / hp	horsepower
HP	high pressure
HTF	heat transfer fluid
IESNA	Illuminating Engineering Society of North America
in	inch
inches H_2O	inches of water
inches Hg	inches of mercury
inches Hg/h	inches of mercury per hour
IP	intermediate pressure
ISO	International Organization for Standardization
Kts	knots
kV	kilovolt
kVA	kilovolt Ampere (one thousand Volt Amperes)
LDC	Local Distribution Company
LFL	lower flammability limit
LHV	lower heating value

Term	Description
LNG	Liquefied Natural Gas
LNG Terminal	Sparrows Point LNG Import Terminal
LOI	Letter of Intent
LP	low pressure
LTD	Level, Temperature, Density
M&R	Metering and Regulator
m^3	cubic meters
m^3/hour	cubic meters per hour
MAOP	Maximum Allowable Operating Pressure
mbar	millibar
mbar/hour	millibar per hour
MCC	Motor Control Center
mcf	million cubic feet
MCMERG	Mid-Chesapeake Marine Emergency Response Group
MCR	Main Control Room
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
Mg/l	Microgram per Liter
MIS	Management Information System
MLLW	mean low low water
MLV	Mainline valve
MMBtu/hr	million British thermal units per hour
MMcf/day	million cubic feet per day
MMscfd	million standard cubic feet per day
MP	Milepost
mph	miles per hour
MW	megawatt
N/A	not applicable
NAS Pax River	Naval Air Station Patuxent River
NAVD	North American Vertical Datum
NDE / NDT	Nondestructive Examination / Nondestructive Testing
NEC	National Electrical Code
NEPA	National Environmental policy Act of 1969
NFPA	National Fire Protection Association
NGA / NGPA	Natural Gas Act / Natural Gas Policy Act
NHPA	National Historic Preservation Act of 1969
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
No. ins	number of inches
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxides

Term	Description
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Noise Sensitive Area
NWI	National Wetland Inventory
NVIC	Navigation and vessel Inspection Circular
O&M	Operations And Maintenance
OBE	Operating Basis Earthquake
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
P&ID	piping and instrumentation diagram
PAH	Poly Aromatic Hydrocarbon
PCB	Polychlorinated Biphyenyls
PCMS	Plant Control and Monitoring System
PCR	Platform Control Room
PDEP	Pennsylvania Department of Environmental Protection
PDM	Processed Dredged Material
PIANC	Permanent International Association Navigation Congress
PM	particulate matter
POTW	Publicly-owned Treatment Works
PPB / ppb	parts per billion
PPM / ppm	parts per million
PPT / ppt	Parts per trillion
psf	pounds per square foot
psig	pounds per square inch gauge
PWSA	Preliminary water way suitability assessment
PVC	Poly Vinyl Chloride
QA	Quality Assurance
QC	Quality Control
RGS	Rigid Galvanized Steel (conduit)
ROW	Right-of-Way
RR	Resource Report
RTD	resistance temperature detector
RTU	remote terminal unit
RUSLE	Revised Universal Soil Loss Equation
SAV	Aquatic vegetation
SCADA	Supervisory Control and Data Acquisition
scfh	standard cubic foot (feet) per hour
scfm	standard cubic foot (feet) per minute

Term	Description
SCUBA	Self-contained Underwater Breathing Apparatus
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SIS	Safety Instrumented System
SPCC	Spill Prevention, Control, and Countermeasure
SSE	Safe Shutdown Earthquake
SSURGO	Soil Survey Geographic
STATSCO	State Soil Geographic
SWPPP	Storm Water Pollution Prevention Plan
Tcf	Trillion Cubic Feet
TCP/IP	Transmission Control Protocol/Internet Protocol,
THPO	Tribal Historic Preservation Office
TMDL	Total Maximum Daily Load
TOC	Total organic carbon
Trap	Pig Launcher Receiver Facility
UL	Underwriters Laboratories
UPS	Uninterruptible Power Supply
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USDOE	United States Department of Energy
USDOT	United States Department of Transportation
USEPA / EPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
usg	United States gallons
usgpm	United States gallons per minute
V	voltage
VOC	volatile organic compound
WSA	Water way suitability assessment
WWTP	Waste Water Treatment Plant
§	Section

2. WATER USE AND QUALITY

2.1 Introduction

AES Sparrows Point LNG, LLC (Sparrows Point LNG) proposes to construct, own, and operate a new liquefied natural gas (LNG) import, storage, and regasification terminal (LNG Terminal) at the Sparrows Point Industrial Complex situated on the Sparrows Point peninsula east of the Port of Baltimore in Maryland. LNG will be delivered to the LNG Terminal by LNG marine vessels, offloaded from these vessels to shoreside storage tanks, regasified to natural gas on the LNG Terminal site (Terminal Site), and the regasified natural gas transported to consumers by pipeline. The LNG Terminal will have a regasification capacity of 1.5 billion standard cubic feet of natural gas per day (bscfd), with the potential to expand to 2.25 bscfd. Regasified natural gas will be delivered to markets in the Mid-Atlantic Region and northern portions of the South Atlantic Region through an approximately 88-mile, 30-inch outside diameter interstate natural gas pipeline (Pipeline) to be constructed and operated by Mid-Atlantic Express, L.L.C. (Mid-Atlantic Express). The Pipeline will extend from the LNG Terminal to points of interconnection with existing interstate natural gas pipeline systems near Eagle, Pennsylvania. Together the LNG Terminal and Pipeline projects are referred to as the Sparrows Point Project or Project. Both Sparrows Point LNG and Mid-Atlantic Express (hereinafter collectively referred to as AES) are subsidiaries of The AES Corporation.

The Project footprint is located in the counties of Baltimore, Harford, and Cecil in Maryland and the counties of Lancaster and Chester in Pennsylvania. The Terminal Site, which is located entirely within Baltimore County, is a parcel located within a former shipyard. The route proposed for the Pipeline (Pipeline Route), which crosses all of the listed counties, includes industrial, commercial, agricultural, and residential lands. Together, the Terminal Site and the Pipeline Route comprise the Project Area.

As described in Section 1.10 of Resource Report 1, *General Project Description*, The AES Corporation is considering the possibility of building a combined cycle cogeneration power plant (Power Plant) on the Terminal Site. The Power Plant would be configured with one F-Class combustion gas turbine, one steam turbine, and associated auxiliaries. The Power Plant would operate only on natural gas and would produce approximately 300 megawatts (MW) of clean electric power within an area of high energy demand. The Power Plant would be connected to the local utility electric system by an overhead electric power transmission line.

2.2 Objective and Applicability

Resource Report 2, *Water Use and Quality*, describes the existing groundwater and surface water quality within the Project Area, characterizes the potential impacts to groundwater and surface water quality associated with construction and operation of the Project and identifies proposed measures to avoid, minimize and/or mitigate those potential impacts. The following sections provide data collected during field reconnaissance, review of available technical resources, and agency consultation with various federal, state, and local authorities concerning water resources potentially affected by the Project. Wetland delineation studies for most accessible properties along the Pipeline Route have been completed, the results of which are appended to this Resource Report. Areas requiring additional wetland delineation and/or stream data for construction design (e.g., special crossing or protection method requiring additional implementation space) will be determined in consultation with the appropriate agencies. Additional studies that may be required by those agencies as a result of the consultations will be completed by AES during the design stage of this Project (see Project Schedule in Resource Report 1, *General Project Description*).

Potential impacts to water use and quality may result from construction and/or operation of the LNG Terminal – specifically, the marine facilities associated with the LNG Terminal – and the Pipeline. The marine facilities associated with the LNG Terminal will consist of an existing marine pier that extends horizontally approximately 500 feet from land. The marine terminal will have two berths, namely the North and South Berths, located on either side of the existing pier. Each berth will be designed to accommodate an LNG carrier with capacities from 125,000 cubic meters (m^3) up to 217,500 m^3. Although the marine terminal will be able to accommodate two vessels at one time, unloading will only be permitted from one vessel at any given time. To support the proposed marine terminal operations, an approach channel and turning basin will be constructed by dredging to deepen and expand existing channels.

2.3 Groundwater Resources

2.3.1 Hydrogeology Overview

In both Pennsylvania and Maryland, the major uses of groundwater include public supply, residential, agricultural and industrial use. The United States Environmental Protection Agency (EPA) has designated six sole source aquifers in the Mid-Atlantic Region. A sole source aquifer (SSA) is generally defined by the EPA (under Section 1424(e) of the Safe Drinking Water Act) as an aquifer that is a "sole or principal drinking water source" for an area where contamination of the aquifer could create a significant hazard to public health. The sole source aquifers located within the Mid-Atlantic Region include (EPA 2006):

- New Jersey Coastal Plain Aquifer – Located in Delaware, Pennsylvania and New Jersey;
- Maryland Piedmont Aquifer – Montgomery, Howard and Carroll Counties of Maryland;
- Poolesville Area Aquifer Extension of the Maryland Piedmont Aquifer;
- Seven Valleys Aquifer in York County, Pennsylvania;
- Prospect Hill Aquifer in Clark County, Virginia; and
- Columbia and Yorktown, Eastover Multi-aquifer System Accomack and North Hampton Counties of Virginia

None of these designated sole source aquifers occurs within the areas affected by the Project in either Pennsylvania or Maryland.

Based on an initial review of available data from the Pennsylvania Department of Environmental Protection (PDEP) – Groundwater Information System, Maryland Department of Natural Resources (MDNR) and Maryland Department of the Environment (MDE), the Project Area is divided into several physiographic provinces that control groundwater movement through geologic processes related to geomorphology, litho logy, and structure. Five physiographic provinces in the Pennsylvania and Maryland region are the Appalachian Plateau, the Valley and Ridge, the Blue Ridge, the Piedmont Plateau, and the Coastal Plain. The Project Area is located within the Piedmont Plateau and Coastal Plain provinces. More specific descriptions of the geologic conditions for the Project are presented in Resource Report 6, *Geological Resources.*

The sediments of the Coastal Plain dip eastward at a low angle, generally less than one degree, and range in age from Triassic to Quaternary. The younger formations outcrop successively to the southeast across Southern Maryland and the Eastern Shore of Maryland. A thin layer of Quaternary gravel and sand covers the older formations throughout much of the area. Plentiful supplies of ground water are available from a number of aquifers throughout much of this region.

The Piedmont Plateau province is composed of hard, crystalline igneous and metamorphic rocks, and extends from the inner edge of the Coastal Plain westward to the eastern boundary of the Blue Ridge Province. Bedrock in the eastern part of the Piedmont Plateau consists of schist, gneiss, gabbro, and other highly metamorphosed sedimentary and igneous rocks of probable volcanic origin. In several places these rocks have been intruded by granitic plutons and pegmatites. Deep drilling has revealed that similar metamorphic and igneous rocks underlie the sedimentary rocks of the Coastal Plain. Several domal uplifts of Precambrian gneiss mantled with quartzite, marble, and schist are present in Baltimore County and in parts of adjacent counties. Differential erosion of these contrasting rock types has produced a distinctive topography in this part of the Piedmont Plateau. The boundary between the Piedmont Plateau and the Coastal Plain is referred to as the "Fall Line."

Small to moderate supplies of groundwater are available throughout the Project Area; favorable geological conditions in some regions may yield larger amounts of groundwater.

2.3.2 Aquifers Within the Project Area

2.3.2.1 Sparrows Point LNG Terminal Site

The Terminal Site and approximately the first 21 miles of the Pipeline Route lie within the limits of the Coastal Plain province and the Northern Atlantic Coastal Plain Aquifer. This regional aquifer system extends along the coast from New Jersey southward through North Carolina, and consists of a complex series of individual aquifers in generally unconsolidated sediments that are separated by confining units of silt and clay. Six major subdivisions of this regional aquifer system have been identified as follows, in descending order:

- Surficial Aquifer
- Chesapeake Aquifer
- Castle Hayne-Aquia Aquifer
- Severn-Magothy Aquifer
- Peedee Upper Cape Fear Aquifer
- Potomac Aquifer

Not all units are present throughout the limits of the Northern Atlantic Coastal Plain Aquifer. In the vicinity of the Terminal Site the only subunit present is the Potomac Aquifer. This is the lowest and largest of the aquifer subunits, and extends throughout most of the Northern Atlantic Coastal Plain Aquifer. The Terminal Site lies near the western extreme of the aquifer system where the sediments thin against the bedrock highlands of the adjacent Piedmont Plateau physiographic province. The confined aquifers of the Northern Atlantic Coastal Plain Aquifer system receive most of their groundwater recharge from this bedrock outcrop/subcrop belt, and not from surface infiltration, although some contribution from vertical leakage through overlying confining units does occur. Water loss through evapotranspiration is very minor.

The Potomac Aquifer is characterized primarily by sands of the Potomac Group, and is primarily below sea level, except in its westernmost extreme. In Maryland, the Potomac Aquifer comprises the Patapsco and Patuxent aquifers, which are characterized by lenticular deposits of fine to coarse sand that are primarily of fluvial and deltaic origin.

Water in the Potomac Aquifer is a mixture of fresh and saline water. The aquifer shows a west-to-east progression typical of the coastal aquifers: variable composition on the western extreme transitioning eastward to calcium/magnesium bicarbonate composition, to sodium bicarbonate to sodium chloride on the easternmost, seaward extreme. Groundwater pumping from this unit has resulted in development of large composite cones of depression and has exacerbated saltwater encroachment into the aquifer beneath land. This has been observed in several locations throughout the Potomac Aquifer, including Baltimore Harbor.

United States Geological Survey (USGS) data (1997, 1998) indicate 54 percent of the freshwater withdrawal from the Potomac Aquifer was for public water supply systems, with lesser amounts for industry, mining, thermoelectric power, and domestic/commercial/agricultural uses. Withdrawal rates reported in the USGS report for the greater Baltimore vicinity were in the 50,000 to five million gallons-per-day (gpd) range.

2.3.2.2 Mid-Atlantic Express Pipeline

The Pipeline Route from approximately milepost (MP) 21 in Maryland to the endpoint at MP 88 in Pennsylvania lies within the Piedmont Plateau physiographic province. The Piedmont Plateau province includes northern-central Maryland and much of southeastern Pennsylvania, and is characterized by crystalline (metamorphic and igneous) rock formations. In addition, the Pipeline Route between approximately MP 79.5 and MP 81.0 crosses a relatively narrow east-west oriented band of subcropping carbonate (limestone and dolostone) rock units referred to as the Piedmont Carbonate Aquifer. The Paleozoic and Precambrian-aged carbonate-rock aquifers comprise only about three percent of the Piedmont Plateau and the Blue Ridge provinces. Although these carbonate rocks are of small extent, they can be significant local sources of water.

The groundwater in the crystalline bedrock units of the Piedmont Plateau is contained in fractures (primary porosity is essentially nil) and storage capacity and yield are generally low due to low secondary porosity of these rock types. Specific average yields for the Piedmont Plateau province as a whole were not available; general references indicate yields are typically less than ten gallons per minute (gpm) (14,400 gpd). Water is generally soft in these areas.

The groundwater in the Piedmont Carbonate Aquifer can be very hard and contain relatively large amounts of dissolved solids resulting from dissolution of bedrock by slightly acidic groundwater. Groundwater yields in the carbonate areas can be significantly higher than the areas underlain by crystalline rock units, due to relatively high secondary porosity resulting from the potential presence of open joints or even solution cavities of varying size. Faulted zones in the rock can also result in greater groundwater yields. Yields ranging from 17 to 650 gpm (24,500 to nearly one million gpd) are reported for the Ledger dolomite, Kinzer Limestone and Vintage Dolomite formations of this aquifer. These yield data may be related to groundwater extraction in areas away from the proposed Pipeline Route.

2.3.3 Potential Contamination Sources

AES contracted with FirstSearch™ Technology Corporation to prepare an Environmental FirstSearch™ Report that summarizes sites/areas listed on various environmental databases maintained by federal and state agencies within 0.25 miles of the Terminal Site and the Pipeline Route (FirstSearch™ 2006). The databases searched include locations of environmental investigation and cleanup such as spill sites, or "Superfund" (Comprehensive Environmental Response, Compensation and Liability Act – or CERCLA) sites, operating facilities that generate or manage hazardous waste (Resource Conservation and Recovery Act – RCRA), or facilities listed for evaluation of air emissions, polychlorinated biphenyl (PCB) generation, or similar factors. The properties that affect land resources, that come within 0.25 mile of the Project Area, and that are listed in the regulatory databases searched are described in Section 8.5.5 of Resource Report 8, *Land Use, Recreation and Aesthetics*. They are also are identified in Table 8.5.5-1 of Resource Report 8, "Contaminated Site and Landfills Located within 0.25 Mile of the Project."

There are several properties located within 0.25 mile of the Pipeline Route that are listed as Leaking Underground Storage Tank (LUST) spill sites or solid waste (SW) landfill sites.[1] Two National Priority List (NPL) sites, the Strasburg Landfill in Pennsylvania and the 68th Street Dump in Maryland, are located along but not within the Pipeline Route. There are no NPL sites within or adjacent to the Terminal Site.

The Strasburg Landfill covers 22 acres near Coatesville in western Newlin Township, Chester County, Pennsylvania. In 1983, PDEP found benzene, vinyl chloride, 1,2- dichloroethane, copper, and lead in on-site monitoring wells and various chlorinated organic compounds in an off-site private well downgradient of the landfill. PDEP analyses identified the same contaminants in leachate from the landfill. The landfill was closed in 1983 by PDEP. After it was closed, the landfill was capped with a

[1] The limited number of properties that the Pipeline crosses that are listed as SW landfill sites received special attention to coordinate the centerline routing so as to avoid or minimize the potential to cross the footprint or affected area of waste on the properties.

layer of compacted soil, a polyvinyl chloride (PVC) liner, and another layer of soil and weathered rock. In addition, leachate collection and treatment systems were installed. Monitoring wells were also installed around the site. In response to community concerns in 1989, EPA launched an investigation of the landfill and discovered that numerous volatile organic compounds (VOCs), including vinyl chloride, benzene, trichloroethene, and tetrachloroethene, had been detected in groundwater from on-site and off-site monitoring wells. This site was added to the NPL on March 31, 1989.

Additional studies have been performed by EPA, and remediation that began in September 1999 was completed in September 2000. Construction has been completed at the site and EPA has determined that under current conditions at this site, potential or actual human exposures are being controlled adequately. The site has not yet been de-listed from the NPL.

The Pipeline Route parallels the existing Columbia Gas Transmission Corporation ("Columbia") right-of-way (ROW) past the north side of the landfill property outside a barrier fence that surrounds the landfill property. The Pipeline will not go through the landfill. The Pipeline Route relative to the landfill property can be viewed on the alignment sheet set included as Appendix 1A to Resource Report 1, sheet number AES-PP-065 (the landfill is located on property numbers 946 and 947, both situated entirely or mostly south of the Pipeline Route). The Pipeline is routed past and outside of the landfill footprint. Construction and operation of the Pipeline is not expected to have any significant impact on the landfill, nor is the landfill expected to have any significant impact on construction and operation of the Project. The Pipeline Route is located beyond (north of) the physical footprint of the landfill and outside its surrounding fenceline: The Pipeline Route is located generally at elevation 420 to 430 feet above mean sea level to the north of the landfill, whereas the landfill occupies ground at elevations of 320 to 420 feet (i.e., the Pipeline is hydrologically upgradient of the landfill): Because the control measures of the landfill were developed with a pipeline already in place, the relatively shallow and temporary disturbance for construction of the Pipeline is not expected to modify site ground or water flow conditions in any way that would materially affect control measures, landfill stability, or maintenance of the closure systems of the landfill, such as landfill cap, water control, or monitoring wells.

The 68th Street Dump/Industrial Enterprises is located near the town of Rosedale in Baltimore County, Maryland. The 68th Street Dump site covers about 235 acres in Rosedale and another 18 acres in the City of Baltimore. The site consists of several adjacent landfills which received municipal, commercial, and industrial wastes, from the 1950s through the early 1970s. There are six surface waterbodies that flow through the site. Herring Run flows eastward through the site and empties into the headwaters of the Back River, a tributary to the Chesapeake Bay. The portion of the 68th Street Dump that is nearest, but not within, the proposed Pipeline Route is referred to as "Source Area #2" along the south side of Herring Run (further information is provided below). Moore's Run and an unnamed stream flow eastward, Redhouse Run flows southward, and two unnamed streams flow northward through the former dump site and empty into the dump's on-site portions of the Herring Run. One of the unnamed streams originates from an on-site pond located in the northern portion of the 68th Street site. Hazardous substances detected at the 68th Street site include: VOCs, semi-volatile organic compounds, PCBs, and metals. A release of hazardous substances to a local fishing area and wetlands has been documented.

The portion of the 68th Street Dump nearest to the proposed Pipeline Route is located approximately 1,400 feet west of the location where the Pipeline Route crosses railroad tracks on the north side of the Back River (the intersection of the railroad track and Pipeline Route is at property number 126 on Alignment Sheet AES-PP-008 in Appendix 1A of Resource Report 1; however, because of the distance of the dump site from the Pipeline Route, the dump site does not appear on the alignment sheet). At the Back River, AES anticipates that the Pipeline will be installed by horizontal directional drill (HDD), with the drill path paralleling the existing powerline and pipeline corridor, that also cross the river at this location. Because the Pipeline Route will not cross the 68th Street Dump itself, and with the use of the HDD method of crossing (where drill mud is used to provide hydraulic separation for and support the pipeline drill hole). Construction and operation of the Pipeline is not anticipated to have any significant impact on existing conditions at the 68th Street Dump site.

2.3.4 Wellhead Protection Areas

Groundwater is the most commonly used source of water supply in the Project Area, and some regions of the Project Area rely exclusively on groundwater for their water needs. In Maryland, groundwater is obtained from both unconfined and confined aquifers. Almost all of the public water systems using groundwater in Southern Maryland rely on confined aquifers, as do a large portion of those on the Eastern Shore. In Central and Western Maryland, the aquifers are unconfined.

In Maryland, about 10 percent of the community water systems (around 50 systems) rely on surface water, yet these surface water systems serve about 80 percent of the population using public water systems. Protecting a surface water source involves protecting the entire watershed, which can be relatively small (less than one square mile) to very large. The Potomac River watershed is about 10,000 square miles and the Susquehanna River watershed is about 27,500 square miles. Some water supply watersheds (such as the Savage River reservoir watershed) are close to 90 percent forested, while others (such as Baltimore City's reservoir watershed) are predominately agricultural.

Agricultural activities and urban development are the most prevalent sources of contaminants for surface water systems. Contaminants from agricultural land include nutrients and microbial pathogens. Excessive erosion (sediment) and de-icing compounds typically are present in runoff in developed areas. The discharge of treated wastewater and risks from overflowing sewage collection systems upstream of intakes were noted as significant sources of contaminants in some watersheds. Sources relying on river intakes are more susceptible to elevated levels of fecal contamination and turbidity following rain events, while sources using reservoirs were more susceptible to eutrophication from phosphorus. Major roads, rail lines and pipeline crossings presented the potential for spills above some intakes.

As required by the federal Safe Drinking Water Act Amendments of 1986, the State of Maryland established a wellhead protection program which was reviewed and approved by the EPA in June of 1991. The Maryland Wellhead Protection Program is administered by the MDE, Water Management Administration, Water Supply Program. AES reviewed Metadata files provided by the MDE for Baltimore, Harford and Cecil Counties. The data included community water systems, non-transient-non-community wells, and transient non-community wells. Based on a review of this information, the Pipeline Route crosses nine wellhead protection areas.

As required under the federal Safe Drinking Water Act, the Commonwealth of Pennsylvania, through the Bureau of Water Supply Management of the PDEP, has developed a Wellhead Protection Program to protect groundwater sources used by public water systems from contamination that may have an adverse effect on public health. Participation in the program is voluntary and builds upon the basic requirement for water purveyors to obtain the best available source and to take appropriate actions to protect the source, thereby ensuring a continual and safe water supply (PDEP, Pennsylvania Wellhead Protection Program, 2000). The Pennsylvania Safe Drinking Water regulations define a three-tiered wellhead protection zone. Zone 1, the innermost, ranges from 100 to 400 feet radius, depending on source and aquifer characteristics. Zone 2 has been defined as the capture zone that is by default a 0.5-mile radius around the source, unless a rigorous hydrogeologic delineation is performed. Zone 3 is the area beyond Zone 2 that contributes to the recharge of the aquifer within the capture zone.

According to EmapPA, a web-based GIS application developed by the PDEP, there are no public water systems located within 150 feet of the Pipeline Route involved in local Wellhead Protection Programs.

2.3.5 Public and Private Water Supply Wells

Maryland obtains drinking water from both surface and groundwater sources. There are approximately 3,700 public drinking water systems in the state, of which 72 percent are transient non-community, such as restaurants and campgrounds. Only about 50 systems rely on surface-water sources, the remaining systems use groundwater sources.

Pennsylvania obtains drinking water from both surface water and groundwater sources. There are approximately 10,000 public drinking water systems in the state that have their own source of water. Some public water systems have more than one source. The total number of sources for the state is approximately 15,000. Approximately 540 of these water systems rely on surface-water sources, which serve close to 84 percent of the population of Pennsylvania.

Based on an environmental database search performed by FirstSearch™, there are 50 public and private water supply wells located with 150 feet of the proposed construction right-of-way (CROW). The well owners, locations and distance from the Pipeline centerline are shown in Table 2.3-1. Additionally, based on a review of the USGS National Hydrography Dataset and a field survey, there are no springs that occur within 150 feet of the proposed CROW.

2.3.6 Groundwater Impact Mitigation

Based on the nature of the local aquifer conditions, the construction, operation and maintenance of the Project is not expected to have any long-term impacts on groundwater resources. Ground disturbances associated with construction of the Pipeline will be primarily limited to less than six feet below the existing ground surface, with the exception of HDD segments. Construction activities such as trenching, de-watering and backfilling may have the potential to cause minor fluctuations in localized shallow aquifer groundwater levels and/or increase turbidity adjacent to the Project Area. If the shallow aquifer is intercepted, potential adverse effects on the aquifer from construction activities (e.g., trenching, de-watering, backfilling) are anticipated to be temporary and minor. An evaluation of the potential need for de-watering activities during construction of the Pipeline will be included as part of the Project-specific construction plan that will be prepared to support design and construction efforts. AES will acquire the necessary permits for any de-watering activities that may be required.

As described in Section 2.3.3, contaminated groundwater may be present in the Project Area and the immediate vicinity based on the identified locations of known or potentially contaminated groundwater sites. Supplemental, limited soil and groundwater data will be collected as part of a planned geotechnical design investigation program that AES will complete for final design of the Project. AES anticipates that the preliminary subsurface exploration program associated with the Pipeline will include investigations for the Pipeline at selected waterbody crossings along the proposed alignment to assess the soil, rock and groundwater conditions. A minimum of two on shore test borings would be performed per crossing; one on each side of the proposed crossing. At larger crossings, it is anticipated that six test borings may be performed: two off shore borings and up to four on shore borings, two on each side of the crossing. The additional subsurface exploration program at the Terminal Site, subject to needs for final design, could include additional test borings across the Terminal Site to assess the soil and groundwater conditions. Additional borings for the marine structures and Pipeline at the Terminal Site may be performed approximately every 100 feet, with consideration given to the location of the preliminary test borings. Nominally, two additional test borings for each LNG tank may be performed. Test borings may also be performed for the ancillary structures, as necessary to support final engineering design. AES anticipates that all borings would be advanced using hollow stem auger or standard wash boring techniques with steel casing, and extend from 70 to 150 feet below ground surface. AES would perform design-stage geotechnical investigation at or following the time of Federal Energy Regulatory Commission (Commission or FERC) approval of the Project.

No unstable areas are known to exist along the Pipeline Route, and the various crossings identified above are all crossed by other utilities and infrastructure at or near the proposed Pipeline alignment. Accordingly, no rerouting on the basis of subsurface conditions in these areas is anticipated. As described in Resource Report 6, *Geological Resources*, the Pipeline Route is characterized as having low potential for seismic activity, no documented incidence of liquefaction, and low to moderate potential for landslide. Three locations where steep slope creates limited potential for instability are located north of Little Gunpowder Falls (MP 22.2); immediately south of Deer Creek (MP 35.5); and immediately south of the Susquehanna River (MP 44.2). The crossing of the Susquehanna River is expected to be by HDD and will pass well beneath the ground surface at the subject crossings: These factors will effectively eliminate any consideration of landslides as a potential impact. The HDD crossing method will drill beneath these areas of steep slopes, therefore avoiding slopes and issues associated with surficial soil slumping or landslides. The other two areas are stream crossings, and localized factors such as apparent bedrock competency and heavy vegetative cover should minimize the potential for slope failures.

As indicated in Resource Report 6, *Geological Resources*, geotechnical investigations are planned to support HDD crossing analysis at the Susquehanna River crossing, but no additional geotechnical investigations are planned for the Deer Creek or Little Gunpowder Falls crossings. At the proposed point of crossing, the Susquehanna River is underlain by bedrock of the Baltimore Gabbro, a massive igneous and metamorphic complex. The subject section contains slightly more relief (ranging upward to more than 1,000 feet of elevation), while the Lowlands Section contains less relief (elevations of less than approximately 500 feet). The Uplands Section is characterized by folded and faulted crystalline igneous and metamorphic bedrock, including schist, gneiss, gabbro and quartzite.

Therefore, the geotechnical investigation described above would be used in design for such factors such as final rock strength and fracture properties (for areas where blasting for Pipeline construction may be needed), anticipated drill penetration rate and drilling mud program design (for HDD crossings), and confirmation of general depths to bedrock.

As appropriate, AES will develop a limited environmental monitoring, sampling and analytical component to the geotechnical investigation program to assist in evaluating the potential for encountering contaminated groundwater during construction in the Project Area.

If unanticipated contaminated groundwater or soils are encountered during investigation or construction activities, AES will notify the affected landowner and cooperate with appropriate local, state and federal agencies with respect to the management and/or disposal of contaminated media. For areas of known or suspected contamination, AES will coordinate with the appropriate agencies prior to soil or sediment removal. Additional details regarding soil contamination are discussed in Resource Report 8, *Land Use, Recreation and Aesthetics*, and a more detailed discussion of sediment quality in the Project Area is presented below in Section 2.4.3.

AES will develop a Project-specific Spill Prevention, Countermeasures and Control (SPCC) Plan that will describe the measures to be implemented to avoid or minimize the potential for significant leaks or spills of petroleum products or other hazardous materials that may occur in the Project Area. The SPCC Plan, which will be based on the requirements outlined in Appendix 2C of this Resource Report, is intended to prevent adverse impacts to groundwater and surface water resources in the Project Area. Specific measures for minimizing and mitigating potential impacts to groundwater will include the following:

- Trench breakers. These devices are intended to slow the flow of groundwater along the Pipeline trench to prevent soil piping and erosion of the trench alignment. Trench breakers will be constructed (at intervals specified on route alignment sheets and in Resource Report 1, *General Project Description*) of materials such as sand bags or polyurethane foam.

- Trench de-watering. Sediment filtering bags will be used to prevent downstream sedimentation effects on surface water or groundwater supplies whenever water is pumped from the Pipeline trench to dewater temporarily for construction purposes. Sediment filter bags, when implemented and maintained properly, prevent the discharge of heavily silt-laden water by trapping particles larger than 150 microns. Filter bags will be positioned in well-vegetated upland areas, which will provide additional filtration upon discharge. The filter bags will be changed when they become half full. The pumping rate through the filter bags shall be no greater than 750 gpm or one-half the maximum specified by the manufacturer, whichever is less. It has been the experience of consultants and contractors employed by AES that filter bags have been a successful means of controlling the discharge of silt-laden waters. If the water being discharged from the filter bag appears "milky" or excessively cloudy, then corrals will be positioned at least 25 feet from any waterbody and closely monitored to ensure proper function to prevent excessively turbid water from entering a waterbody.

- Restricted storage and use of hazardous materials. Refueling and storage of hazardous substances will be prohibited within 200 feet of private wells and 400 feet of municipal wells. Stream buffer areas will be maintained at all times. The buffer area is that area 50 feet from the edge of water on both sides of the stream. Activities such as stacking cut logs, burning cleared brush, discharging water from trenches, welding pipe sections (to the extent feasible), refueling and maintaining equipment will be done outside of buffer areas. These areas will also be seeded and mulched after pipeline installation in accordance with the Environmental Construction Plan (ECP) included as Appendix 2A. Construction equipment will not be parked or stored in the buffer area. No fuel storage, fuel transfer, oil change or hydraulic fluid additions will occur within 100 feet of any waterway or wetland.

- Storm Water Management. AES's contractors will prepare and adhere to a Project Stormwater Pollution Prevention Plan in compliance with the EPA's Storm Water Program General Permit requirements.

- Environmental Inspection. Environmental inspections will be performed by an Environmental Inspector retained by AES (one per spread). Additionally, AES will participate in a Third-Party Environmental Compliance Monitoring Program managed by the Commission and cooperating agencies. If needed, one Third-Party Environmental Monitor per spread as a joint agency representative will also be involved in the environmental inspections. It will be the responsibility of these inspectors to ensure protective measures are in place to protect groundwater resources.

The measures indicated above are discussed further in the AES Sparrows Point Project Environmental Construction Plans (ECP) included in Appendix 2A.

Areas of potential shallow (or outcropping) bedrock have been identified along the Project Area (as discussed in Resource Report 6, *Geological Resources*) and may require the use of controlled blasting or other rock removal techniques. Prior to initiation of construction in these areas, an evaluation of alternative rock excavation techniques (such as non-explosive demolition agents, ripping and cutting, and/or hydraulic hoe ramming) will be undertaken to determine if these methods are practicable (in order to avoid blasting, if feasible). Potential impacts to wells or water supplies will be avoided or minimized by routing away from identified resources. Development of a Blasting Plan for the Project is presented in Resource Report 6, *Geological Resources*.

All drinking water wells within 150 feet of the CROW, as shown in Table 2.3-1, will be monitored. Monitoring of drinking water well yields and water quality will be conducted on a pre-construction basis to establish pre-construction conditions. Un-filtered water samples will be collected and analyzed at a laboratory for water quality parameters including: coliform bacteria, nitrate, pH, total dissolved solids (TDS), sulfate, iron, manganese, lead, hardness, barium, and strontium. Well yield shall be established by interview with the homeowner and confirmation that water will run for at least 20 minutes. Following construction, the tests will be repeated to determine if any impacts to the well have occurred. Impacts will be defined as greater than a 10 percent deviation from the pre-construction well yield and quality tests, or any changes to water quality that result in non-conformance with local drinking water criteria established by the Board of Health. If it is appropriately determined that any private water supply is damaged as a result of the Project, AES will arrange for a temporary source of potable water until the water quality and/or well yield is restored. AES will ensure the restoration of water quality, which may include measures such as redevelopment of the well up to and including re-drilling of the affected well.

2.4 Surface Water Resources

An assessment of surface water resources was conducted for the Project Area through field reconnaissance and review of available maps and reference materials. Referenced materials include USGS Topographic Maps, the MDE surface waters database, and the PDEP eMapPA v.4.0 web-based mapping application. This technical information was used in conjunction with field data to identify and characterize the surface waterbodies summarized on Table 2.4-1. Each named waterbody that is crossed by the Project is labeled and identified on the Alignment Sheets, Appendix 1A to Resource Report 1, *General Project Description.*

2.4.1 Waterbody Crossings

The 177 waterbodies identified during field reconnaissance, including perennial, intermittent and ephemeral streams, will be crossed during construction using one of the crossing methods described below. The selected method will provide the least disturbance and most expedient crossing to minimize overall impact. The crossing methods below are further described in Appendix 2B-1 and Best Management Practice (BMP) Drawings. The ECP and BMPs were developed by AES based on the FERC's requirements in the Wetland and Waterbody Construction and Mitigation Procedures (January 17, 2003). Crossing methods for each of the waterbodies are indicated on Table 2.4-1 and crossing plans for select crossing locations are included in Appendix 2B-2. The Pipeline Route will include two major waterbody crossings -- the Susquehanna River and the Back River -- each of which is described in more detail below.

- Horizontal Directional Drilling. For this type of crossing, a specialized drill rig is used to advance a shallow-angled borehole below the stream to be crossed and, using a telemetry guidance system, the borehole is "steered" beneath the stream and then back to the ground surface. The hole is then reamed to a size adequate for the pipe to pass through, and the pipeline is then pulled back through the borehole. This method provides the maximum protection to surface waterbodies. AES is currently evaluating the use of the HDD method at five locations, as described in Section 2.4.4.1

- In areas requiring additional geologic data for construction design, including HDD crossings, geotechnical studies will be completed prior to construction. The results of these investigations will be filed with FERC when available. Following these investigations, AES will develop specific details regarding HDD crossings, including entry and exit pit locations and size, site-specific plans (to scale) with areas of disturbance, and contingency mitigation measures to contain and clean up inadvertent release of drilling mud (in the unlikely event that an inadvertent release of drilling mud occurs).

- Conventional Bore. A conventional bored crossing requires the excavation of bore pits on each side of the stream being crossed. Drilling equipment is used to install a horizontal borehole from one bore pit to the other. The pipe is then pulled through the borehole. For a general description of the conventional bore crossing method see BMP Drawing Number 14. This method is commonly used where open cut trenching is impractical or undesirable. Use of a bored crossing should not be time-restricted because it involves no work within or impact to the streambed or stream banks. In the event that a bored crossing along the primary route described in this filing is determined to be infeasible, AES may select an alternative crossing technique. AES will make this determination following completion of the geotechnical investigations.

- Dam & Pump Crossing Method. This method may be used in situations where pumps are able to adequately transfer water around the work area and there are no concerns about sensitive species passage. The dam and pump crossing method ensures stream flow is maintained. Potential water quality impacts are minimized or avoided by screening pump intakes and preventing streambed scour at the pump discharge by utilizing an energy dissipater (see BMP Drawing Number 17, Appendix 2B).

- Flume Stream Crossing Method. This method requires installation of a flume pipe to convey water across the trench and a diversion structure to funnel water into the flume pipe(s). The flume crossing method ensures stream flow is maintained. This method may be used in situations where there are concerns about sensitive species passage. Water quality impacts are minimized because trench spoil does not come into contact with stream water and therefore stream sediment is not mobilized (see BMP Drawing Number 16, Appendix 2B).

- Dry Non-Specified Crossing. This crossing method designation means that either dam and pump crossing method or the flume crossing method will be utilized, and the selection will be determined in the field at the time of crossing by the contractor and AES's environmental inspector.

- Multi-Flume Method. This crossing method may be implemented where stream flow is too high to be accommodated by a single flume. Similar to the flume crossing method, in which a single flume pipe is installed to convey water across the trench, the multi-flume crossing method utilizes several flumes in areas of high flow. Water quality impacts are minimized by limiting trench spoil contact with stream water. All in-stream pipe fabrication is completed prior to stream ditching to minimize duration of stream diversion. In-stream pipe is installed at least five feet below the designed drain bottom.

AES intends, to the extent reasonably practicable, to perform stream crossings during the dry season to minimize or avoid impacts to the stream. Weather forecasts will be factored into scheduling work for individual crossings. Based on the characteristics of the waterbodies, it is anticipated that the majority of the minor (10 feet or less from waters edge to waters edge) and intermittent streams identified in Table 2.4.1 may be dry (no flow) at the time of crossing. Crossing of intermittent streams during no flow situations will be conducted using an open cut method. Provisions will be made to use a dry crossing if conditions change during construction.

Under conditions of stream flow, dry non-specified methods would be implemented at the contractor's discretion, and with the approval of AES's environmental inspector (unless otherwise specified in Table 2.4-1), and would be scaled accordingly to prevent interruption of stream flow and maintain water quality. In the event that water is encountered below the dry stream bed, trench dewatering will be performed in accordance with the ECP, which requires the use of sediment filtering bags (see BMP Drawing Number 20) whenever water is pumped from the pipeline trench.

Restoration activities associated with all stream crossings will be performed after completion of Pipeline installation in accordance with the ECP, Appendix 2A. Channel stability is not perceived as a construction or restoration problem at any of the surface crossing locations observed to date. During clearing operations, vegetative strips will be maintained along the bank of the waterbody as shown in BMPs 21 and 22. Trees will be cut flush with the surface, but no stumps or roots will be removed. The length of actual, temporary bank disturbance will be limited to the width of excavation necessary to place fabricated pipe in the crossing (typically less than 10 feet). Native stone will be used to the extent possible during stream crossing restoration and stabilization. During the operational phase, native plant species, with the exception of deep rooting trees, will be allowed to reestablish along the banks of the waterbody. The bank conditions will be inspected twice annually during the operational phase of the Project. AES will address any evidence of bank instability caused by Pipeline construction or that poses a threat to the Pipeline in accordance with the ECP, Appendix 2A.

2.4.1.1 Horizontal Directional Drills

AES has evaluated selected critical waterbodies for crossing using the HDD method, consistent with the request by National Marine Fisheries Service (NMFS), including:

- Back River
- Gunpowder Falls
- Deer Creek

- Susquehanna River
- Octorara River

Currently, AES has determined that the use of HDD to cross the Back River and Susquehanna River will avoid or minimize potential adverse impacts to those waterbodies. Detailed crossing plans and contingent measures for each of the proposed HDD waterbody crossings are included in Appendix 2E. The Gunpowder Falls, Deer Creek and Octoraro River crossings can be performed utilizing other techniques, as described above in Section 2.4.1., while still ensuring that protective environmental impacts have been avoided or minimized. In case of the Back River and Susquehanna River, use of the HDD method provides potential advantages to crossing the waterbodies for the following reasons:

- It is the method most likely to have no impact on water quality or flow during construction.
- It offers the maximum depth of cover under obstacles thereby offering greater protection over the Pipeline than other typical crossing methods.
- It does not disturb surface features (vegetation, stream banks, etc.) during or after construction.

The method can have other off-setting impacts at the construction area around the feature being crossed. However, these off-setting impacts are typically temporary. Greater area required for set-up and operations at both ends of the drill hole, round-the-clock operation of the drill rig during construction of the crossing and associated noise, and the potential for frac-out of the drilling fluid. During HDD operations, fluid pressures can build up within the borehole, potentially resulting in hydraulic fracturing and subsequent migration of drilling fluids to the surface defined as "frac-out." The two primary factors that affect hydraulic fracturing in soil are borehole pressure and depth of cover. When the pressure in the borehole exceeds the strength of the surrounding strata, a potential frac-out condition occurs. AES will consider these factors as part of its ongoing evaluation of the use of HDD to complete certain waterbody crossings, as compared to the use of other conventional crossing methods.

Where the pipeline will be installed by HDD, prior to design of the plan and profile drawings and the start of construction, soil core samples will be taken on both sides of the crossing to evaluate rock, sand, or soil conditions. Following the analysis of the subsurface conditions, the drill site will be surveyed to determine and stake the drilling entrance and exit points. A drill plan and profile drawing will then be generated to accurately define the operation. The profile drawing will establish the entrance and exit angles, the maximum depth of the pipe, the minimum radius of curvature to avoid overstressing the pipe, and the length of the pull.

Typically, the drilling rig spread will be located on one bank and the pipe fabrication and pullback spread will be located on the other bank. The contractor will provide Bentonite clay mixed with water for the drilling fluid, and will mobilize the drilling equipment, erect the drilling rig, drill the hole, ream the hole as necessary, and pullback the pre-fabricated pipe section in the proposed horizontal drilled crossing. As the drilling operation progresses, the contractor will continuously plot the actual profile of the Pipeline against the proposed Pipeline profile to ensure cover requirements and target exit points will be achieved.

During the drilling, reaming, and pullback process, the contractor will maintain control of the drilling mud to make sure that no drilling mud enters the waterbody, any tributaries, or stream beds. The contractor will provide all on-site materials and equipment required to contain and clean up drilling mud releases, and will have full time qualified personnel on-site to clean up any accidental releases of drilling mud. In the unlikely event of an accidental release of drilling mud, the following steps will be taken to ensure that environmental impact due to result from the cleanup process:

- All work will stop and the drilling mud will be contained at its source if possible.
- Migration into any waterway will be prevented.
- The proper authorities will be notified.
- Drilling mud reaching the surface will be cleaned up immediately to ensure it will not runoff into the river, waterway, or ditches. Silt fencing will be used to prevent silt from escaping into low drainage areas.
- Drilling mud will be disposed of in a manner preventing reentry into the cleanup area.

The drill rig side will typically require a workspace of approximately 150 feet by 150 feet and will contain the following equipment:

- Drilling rig unit;
- Power generation unit;
- Drilling pipe storage;
- Water pump and water piping;
- Bentonite storage;
- Slurry mixing tank;
- Slurry pump;
- Drill cuttings separation equipment;
- Entry point slurry containment pit;
- Cuttings settlement pit; and
- Offices and storage.

Typically, a workspace of approximately 150 feet by 150 feet is necessary at the exit point for the equipment listed below:

- Cuttings settlement pit;
- Exit point slurry containment pit;
- Drill pipe storage; and
- Miscellaneous equipment and storage.

An additional workspace of 50 feet wide by the length of the HDD pipe section is required for the pipe sections and pipe rollers.

AES has developed a site specific HDD Contingency Plan that includes the design of each HDD, including size and location of staging areas for the entry and exit pits, procedures to control the inadvertent release of drilling mud, procedures for the clean-up of any inadvertent releases, notification requirements, a description of how abandoned holes would be sealed, and contingency crossing techniques, if necessary. The HDD Contingency Plan is included as Appendix 2E.

2.4.2 Offshore Water Resources

The Baltimore Harbor watershed is located to the east of Baltimore City, and includes numerous small tributaries to the north side of the Patapsco River. The tributaries drain to tidal estuaries. The watershed is entirely within the Coastal Plain, and streams tend to be short and tidally influenced. Many streams in the industrial areas of the Baltimore Harbor have been channelized, and the natural drainage pattern has been altered (e.g., cooling water for Bethlehem Steel is withdrawn from Jones Creek and discharged to Bear Creek). It is estimated that 60 percent of the freshwater in the Harbor originates from Patapsco River (MDE, 2000a) inputs. Smaller tributaries feeding the Harbor are the Gwynns Falls, Jones Creek, Bear Creek, and Curtis Creek.

The Baltimore Harbor estuary is highly developed, being mainly urban residential, commercial, and industrial. Land use in the large tributaries shifts from industrial/commercial to residential and eventually rural/agricultural in the headwaters. The largest wastewater treatment plant (WWTP) within the vicinity of the Project is Baltimore City-owned Patapsco WWTP, which discharges into the middle tidal region (MDE, 2000a).

All Maryland stream segments are categorized by sub-basin and are given a "designated use" in the Code of Maryland Regulations (COMAR) 26.08.02.08. Waters in the Baltimore County portion of Baltimore Harbor are designated as Use I: water contact recreation and aquatic life. The 1998 Clean Water Action Plan classified this watershed as "Priority" Category 1, a watershed not meeting clean water and other natural resource goals and therefore needing restoration. It is also classified as a Category 3, a pristine or sensitive watershed in need of protection. Failing indicators include high phosphorus and nitrogen loadings, poor submerged aquatic vegetation (SAV) abundance and habitat index, poor tidal benthic index of biotic integrity, poor non-tidal benthic index of biotic integrity (BIBI), poor non-tidal instream habitat index, high percent impervious surface (35 percent), high population density, and high percent unforested stream buffer (61 percent). Wetland loss was estimated to be 7,681 acres. Indicators for Category 3 include migratory fish spawning areas and designated Wildlands acres (within North Point State Park).

The Maryland 2004 Clean Water Act (CWA) Section 303(d) List contains basins and sub-basins that have measured water quality impairment. The general location of the impacted areas of Baltimore Harbor described below are shown on Figure 2.4-1. The basin/sub-basin name and type of impairment are as follows:

- Baltimore Harbor (tidal): poor biological community, nutrients, sediments, PCBs (in sediments).
- Furnace Creek (tidal in Anne Arundel County): fecal coliform.
- Bear Creek (tidal): chromium (in sediments), zinc (in sediments), PCBs (in sediments).
- Northwest Branch Inner Harbor (tidal): lead (in sediments), chromium (in sediments), zinc (in sediments), PCBs (in fish tissue).
- Curtis Creek (tidal): zinc (in sediments), PCBs (in sediments and fish tissue).
- Furnace Branch (tidal): PCBs (in fish tissue).
- Middle Harbor (tidal): zinc (in sediments), PCBs (in fish tissue).

The Baltimore Harbor is impaired by several constituents, including PCBs, chromium, zinc, lead, mercury, nickel, copper, cyanide and chlordane. According to the state report for the CWA Section 305(b) (2002), chlordane, PCBs, metal, low oxygen, and bacteria in the tidal waters were attributed to industrial and municipal discharges, non-point sources, poor tidal flushing, and unknown sources. In non-tidal waters, siltation resulted in some areas failing to meet all designated uses due to urban runoff, habitat alteration, and channelization. Fish consumption advisories were issued in 1986, and expanded in 2001, for chlordane, PCBs, and dieldrin.

A total maximum daily load (TMDL) was developed by MDE and approved by EPA on May 20, 2001 for chlordane in the Baltimore Harbor. Chlordane is a broad-spectrum pesticide that was used to control termites and other pests from the 1940s until 1988, at which point it was banned. Because chlordane is found in fish tissue of certain species (specifically, catfish and eel caught in the Harbor), MDE issued a fish consumption advisory for this waterway. Chlordane historically accumulated in the sediment of the tidal reaches. Because there are no current sources of chlordane, other than trace occasional amounts from urban runoff, there should be a slow decline in the concentration found in the fish tissue.

A water quality analysis for lead was completed by the MDE in September 2004 for the Inner Harbor/Northwest Branch and for zinc in the Inner Harbor/Northeast Branch and Bear Creek. While sediment toxicity was found in these waters, no water quality impairment due to zinc or lead was found. Additionally, a water quality analysis for chromium was completed for the Inner Harbor/Northwest Branch and Bear Creek. No water quality impairment due to chromium was found.

2.4.3 Contaminated Sediments

2.4.3.1 Summary of Regional Sediment and Water Quality Setting

AES reviewed information from the various federal, state and local environmental databases using the electronic database service First Search. Maryland has listed Baltimore Harbor and the Patapsco River as "impaired," because of excess contaminants, sediments or nutrients, or all three. In spring of 2002, researchers from the University of Maryland Center for Environmental Science (UMCES) analyzed sediment samples from locations throughout Baltimore Harbor, and used the data to create a map of contaminant locations and concentrations. Below is a summary of identified chemical hotspots, including concentrations of various organic compounds and heavy metals. This study also found throughout the Harbor persistent levels of chlordane. The organic and heavy metal compounds detected in the UMCES analysis include:

- PCBs and poly aromatic hydrocarbons (PAHs) appeared in high concentrations in the Inner Harbor, which is reported to reflect the influence of stormwater runoff carried to the Harbor from Jones Falls. PAHs were reported in the references as elevated in sediment on the southern shore of Sparrows Point, and in Bear Creek sediments, probably due to heavy industry in these areas. PCB concentrations were reported as elevated in Bear Creek and Curtis Creek, relative to other sites along the Patapsco River.
- Zinc and chromium were reported as elevated in Bear Creek and at several sites in Northwest Branch.
- Nickel exhibited high values at 70 percent of the sites sampled across the area.
- Mercury was reported as highest at the entrance to the Inner Harbor, likely due to stormwater runoff; high concentrations also occurred in Curtis Creek, Bear Creek, and Back River.
- Copper was highest in Northwest Branch and Curtis Creek.

Water flow in the Sparrows Point area is primarily influenced by Patapsco River input from the west and Bear Creek input from the north. The confluence of the two waterbodies is located north and west of the Terminal Site, and the combined surface water flow generally carries surface water and entrained sediment into and past the western shores of Sparrows Point. In addition, a low tidal range (approximately $\pm$ two feet) introduces some flux contrary to the river/creek flows (i.e., incoming tide will somewhat offset outgoing river and/or creek flow). Thus, inputs of compounds of concern from urban sources will, in general, flow toward the main portions of the Chesapeake Bay. The chemical nature of different compounds of concern, and geochemical interactions as they affect environmental migration within the system, are further described below.

The Baltimore Harbor system, including the Patapsco River estuary, is surrounded by the Baltimore metropolitan region. During the past several years, extensive studies have been conducted of the levels of metals, mercury and organic contaminants in Baltimore Harbor sediments (Ashley and Baker, 1999; McGee et al.; 1999; Mason and Lawrence; 1999) and surface waters (Bamford et al.; 1999).[2] These studies showed large spatial gradients in contaminant levels in the sediments due to relatively poor mixing that resulted in "hot spots" near storm water outfalls and industrial areas. For example, elevated levels of PAHs and metals were indicated to be found around Sparrow's Point, which historically has been the site of intensive coal coking and steel production. (CERP, 2002)

Organochlorine compounds, including PCBs, were shown to be at elevated levels adjacent to Harbor storm water outfalls. Forty percent of the sites characterized within the Baltimore Harbor have PCB levels that exceed the "effects range-medium" value of Long, et al. (1995). Survival of the estuarine amphipod *Leptocheirus plumulosus* was reduced in seven of twenty-five Baltimore Harbor sediment sites studied by McGee et al. (1999). Further, the reported toxicity of sediment at monitoring stations in Bear and Colgate Creeks was determined to potentially have been due to sediment-associated metals, while sediment toxicity in the Inner Harbor was likely due to both metals and organic contaminants (PAHs).

A number of trace element contaminants were reported as present in Chesapeake Bay sediments at concentrations that can potentially have harmful effects (Eskin et al. 1996). Trace element contaminants can be categorized into different groups depending on their chemical and toxicological behavior.

In the September 1993 Toxics Reduction Strategy Reevaluation Directive, the Chesapeake Executive Council designated Baltimore Harbor, the Anacostia River, and the Elizabeth River as Chesapeake Bay Regions of Concern (areas with known chemical contaminant-related impacts). These Regions of Concern are focal points for multi-agency cooperative efforts in specific toxic assessments, reduction and prevention within the tidal waters of the Chesapeake Bay. In the Chesapeake Bay Regions of Concern, hydrocarbons, including PAHs, are the most likely organic chemicals causing ambient toxicity, while the persistent organochlorines (e.g., PCBs) are most likely of concern in bio-magnification. The report summarized that, although a myriad of organic chemicals are produced and released to the Chesapeake Bay region, including Baltimore Harbor, only those with sufficient persistence and particle-reactivity will accumulate in sediments. These organic chemicals may be classified by source or by their potential effects. Many organic chemicals found in Chesapeake Bay sediments are inadvertently produced through the combustion of carbon-containing fuels such as wood, coal and diesel (PAHs) and the incineration of industrial, medical, and municipal wastes (chlorinated dioxins and furans). Others are industrial and agricultural chemicals that enter the environment during manufacturing and shipping, through improper disposal practices, or through agricultural runoff (e.g., chlordane in Baltimore Harbor).

2.4.3.2 Sparrows Point Project Sediment Sampling and Results

In June 2006, AES collected sediment samples from a floating barge[3] using a vibracore sampler to extract sediment samples from three depths identified as "shallow" (0 to two feet below the sediment surface), "intermediate" (depths greater than two feet below the sediment surface but less than 10 feet), and "deep" (depths greater than 10 feet below the sediment surface and targeted at the projected 45-feet below sea level, the depth to which dredging would be conducted for the shipping channel and turning basin). Shallow and intermediate samples are representative of the sediment that would be removed

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[2] Other historical studies have been performed for the general areas surrounding the Terminal Site. Focus is given to the referenced studies due to the closer proximity in time and applicability of location as compared to those other studies. Site-specific testing, described in Section 2.4.3.2, was conducted by AES to confirm the results of the referenced studies.

[3] Samples were collected via Vibracore sampling methods to recover representative, undisturbed sub-bottom sediment samples. Samples were collected within new, clean lexan liners within the Vibracore sample tubes; upon recovery, the cores were examined by an experienced environmental geologist, sample logs generated (see Appendix J to Resource Report 13 for the logs), and samples were selected from the appropriate sample intervals and contained in new, clean, laboratory-supplied sample jars. Samples were transported under chain-of-custody procedures to the Maryland-certified environmental laboratory for analysis using EPA analytical procedures appropriate to the analytes of interest.

during the course of the proposed channel dredging, and deep samples are representative of the channel and sediment surface that would be exposed to the benthic environment after the completion of dredging operations.

Locations of the vibracore drilling and sampling are shown on Figure 2.4-2. During the sampling event, 15 locations were cored, and 16 sediment samples were collected for off-site laboratory analysis, nine shallow, three intermediate, and four deep. Locations and depths of sample collections were selected to provide overall sediment quality information for the area potentially subject to dredging due to the fact that the proposed area of the shipping channel and turning basin was still under evaluation and subject to change at the time of vibracore sampling. This potential for change is indicated by the former shipping channel and turning basin alignment submitted to the FERC in filings in March and May 2006, relative to an updated channel and turning basin submitted in a Draft Resource Report 1, *General Project Description*, on August 18, 2006. Both the current and former channel and turning basin configuration are shown on Figure 2.4-2.

AES will file its application to the United State Army Corps of Engineers (COE) for approval of dredge operations concurrently with this formal application to the FERC in January 2007. The application will be based on the existing data collected by others in the proposed dredge area and data collected specifically for the Project by contractors retained by AES. Based on the COE review of the permit application, if it is determined that additional sampling of dredge material is required for specific disposal alternatives, then the COE will be consulted at that time regarding the additional requirements for disposal of the dredge spoil.

Each sample was submitted under an intact chain of custody to an on shore laboratory, Caliber Analytical Services located in Towson, Maryland, for the analysis of organic and inorganic parameters in accordance with EPA promulgated methods. VOCs were determined using EPA Method 8260B, semi-VOC concentrations were determined using EPA Method 8270C, and chlorinated pesticides and PCBs were determined using EPA Method 8081A. Inorganic parameters including the priority pollutant metals and total cyanide which were analyzed in accordance with EPA Methods 6020A and 9012 respectively. Additional parameters of analysis included tributyl tin by VIMS Method 338, Total Organic Carbon (TOC) by ASTM Method D5373, and hexavalent chromium (Cr^{6+}) by EPA Method 7196A. Tributyl tin and hexavalent chromium, while not required analytes by COE Guidance for dredge material characterization, were analyzed based on community input received relative to sediment quality and industrial practices in the area.

Table 2.4-2a presents a summary of the laboratory results for the shallow, intermediate, and deep samples. Results are also shown in a series of three figures attached, Figure 2.4-2a, Figure 2.4-2b, and Figure 2.4-2c for the shallow, intermediate, and deep samples respectively. In summary:

- Neither pesticides nor PCBs were detected in any of the sediment samples collected.
- PAHs (included with the semi-volatile analyses) were detected in each of the sediment samples collected from the shallow and intermediate sampling depths; however, PAHs were generally not detected in the deep samples. The concentrations detected tended to be in the part-per-billion (PPB) to part-per-million (PPM) range, consistent with data from this same area associated with past dredge sampling, and consistent with other areas in the Port of Baltimore area (see further discussion on this below).
- Elevated levels of several metals were detected in the shallow and intermediate samples collected (see Table 2.4-2a). Generally, consistent with the PAH trend above, the concentrations of detected metals dropped with depth of sample (i.e., shallow and intermediate results were higher than deep results). The concentrations of metals detected tended to be in the PPM range, again consistent with area data associated with past dredge sampling and agency investigations of the Port of Baltimore (see further discussion on this below).
- Analyses conducted for dioxins are contained in Table 2.4-2b. Concentrations detected were all low, in the part-per-trillion (PPT) range, and are consistent with values

reported in literature for the Baltimore and Chesapeake Bay area, and believed to be a result of atmospheric deposition (Derrick, et. al., 2001; Van den Burg, et al, 2005). The data have been listed by individual compound; however, aggregate toxicity is represented by calculating a single value for all dioxins combined in terms of the most toxic dioxin congener 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). Based on this comparison, no samples exceed the apparent effects threshold (AET) included in the NOAA Screening Quick Reference Table (SQUIRT – see Buchman, 1999), the threshold where effects on marine biological organisms may be expected, with the exception of one sample in vibracore boring HA-114 (see Figure 2.4-2 for location). As shown on Figure 2.4-2, this sample was taken from an area no longer subject to potential dredging due to relocation of the planned approach channel and turning basin.

Overall, these data indicate that the removal of the shallow and some of the intermediate sediment during dredging operations should improve the conditions in the areas tested and to be dredged.

The sampling results obtained by AES were compared with NOAA screening values for chemical compounds in sediment that may result in an observable toxicity effect on marine biota. On Figures 2.4-2a, 2.4-2b and 2.4-2c, the samples with detectable compounds are presented relative to Marine Sediment Guidelines from the NOAA Quick Reference Tables ("SQUIRT") values, see reference for Buchman 1999). If a compound was both detected and exceeded a SQUIRT guideline, it is shown relative to its associated vibracore boring location. Note that PCBs were analyzed using EPA Method 8081A, appropriate for evaluation of PCB content for innovative recycling treatment and disposal methods. Because the material will be dredged and removed from the marine setting, ultra-low PCB detection limits that may otherwise be used for comparison to SQUIRT criteria were not used. MDNR was consulted regarding the test methods performed. MDNR concurred that test method 8081A was an appropriate method for the evaluation of recycling the dredged material. MDNR indicated that a low-detection limit, congener-specific method would be needed for PCB toxicity evaluation. If deemed necessary by COE guidance documents or regulations for the final dredged depth, AES will perform additional sampling and lower detection limit analysis of the newly dredged bottom elevation for PCB toxicity evaluation.

As shown in Table 2.4-2a the primary detected compounds are PAHs and metals – these results are shown by location and comparison to the NOAA Screening values on Figures 2.4-2a, 2.4-2b and 2.4-2c. By comparing the detected compounds for those that exceed the SQUIRT values, it is evident that both the concentration and number of PAH and metals detections diminish to a point of no SQUIRT exceedances in the deep sediments for PAH compounds, and only slight exceedances for nickel (at two locations) and arsenic (at one location) – see Figure 2.4-2c.

An analysis was performed of the sampling results obtained from the June 2006 sampling event that compared those results with results from three other studies conducted in the general vicinity offshore of the Terminal Site and Baltimore Harbor area. The other studies included:

- Baltimore Harbor Anchorages and Channels, Maryland and Virginia. Integrated Feasibility Report and Environmental Impact Statement. U.S. Army Corps of Engineers, Baltimore District. March 1997 (COE 1997).
- Registered Toxic Study. Chemical and Physical Analysis of Sediments from the Marine Channel and Associated Berths and Turning Basin. EA Engineering, Science, and Technology, Inc. February 1985.
- Registered Toxic Study. Spatial Mapping of Sedimentary Contaminants in the Baltimore Harbor/Patapsco River/Back River System. Maryland Department of the Environment. August 1997.

A summary of the June 2006 vibracore results (average concentrations for shallow, intermediate and deep samples) is provided, along with a similar summary of averaged analytical data from these three listed studies, on Table 2.4-2c. Based on upon this comparative analysis, the following was observed:

- PAH concentrations detected in the June 2006 vibracore samples tended to be higher than those reported for Baltimore Harbor Anchorages and Channels (COE, 1997), but consistent with or lower for several PAH compound concentrations documented in the MDE Baltimore Harbor/Patapsco River/Back River study (COE 1997), and the sampling performed for the Sparrows Point Marine Channel (EA Engineering Science, 1985). The individual PAH compounds that were higher in the June 2006 vibracore samples than the comparison studies included the compounds Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Bis(2-ethylhexl)phthalate and Pyrene. In addition, these comparison values are skewed by the highest sample values from the shallow and intermediate sample locations associated with the former turning basin and pier arrangement (samples HA-111, HA-114 - see Figure 2.4-2), which will not be subject to dredging under the updated channel and turning basin configuration. With sample HA-111 removed from the shallow average calculation, four PAH constituents increase by 5 to 10 percent, while the remaining twelve PAH constituent concentrations decrease from two to 39 percent. The removal of sample HA-114 from the intermediate sample average results in decreases in all PAH concentrations ranging from 82 to 100 percent.

- Metals detected in the June 2006 vibracore samples show values consistent with the reference studies (see Table 2.4-2c).

In summary, the data show that the highest concentrations of chemical constituents, primarily semi-volatile PAHs and heavy metals, are found in the shallow, fine-grained sediments with high organic carbon content that accumulate in low-energy depositional areas that tend to be close to the shore. These are the areas of samples HA-111 and HA-114, which are outside of the current shipping channel/turning basin area to be dredged. Constituent concentrations generally decrease with depth at all locations, and decrease with distance from shore. The depth range of sediments with elevated constituent concentrations also appears to thin further away from the shore, consistent with net import and deposition of fine-grained sediments close to the shore, rather than net scour and export of these sediments.

Comparison of the June 2006 vibracore constituent concentrations and ranges of positive detections (Table 2.4-2a) with concentration averages in the historical data (Table 2.4-2c) show concentrations of detected chemical constituents in shallow sediments within the proposed Project Area are generally similar to concentrations in sediments within other portions of the Baltimore Harbor/Patapsco River/Back River system. The locations of the historic vibracore and sediment samples are shown on Figure 2.4-3. Deeper sediments within the area proposed to be dredged, which would account for the majority of the total volume proposed to be dredged, contain much lower concentrations of these constituents compared to the historical data, ranging to undetectable levels.

Careful consideration of practicable and permittable disposal options for the dredged material is warranted based on anticipated volumes and sampling results. The chemical characterization data include the range of constituents and types of methods prescribed by the COE and the EPA for evaluating dredged material for disposal at permitted areas (e.g., Authorized Ocean Dredge Material Disposal Site).

Evaluation for ocean disposal involves a tiered sequence of chemical characterization of bulk sediment, sediment elutriate, and potentially toxicity and bioaccumulation testing, performed in accordance with regional implementation requirements that are generally consistent with the Evaluation of Dredged Material Proposed for Ocean Disposal Testing Manual (EPA and COE, 1991). Under procedures described therein, sediments are characterized chemically from which bulk chemical data may be used to predict water quality under conservative assumptions, that is, assuming that chemical constituents in sediments are released to the water column during disposal. The next tier in sediment evaluation involves generating elutriate from bulk sediments, and directly measuring constituent concentrations in the elutriate water, more realistically reflecting conditions in the water column following disposal.

Elutriate data collected were generated for four sets of sediment composites (results reported in Table 2.4-2d). When compared against both acute and chronic marine water quality criteria, the elutriate data indicate that the majority of sediments to be dredged from the channel and proposed turning basin are likely suitable for ocean disposal. In Table 2.4-2d, no compounds exceeded comparison criteria with the exception of concentrations for lead (8.6 μg/L) and nickel (8.9 μg/L), which slightly exceeded their respective chronic criteria (5.6 μg/L for lead and 8.3 μg/L for nickel) in the elutriate generated from one composite of shallow sediments from the three stations closest to the existing shipyard (HA-101, HA-105, HA-114). This result suggests that the sediments with the most elevated constituent concentrations from the sediments evaluated thus far would warrant further testing before suitability for ocean disposal could be determined. However, it should be noted that the location of stations HA-101, HA-105, and HA-114 is outside the current alignment of sediments that need to be removed for the shipping channel and turning basin. Notwithstanding, as has been proposed in its filings, AES will manage those sediments with relatively elevated concentrations of detected compounds, i.e., the relatively small proportion of shallow and potentially some or all of the intermediate sediments, to minimize potential risk to human health and the environment, and in a manner consistent with the beneficial recycling/innovative re-use goals of the Port of Baltimore.

Further evaluation and exploration of sediment management/disposal options may be warranted for what appears to be two distinct categories of sediments to be dredged as part of the LNG Terminal construction: shallow sediments containing PAHs and metals, and the generally uncontaminated underlying sediments. As indicated above, when the COE reviews the permit application, if it is determined that additional sampling of dredge material is required for specific disposal alternatives, then the COE will be consulted at that time regarding the additional requirements for disposal of the dredge spoil.

2.4.4 Public Watershed Areas

Watershed areas were determined from data provided by EPA, MDNR and Pennsylvania Watersheds Data System. Based on this data, the Project is located within the Chesapeake Bay Watershed. A large watershed like the Chesapeake Bay Watershed is composed of numerous sub-watersheds that are drained by tributary streams and rivers. The Project is located within the following sub-watersheds, as shown on Figure 2.4-4:

- Pennsylvania
  - Susquehanna River Basin Watershed
    - Lower Susquehanna Basin (HUC 02030506)
  - Delaware River Watershed
    - Schuylkill Basin (HUC 02040203)
    - Brandywine-Christina Basin (HUC 02040205)
    - Chester-Sassafras Basin (HUC 02060002)
- Maryland
  - Chesapeake Bay Watershed
    - Lower Susquehanna Basin (HUC 02030506)
    - Gunpowder-Patapsco Basin (HUC 02060003)

Each of these watersheds is further described below.

2.4.4.1 Susquehanna Watershed

The Susquehanna River drains about 27,000 square miles of New York, Pennsylvania, and Maryland. The study unit, however, consists of 9,200 square miles in the lower Susquehanna River basin from Sunbury, Pennsylvania, downstream to the Chesapeake Bay at Havre de Grace, Maryland.

Three physiographic provinces are included in the lower basin: the Valley and Ridge, Piedmont Plateau, and Blue Ridge. The Valley and Ridge physiographic province is underlain by folded and faulted rocks, which are a sequence of alternating shale, sandstone, and limestone of Paleozoic age that forms steep mountains and ridges separated by valleys. The Piedmont Plateau physiographic province consists of uplands and lowlands; the uplands are underlain by crystalline rocks and the lowlands by limestone, sandstone, and shale. The Piedmont Plateau physiographic province generally has terrain that is gently rolling to hilly. Only a small part of the Blue Ridge physiographic province, which is underlain by crystalline rocks, lies within the lower basin.

Major industries in the area include agriculture, steel and paper manufacturing, and food processing. Agriculture is the dominant land use in the Project Area. About 35 percent of the lower basin is used for that purpose. More than 50 percent of the basin is forested and about 15 percent is urban, residential, or other land uses.

The Susquehanna River flows through three consecutive reservoirs and dams in the lower basin--Safe Harbor, Holtwood, and Conowingo--before reaching the Chesapeake Bay.

Water use in the lower basin for public supply totaled about 200 million gpd in 1985. About 80 percent of this withdrawal is from surface water. The lower Susquehanna River supplies water for eight municipalities that withdraw a total of nearly 20 million gpd; 140 million gpd is withdrawn from various tributaries and reservoirs.

Aquifers in the lower Susquehanna River basin are in either carbonate rocks, crystalline rocks, or sequences of sandstone and shale. Groundwater from these aquifers supplied more than 180 million gpd[4] for public supply and for rural domestic, industrial, and agricultural uses. Major carbonate rock aquifers lie beneath some valleys of the Valley and Ridge physiographic province and the northernmost Piedmont Plateau province. Crystalline-rock aquifers are restricted to the southernmost parts of the lower basin within the Piedmont Plateau physiographic province of Pennsylvania and Maryland. Sandstone and shale aquifers predominate along valley margins and associated ridges in the northern and western parts of the Valley and Ridge physiographic province.

Major water-quality issues in the Susquehanna Watershed are related to:

- Nutrient and sediment loads from point and non-point sources and their effects on surface- and groundwater quality in the lower Susquehanna River basin and the Chesapeake Bay.
- Contamination of surface and groundwater by pesticides, which are used in agricultural and urban areas, and by other organic chemicals.
- Sedimentation and contamination of surface water by urban runoff and combined stormwater-sewer overflows.
- Acidic precipitation and its contribution to nitrogen and sulfur compounds and trace metals in the lower Susquehanna River basin.
- Effects of agricultural best-management practices on surface water and groundwater quality.

[4] Data value of 1985, the most recent reported with the state geologic survey information relative to these aquifers.

- Contamination of surface water and groundwater by acid mine drainage and industrial waste.
- Contamination of surface water and groundwater resources by radiochemicals from natural and manmade sources.
- The extent of and processes involved in groundwater contamination in limestone karst and in highly fractured rock aquifers.

2.4.4.2 Delaware River Watershed

The Delaware River drainage basin encompasses more than 12,700 square miles and includes parts of Pennsylvania (6,465 square miles), New Jersey (2,969 square miles), New York (2,363 square miles), and Delaware (968 square miles). The watershed area includes the entire drainage basin, except for 770 square miles of the Coastal Plain in the State of Delaware and the tidal portions of the Delaware Estuary. About 7.2 million people live within the watershed. An additional 7 million people in New York City and northern New Jersey rely on surface water diverted from the basin for their water supply.

The headwaters of the Delaware River are in the Catskill Mountains in the northern part of the basin. Upstream from Trenton, the river drains an area of 6,780 square miles and has an average yearly flow of 11,700 cubic feet per second (ft^3/s) (Durlin and Schaffstall, 1997). Downstream from Trenton, the river is tidally influenced, but is not saline until south of Philadelphia. The two major tributaries to the Delaware River are the Lehigh and Schuylkill Rivers. The Schuylkill River drains an area of 1,893 square miles, has an average yearly flow of about 2,720 ft^3/s, and discharges into the Delaware Estuary at Philadelphia. The Lehigh River drains an area of 1,359 square miles, has an average yearly flow of about 2,890 ft^3/s, and discharges into the Delaware River at Easton, Pennsylvania.

Several large reservoirs on the headwaters of the Delaware and Lehigh Rivers are used for water supply, power generation, flood control, flow augmentation, and recreation. Three reservoirs in the upper Delaware River Basin operated by the City of New York divert up to 800 million gpd out of the basin (Parker and others, 1964). Reservoirs are also used to augment flow in order to maintain an average daily flow of 1,750 ft^3/s at Montague, New Jersey, and to maintain sufficient flow at Trenton, New Jersey, to control salinity in the estuary. In the summer, reservoir releases can constitute more than 70 percent of the total flow in the upper Delaware River and 40 percent or more of the total flow at Trenton.

Parts of five physiographic provinces lie within the Delaware River Basin. These are the Coastal Plain, Piedmont Plateau, New England, Valley and Ridge, and Appalachian Plateaus. Topography varies from the relatively flat Coastal Plain, which consists of unconsolidated sediments, to rolling lowlands and a series of broad uplands in the Piedmont Plateau. North of the Piedmont Plateau province, the New England and the Valley and Ridge Provinces consist of rock layers that have been deformed into a series of steep ridges and parallel folds that trend northeast-southwest. The Appalachian Plateaus occupy the upper one-third of the basin and are characterized by rugged hills with intricately dissected plateaus and broad ridges. Altitude in the basin increases from sea level in the south to more than 4,000 feet in the north. During the last major glacial advance, the Appalachian Plateaus and parts of the Valley and Ridge and the New England Provinces were glaciated. North of the line of glaciation, valleys typically are underlain by thick layers of stratified drift and till.

On the basis of 1992 satellite-derived thematic mapper land-use data, it is estimated that about 60 percent of the Delaware River Basin is forested, 24 percent is agricultural, nine percent is urban and residential, and seven percent is surface-waterbodies and miscellaneous land uses. Eighty percent of the population within the Delaware River Basin lives in the Piedmont Plateau and Coastal Plain provinces, which cover only about 40 percent of the total area. Agricultural land covers almost 30 percent of the Coastal Plain and 35 percent of the Piedmont Plateau. Both areas have almost 20 percent urban land use. Most of the population and urban land use is found along the estuary, which separates the two provinces.

The Delaware River Basin Commission estimated that basinwide use of water for all purposes was about 7,337 million gpd in 1991. This is equivalent to the mean annual stream flow of the Delaware River at Trenton, New Jersey. Power generation accounts for the bulk of the water use (69 percent), followed by public-supply use and self-supplied-industrial use (15 percent each). Most of the water is returned to streams and aquifers within the basin, except for about 311 million gpd in consumptive uses within the basin and about 900 million gpd in diversions out of the basin to New York City and northeastern New Jersey. About 60 percent of consumptive water use within the basin is from surface-water sources and 40 percent is from groundwater sources.

Some of the major water-quality issues that are currently being addressed by water-resource managers in the Delaware River Basin include:

- Relation of land use to non-point sources of contaminants.
- Effects of natural settings on the distribution, fate, and effects of contaminants in water, sediment, and biota.
- Relations between stream flow and loadings of nutrients, contaminants, and pathogens.
- Effects of nutrients and habitat on algae and macrophytes in streams, lakes, and estuaries.
- Distribution of toxic substances, particularly PCBs, and trace elements in surface water, groundwater, and biota.
- Presence of human pathogens and pesticides in drinking-water supplies and recreational waters.
- Effect of dams, impoundments, and diversions on water quality, and on the health of fish and benthic invertebrate communities.
- Development of management strategies for protecting areas of existing high water quality.
- Effects of on-lot septic systems and reduced stream flow caused by groundwater withdrawals on water quality and ecological communities.
- Distribution of natural radioactivity in domestic groundwater supplies.
- Effects of groundwater/surface-water interactions on water quality.
- Effects of coal-mine discharges on water quality and ecological communities.

2.4.4.3 Chesapeake Bay Watershed

The Chesapeake Bay Basin encompasses 64,000 square miles of land and is the largest watershed on the eastern seaboard of North America. The Bay basin includes parts of six states (Maryland, Virginia, New York, Pennsylvania, West Virginia, and Delaware) and the District of Columbia. An estimated 94 percent of the land in Maryland drains to the Chesapeake Bay.

The Chesapeake Bay is one of the largest and most productive estuarine systems in the world. The Chesapeake Bay "main stem," defined by tidal zones, is approximately 195 miles long and 3.5 to 35 miles wide, and has a surface area of nearly 4,400 square miles. The main stem is entirely within Maryland and Virginia. Nearly 50 rivers, with thousands of tributary streams and creeks, drain the approximately 64,000 square miles forming the Chesapeake Bay Basin. The basin contains more than 150,000 stream miles in the District of Columbia and parts of six states: New York, Pennsylvania, Maryland, Virginia, West Virginia, and Delaware. Nine rivers, including the Susquehanna, Patuxent, Potomac, Rappahannock, York (consists of the Mattaponi and Pamunkey), James, Appomattox, and Choptank, contribute approximately 90 percent of the Bay's mean annual freshwater inflow of 69,800 ft^3/s (COE, 1977). The Susquehanna River, the largest river entering the Chesapeake Bay, drains nearly 43 percent of the 64,000-square mile basin and normally contributes about 50 percent of the freshwater reaching the Bay.

Maryland derives a significant economic benefit from the Chesapeake Bay, including income from the harvesting of fish and shellfish, commercial shipping and recreational boating.

The Chesapeake Bay has been degraded because of water-quality problems, loss of habitat, and over-harvesting of living resources. The Chesapeake Bay was listed by EPA as an impaired waterbody in 2000 under the CWA (Section 303(d) list) because of excess nutrients and sediment, and it must meet Federal regulatory water-quality standards by 2010. The Chesapeake Bay Program (CBP), a multi-agency partnership, completed Chesapeake 2000 (full reference in list at end of this Resource Report), a new agreement that revises and establishes restoration goals for the next 10 years in the Bay and its watershed. In the agreement, improving water quality is identified as the most critical element in the overall protection and restoration of the Chesapeake Bay and its tributaries. Part of the degradation in water quality is caused by excess sediment in the water column and its adverse effects on the living resources and associated habitat.

During the last 30 years, excess sediment has caused significant reductions in SAV; covered filter-feeding benthic organisms, thereby affecting their vitality; and delivered chemical constituents and pathogens associated with sediment to the Bay, affecting fisheries and other living resources. Water clarity and sediment problems are not unique to the estuary and its tidal tributaries; many stream habitats in the watershed also are affected by these problems.

2.4.4.4 Reservoirs

AES identified five reservoirs within three miles of the Project Area, as shown in Table 2.4-3. Two of the reservoirs, the Loch Raven Reservoir and Octoraro Lake supply municipal water supply systems for Baltimore City and Chester County, respectively. The Fullerton Reservoir is planned to be the supply source for a proposed water filtration plant that is currently in its initial design phase. The Fullerton Filtration Facility is expected to be operational in 2008. The Conowingo Reservoir serves as the supply source for the Conowingo hydroelectric power plant and the Atkisson Reservoir is designated for Fish, Shellfish, and Wildlife Protection and Propagation.

The Conowingo Reservoir serves as a public water supply for the City of Baltimore (250 million gpd maximum withdrawal) and for the Chester Water Authority (30 million gpd maximum withdrawal). HDD will be used during the construction of the Conowingo Reservoir Crossing. A specialized drill rig will be used to advance a shallow-angled borehole below the Susquehanna River. Using a telemetry guidance system the borehole will be "steered" beneath the river and then back to ground surface at an upland location on the opposite (north) side of the river. As described in Section 2.4.1, this method provides the maximum protection to surface waterbodies. The Conowingo Reservoir HDD entry point will be located at MP 43.6 on the south side of the river. The HDD exit point will be located at MP 44.6 on the north side of the river. The length of the Conowingo Pond HDD crossing is approximately one mile in length from entry to exit point, of which approximately 3,200 feet is under the Conowingo Reservoir.

There are three public water supply intakes located in the Conowingo Reservoir. The Baltimore City intake is located approximately 2 miles downstream of the proposed crossing location at the Conowingo Dam on the south side of the reservoir. The Chester Water Authority intake also located approximately 2 miles downstream of the proposed crossing location near the dam on the north side of the reservoir. The Peach Bottom intake is located approximately 2 miles upstream of the proposed crossing location. Potential impacts to Conowingo Pond could include potential water quality impacts from an inadvertent release of fuels or oils from drilling equipment, potential bottom sediment disturbance or surface water turbidity in the event of a frac-out at a point during the HDD installation, or potential disturbance or water quality impacts from hydrotesting water withdrawal or discharge.

Riverbed sediments disturbance and surface water turbidity impacts could occur in the event of a frac-out. The HDD Contingency Plan included as Appendix 2E, identifies measures that will be taken to avoid or minimize the potential for release of drilling fluids and measures to mitigate and cleanup any released drilling fluids in the event of a frac out.

HDD operations will be suspended if continued operation would pose a risk of releasing drilling fluid at levels that exceed the applicable permit conditions. If corrective actions do not prevent or control unacceptable releases of drilling fluid abandonment of the HDD borehole may be required and an assessment made to determine if modifications could be made to the alignment to achieve a successful HDD.

Once the Mid-Atlantic Express Project detailed design is complete site specific details will augment the HDD Contingency Plan and include the engineering design of the HDD, with specific size and location of staging areas for the entry and exit pits, procedures to control the inadvertent release of drilling mud, procedures for the clean-up of any inadvertent releases, notification requirements, a description of how abandoned holes would be sealed ,and contingency crossing techniques, if necessary.

Additionally, the Pipeline crosses three sub-basins (within the Susquehanna River Basin) that feed into the Conowingo Reservoir from MP 39.4 to MP 47.6 (8.2 miles). The boundaries of the watersheds are shown on Figure 2.4-4. The Pipeline also traverses four sub-basins that feed the Octoraro Reservoir, which serves as a public water supply for the Chester Water Authority (30 million gpd maximum withdrawal) from MP 56.7 to MP 63.4 (6.7 miles). AES has developed the ECP, included as Appendix 2A, after consultation with the MDE, PDEP, MDNR, the Susquehanna River Basin Commission, as well as county conservationists in both Pennsylvania and Maryland, in order to address local concerns and practices regarding erosion and sediment control in the plan. The ECP will be utilized during construction to avoid or minimize impacts to wetlands, waterbodies and watershed areas during construction of the Pipeline.

2.4.5 Hydrostatic Test Water

2.4.5.1 Pipeline Hydrotesting

Before any segment of proposed Pipeline is placed in-service, it will be hydrostatically tested to ensure it conforms to AES's Pressure Testing of Pipelines and Fabrication procedure and U.S. Department of Transportation (Part 192) specifications. In developing a Project-specific hydrostatic test plan, AES considered the Pipeline design features such as elevation and valve locations, classification of the pipeline, and input from Pipeline contractors for an evaluation of hydrostatic test water intakes and discharge points. Potential impact to sensitive waterbodies (fisheries) were considered in the preparation of the hydrostatic test plan. The plan addresses means to avoid juvenile and adult fish entrainment and the disturbance of bottom sediments by placing restrictions on bottom draw and requiring a screen at the intake as well as velocity controls consistent with EPA guidance and permits from local agencies. The MAE Pipeline Hydrotesting and Pre-Commissioning Plan is included as Appendix 2F. The methods summarized in the plan are based upon and will be performed consistent with Maryland General Permit for Discharge of Hydrostatic Test Waters (COMAR 26.08.04.09.K) and Pennsylvania General Permit for Discharges from Hydrostatic Testing of Tanks and Pipelines (NPDES General Permit PAG-10). These agencies will be contacted for specific requirements and conditions that may affect the sources of water and discharge locations, and conduct of the testing, to the extent that the plan may deviate from requirements of the general permits.

The hydrostatic testing will be conducted to at least 150 percent of the maximum allowable operating pressures (MAOP) and 90 percent of the Specified Minimum Yield Strength (SMYS) requirements. The test pressure will be maintained for a minimum of eight hours.

Testing will be performed using water withdrawn from nearby streams or municipal supplies, primarily the Susquehanna River, and pumped into the Pipeline behind a fill pig. Both water intake and discharge are anticipated to be from location(s) within the new pipeline ROW corridor where the corridor crosses the Susquehanna River. The intake structure will extend from the west bank of the River. A high-pressure pump will be used to pressurize the Pipeline to the appropriate designated test pressure based on classification of the Pipeline in the test section. Selected locations may require filling from a chlorinated municipal supply for hydrostatic testing. After testing, the pipe section will be depressurized and test water will be discharged to an approved location where it will be sampled, treated (if necessary) and released back into the environment. Hydrostatic test water will not be discharged directly to any watercourse. The proposed sources, volumes and discharge locations for each pipeline segment hydrostatic test are described in detail in the MAE Hydrotesting and Pre-Commissioning Plan included as Appendix 2F.

Before discharge, the test water will be sampled and treated (if necessary) to meet applicable discharge requirements or permit conditions. Discharge will be performed utilizing an energy dissipater (see BMP Drawing Number 25) with discharge to an upland area near a stream (i.e., not directly to the stream). These methods are further described in the MAE Hydrotesting and Pre-Commissioning Plan included as Appendix 2F. The MAE Hydrotesting and Pre-Commissioning Plan is based upon and will be performed consistent with Maryland General Permit for Discharge of Hydrostatic Test Waters (COMAR 26.08.04.09.K) and Pennsylvania General Permit for Discharges from Hydrostatic Testing of Tanks and Pipelines (NPDES General Permit PAG-10).

2.4.5.2 LNG Tank Hydrotesting

The LNG tanks and piping will be hydrostatically and pneumatically tested in compliance with the applicable codes that govern the pipe and/or tank design. Hydrotesting will be performed on the inner container of each LNG storage tank. The inner containers will be made of nine percent nickel. Hydrotest water will be taken from the Patapsco River and will be filtered to prevent the ingress of coarse materials. The test water will be sampled and tested for compliance with API 620, Section Q.8.3 requirements for test water quality prior to use. If necessary to meet API requirements, the water will be treated with corrosion inhibitors prior to admission to the tanks.

Water will be pumped from the Patapsco River into the inner LNG tank through the manhole in the outer containment tank roof. In accordance with API 620, the water flow rate will not exceed three feet of depth per hour (equivalent to 17,800 gpm for each 246-foot inner diameter inner tank), to a depth of about 76'-1" above the inner tank floor. Accordingly, the time to fill the tank will be at least 25 hours of pumping at the maximum allowed rate. Approximately 28 million gallons of water will be required to test each tank. The water residence time in the tank will be sufficient to meet the testing time required per API 620 (including a one-hour hold time) and will otherwise be limited to prevent any possible corrosion.

Prior to withdrawing water from State of Maryland waters for use during pre-commissioning, AES will obtain a Water Appropriation and Use Permit from the MDE Water Management Administration (WMA) in accordance with COMAR 26.17.06. Potential impact to sensitive waterbodies (fisheries) have been considered in the preparation of this hydrostatic test plan. The hydrostatic test water intake structures will be designed to avoid juvenile and adult fish entrainment and the disturbance of bottom sediments by placing restrictions on bottom draw and requiring a screen at the intake as well as velocity controls consistent with EPA guidance and permits from local agencies.

Maryland's cooling water intake and discharge regulations (COMAR 26.08.03) stem from Sections 316(a) and (b) of the CWA. COMAR 26.08.03.05, and litigative and administrative rulings stipulate that the location, design, construction and capability of cooling water intake structures must reflect the best technology available (BTA) for minimizing adverse environmental impacts, providing that the costs of implementing the BTA are not wholly disproportionate to the expected environmental benefits. Maryland law exempts facilities with withdrawal rates less than 10 million god and less than 20 percent of stream or net flow by the intake. Maryland's regulations do not specify a design intake velocity, and typical Maryland facilities generally have one to two feet per second (fps) screen face velocity.

While AES does not propose to construct a cooling water intake system, these regulations were utilized as the guidance for the conceptual design of the proposed hydrostatic test water intake structure that would be used to provide hydrostatic test water for each pipeline segment. The seawater pumps will be located along the water's edge on the western shoreline of the LNG Terminal. The pumps will be vertically mounted centrifugal pumps and will take suction from the Patapsco River. The intake structure will be configured with in-take screens designed to prevent ingress of debris, and to maintain inlet velocities below two fps with a velocity cap to minimize the effect of flow on the local marine life as further described below.

The intake velocity and aperture size of the intake screens will be designed to minimize the rates of impingement and entrainment, based on consultations with NMFS the screen size will be less than two millimeters (mm). It is possible that organisms smaller than the aperture size of the screens and that swim at a slower rate than the intake velocity could be drawn in with the test water, while larger, slow moving biota could be trapped on the screens for the length of time it takes to fill each tank.

To address potential impact to marine organisms and biota, the intake velocity of the system will be restricted to less than two fps, with a flow rate of approximately 1,200 to 3,600 gpm so that the potential for entrainment of marine biota is minimized. The screen through which the water is drawn will be sized to minimize the rate of impingement on the screens while the pipeline is filling.

Due to the timing of the construction, it is unlikely that the same water can be reused for testing of two or more of the three tanks. Therefore, after each tank hydrotest, the test water will be pumped out of the tank, tested, treated (if necessary) and discharged to the Patapsco River in a location and manner in accordance with applicable permits and regulations.

After completion of the hydrotest, the tanks will contain test water that must be removed. Because the base case for pre-commissioning is not to use water inhibition or chemical additives, water discharge is simplified. If chemical additives are required, the water will be treated to the level required such that it complies with any and all licenses and permits required for discharge and does not detrimentally affect the quality of the receiving waters.

There is not expected to be a thermal impact to the discharge waterbody due to the discharge of water used in the hydrotest procedures. The only potential environmental concern will be sediment and suspended debris. These will be removed by filtration and the use of sedimentation pools or temporary holding tanks, before discharge into the environment. Water sampling and testing will be performed to ensure compliance with current environmental regulations and permits obtained for the Project. AES will obtain coverage under the Maryland General Permit for Discharge of Hydrostatic Test Waters (COMAR 26.08.04.09.K), General Permit No 06HT. In accordance with the permit conditions AES will file a Notice of Intent with MDE WMA at least 60 calendar days prior to commencement of activities covered under the general permit. AES will notify the MDE at least 48 hours prior to discharge and will perform sampling and analysis of the discharge in accordance with the Section IV.D of the General Permit, Discharge Limits for Hydrostatic Testing of Pipes, Pipelines and Tanks including the following flow rate, oil & grease, total iron, total residual chlorine, total suspended solids, dissolved oxygen, temperature difference, temperature and pH. The sampling and analytical methods used will conform to the procedures for the analysis of pollutants as identified in 40 CFR Part 136.

If the water from the tanks, after water analysis has been completed, can be discharged without pretreatment, the test water will be released in an upland location through an energy dissipater which will flow into the Patapsco River, in compliance with applicable permit limits. Any solid residue recovered during cleaning will be collected and disposed off at a licensed disposal site.

Following hydrotesting, the inner tank inside wall, floor and internal structures will be rinsed with fresh water. The rinse water will be pumped out of the tank and discharged to the Patapsco River in a location and manner in accordance with applicable permits and regulations as described above.

Each tank will be equipped with a settlement monitoring system to measure and record inner and outer tank movements during hydrotest. The settlement monitoring system consists of survey/reference points equally spaced around the tank and will be capable of measuring differential settlement between inner and outer tanks. During hydrotest, settlements, rotation and base slab tilting will be monitored at approximately each 16-foot increment of water fill height. Measurements will also be recorded when the tank is emptied.

2.4.6 Construction & Operation Permits

Table 1.8-1 to Resource Report 1, *General Project* Description, summarizes the permits and authorizations required for construction and authorization of the Project. AES developed the information in that table based on a review of the applicable regulatory requirements and consultation with agency representatives. AES has consulted with numerous local, state and federal agencies regarding the potential impacts to surface waters and wetlands, including, but not limited to, the COE, NOAA, NMFS, MDE, MDNR, and the PDEP. Specific to surface waters and wetlands, these approvals, permits or consultations may include the following:

- Section 404 of the CWA (33 U.S.C. § 1344): permits for the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands, as administered by the COE;
- Section 10 Rivers and Harbors Act (33 U.S.C. § 403): authorization for dredging, and construction of the pier and berthing facilities, as administered by the COE;
- Section 401 of the CWA (33 U.S.C. § 1341): Water Quality Certification; MDE has the authority under its Wetlands & Waterways Program to review any federal permit or license that may result in a discharge to wetlands and other waters under state jurisdiction, in order to ensure that the actions would be consistent with the State's water quality requirements;
- Section 401 Water Quality Certification administered by the PDEP;
- MDE Non-Tidal Wetlands and Waterways Permit for Pipeline Facilities;
- MDE Tidal Wetlands Permit for Terminal Facilities;
- Coastal Zone Consistency Determination for activities in the Coastal Zone as managed by MDNR;
- Industrial wastewater discharge permit pursuant to Title 26 COMAR is administered by MDE;
- General NPDES Permit Number MDR10/State Discharge Permit Number 03 GP for stormwater discharges associated with construction activities as administered by MDE;
- Water appropriation and use permit under COMAR 26.17.06 as administered by the MDE Water Management Administration;
- Chesapeake and Atlantic Coastal Bays Area Approval administered by the Critical Area Commission for the Chesapeake and Atlantic Coastal Bays; and
- Susquehanna River Basin Commission surface water consumptive use or withdrawal permit.

A listing of each permit application and the date when it will be filed is presented in Table 1.8-1 of Resource Report 1, *General Project Description*.

Additionally, the LNG Terminal will operate under SIC Code 4922, and will apply for coverage under the Maryland General Permit for Stormwater Discharge associated with Industrial activity. As such, AES will design the LNG Terminal with appropriate stormwater controls and ensure that stormwater that comes in contact with industrial process areas is treated prior to discharge. Additionally, all process wastewater will be routed to the Baltimore County publicly-owned treatment works (POTW). A permit for discharge to the POTW will be obtained prior to initiation of operations at the LNG Terminal. The discharges to the POTW will be monitored and treated to meet the pre-treatment standards required by the Baltimore County POTW.

The Power Plant will operate under SIC Code 4911. There will be synergies with the LNG Terminal, such as fuel supply to the combined cycle plant, transfer of cold from the LNG Terminal heat transfer system to the combined cycle process for cooling, and transfer of waste heat from the Power Plant into the LNG heat transfer system for vaporization of the LNG. The Power Plant would use natural gas supplied from the LNG Terminal and transmission lines leaving the Terminal Site to tie into the local utility system. The Power Plant will provide the primary power source to the LNG Terminal, with the back up supply coming from the existing 110 kV utility system. Electric energy in excess of the needs of the LNG Terminal will be transmitted to the existing electrical grid via overhead power lines. The Power Plant will make its additional power supplies available for purchase at competitive market prices, will create additional union construction and permanent jobs, will provide additional tax revenues for the local area, and will be a "cogeneration" plant whose "excess" heat will be used to re-vaporize the LNG at the LNG Terminal.

The Power Plant will not require an outside source of cooling water while operating in conjunction with the proposed LNG Terminal. All cooling needs will be supplied by a heat/cold exchange system with the LNG Terminal. When the LNG Terminal is not operating, or there is insufficient cold from the LNG being vaporized and power is needed in the local area, it will be possible to operate the Power Plant using water obtained from the municipal water system.

AES will apply for coverage under the Maryland General Permit for Stormwater Discharge associated with Industrial activity for the LNG Terminal. Although power plants are excluded from coverage under the General Permit, AES nevertheless will design the Power Plant with appropriate stormwater controls, to minimize stormwater runoff associated with outdoor elements of the Power Plant, and to ensure that such stormwater be routed to the Baltimore County POTW, or through appropriately permitted discharge.

2.4.7 Sensitive Surface Waters

Sensitive surface waters may include waters that do not meet water quality standards associated with their designated beneficial use, waters that have been designated for intensified water quality management, waterbodies that contain threatened or endangered species or critical habitat, waters less than three miles upstream of potable water intake structures, outstanding quality waterbodies, waters of particular ecological and recreational importance, waterbodies located in sensitive and protected watershed areas, or physically unstable waterbodies.

The Project is located within the USGS Mid-Atlantic Region. The CWA requires state governments to assess surface and groundwater resource conditions. Section 305(b) of the CWA provides a consistent method of water quality classifications based on the degree to which an aquatic resource supports aquatic biota, and includes:

- Full support,
- Full threatened,
- Partial support/minor impairment,
- Partial support/moderate impairment, and

- Non-support.

The CWA provides the statutory basis for the Maryland and Pennsylvania state water quality standards program.

MDE and PDEP were consulted to determine whether the Project Area crosses any sensitive surface waters. The following criteria were discussed and conclusions reached:

- Fourteen of the surface waters crossed by the Pipeline are listed on the MDE and PDEP's 2004 Section 303d List of Impaired Waters Requiring a TMDL, all of which have been designated for intensified water quality management and improvement;
- One waterbody was found to contain threatened or endangered species and AES continues to perform Bog Turtle surveys, as discussed in Resource Report 3, *Vegetation and Wildlife*;
- One waterbody, the Susquehanna River, is crossed within less than three miles upstream of two potable water intake structures;
- AES continues to evaluate whether waters of particular ecological importance would be crossed;
- All the waterbodies crossed by the Pipeline are located within the protected Chesapeake Bay Watershed;
- AES continues to evaluate surface waters that were found to have important riparian areas;
- No rivers on or designated to be added to the Nationwide Rivers Inventory;
- The Pipeline Route will cross Deer Creek which is listed by Maryland as a Scenic and Wild River; and,
- The Pipeline Route crosses 14 high quality waterbodies and six waterbodies of exceptional value in Pennsylvania, as shown in Table 3.3.1-1 of Resource Report 3.

This review identified 14 sensitive surface waters on the following basis:

- <u>Baltimore Harbor</u>. This waterbody, which includes the Patapsco River and Bear Creek, is a sensitive surface water. The Baltimore Harbor is impaired by several constituents including PCBs, chromium, zinc, lead, mercury, nickel, copper, cyanide and chlordane. According to the CWA 2002 305(b) report that provides EPA's summary of impaired waters requiring TMDLs, chlordane, PCBs, metal, low oxygen, and bacteria in the tidal waters were attributed to industrial and municipal discharges, non-point sources, poor tidal flushing, and unknown sources. In non-tidal waters, siltation resulted in some areas failing to meet all designated uses due to urban runoff, habitat alteration, and channelization. Fish consumption advisories were issued in 1986, and expanded in 2001, for chlordane, PCBs, and dieldrin.
- <u>Bread and Cheese Creek.</u> This is a sensitive waterbody that is included on Maryland's 303d list due to biological impairments.
- <u>Back River</u>. This is a sensitive waterbody that is included on Maryland's 303d list due to fecal coliform, biological, nutrient, sediment, zinc and PCB impairments.

- Stemmers Run. This is a sensitive waterbody that is included on Maryland's 303d list due to biological impairments.

- Tributary of Little Gunpowder Falls. This is a sensitive waterbody that is included on Maryland's 303d list due to nutrient impairments.

- Little Gunpowder Falls. This is a sensitive waterbody that is included on Maryland's 303d list due to nutrient impairments.

- Winters Run. This is a sensitive waterbody that is included on Maryland's 303d list due to biological and nutrient impairments.

- Susquehanna River. This is a sensitive waterbody that is included on Maryland's 303d list due to nutrient, biological, sediment, cadmium and PCB impairments. Metals, low pH, and nutrients are the primary causes of stream impacts in the Susquehanna River Basin. Coal mine drainage is the source of most of the metals and pH problems degrading streams. Sources of nutrients include municipal and domestic wastewater discharges, agricultural runoff, and groundwater inflow from agricultural areas.

- Conowingo Creek. This is a sensitive waterbody that is included on Maryland's 303d list due to biological, nutrient and sediment impairments.

- Doe Run. This is a sensitive waterbody that is included on Pennsylvania's 303d list due to nutrient impairment.

- West Branch Brandywine Creek. This is a sensitive waterbody that is included on Pennsylvania's 303d list due to nutrient and sediment impairments.

- Broad Run. This is a sensitive waterbody that is included on Pennsylvania's 303d list due to biological, nutrient, dissolved oxygen, sediment and flow alteration impairments.

- Beaver Creek. This is a sensitive waterbody that is included on Pennsylvania's 303d list due to sediment impairments.

- East Branch Brandywine Creek. This is a sensitive waterbody that is included on Pennsylvania's 303d list due to sediment and flow alteration impairments.

2.4.8 Waterbody Construction and Mitigation Procedures

2.4.8.1 Pipeline

As described in Section 2.4.1, the construction of the Pipeline across waterbodies would result in minor, short-term impacts. These impacts would occur as a result of in-stream construction activities or construction on slopes adjacent to stream channels. These activities would result in a temporary localized increase in turbidity levels and downstream sediment deposition. Sedimentation and turbidity may occur as a result of in-stream construction, trench dewatering, and soil erosion along the CROW. In slack or slowly moving waters, increases in suspended sediment may increase the biochemical oxygen demand and reduce levels of dissolved oxygen in localized areas during construction. Motile organisms may avoid these areas, but sessile and some planktonic organisms may be adversely affected. Suspended sediments would also alter the chemical and physical characteristics of the water column (e.g., color and clarity) on a short-term basis. However, no foreign sediments would be introduced as all dredged or fill material would consist of onsite sediments.

The proposed construction procedures, described in Section 2.4.1, are designed to ensure that potential impacts at all stream crossings are minimized to the maximum extent practicable. AES would implement procedures and waterbody protection measures outlined in AES's Construction BMPs, which include the FERC's Plan and Procedures (see Resource Report 1, *General Project Description*, Appendix 1A), to further minimize impacts to waterbodies crossed by the Pipeline.

To limit the time required for construction of a stream crossing, the ROW will be prepared on either side of the stream prior to the construction of the actual crossing. Where construction will be through wooded stream banks, care will be taken to preserve as many existing trees as possible. Stream crossings will be perpendicular to the flow, to the extent practical.

If necessary, the piping used for stream crossings and in floodplains will be weighted to prevent flotation. The piping will be welded together in the staging areas and then carried or floated along the ROW into place. If the streambed is composed of unconsolidated material, the piping will be pulled into place. In rock-bottomed streams, the pipe will be floated or lifted across and then lowered into place. After the piping is lowered into the trench, previously excavated material will be returned to the trench line for backfill. Stream flow will be maintained at all waterbody crossings (except at open-cut crossings), and no alteration of the stream's capacity is anticipated as a result of Pipeline construction.

At small streams encountered along the ROW, a backhoe, clam dredge, dragline, or similar equipment will be used for trench excavation. As a rule, the completion of all construction activities should not exceed 24 hours at minor stream crossings and 48 hours at intermediate stream crossings.

After the completion of construction, streambeds will be restored to their closely approximate former elevations and grades. Spoil, debris, pilings, cofferdams, construction materials, and any other obstructions resulting from or used during construction of the pipeline will be removed to prevent interference with normal water flow and use. Any excavated material not used as backfill will be disposed of in a manner and at locations satisfactory to the agencies having jurisdiction. Following grading, all stream banks will be restored to prevent subsequent erosion, in accordance with permit requirements.

2.4.8.2 LNG Terminal

A king pile steel sheet pile bulkhead will be installed along the western limits of the upland facility. The steel sheets will be driven with either a vibratory or impact pile driving hammer. Where accessible, the piles will be driven from a land based rig. In locations where access is from the waterside only, the piles will be driven by a rig based on a floating construction barge. The barge can be anchored into location with spud piles to provide a stable working area. Templates will be used to ensure that the sheet piles are driven in the proper location and that plumbness is maintained within acceptable limits.

This construction phase will result in temporarily increased turbidity levels, as sheet piles and associated structures are placed in or attached to the seabed. The construction plan will incorporate available methods for minimizing and/or monitoring the scale of these disturbances. These will include use of best management practices for minimizing/localizing turbidity (e.g., limiting need for construction vessels that may suspend shallow sediments with propeller wash), and by limiting bottom-disturbing activities to seasonal windows when these activities would cause the least impact to natural communities. Potential impacts to and mitigation measures for marine biota resulting from construction and operation of the LNG Terminal are discussed in Section 3.3.3.1 of Resource Report 3, *Fish, Wildlife and Vegetation*.

Demolition of selected structures at the existing Sparrows Point site will be needed to prepare the site for construction. The shipyard formerly consisted of 10 slips used for ship construction and/repair. Slips No. 1 through No. 5 are demolished and the area they occupied is at a common grade. Portions of the remaining slips (No. 6 through 10) are used for hauling out and dismantling barges.

As described in Section 1.3.3.1 of Resource Report 1, *General Project Description*, for development of the LNG Terminal, the remaining slip structures on shore will be demolished and the associated area leveled to the site's common grade. Portions of existing finger piers and low-level relieving platforms that lie along the waterline of the new bulkhead alignment will be removed as may be required for facility construction. To the extent removal may be needed, biologic evaluation of existing finger pier and relieving platform elements has been performed and does not indicate the elements provide significant substrate for benthic, encrusting or pelagic communities (see below within this Section 2.4.8.2). The LNG Terminal will make use of an existing pier located at the northern end of the Terminal Site. The existing pier will be modified to accommodate mooring of LNG ships. The modifications will consist of repairing existing piles, resurfacing the deck, and building an unloading platform and pipe trestle on top of the pier.

The pier will have two berths, one on the north side of the pier and the other on the south side. The main components of the marine facilities at the Terminal Site will include the following:

- An existing finger pier that will support an elevated pipeway and spill containment system, an elevated unloading platform and gangways; the pier will also support the mooring of the LNG ships and provide a roadway to the loading platform area;
- Dredged areas for ship access;
- Aids to navigation;
- A retractable security barrier; and
- Mechanical systems.

The features of the marine facility at the Terminal Site are shown on Figure 1.3-2. This demolition will impact previously disturbed marine bottom. Specifically, during construction of the LNG pier, AES will install a sheet pile bulk head wall to establish a new vertical edge of the shoreline. During this process approximately 44,733 square feet of materials will be dredged to create new bottom area on the water ward side of the bulkhead. The bulkhead wall will continue south of the pier structure, which will result in removal of additional land features on the water ward side of the bulkhead, and the creation of approximately 22,202 square feet of new marine bottom area. To the south of the berthing area a sheet pile wall will be driven to a depth of approximately 45 feet to create a vertical structure, so that the landward side can be filled to the proposed final grade of the site. The alignment of the proposed bulkhead will be coincident with the existing waters edge and, therefore, there will be no additional impacts to the marine bottom.

During installation of the sheet pile bulkhead, AES will install, as required, silt curtains in the shallow water area, to prevent sedimentation impacts in the area of construction. AES anticipates this construction will take approximately six months to complete, and will be conducted from March to September. Based on the biological surveys performed, as described in Resource Report 3, *Vegetation and Wildlife*, there is no submerged aquatic vegetation and benthic biota are not located in the immediate vicinity of the construction area. Additionally, all filling activities will be conducted on the landward side of the sheet pile wall, resulting in no filling of marine areas. The new bulkhead alignment will consist of approximately 2,175 linear feet of sheetpile wall, as shown on Figure 1.3-2 (Sheet 2) of Resource Report 1, *General Project Description*. The area of waters that will be impacted as part of the Project is presented in Table 2.4-5 along with a summary of anticipated water use and quality impacts related to waterfront construction (sheet pile driving and land removal).

Data for the three largest Maryland commercial fisheries (Blue Claw, Oyster, and Striped Bass) were available through the Maryland Commercial Fisheries Annual Landings Data Set (MDNR 2005a) that were pertinent to the proposed Project Area (Patapsco River and the north-central Chesapeake Bay) and are summarized below by fishery and total annual landings in pounds.

- Blue crab (*Callinectes sapidus*): 2004 total landings of 31,987,749 pounds with 0.002 percent (48,417 pounds) of total catch harvested in Patapsco River.

- Atlantic Oyster (*Crassotrea virginica*): 2004 total landings of 63,057 pounds with 0.03 percent (1,956 pounds) of total catch harvested in north-central Chesapeake Bay region (not part of proposed project area).

- Striped bass (*Morone saxatilis*): 2004 total landings of 1,924,470 pounds with 0.003 percent (5,659 pounds) of total catch harvested in Patapsco River.

Currently, the Patapsco River, including Baltimore Harbor, has been closed indefinitely to shellfish harvest; therefore, the proposed pier demolition will pose no immediate impact on the harvesting of any shell-fisheries within or adjacent to the Project Area. Commercial harvest of migratory species such as blue crab and striped bass is minimal in the Patapsco, accounting for only 0.002 percent and 0.003 percent, respectively, of the total harvest for the State of Maryland. Because any resulting impact from the proposed demolition will be temporary, and time of year constraints may be imposed (if deemed necessary), it is unlikely that any harvesting of these fisheries occurring within or adjacent to the proposed Project Area will be negatively impacted. Additionally, multiple species of herring and shad, yellow perch, white perch, and American eel, are of commercial and recreational importance within the Chesapeake Bay system. Similar to striped bass, these species are highly mobile and migratory and will most likely not suffer any negative impact as a result of the proposed pier demolition, especially because species migration schedules will be factored into the proposed demolition timeline.

Impacts to fish from sound or pressure waves resulting from demolition/construction noise are possible, but unlikely. Changes in ambient water pressure during pile driving and/or explosions (i.e., removal of bedrock) could have negative impacts on finfish species with gas-filled swim bladders that are in near-proximity to the proposed Project Area during demolition/construction activities. For aquatic species, risk of injury or mortality resulting from noise is generally related to the effects of rapid pressure changes, especially on gas-filled spaces in the animal's body (Carlson et al 2005). The main sensory organ used by fish to detect low-frequency (less than 100 Hz) waterborne signals is the lateral-line. The lateral-line organ is mostly involved in processing acoustic signals when the source is within a few body lengths of the fish. Otoliths located within the skull of the fish are sensitive to vibration rather than sound pressure. In fish species that contain gas-filled swim bladders, pressure waves are converted to vibrations via the swim bladder and are transferred to the otoliths, allowing the fish to detect both sound and vibration. High energy waves that may result from demolition activities may disturb these sensory systems; however, this is unlikely in the case of finfish species with swim bladders that are reduced or altogether absent (demersal species such as flounder typically do not have swim bladders and tend to be less susceptible to blast impacts) (COE 2004; Popper and Clark 1976). Field tests have shown the weight of the charge and distance from the detonation or distance from pile driving are the most important factors affecting the extent of injury and mortality to local finfish, although water depth, substrate, depth of the fish, and size and species of fish are also important (COE 2004; Keevin and Hempen 1997; Wiley et al. 1981; Teleki and Chamberlain 1978). However, during previous sampling efforts of the proposed Project Area, minimal numbers of finfish were collected within 50 meters of the finger piers. Additionally, a pier inspection involving divers equipped with self-contained underway breathing apparatus (SCUBA) and underwater video indicated that no finfish were present in or around the finger piers surveyed, therefore decreasing the potential for negative effects of construction related noise and pressure emissions on local fish.

Qualitatively, the pier inspections also revealed that only a minimal number of species utilize the concrete slabs, steel piles, and wood piles, as habitat. From field identifications provided by the SCUBA team, included as Appendix 3A, Marine Field Survey Report to Resource Report 3, *Vegetation and Wildlife*, it seems that barnacles (subclass Cirripedia), fan worms (*Sabella spp.*), and zebra mussels (*Dreissena polymorpha*) were the most abundant and would suffer no negative impacts as recolonization rates for these species are high.

Additionally, positive impacts could be associated with the removal of highly invasive species like the zebra mussel, but it is unlikely that the proposed demolition would provide a permanent solution. Positive impacts to the benthic communities may result from the proposed demolition as more bottom space will be created and/or restored within the proposed Project Area. Although a short term negative impact on local benthic communities within the immediate vicinity of the proposed construction is likely (displacement and potential mortality), rapid recolonization is expected because the majority of species found in the area of the Terminal Site are opportunistic (substantiated by MDE (2005)[5]).

It is unlikely that a significant decrease in water quality will result from the proposed pier demolition, based on data collected in conjunction with the Chesapeake Bay Program. The MDNR created an Index of Biotic Integrity for the Patapsco/Back River basin that classifies the health of the Patapsco River as very poor, the lowest rating possible (MDNR 2005b). Total Nitrogen Concentrations, Total Phosphorous Concentrations, Abundance of Algae, Total Suspended Sediments, Water Clarity by Secchi Depth, and Summer Bottom Dissolved Oxygen data have been collected by The Chesapeake Bay Water and Habitat Monitoring Program since 1985, the Maryland Biological Stream Survey (MBSS) since 1995, and the Stream Waders Volunteer Program since 2000. The Patapsco River has continuously received the lowest rank of poor with the exception of Total Suspended Sediments that was rated fair. More specifically, Dissolved Oxygen averaged 1.2 microgram per liter (mg/l) and 0.67 mg/l during a seven month collection period during the 2004 and 2005 sampling seasons, making it unlikely that the Baltimore Harbor region and the proposed Project Area within the Patapsco River can adequately support most biological life for any long term duration. Because any potential impacts resulting from the proposed pier demolition will be temporary, and given the degraded nature of the existing water parameters, it is unlikely that any additional decreases in water quality would affect existing biological communities, as biota currently found within the Project Area are seemingly well adapted to poor conditions.

With respect to diminished summer dissolved oxygen levels, the types of conditions that may lead to low oxygen levels at depth may include:

- Seasonal influx of fresh water (such as from Spring runoff) creating an elevated gradient in dissolved chloride content that stratifies the water column and prevents turnover of relatively oxygenated shallow water with deeper low oxygen-content water.
- Bathymetric sediment surface pockets or closed-sided areas of bottom topography that prevent water circulation from top to bottom of the water column, or exchange of water between laterally-located areas that otherwise receive good tidal or current exchange.
- High chemical oxygen demand (COD) that consumes dissolved oxygen. High COD in a setting such as the Port of Baltimore often results from highly contaminated bottom sediment.

The area proposed to be dredged by AES has two of these factors in place: presence of contaminated sediment at the water-sediment interface; and a deeper section of bathymetry in the area of the current floating drydock where circulation with deeper water of the Patapsco may be cut off (water depth in the drydock area is approximately 40 to 45 feet deep, but is cut off from deeper areas of the Patapsco River and Chesapeake by the shallower shipping channel, at approximately 25- to 30-foot depth). Performance of the dredging necessary for the project will remove a large volume of the contaminated sediment leaving relatively clean sediment in place at the new sediment-water interface. The newly established depths for LNG ship entry to the LNG Terminal area will also establish a relatively consistent 45-foot depth from the Brewerton Channel up to the new LNG ship berth thereby eliminating the current closed-ended basin around the floating drydock, which should improve the ability for water to circulate with tidal and normal stream flow throughout the water column. Therefore, local conditions relative to the two factors that may be contributing to existing low oxygen levels should improve with dredging.

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[5] The MDE Federal Navigation Channel Use Attainability Analysis stated: "The existing benthic community in the Outer and Inner Harbor deep-dredged channels can be characterized as unstable due to frequent disturbances, such as the 42-foot dredging project, annual maintenance dredging and prop-washes associated with ship movements, and is thought to consist primarily of opportunistic species. The community likely to recolonize in the deep dredged channels would be similar in nature to the existing benthic community, since the existing benthic community is unstable and frequently disturbed, and recolonization may occur within a relatively short time."

2.4.8.3 Pier Construction

The marine facilities will consist of two berths for LNG ships. The tug support will be provided by existing tug operators in the Baltimore port area, and no tug berthing is planned at the facility. In order to reduce the potential for seabed impacts, AES has proposed the rehabilitation of the existing pier, installation of an elevated unloading platform, and the installation of an elevated pipeway and associated spillway.

Pier rehabilitation will include the concrete encasement and/or splicing of the existing piles, repairs to the concrete cap, and repairs/resurfacing of the existing concrete deck. The repairs to the piles and caps will take place from floating construction barges. The floating construction barges provide the ability to be repositioned as required in the working area in order to provide uninhibited access to the items being repaired, ensuring proper construction techniques can be utilized.

Pre-cast concrete elements for the unloading platform, pipeway and associated spillway will be set into place via crane, which will be located either on floating construction barges or the existing pier, pending space availability. The floating construction barges will be anchored into place with spud piles. These construction barges provide the ability to be repositioned as required in the working area in order to provide uninhibited access to the item under construction, ensuring proper construction techniques can be utilized.

The cast-in-place concrete elements to support the deck rehabilitation, unloading platform, pipeway and associated spillway will be constructed from floating construction barges or landside, as space allows. As noted for the pre-cast elements and pier repairs, floating construction barges provide the ability to be repositioned as required in the working area in order to provide uninhibited access to the item under construction, ensuring proper construction techniques can be utilized.

Once the rehabilitation of the pier deck has been completed, the elevated steel structure will be built to support the unloading platform, pipeway and spillway. This construction will take place from the land side; however, the final setting of the unloading arms will take place from a construction work barge.

2.4.8.4 Marine Dredging

Construction of the LNG Terminal will include widening and deepening the existing approach channel leading off of the Brewerton Channel and creating a turning basin immediately offshore of the Terminal Site to accommodate the ships expected at the LNG Terminal.

The Brewerton Channel, the existing approach channel, and certain areas offshore of the proposed Terminal Site, have been dredged in the past. COE permits and a Water Quality Certification from the State of Maryland authorize dredging in these areas using hydraulic or mechanical techniques. Dredging of the approach channel and areas offshore of the proposed Terminal Site is allowed under existing permits for maintenance and waterfront operations to a depth of -39 feet. In addition, on May 6, 2005, the COE issued a permit to BWI-Sparrows Point LLC (CENAB-OP-RMN [BWI-Sparrows Point LLC/Dredging] 04-64865-1) approving mechanical or hydraulic dredging of a channel, turning basin, and berthing areas to 39 feet below MLLW, and to place approximately 600,000 cubic yards of dredge material at the Hart-Miller Island disposal site. The permit also approved a subsequent phase consisting of the deposit of approximately 2.6 million cubic yards of dredge material at disposal sites yet to be determined. Finally, the permit approved certain construction of sheet piling and fendering systems.

Some of the same dredge areas required for the LNG Terminal have been approved under the BWI Permit, however, the dredging currently approved is for the ship repair/maintenance facility, and not for dredging for the Terminal Site. AES has been informed by the COE that the BWI Permit is non-transferable. The description of the marine dredging contained herein has been developed to anticipate dredge operations consistent with this location's currently existing conditions, i.e., without taking into account any of the dredging contemplated in the validly-issued BWI Permit. Several dredging projects in the Project Area have been approved in recent years that included the disposal of dredged materials at the Hart-Miller Island Disposal site, as summarized in Table 2.4-4. Depending on the bathymetric conditions of the dredge areas at the time of Project construction, the actual volumes of dredged and material handling requirements may be less than envisioned.

The approach channel expansions will be performed primarily by use of conventional mechanical clamshell dredge, with some limited areas near shore excavated by backhoe dredge. The analyses performed by AES indicate that the sediment quality in the Project Area is consistent with previously permitted projects. Based on the COE review of the permit application, if it is determined that additional sampling of dredge material is required for specific disposal alternatives, then the COE will be consulted at that time regarding the additional requirements for disposal of the dredge spoil. If those additional chemical analyses indicate sediment quality is more significantly degraded than is allowed by current dredge permits, environmental dredge bucket removal or equivalent would be used. The limits of the existing approach channel and area bathymetry, and the dredge area proposed by AES, is shown on Resource Report 1, *General Project Description*, Appendix Figures 1C-1. A portion of the material dredged will be managed at an on shore dredge material recycling facility to be developed for the LNG Terminal.

Dredging is anticipated to begin in the berthing area immediately adjacent to the Terminal Site, and progress in reaches towards the Brewerton Channel to allow for earlier commencement of pier/dock construction operations. Assuming a dredged channel and turning basin depth of 45 feet, it is estimated that approximately 3.7 million cubic yards of dredged material may be generated, a portion of which will be used for recycling. Maintenance dredging under current permits may decrease this amount somewhat, depending on the amount performed prior to LNG Terminal construction.

Dredging will be conducted utilizing a mechanical (clamshell) dredge, or if conditions warrant, with an environmental bucket or suitable alternative as required by permit. A directional Global Positioning System (GPS) will be used to locate the channel limits and to identify shoaled areas. Sediment will be removed to the design depth of 45 feet below MLLW. Computer-controlled recording software will track the progress of the dredging and will ensure complete coverage of the area to be dredged.

Project-specific factors such as bathymetry, wave energy, equipment availability, and physical and chemical analysis of the sediments to be dredged all influence the selection of dredging methodology. The physical and chemical characteristics of materials to be dredged also influence the determination of disposal methods. In general, environmental dredging techniques are employed where the level of chemical constituents present in the dredged material to be removed indicate a potential for unacceptable risk for adverse environmental or human health effects from the dredging process. For the Project, initial characterization and background data indicate that the dredging will encounter both recently deposited (Holocene) sediments as well as underlying "native" sand materials. Environmental dredging methods may be used only for the overlying sediment layer in areas where results of physical and/or chemical characterization of the sediments indicates the need for use of such methods.

The use of closed, or environmental, clamshell buckets is not a new practice. The COE Dredging Manual (EM-1110-2-5025, March 1983) states that closed clamshell buckets "are best adapted for maintenance dredging of fine-grained material." The Manual further states that a direct comparison of typical clamshell buckets to watertight clamshell buckets indicated that the closed bucket generates 30 to 70 percent less turbidity in the water column than the conventional bucket, and that leakage of material from a watertight bucket is reduced by approximately 35 percent. This assertion was demonstrated in a study conducted by the COE in August of 1999. The study directly compared sediment re-suspension characteristics of an environmental enclosed clamshell bucket versus a conventional clamshell bucket, and the results were published in a COE paper, "Dredge Bucket Comparison Demonstration at Boston Harbor" (March 2001). The results of this study indicated that average turbidity for the conventional bucket measured 57.2 Formazin Turbidity Unit (FTU) compared to an average of 12 FTU for the environmental enclosed bucket. Total suspended solids concentrations for the conventional clamshell bucket averaged 210 mg/l, compared to an average of 50 mg/l for the environmental enclosed clamshell bucket. The conclusions of the study indicated that the "depth averaged turbidity for the Enclosed bucket was 79 percent less than observed for the Conventional bucket" and "depth-averaged TSS concentrations for the Enclosed bucket [were] 76 percent less than for the Conventional bucket." AES is performing additional analysis of expected turbidity as result application in January 2007.

An enclosed environmental clamshell bucket has several advantages over a conventional clamshell bucket. These advantages include greater control over contaminant release, increased ability to minimize residual sediment after dredging, and greater ability to limit sediment resuspension (source: Palermo, et. al. "Operational Characteristics and Equipment Selection Factors for Environmental Dredging," *Journal of Dredging Engineering*, 2004). According to the EPA publication "Selecting Remediation Techniques for Contaminated Sediment (June 1993)," closed clamshell buckets are routinely used by the COE in the Great Lakes to reduce the amount of resuspended sediment.

According to the EPA guidance document "Contaminated Sediment Remediation Guidance for Hazardous Waste Sites" (December 2005), dredging or excavation has been selected as a cleanup method for contaminated sediment at more than 100 sites. Examples of projects that have successfully used environmental clamshell dredging for removal of contaminated sediments include:

- Rochester River sediments at Port Charlotte, near Rochester, New York (cleanup of chemical spill).
- Claremont Channel Deepening Project in Jersey City, New Jersey (navigational dredging of 800,000 cubic yards of low-impacted sediment).
- Port of Jacksonville, Florida (PCB contaminated sediment removal).
- Tarrytown, New York (removal of coal tar contaminated sediments).
- Saginaw Bay, Michigan (dredging of 300,000 cubic yards of contaminated sediment).
- Todd Shipyard and Lockheed Shipyard in Seattle, Washington (230,000 cubic yards of sediment contaminated with marine paint additives).

Environmental (closed) clamshell dredging methods have also been the method of choice for New York/New Jersey Harbor navigational maintenance dredging and deepening projects since 1995, being used to effectively remove over 3 million cubic yards of contaminated sediment for subsequent treatment and upland beneficial use (source: NJDOT Office of Maritime Resources, 2005).

The following dredging projects in the New York/New Jersey Harbor where environmental enclosed clamshell buckets were employed exhibited sediment contaminants similar to those in the Sparrow's Point sediment:

- Raritan Bay Cable Crossing Dredging (Red Root Reach) - Average Arsenic concentration of 68.5 PPM versus 30.3 PPM for Sparrows Point
- Claremont Channel Deepening Project – 2000-2001 – Average PCB concentration of 0.966 PPM versus non-detect for Sparrow's Point; Average Lead concentration of 224 PPM versus 372 PPM for Sparrow's Point
- Arthur Kill Contract 2-3 – 2005 – Average Benzo(a)pyrene concentration of 2.22 PPM versus 1.68 PPM for Sparrow's Point

Dredging production is expected to be up to 12,000 cubic yards per day and last approximately 24 months, with accommodation being made for required work stoppage periods. It is anticipated that 10 to 14 1,500 to 3,500 cubic yard work scows will be assigned to the Project for dredged material transport. All scows and containers will be of solid hull construction, and will be completely sealed and watertight in order to avoid any release of dredge material.

The initial step in processing is the reduction of the water content of the dredged sediments. The proposed dewatering process would involve dewatering of loaded barges at the dredging site or the dredge material recycling facility (DMRF). The proposed 10,000 cubic yards per day DMRF will occupy approximately five acres of the 15 acres of upland property located immediately to the south of the Terminal Site (see Figure 1C-3 in Appendix C of Resource Report 1, *General Project Description*). Loaded scows would be allowed to settle so that the free-liquid portion would be visibly free of suspended sediments prior to pumping the decant water to the cargo area of a dedicated dewatering barge. After settling, the decant water from dewatered dredged material at the processing facility will pass through a settling tank system and be filtered prior to discharge back to the harbor. Chemical and physical analysis will be conducted on the decant water in accordance with a MDE Water Management Program Individual Permit for Industrial Water Discharge that will be issued for the DMRF. Threshold values for discharge will be set forth in that permit. Alternately, after the initial barge settling period, portable pumps will be utilized to pump the water to land based tanks (i.e. frac tanks) for additional settling. Following this secondary settling, the water will be filtered and discharged under applicable permit conditions.

After raking, the raw dredged material will be stevedored from the work barges directly into a pugmill processing system utilizing hydraulic excavator(s) equipped with hydraulic closed clamshell bucket(s). The screened raw dredged material will be fed to a twin-shaft pugmill blending system and mixed with reagent admixtures. Once mixed, the raw dredged material will be transformed into processed dredge material (PDM), which will be emptied from the pugmill onto a radial stacking conveyor. The "radial stacker" can be positioned to load directly into trucks, or to stockpile the material for rehandling to trucks, railcars, or back to hopper scows. Based on the current plan, there will be no raw dredged material stored in any upland location at any time during this process.

Existing site roadways will be used to transport the PDM from the pugmill processing system to the temporary PDM storage area. The temporary PDM storage area will consist of an approximately 10-acre area (within the 15-acre upland area) covered by bituminous paving, or lined with a 10-mil high density polyethylene (HDPE) liner covered by 6- to 12-inches of existing site soil or imported soil. A scale house and truck scale will be located adjacent to the temporary PDM storage area for weighing of the outbound shipments of the PDM product upon sale. Existing site roadways will be used for outbound shipments of the PDM product.

The DMRF and temporary PDM stockpile area will be graded as necessary and paved with bituminous concrete, and equipped with stormwater management controls tied to existing facilities.

Further details and specifications regarding dredging, equipment, schedule, spoils handling and processing is provided in Resource Report 1, *General Project Description*, Appendix 1C - Dredging Management Plan. AES anticipates that operations at the DMRF will be completed one year following completion of the dredging activities.

In addition, the treatment methods used for dredge material recycling utilize admixtures to both chemically and physically stabilize the dredged sediment. Specific agents that are admixed (such as Portland cement, pozzolanic materials, etc.) will be tailored to match sediment makeup (grain size, moisture, etc.) and chemical quality, so that the recycled material produced meets physical properties for intended application (like flowable fill or sub-base aggregate-type material), and will not leach contaminants once it has been processed. AES will perform additional sampling and characterization of the sediment in the proposed dredge area, as required, in accordance with COE dredge permit application requirements, to further characterize the levels of contamination, if any, and will conduct the appropriate treatment of the sediment at the DMRF as discussed in Section 1.5.1.2.A of Resource Report 1, *General Project Description*. AES intends that the PDM will be used as fill at alternate sites, or disposed of in accordance with applicable federal, state and local regulations, so that disposal of unused PDM will not result in impacts to wetlands or waterbodies. AES will ensure that the PDM meets applicable environmental standards prior to use and placement as fill material. Any potential users of the PDM will be required by local regulations to obtain the appropriate permits prior to fill placement, to ensure impacts to wetlands and waterbodies will not occur.

Other potential options for management of dredged material include off-site disposal, open ocean disposal at approved off shore locations, and upland fill sites. All of these also depend on the chemical makeup of the dredged material, approvals from applicable agencies and, in some cases, approval by the receiving facility(s). If ocean disposal is identified as a feasible alternative for dredge material disposal, AES will perform any additional sampling required, and obtain the necessary permits to dispose of the dredged material in an approved location as further described below.

AES has evaluated the feasibility of offshore disposal from the standpoint of sediment quality relative to other dredge management projects performed in the Port of Baltimore and Sparrows Point area for purposes of determining if offshore disposal may be viable for all or a portion of the dredge material management.

Sediment sampling has been performed in the area where the shipping channel and turning basin would be widened from the existing Sparrows Point access routes to allow adequate LNG ship draft and maneuvering for berthing at the LNG Terminal. The sampling was performed during the period of May-June 2006, and results are summarized in Section 2.4.3. The results show that sediment quality in the areas subject to dredging is comparable in chemical quality to other sediments that have been dredged from the Port of Baltimore for disposal in the area Contained Disposal Facilities (CDFs - Hart-Miller Island, Cox Creek) and ocean disposal sites. Environmental contaminants are present in the upper portion of the sediment profile comprising primarily PAHs and heavy metals. The sample results show that these compounds tend to decrease in concentration with depth, and were generally not detected in sediments below approximately 10 to 15± feet or at the planned dredge depth of 45 feet below mean sea level (the new mudline surface that would remain once dredging has been completed).

Ocean placement at an authorized ocean dredge material disposal site could be a viable placement location for the relatively clean dredge material located below the shallow sediments containing typical Port of Baltimore contaminant compounds. Use of such a location would be subject to EPA and COE approval, and would require evaluation consistent with the COE *Dredging and Dredge Material Placement* manual (Welp, et. al, 2003).

AES has determined as part of its dredge material evaluation that the use of an approved offshore disposal site alone – assuming that the sediment quality would be acceptable for placement at an EPA-approved offshore site - would be less preferable than the use of an innovative re-use processing facility. As compared to a re-use processing facility, the use of an approved offshore site would require vessel transit to and from the offshore site, thereby extending the timeframe required to handle the dredge material. Such transit may involve weather, as well as other, delays. The use of an approved offshore disposal site also may involve a more lengthy timeframe for obtaining approval. However, offshore disposal could be used in conjunction with an innovative re-use processing facility as a viable alternative for dealing with the relatively large volumes of cleaner material.

2.4.9 Operational Impacts

2.4.9.1 Pipeline

After the completion of Pipeline construction, streambeds will be restored to their former elevations and grades. Spoil, debris, pilings, cofferdams, construction materials, and any other obstructions resulting from or used during construction of the Pipeline will be removed to prevent interference with normal water flow and use. Following grading, all stream banks will be restored to prevent subsequent erosion, in accordance with permit requirements. AES will monitor the revegetation of those disturbed areas in accordance with FERC's Plan and Procedures.

Typically, final restoration occurs within 10 to 20 days of rough backfilling. Permanent erosion and sediment controls are installed (e.g., waterbars on sloping terrain) and the CROW is re-seeded and/or mulched per permit requirements and landowner agreements. Pipeline markers are then installed. Soil adjuncts and fertilizers may be added where necessary. Temporary erosion controls are removed when the area has been stabilized in accordance with project requirements. The revegetation will be monitored for at least two growing seasons following final restoration. The Pipeline facilities will be located underground; therefore, AES does not anticipate any additional impacts to water resources from the operation of the Pipeline.

2.4.9.2 LNG Terminal

Minimization and avoidance of significant changes to oceanographic attributes will be a primary objective in the development of the final design of marine-based structures. Potential impacts as they relate to the water resources components discussed in this section are described below.

Water quality in the vicinity of the LNG Terminal is likely to be influenced slightly during construction of the pier as described above in Section 2.4.8. During operations, however, AES does not anticipate significant impact to water resources resulting from the operations adjacent to the pier. The potential impacts that could arise from the operations adjacent to the pier would result from ship movements (on and off berth), taking on ballast, tug and vessel movements (propeller wash sediment re-suspension), stormwater management, storm water discharges, and possibly ships boiler cooling and fire water intake, and boiler cooling water discharge. Each of these potential impacts is further described below.

No seawater or sewage discharges will be made by LNG ships while in port[6], with the possible exception of ships boiler cooling water. Operations adjacent to the pier while a vessel is in port will, however, involve the use of seawater for vessel ballasting. Among other factors, vessel displacement will determine ballasting water usage. LNG carriers in the 217,500 m^3 range can typically carry up to 80,000 m^3 of ballast water (i.e., maximum ballast tank capacity). These carriers typically have two to three onboard pumps each with a 2,500 cubic meter per hour (m^3/hr) rated capacity. Typically, the intakes will be screened to prevent foreign objects or fish to be pumped into the ballast tanks.

The LNG carriers will be loaded when they arrive at the LNG Terminal. Typically, loaded LNG ships do not carry a significant amount of ballast water. Because the LNG Terminal is a receiving terminal (or import terminal), no ballast water is expected to be discharged at or near the LNG Terminal. In compliance with International Convention for the Control and Management of Ships' Ballast Water and Sediments enacted by the International Maritime Organization (IMO), all LNG carriers calling at the LNG Terminal will be required to have on board, and implement a duly approved Ballast Water Management Plan. The Ballast Water Management Plan is specific to each ship and includes a detailed description of the actions to be taken to implement the ballast water management requirements.

In addition to water withdrawal for ballast, LNG ships servicing the Project may also withdraw and discharge water for cooling the ships' boilers. The specific volumes needed for this operation are not available; however, based on the limited annual LNG ship traffic and the small amounts of cooling water needed for each ship's engines, these withdrawals are not anticipated to result in any appreciative impacts beyond those described for ballast water intake, and all cooling water intake use would be limited to non-contact cooling water to limit the potential for impact to thermal change in the discharge water content.

The operation of the Project's emergency fire suppression system may require seawater, which would be taken on an emergency basis only.

During operations at the pier, it is anticipated that up to three high-powered tugs will be used for berthing and de-berthing of the LNG ships. The propeller-induced flows from these tug operations could re-suspend bottom sediments within the dredged areas of the LNG Terminal and in the surrounding shallow water areas. AES performed a Propeller Wash Sediment Impact Study (included as Appendix 2G) for the LNG Terminal to evaluate the potential fate of these re-suspended sediments, particularly if they are considered contaminated, and whether the material is likely to be transported away from the area adjacent to the Terminal Site and deposited in environmentally sensitive areas, in Bear Creek, or in other surrounding areas. The study demonstrated that the transport of re-suspended

[6] LNG ships will comply with IMO requirements for sewage water and ballast discharge. No sewer water discharge is allowed within 12 nautical miles from nearest land limit in accordance with Annex IV of the International Convention for the Prevention of Pollution from Ships (MARPOL), 1973. Ballast water discharge for international travel is to take place at the 200 nautical mile EEZ limit; ballast water discharge for travel within US waters is required to take place following the IMO criteria, Annex I of MARPOL, as well as the USCG Voluntary Ballast Management Guidelines

sediments due to tug operations will not cause significant transport into Bear Creek. Likewise, if there are contaminated sediments at the source, significant and measurable quantities of contaminants will not be transported into Bear Creek or other adjacent areas. The simulations were based on tidal circulation (only) and did not account for residual currents caused by upland fresh water or storm water flows into Bear Creek. Sensitivity analysis simulations indicated that a small downstream current significantly modifies the sediment deposition patterns and further reduces the potential for transport of re-suspended sediments into Bear Creek.

As described in Section 2.4.6, AES will apply for coverage for the LNG Terminal under the Maryland General Permit for Stormwater Discharge associated with Industrial activity. AES will design the LNG Terminal with appropriate stormwater controls, and ensure that stormwater that comes in contact with industrial process areas is treated prior to discharge, as described in Resource Report 13, *Engineering and Design Material*. Additionally all process wastewater will be routed to the Baltimore County POTW. Discharges to the POTW will be permitted as described in Section 2.4.6, and monitored and treated to meet the pre-treatment standards required by the Baltimore County POTW.

A fire fighting system composed of fixed and portable firewater systems, fixed and portable dry chemical extinguishing systems, and a high expansion foam system, will be installed at the Terminal Site. This fire fighting system will contain two on shore firewater pumps, each capable of providing the entire firewater demand (100 percent redundancy).

The firewater system that will be installed at the Terminal Site will be a private, fresh water distributed fire main loop that is fed via fire pumps from a firewater storage tank. The distributed loop will provide firewater to various sprinkler systems, automatic water systems, hydrants, monitors and other systems as needed. The storage tank capacity will be sufficient to provide water to the largest system demand for two hours. The fire water tank will be supplied with water from the city water main.

In addition, there will be an LNG storage tank deluge system to protect storage tanks that are exposed to the heat from a fire involving an adjacent tank or sump. The deluge system will be fed from dedicated pumps taking suction from the Patapsco River. The main fire water pumps consist of a jockey pump and two 100 percent fire pumps, one motor driven and the other diesel driven.

Seawater fire pumps will be installed along the water's edge on the western shoreline of the Terminal Site. The pumps will be vertically mounted centrifugal pumps and will take suction from the Patapsco River. These pumps will supply fire water to the LNG tank deluge system at a design flow of 4,500 gpm (and a maximum capacity of 6,750 gpm) per pump. The fire water pump intake structure will be configured with in-take screens designed to prevent ingress of debris, and to maintain inlet velocities below two fps to minimize the effect of flow on local marine life.

Maryland has regulations governing cooling water intake and discharge (COMAR 26.08.03) that implement the requirements of Sections 316(a) and (b) of the CWA, and COMAR 26.08.03.05. These regulations require the location, design, construction and capability of cooling water intake structures to reflect the best technology available (BTA) for minimizing adverse environmental impacts, provided that the costs of implementing the BTA are not wholly disproportionate to the expected environmental benefits. Maryland law exempts facilities with withdrawal rates less than 10 million gpd and less than 20 percent of stream or net flow by the intake. Maryland's regulations do not specify a design intake velocity, and typical Maryland facilities generally have a one to two fps screen face velocity.

While AES does not plan to construct a cooling water intake system, these regulations were utilized as the guidance for the conceptual design of the proposed fire water intake structure that would be used to provide water for the LNG tank deluge system at the Terminal Site. The seawater intake system will be designed to provide a steady supply of seawater under operating conditions of the fire suppression systems.

The seawater intake structure will be designed to minimize entrainment of marine organisms through effective use of a low velocity suction intake system, designed for less than two fps with a velocity-cap. The seawater will be drawn from the area of the marine pier through the velocity cap fitted to a pipeline located within the sheet pile wall that will be used to construct the bulkhead at a depth of approximately 15 feet below mean low low water (MLLW). The design will ensure a low pressure drop around the intake to prevent entrainment of suspended solids and marine life. Due to the dredging that is proposed for this area and the height of the structure, turbulence and intrusion of sand and debris are expected to be minimal.

The support chamber for the velocity-cap will extend horizontally from a buried pipeline protruding through the sheet pile bulk head. The velocity cap will be supported by king piles. The support chamber will be firmly anchored to the king piles and will be designed to withstand the prevailing waves and currents. The intake structure is in the preliminary conceptual design phase, and the actual intake structure may vary from the typical design described above. When the detail design is complete, AES will submit the appropriate description and typical design drawings to the FERC.

2.4.9.3 Power Plant

The Power Plant, if constructed, would operate under SIC Code 4911. The Power Plant would not require an outside source of cooling water while operating in conjunction with the proposed LNG Terminal. All cooling needs would be supplied by a heat/cold exchange system with the LNG Terminal. When the LNG Terminal is not operating or there is insufficient cold from the LNG being vaporized and power is needed in the local area, it would be possible to operate the Power Plant using water obtained from the municipal water system.

If AES elects to move forward with construction of the Power Plant, it would apply for coverage under the Maryland General Permit for Stormwater Discharge associated with Industrial activity. AES would design the Power Plant with appropriate stormwater controls and ensure that stormwater that comes in contact with industrial process areas is treated prior to discharge. Additionally all process wastewater will be routed to the Baltimore County POTW. A permit for discharge to the POTW would be obtained prior to initiation of operations at the Power Plant. The discharges to the POTW would be monitored and treated to meet the pre-treatment standards required by the Baltimore County POTW.

2.5 Wetlands

Most wetlands are classified as "Waters of the United States" and are protected under Section 404 of the CWA. The term "Waters of the United States" covers both deepwater aquatic habitats and six categories of special aquatic sites (of which wetlands is one category) designated by the EPA in its Section 404(b)(1) guidelines (40 CFR Part 230).

The COE and EPA jointly define wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that in normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include swamps, marshes, bogs, and similar areas.

For an area to be defined as a jurisdictional wetland, it must, under normal circumstances, possess positive indicators of each of three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology as described below.

- Hydrophytic Vegetation – The prevalent vegetation must consist of plants adapted to life in hydric soils. These species, due to morphological, physiological, and/or reproductive adaptations, can and do persist in anaerobic soil conditions.

- Hydric Soils – Soils in wetlands must be classified as hydric, or they must possess characteristics that are associated with reducing soil conditions. Hydric soils are soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation (Environmental Laboratory 1987).

- Wetland Hydrology – The area must be permanently or periodically inundated or have soils that are saturated to the surface for some time during the growing season.

2.5.1 Existing Resources

Environmental field surveys were conducted between May 18 and October 10, 2006 along the proposed Pipeline Route. Approximately 71 miles of the total 87.57 miles of the proposed Pipeline Route were accessible and field surveyed for wetlands and water resources. Approximately 16.57 miles have not yet been field surveyed for the presence of waterbodies and wetlands, including potential additional workspace areas that may be required for staging of equipment and construction of appurtenant facilities. In addition, not all temporary access roads have yet been identified and, thus, workspace areas required for these temporary access roads have not yet been surveyed. Additional surveys will be performed on new accessible property in 2007, as additional property access is available.

Wetlands were identified using a hierarchy of sources to produce the most accurate and comprehensive wetlands inventory possible. Prior to performance of environmental field surveys, the Project Area was evaluated in relation to USFWS, National Wetlands Inventory, NWI maps. Wetland types and locations were noted and compared with recent aerial photography. AES also obtained soils surveys for the Project Area from the United States Department of Agriculture, Natural Resources Conservation Service in Harford and Cecil Counties, Maryland, and Lancaster and Chester Counties, Pennsylvania. Table 2.5-1 lists the wetlands crossed by or adjacent to the proposed Project in the accessible areas surveyed. In the area surveyed, the Project crosses 74 wetlands, and 20 additional wetlands were identified adjacent to the Project Area. In areas that have not yet been surveyed, five NWI-mapped wetlands have been incorporated in Table 2.5-1 for this Resource Report.

Following a review of background information, wetland scientists from NEA performed systematic field surveys in all accessible areas along the proposed Pipeline, aboveground facilities, and pipe yard/staging areas between June and August 2006. Field wetland delineation methodology was based on the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987) and classified according to the USFWS classification system (Cowardin et al. 1979). Specifically, the survey included an area 150 feet wide generally centered on the proposed Pipeline centerline, and within 100 feet of the boundary of aboveground facility and pipe yard/staging areas. Full details of NEA's wetland delineation survey, including vegetation community profiles and qualitative assessments, are provided in the Project's wetland delineation and waterbody identification reports in Appendix 2D.

Topography along the Project Area ranges from flat in the developed southern end of the Project Area to rolling hills with moderate slopes proceeding northward through Maryland and Pennsylvania. Beyond the Baltimore metropolitan area, most of land traversed by the Pipeline is currently used for agricultural and mixed rural residential purposes. The majority of soils crossed by this loop are gently sloped to moderately steep (three to 25 percent slopes), well drained, silt loams. Accordingly, wetlands along the Project Area are primarily restricted to hillside seeps, low-lying areas, and along streams and their associated floodplains.

In general, the Pipeline crosses the majority of the major palustrine wetland types, along with a small amount of estuarine wetland at the southern terminus. Palustrine wetland areas were the dominant type encountered across the Pipeline Route and included several types of emergent, scrub-shrub, and forested wetlands, including open water marshes, semi-open emergent marshes, emergent marshes, herbaceous wet meadows, shrub-emergent meadows, wooded swamps, and floodplain forests.

Open aquatic marshes are dominated by arrowhead (*Sagittaria latifolia*), arrow arum (*Peltandra virginica*), narrow-leaf cattail (*Typha angustifolia*) and broad-leaf cattail (*Typha latifolia*). Semi-open emergent marshes and emergent marshes areas are dominated by awl sedge (*Carex stipata*), tussock sedge (*Carex stricta*), lurid sedge (*Carex lurida*), fringed sedge (*Carex crinata*), rice cutgrass (*Leersia oryzoides*), creeping spike rush (*Eleocharis acicularis*), soft rush (*Juncus effuses*), reed canary grass (*Phalaris arundinacea*), fowl meadow grass (*Poa palustris*), woolgrass (*Scirpus cyperinus*), manna grass (*Glyceria striata*), eastern joe-pye weed (*Eupatoriadelphus dubius*), New England aster (*Aster novae-angliae*), boneset (*Eupatorium perfoliatum*), blueflag iris (*Iris versicolor*), sweetflag (*Acorus calamus*), sensitive fern (*Onoclea sensibilis*), and cinnamon fern (*Osmunda cinnamomea*).

Shrub emergent marshes are dominated by similar species found in emergent marsh areas with the addition of a strong woody shrub component. Dominant shrub species within these areas include silky dogwood (*Cornus amomum*), winterberry (*Ilex verticillata*), common elderberry (*Sambucus canadense*), speckled alder (*Alnus rugosa*), swamp rose (*Rosa palustris*), and buttonbush (*Cephalanthus occidentalis*).

Wooded swamps and floodplain forests encountered are typically forested wetlands with a strong shrub component. Dominant species include red maple (*Acer rubrum*), American elm (*Ulmus americana*), pin oak (*Quercus palustris*), green ash (*Fraxinus pennsylvanica*), black gum (*Nyssa sylvatica*), sweetgum (*Liquidambar styraciflua*), arrowwood viburnum (*Viburnum dentatum*), witch hazel (*Hamamelis virginiana*), highbush blueberry (*Vaccinum corymbosum*), winterberry (*Ilex verticillata*), and silky dogwood (*Cornus amomum*).

Estuarine wetlands encountered across the route included intertidal emergent wetlands and scrub-shrub wetlands. Intertidal emergent wetland habitats are dominated by common reed (*Phragmites australis*). Scrub-shrub wetlands are typically dominated by common reed, groundsel tree (*Baccharis halimifolia*) and marsh elder (*Iva frutescens*).

NWI wetlands are crossed by the Project and are consistent with the size and location of the field delineated wetlands. NWI wetlands encountered along the Pipeline Route are characterized as predominantly palustrine types including forested wetlands, scrub-shrub wetlands and emergent wetlands. In addition, a smaller number of estuarine wetlands were encountered including intertidal emergent wetlands and scrub-shrub wetlands.

2.5.1.1 Pipe Yard/Staging Areas

AES has sited the locations for pipe yards and staging areas, the size and configuration of these areas is dependent upon its purpose as well as the existing site conditions (e.g., available and/or accessible space, nearby resources) at each proposed work location. The locations of the pipe yards/staging areas are shown in Table 2.5.1-1. To the maximum extent practicable, AES plans to utilize previously disturbed uplands areas for pipe yard/staging areas. Additional wetland delineation surveys of the proposed pipe yards/staging areas will be performed in the spring of 2007 as additional property access is available. A description of the completed locations and configurations of each pipe yard/staging area are included in Resource Report 8, *Land Use, Recreation and Aesthetics*.

2.5.1.2 Meter Stations

Construction of the Pipeline will require installation of nine mainline valves and three interconnect metering facilities as shown in Table 2.5.1-2. A typical layout of meter-regulator and interconnect facilities is provided in Resource Report 1, *General Project Description*, Figure 1.3-7. The permanent land requirements for these facilities are limited to the footprint of the facility and sufficient area to secure the sites with fencing and provide needed access, as described in Resource Report 8, *Land Use, Recreation and Aesthetics*. Table 8.3.3-1 of Resource Report 8 provides the location of each of these aboveground facilities, summarizes the land use types, and provides the acreages associated with both temporary and permanent impacts to these land use types. Additional land at these locations will be required on a temporary basis during construction to provide sufficient access and adequate space for material laydown, equipment, and worker safety. These areas were included in the wetland delineation. Wetlands were not present at the proposed meter station locations.

2.5.1.3 Sensitive Wetlands

The MDNR Wildlife Heritage Service (WHS) determined that the proposed Pipeline Route crosses through two Nontidal Wetlands of Special State Concern (NTWSSC), which are regulated by the MDE (MDNR WHS 2006). However, based on AES field survey data, the proposed Pipeline Route only crosses one NTWSSC, which occurs at mile post 22.22 to 22.23 on Wild Cat Branch, a stream located within Gunpowder Falls State Park. The second NTWSSC roughly parallels the proposed Pipeline Route from mile post 46.45 to 46.63, with the closest boundary of the NTWSSC being approximately 130 feet northwest of the proposed Pipeline Route. AES will consult with MDE regarding the delineation of the NTWSSC boundaries according to MDE policies, procedures and regulations and provide the MDE an opportunity to review the wetland information.

2.5.2 Wetland Construction and Mitigation Procedures

The Pipeline will traverse a number of wetlands, the majority of which are palustrine wetland types, along with a small amount of estuarine wetland at the southern-most pipeline areas. Palustrine wetland areas were the dominant type encountered across the Pipeline Route; in general the wetlands observed included several types of emergent, scrub-shrub, and forested wetlands, including open water marshes, semi-open emergent marshes, emergent marshes, herbaceous wet meadows, shrub-emergent meadows, wooded swamps, and floodplain forests. Total impacts to wetlands by type of wetland and type of impact are shown in Table 2.5.2-1.

In general, impacts to wetland vegetation resulting from the proposed Pipeline will be minimal and temporary in nature. The majority of the impacts will occur in forested wetlands because Pipeline installation will require the removal of trees and shrubs. Permanent impacts will occur within the permanent ROW, where the wetlands will be maintained for the life of the Pipeline as emergent/scrub-shrub communities. The following construction and mitigation procedures will minimize impacts to wetlands during Pipeline construction and restoration.

2.5.2.1 Construction Procedures

AES will ensure that construction-related impacts to wetlands are kept to a minimum and will adhere to the following wetland crossing procedures which are based on the Commission's Wetland and Waterbody Construction Procedures:

- Vegetation will be cut off at ground level, leaving existing root systems intact, and the cut vegetation will be removed from the wetlands for disposal.
- Pulling of tree stumps and grading activities will be limited to that area directly over the trench, and to a lesser extent, to the work or travel area. Where, in the judgment of the Chief Inspector or Environmental Inspector, construction safety would be compromised, stumps will be pulled in the workspace outside of the trench line.
- AES will attempt to use no more than two layers of timber rip-rap or prefabricated timber mats within the work area to stabilize the ROW.
- All corduroy pads, prefabricated equipment pads, and geotextile fabric overlain with gravel will be removed upon completion of construction.
- The top 12 inches of topsoil from the trench will be segregated and then returned to its original position on top of the trench, except in areas where tree roots and stumps, standing water, or saturated soils prevent this.
- Sediment barriers will be installed and maintained at the edge of all wetlands until upslope ROW revegetation is completed. Permanent slope breakers will be installed at the base of all slopes adjacent to wetlands.
- Permanent trench breakers will be installed at the point where the trench enters and exits the wetland to help preserve the wetland's hydrologic characteristics and to control sediment discharges into the wetlands.
- Backfilling of the trench within the wetlands will be performed in such a manner that excess backfill will not be mounded, and that the wetlands will be returned, to the extent possible, to original contours and flow patterns.

- Excess fill material resulting from trench excavation and backfilling must not be discharged or otherwise disposed of in waters of the United States and jurisdictional wetlands.

- Due to relatively deep soils traversed along much of the Project Area, shallow bedrock conditions are not expected to be common. This is particularly the case with wetlands that typically occur in low lying areas and floodplains with deep soils. In the event that bedrock occurs near to the surface in wetlands, AES will minimize impacts by using construction BMPs for shallow bedrock areas, including use of rippers, back-hoe mounted hammers, and blasting where necessary.

Procedures will also adhere to the BMP drawings shown in Appendix 2B.

2.5.2.2 Wetlands with Unsaturated Soils

The construction technique used to cross wetlands with stable, unsaturated soils at the time of construction will be similar to those used in dry upland areas. Soils may be dry and stable enough to support equipment without additional timber mat/riprap equipment support, and pipe may be strung along the ROW on skids through the wetland. Vegetation will be cut just above ground level leaving root systems in place. Grading and pulling of tree stumps will be limited to only the trench line area and, where required, to ensure safe operation of construction equipment to facilitate regrowth of existing root systems after construction. Wetland topsoil will be segregated from subsoil in the trench line area and stored in separate piles while the trench is open. The segregated soils will be backfilled in the proper order, with topsoil on top, and the preconstruction surface contours will be restored. Trench breakers will be placed in the trench at the base of slopes near the wetland boundaries prior to backfilling to prevent draining of the wetland along the trench line. No upland soil or fill material will be backfilled or imported into the wetland. The wetland will be seeded with annual ryegrass to quickly establish a short-lived vegetative cover, allowing the wetland's native seed and rhizomes (contained in the topsoil) to reestablish dominance over time. No lime, fertilizer, or mulch will be applied in wetlands. If revegetation is not successful at the end of a three year monitoring period, AES will develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan, including, but not limited to the use of a native wetland seed mix.

2.5.2.3 Wetlands with Saturated Soils

In wetlands with wet, saturated soils, topsoil will be segregated over the trench line if possible (i.e., where standing water, saturated soils, frozen conditions, or tree roots and tree stumps do not preclude soil separation). Construction in saturated wetland areas may involve either the "drag section" or the "push/pull" technique.

The drag section technique involves equipment carrying a prefabricated section of pipe into the wetland for placement into the excavated trench, if soil conditions permit. This technique requires the installation of equipment support (such as timber rip-rap or prefabricated equipment mats) along the working side of the trench to provide a stable work surface and minimize soil disturbance and rutting. Clean-up and restoration procedures will be similar to those previously described for wetlands with unsaturated soils with the additional step of removing the equipment support from the wetland.

A site-specific crossing plan will be developed for specific large wetland complexes that cannot be crossed using conventional methods. These site-specific crossing will typically involve the use of the push/pull technique, a technique that is generally used only in wetlands with standing water or soils that are saturated to the surface. The trench may be excavated using either a backhoe (working on equipment support in the wetland) or a dragline or clamshell dredge (working either in the wetland or from the edge of the wetland, depending on wetland size and extent of soil saturation). The push/pull technique involves equipment pushing the prefabricated pipe from the edge of the wetland and/or pulling (e.g., with a winch) the pipe from the opposite bank of the wetland into the excavated trench. Floats may be attached to the pipe to give it positive buoyancy, allowing it to be "floated" into place over the excavated trench. Once the pipe is positioned, these floats will be removed and the pipe will settle to the bottom of the trench and the trench will then be backfilled. The push/pull technique enables the pipeline to be installed with minimal equipment operating in the wetland. AES will request a variance to the Commission's Procedure VI.A.3 at these locations to allow a 100-foot-wide construction ROW in the wetland, to account for potential unstable soils along the trench line.

2.5.3 Mitigation Procedures

The proposed construction procedures are designed to ensure that potential impacts to wetlands are minimized to the fullest extent practicable. AES will implement wetland crossing procedures and wetland protection measures outlined in FERC's *Plan* and *Procedures*, which are contained within the Sparrows Point Erosion and Sediment Control Plan (see Resource Report 1, *General Project Description*, Appendix 1A) and Appendix 2B herein to further minimize impacts to wetlands crossed by the proposed Project.

Temporary construction impacts in wetlands may include loss of herbaceous and scrub-shrub vegetation, wildlife habitat disruption, soil disturbance associated with grading, trenching, and stump removal, sedimentation and turbidity increases, and hydrological profile changes. To minimize vegetation disturbance, AES will limit the ROW width to 75 feet in wetlands. Disturbance will be further minimized by restricting equipment access in sensitive wetlands to machinery needed for actual Pipeline installation and by limiting the number of crossing events. To minimize impacts to wetlands, AES will implement erosion and sediment control measures to prevent soils disturbed by construction activities from leaving the construction area and entering the wetland. This will include the spill prevention and response procedures to avoid impacts from refueling of equipment and fuel storage within the vicinity of the wetlands.

Confining stump removal to the trench line will minimize soil disturbance unless safety or access considerations require stump removal elsewhere. Erosion control techniques, including revegetation and deployment of silt fences, slope breakers, trench plugs, rip-rapping, terracing, and netting, will be used in upland areas to restrict sediment runoff into adjacent wetlands.

Preconstruction wetland conditions in the temporary ROW will be restored to the extent possible to promote revegetation by natural succession. Topsoil segregation in farmed and unsaturated wetlands will preserve the native seed source, which will facilitate regrowth of herbaceous vegetation once Pipeline installation is complete. In addition, wetlands will be reseeded with approved grasses to encourage recolonization and control erosion.

To assist safety surveillance, only herbaceous plants will be allowed to grow within a 10-foot-wide strip centered over the Pipeline and trees greater than 15 feet in height will be removed from a 30-foot strip centered over the Pipeline in wetlands. This will result in the conversion of some forested wetlands to other wetlands types, including emergent or scrub-shrub type wetlands. The remaining portion of the 75-feet CROW will be re-established with herbaceous and/or woody species (e.g., wetland trees and shrubs). A more detailed description of proposed mitigation measures for impacts to forested wetlands is described within FERC's Wetland and Waterbody Construction and Mitigation Procedures (January 17, 2003 Version), which is included within Appendix 2A, Environmental Construction Plan.

Impacts to wetlands from blasting will be minimized by implementing wetland construction measures outlined in the ECP. These measures include minimizing workspace requirements, using equipment support, minimizing clearing, and segregating topsoil over the trenchline. With the use of seismically controlled blasting in areas of consolidated rock, AES will ensure that blasting will have little, if any, effect on wetland hydrology. Use of the delayed blasting techniques will mitigate impacts of blasting and limit rock fracture to the immediate vicinity of detonation. All blasts will be matted to minimize fly rock distribution throughout the wetland. AES will also utilize hydraulic rock hammers to gain adequate depth where necessary. Following installation of the Pipeline, the trench will be backfilled with the excavated rock and spoil material up to the level of the original rock grade. No rock larger than two feet in diameter will be placed over the Pipeline. Excavated rock that is unable to be placed back into the trench will be removed from the site, or carefully windrowed as per landowner permission, with breaks left to prevent interruption of natural surface drainage.

Following backfilling, segregated topsoil will be redistributed across the trenchline and the wetland restored to approximate original grade and contours. Reseeding will be performed using annual ryegrass or appropriate seed mix as recommended by the COE and appropriate state regulatory agencies.

AES understands that seeding restored wetlands with annual ryegrass at a rate of 40 pounds per acre has been a successful industry standard practice for many years on thousands of miles of pipelines throughout the U.S. The FERC recently commissioned a study of the long-term success of wetlands that were restored per the FERC's Procedures and concluded that the Procedures were largely effective in ensuring revegetation success (FERC 2004). Seeding with wetland seed mixes is an extremely costly measure that has questionable efficacy in enhancing wetland restoration success or preventing invasion by nuisance plant species. However, in response to the COE comments, AES has consulted with the MDE Wetlands and Waterways Program, and the PDEP Waterways, Wetlands & Erosion Control office to determine if either agency had a preferred wetland seed mix for use in wetland restoration projects. Representatives in both agencies stated that there was no established recommended seed mix for wetland restoration in either state (MDE 2006x; PADEP 2006x). However, the agencies agreed that they would review an applicant's proposal for wetland restoration along with its permit application to determine if it would be considered successful. A proposal that involved a seeding with annual ryegrass only would not necessarily be deemed inadequate if it was determined by the reviewer to satisfactorily facilitate wetland revegetation.

There are numerous wetland seed mixes available from commercial plant nurseries for reseeding of restored wetlands and mitigation projects. These mixes range from quite simple to complex, with increasing complexity not necessarily correlating to increased success rate or increased wetland functions and values. The primary objectives are to stabilize the site, prevent the invasion of opportunistic nuisance species, and allow the plant propagules in the native wetland topsoil and adjacent areas to populate the site. Consequently, if a wetland plant mixture is to be used to supplement an annual ryegrass seeding, it should be comprised of a relatively simple mix that will achieve the stated goals without changing the native community composition as it reestablishes. As such, the following commercially available wetland seed mix is recommended:

Herbaceous Wetland Seed Mix

Percent Weight	Scientific Name	Common Name
19.0	Carex vulpinoidea	Fox Sedge
19.0	Elymus virginicus	Virginia Wild Rye
15.0	Echinochloa crusgalli var. frumentacea	Japanese Millet
15.0	Panicum clandestinum	Tioga Deer Tongue
15.0	Polygonum pensylvanicum	Pennsylvania Smartweed
5.0	Agrostis perennans	Autumn Bentgrass
5.0	Panicum virgatum, VNS	Switch Grass, Variety Not Stated
3.0	Carex scoparia	Blunt Broom Sedge
3.0	Carex stipata	Awl Sedge
1.0	Juncus tenuis	Path Rush

This wetland grass seed mix was developed for use in the Northeast and Mid-Atlantic Region. The species composition allows for variations in moisture and light conditions and the addition of annual ryegrass, Lolium multiflorum, provides erosion control and early organic input. A seeding rate of 15 pounds per acre plus 15 pounds per acre of annual ryegrass is recommended.

Following filing of applications to the COE and Maryland/Pennsylvania state agencies for permits associated with wetlands and waterbody crossings in accordance with the schedule included in Table 1.8-1 of Resource Report 1, *General Project Description*, and final determination of crossing methods and work within regulated wetlands and waterbodies, some loss of wetlands may be determined. Mitigation to address such losses will be addressed through the development of a Wetland Mitigation Plan, consistent with the Baltimore District Corps of Engineers *Mitigation and Monitoring Guideline* (2004), and *Federal Guidance on the Use of Off-Site and Out-of-Kind Compensatory Mitigation* under Section 404 of the CWA.

2.5.4 Cumulative Impacts

Cumulative impacts are those impacts associated with a proposed project together with those associated with present or reasonably foreseeable projects within the area affected by the proposed project. The potential impacts associated with the Project, together with those associated with two other infrastructure projects to be undertaken in the vicinity of the Project, may result in limited, temporary cumulative impacts. These two projects are the expansion of Interstate Highway 95 (I-95) and the construction of a new natural gas pipeline by Eastern Shore Natural Gas Company (Eastern Shore).

With regard to the I-95 expansion project, AES has reviewed the proposed Pipeline Route relative to the I-95 expansion. The I-95 project is underway in the vicinity of the intersection with Interstate Highway 695 (I-695) in Maryland. The I-95 expansion project in the vicinity of the Pipeline Route will be conducted following completion of construction of the Pipeline. Each project will be required to comply with stormwater and sediment and erosion control procedures during construction which will minimize potential impacts to any wetland areas that may be nearby.

Eastern Shore filed an application with the Commission requesting an amendment to its certificate of public convenience and necessity. Eastern Shore proposes to construct and operate four new pipeline segments totaling 20.98 miles of pipeline of varying diameter pipeline in Chester County, Pennsylvania and New Castle County, Delaware. Eastern Shore also proposes to construct and operate 1.4 miles of 16-inch mainline looping on Eastern Shore's right-of-way in Chester County, Pennsylvania, paralleling the existing 8-inch mainline; 3.25 miles of 16-inch new mainline and a regulator station in New Castle County, Delaware; 10.33 miles of 6-inch mainline extension from a point near Milford, Delaware to a point near Milton, Delaware; and 6.0 miles of 6-inch mainline looping, paralleling the existing 6-inch mainline from Laurel, Delaware to Delmar, Delaware. Some of the project components may be located in similar areas; however, both the Eastern Shore Project and the Pipeline proposed by AES will be required to comply with federal, state and local permit conditions during the construction and operation of each project as well as mitigate any impacts to wetlands in accordance with agreements established with state authorities prior to construction of the projects.

AES will minimize the potential for these impacts by complying with applicable permit requirements, the mitigation measures contained in the ECP, and the SPCC Plan. However, these impacts primarily would be short term and/or minor and would be effectively minimized through implementation of appropriate mitigation measures, including adherence to permit conditions.

When projects are constructed at or near the same time, the combined construction activities may have a cumulative impact on vegetation and wildlife living in the immediate area. Right-of-way clearing and grading and other construction activities associated with the Project along with other construction projects would result in the removal of vegetation, alteration of wildlife habitat, displacement of wildlife, and could have other secondary effects in the Project Area such as increased population stress, predation, and establishment of invasive plant species. These impacts would be greatest where other projects are constructed within the same time frame and areas as the proposed facilities.

Construction of the proposed LNG Terminal and Pipeline facilities would result in the temporary removal of vegetation and wildlife habitat, which would contribute to the cumulative impact on these resources. However, the net cumulative effect of construction of the Project on these resources would be small. AES has attempted to avoid or minimize its impacts on vegetation and wildlife by locating the LNG Terminal facilities in a previously disturbed industrial area and the Pipeline generally parallels existing ROW for highways, overhead electric transmission lines and pipelines, which reduces tree clearing and the long-term alteration of habitats. AES will consult with MDNR and PDEP to develop appropriate mitigation for the permanent wetland impacts of the Project.

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