4.0 ENVIRONMENTAL ANALYSIS

4.1 GEOLOGICAL RESOURCES

4.1.1 Physiographic and Geologic Setting

The Project is located within two major physiographic provinces: the Atlantic Coastal Plain Province and the Piedmont Plateau Physiographic Province. The LNG terminal and pipeline up to MP 18 are located within the Atlantic Coastal Plain, while the remainder of the pipeline route is located within the Piedmont Physiographic Province.

The Atlantic Coastal Plain Province is a low-lying region with little topographic relief, ranging up to a few hundred feet of elevation above mean sea level (msl). The Atlantic Coastal Plain Province is dominated by unconsolidated to poorly-consolidated Triassic to Quaternary age sediment deposits (gravel, sand, silt and clay) that are up to 8,000 feet thick near the Atlantic Coast. These sediments thin out toward the northern and western limits of the Province, eventually pinching out near MP 18 where the Fall Line denotes the boundary between the two provinces. Sediments were derived by erosion of former uplands and mountains to the west of this area and are poorly- to well-sorted, and represent high- to low-energy stream and mud or backwater depositional environments. Quaternary age surficial sediments are present within limited portions of the project area and consist of alluvium and fill. Fill material includes heterogeneous material consisting of sediments, rock, and dredge spoil.

North of MP 18, the pipeline route is located within the Piedmont Plateau Province in Maryland and Pennsylvania. The Piedmont Plateau Province is a low- to moderate-relief region characterized with broad, rounded to flat-topped hills and shallow valleys. Topographic relief within the province ranges up to about 500 feet in the Lowlands Section while relief in the Uplands Section ranges upward to more than 1,000 feet of elevation. The geology of the Uplands Section is characterized by folded and faulted crystalline igneous and metamorphic bedrock, including schist, gneiss, gabbro, and quartzite. Surficial deposits consisting of upland gravels (higher hilltop elevations MP 18 to 20) and alluvium (generally within stream flood plains) are present. The Lowlands Section (at MP 79.4 to 81.3) is generally characterized as a zone of carbonate-based (limestone or dolomite) and metamorphic (marble, schist or quartzite) rock. Soils and sediment in the Piedmont Plateau Province have been generally derived from fluvial erosion and deposition. No glacial deposits are present within the limits of the project area.

4.1.1.1 LNG Terminal

Site-Specific Geotechnical Investigation, Geological Hazards, and Seismic Hazard Analysis

Haley & Aldrich (2007) conducted a detailed geotechnical site investigation and site-specific seismic hazard analysis for the proposed project. The findings and conclusions regarding geological hazards, foundation design requirements, and seismic design are summarized below.

The LNG terminal would be situated on the Sparrows Point Peninsula in Baltimore County, Maryland, a low-lying peninsula located at the eastern portion of the Baltimore Harbor. The Sparrows Point Peninsula is relatively flat, with a total topographic relief of less than 15 to 20 feet.

Onshore and offshore sediments in the vicinity of the Sparrows Point Peninsula are expected to be several hundred feet thick in the vicinity of the LNG Terminal site. The estimated depth to rock is more than 200 to 300 feet below ground surface to the west in the City of Baltimore Inner Harbor area, and more than 800 to 900 feet below ground surface to the east at the Back River Neck area (Maryland Geological Survey, 1977, 1979).

Soil borings performed at the LNG Terminal extended to depths up to 126 feet below existing grade and encountered the following geologic units:

- Miscellaneous Fill – This stratum generally consisted of medium dense, gray-brown to dark brown silty to clayey sand containing fragments of wood, slag, cinders and ash. The thickness of this layer ranged from 4.5 to 19.5 feet.
- Talbot Formation – The Talbot Formation was encountered in all the recent test borings below the Fill layer and generally consisted of gray-brown sands along the southern side of the proposed tank locations to gray silts and clays over the remainder of the terminal site. The thickness of this layer ranged from 35 to 115 feet.
- Patapsco Formation (Potomac Group) – Apparent Patapsco Formation deposits were encountered below the Talbot Formation to the final depth of the borings and consisted of gray sands to gray silts and clays.

The inferred shear wave velocity of the soil profile at the site at the tank locations increases nonlinearly from approximately 500 feet per second (fps) from the ground surface to about 600 fps to 1200 fps at a depth 100 feet below the ground surface. It is estimated to increase to about 2800 fps at a depth of 500 feet. The lower bound weighted shear wave velocity in the upper 100 feet of the soil profile is less than 600 fps. Since no actual shear wave velocity data are available, shear wave velocity measurements determined by geophysical tests are recommended to be performed prior to the end of the draft EIS comment period to verify the values that were presumed. The inferred shear wave values suggest that per the American Society of Civil Engineers' (2005) publication, the designated Site Class varies between "D" and "E."

No potential karst features which may be indicative of ground subsidence were identified at the proposed terminal site. Also no sinkholes or areas of underground mining were identified within any portion of the terminal site. Further no evidence of subsidence or ground disturbance at the terminal site was recorded in field surveys of the area. Based on the estimated depth of bedrock of over 500 feet at the terminal site, the potential for subsidence due to the solution of bedrock is very low.

Blasting would not be required at the LNG terminal site or along the offshore shipping channel because the site is underlain by several hundred feet of Quaternary-age deposits consisting of gravel, sand, silt and clay.

The terminal site would be located in area where there are no steep slopes present. No areas within or near the terminal site were identified as susceptible to landslides.

Generally, there are no known faults beneath or near the terminal site. Therefore, the potential for surface faulting at the site is considered is considered extremely remote.

Along the Gulf and Atlantic coasts, the potential wave run-up due to hurricane storm surge is generally far greater than any potential tsunami wave run-ups. However, specific evaluation of the tsunami hazard was not performed since the hazard was considered very low because of the protected inland location of the site.

While the site is located adjacent to Chesapeake Bay, the low probability of strong earthquake ground motions in the area indicate that there is probably a low probability of significant site impacts from seiches. However, specific evaluation of the seiches hazard was not done in the application documents for the project because the hazard was considered very low.

Some but not all Standard Penetration Tests performed at the site had N-values in some layers as low as 2 to 3 indicating the possibility of liquefaction. While most tests are above the liquefaction threshold, the liquefaction potential analysis is inconclusive and further field tests and evaluations are necessary.

Based on the information supplied to date, the liquefaction potential of the site when subjected to SSE level ground motions is inconclusive especially in the area of the southern LNG tanks. For this reason additional soil borings and cone penetration tests (CPTs) are recommended to be performed and further liquefaction potential studies done prior to the end of the draft EIS comment period. If it is concluded that there is a liquefiable layer sand layer, then the potential effects of liquefaction must be considered and factored into the H-pile design of the LNG tank foundations to compensate for potential effects associated with liquefaction, such as additional pile downdrag loads, reduction of shearing strength and ground settlement.

Because the liquefaction potential was inconclusive, associated liquefaction effects such as liquefaction settlements, seismic compaction or lateral spreading ground movements were not evaluated in the application filing documents. However, these effects are recommended to be re-evaluated prior to the end of the draft EIS comment period.

Seismic Design Requirements

The seismic design requirements for LNG facilities are contained in the DOT regulations at 49 CFR Part 193 - which adopts the seismic design provisions of the NFPA 59-A-2001. A detailed geotechnical site investigation and a site-specific seismic hazard analysis are required.

NFPA 59A-2001 defines two levels of earthquake motions, the Operating Basis Earthquake (OBE) and the Safe Shutdown Earthquake (SSE). The OBE and SSE ground motions must be determined by site-specific evaluations and are defined in terms of 5 percent damped response spectra with the following probability levels:

The OBE ground motions at the site are defined as the lesser of:

1. ground motion with a 10% probability of exceedance within a 50 year period (475 year return period); or
2. two-thirds (2/3) of the Maximum Considered Earthquake (MCE) ground motion.

In NFPA 59A-2001 the MCE is defined as future potential ground motion with a 2 percent probability of exceedance within a 50 year period (2475 year return period) with deterministic limits.

The SSE ground motions at the site are defined as the lesser of:

1. 1% probability of exceedance within a 50 year period (4975 year return period); or
2. two times the OBE.

These motions would be used as the basis for the earthquake-resistant design of the LNG facility, applied to the following limited specific list of critical safety-related structures, systems and components per NFPA 59-A-2001 section 4.1.3.:

1. LNG storage containers and their impounding systems;
2. system components required to isolate the LNG container and maintain it in a safe shutdown condition; and
3. structures and systems, including fire protection systems, the failure of which could affect the integrity of (1) or (2) above.

NFPA 59-A-2001 specifies that the above-referenced structures, systems and components must be designed to remain operable during and after an OBE, and must provide for no loss of containment capability of the primary container during and after an SSE. The facility design must also provide for the ability to isolate and maintain the LNG container during and after an SSE. After an SSE event, the container must be emptied and inspected prior to resumption of container filling operations. As a minimum, the impounding system must be designed to withstand an SSE, while empty and an OBE while holding the maximum operating volume of the LNG container. Seismic recording instrumentation is also required.

FERC Seismic Design Guidelines for LNG Facilities

There are areas where NFPA 59A-2001 does not provide specific seismic design requirements to enable a comprehensive philosophical approach to the overall seismic safety of an LNG facility. Consequently there can be a wide range of opinions by technical experts on how various requirements are to be applied. In our "*Draft Seismic Design Guidelines and Data Submittal Requirements for LNG Facilities*" (FERC Seismic

Guidelines), January 2007, we provide specific guidance to applicants on FERC Staff's interpretation of the requirements of NFPA 59A-2001, providing consistent design specifications throughout the U.S., and a basis for uniform reviews of various LNG terminal sites, structures, components and systems under FERC jurisdiction.

In general, the FERC Seismic Guidelines are based on existing rules and procedures found in ASCE 7-05, ASCE 4-98, API 650 Appendix E and other current standards documents applicable to LNG facilities. The guidelines also rely on the National Seismic Hazard Maps and the 2006 International Building Code (IBC 2006) MCE Ground Motion Maps, which were developed specifically for use in the design of buildings and other structures in the United States by the United States Geological Survey.

The FERC Seismic Guidelines classifies the structures, components and systems identified in NFPA 59A-2001 section 4.1.3.3 -- ((1), (2), and (3) above), as "Seismic Category I." The remaining structures, systems and components are classified as either Seismic Category II or III.

Seismic Category II and III structures, systems and components are to be designed in accordance with the seismic design requirements of ASCE 7-05 (i.e., IBC 2006). Category II structures, systems and components must meet the seismic performance goals for "essential" facilities. Category II facilities are expected to survive the Design Earthquake ((DE), which is 2/3 the MCE) with potential structural damage that would not be so severe as to preclude continued occupancy and function of the facility. An "Importance Factor" ("I" or "I_p") of 1.5 is specified for design of Category II facilities.

Category III facilities are considered "non-essential." Normal, non-essential facilities would be designed for the DE in accordance with ASCE 7-05, and are expected to sustain repairable damage when subjected to DE ground motions, although it may not be economical to do so. An "Importance Factor" ("I" or "I_p") of 1.0 is specified for design of Category III facilities.

The FERC Seismic Guidelines provides guidance on lower permitted limits on site specific design ground motions. It also provide guidance in determining the appropriate Site Class spectral amplification values and long-period spectra displacement cutoff transition period per ASCE 7-05, inelastic reduction factors for the SSE, minimum safety factors for tank foundation loadings and maximum permitted foundation settlements, minimum freeboard requirements for LNG sloshing heights and the selection and location of seismic recording devices. And it provides guidance on the seismic design criteria and foundation design criteria to be used for the design of Seismic Category II and III facilities.

Controlling Seismic Events

The terminal site is located in a part of the Eastern US that has experienced far fewer significant earthquakes than the west coast. The largest earthquake in historic times had a magnitude 5 and was about 150 to 200 miles from the project site. There are no faults present beneath or near the terminal site. Deaggregation of the seismic hazard from the USGS probabilistic seismic hazard assessment indicates that local moderate magnitude earthquakes (M 5.0 - 5.5) contribute most of the earthquake hazard in the region of the site. The local earthquakes are not associated with any specific faults or seismic source zones but instead are based on the very small possibility that moderate earthquakes could occur anywhere in the region.

Input Ground Motions

Input ground motions for the terminal site (also called Design Ground Motions) were determined based on probabilistic seismic hazard maps developed by the USGS in 2002 for the bedrock motions at depth (1000 feet below the grounds surface) and then site specific response analyses were performed to obtain the surface motions. These maps also form the basis of the Maximum Considered Earthquake (MCE) mapped values found in the 2006 IBC and ASCE 7-05. The ground motions have been determined in a manner consistent with the recommendations contained in the draft FERC Seismic Design Guidelines and requirements of NFPA 59A-2001 for determined site specific ground motions.

- The Maximum Considered Earthquake (MCE) ground motion parameters (not adjusted for site effects) are S_s = 0.17g and S_1 = 0.05g ("g" in this context is the acceleration due to gravity). The value of T_L is 8 seconds (The site is on the border line contour between 6 and 8 seconds). The site specific MCE ground motion parameters based on site response analysis are S_{MS} = 0.40g and S_{M1} = 0.20g. The site specific SSE peak horizontal ground acceleration is 0.15g.
- The site specific Design Earthquake (DE) ground motion parameters adjusted for site effects (which are 2/3rds of the MCE value adjusted for site effects) are S_{DS} = 0.27g and S_{D1} = 0.13 g. The site specific DE peak horizontal ground acceleration is 0.10g.
- The Operating Basis Earthquake (OBE) was conservatively taken as the earthquake ground motion having a probability of exceedance of 10% in 50 years (Return Period = 475 years) at the bedrock level. Site response analyses were performed to determine the OBE motions at the ground surface. The OBE design ground motion response spectra for the site has a peak horizontal ground acceleration (i.e. zero period acceleration) is 0.06g. The vertical OBE design ground spectra for the site has peak vertical ground acceleration for the site of 0.04g.
- The Safe Shutdown Earthquake (SSE) was taken as equal to the MCE (in accordance with FERC Seismic Guideline recommendations) which is more than twice as great as the OBE. The SSE design ground motion response spectra therefore has a SSE peak horizontal ground acceleration of 0.15g. The vertical SSE design ground motion has a peak vertical ground acceleration for the site of 0.10 g.

Foundation Conditions and Necessary Ground Improvements

The LNG tanks and all significant equipment and structure foundations would be supported steel H-pile deep foundations. Because liquefaction potential results are currently inconclusive, no provision is currently planned for remediation of the liquefaction effects. However, this could change based on further field testing and updated liquefaction evaluation which are recommended to be performed prior to the end of the draft EIS comment period. The terminal site is at the location of a former shipyard and many existing foundations exist. Where these existing foundations interfere with the proposed construction, they will be demolished and removed. Excavation of the subgrade would be required for foundations, utility trenches and the removal of unsuitable or unstable soils within the limits of the proposed construction. A new sheetpile bulkhead would be installed along the shoreline. A special treatment has been proposed by the applicant for the foundations of the LNG tanks to minimize downdrag loads on the steel H-piles. The proposed design is anticipated to use a geofoam (expanded polystyrene) to fill a proposed gap between the bottom of the tank foundation and existing subgrade to (a) provide adequate positive site drainage away from the tank perimeter, and (b) to provide adequate support for temporary loads associated with the construction of the pile cap/based after installation of the piles.

The major equipment and facility's foundation (including the LNG tanks) are proposed to be supported by deeply driven steel H-piles. The LNG tanks would be supported on a reinforced concrete mat foundation that is proposed to be 270 feet in diameter with a minimum thickness of 2 foot 8 inches. The mat would be supported by H-piles spaced between 5 and 6 feet on center and driven to a depth of 120 feet. The pile allowable capacities would have a factor of safety of 3 relative to the ultimate capacity. Tanks settlements are not expected to exceed 3.5 inches at the center of the tank and 1.9 inches at the edge of the tank. Dishing displacements (center to edge) of the LNG foundation are not expected to exceed 1.6 inches.

Final designs and supporting documentation for all critical structures and foundations will be required prior to FERC approval to proceed with construction. **We recommend the following conditions apply to any approval the Commission may consider for the proposed project:**

- **AES should perform at least one additional boring and two additional CPTs to a depth of at least 75 feet at the location of each tank and provide the resulting new geotechnical test data <u>prior to the end of the DEIS comment period</u>. The CPTs should not be predrilled. The purpose**

of these additional tests is to provide definitive data on the liquefaction potential present at the site.

- **AES should perform shear wave velocity measurements at the site to a depth of at least 200 feet determined by actual geophysical tests and provide the resulting shear wave velocity measurement data prior to the end of the DEIS comment period.**
- **Using the additional boring, CPT, and shear wave velocity data and the peak ground acceleration for the SSE of 0.15 g, AES should provide revised liquefaction calculations using the procedures outlined in Youd and Idriss (2001) prior to the end of the DEIS comment period.**
- **If it is determined in response to the above recommendation that the soils will liquefy, AES should provide the following prior to the end of the DEIS comment period:**
  - **a. calculations and estimates of liquefaction associated settlements and pile down drag loads;**
  - **b. details of the liquefaction mitigation method(s) procedures, plan extent, and verification methods proposed to verify mitigation of liquefaction potential; and**
  - **c. detailed calculations of seismic slope stability and lateral movements anticipated after the liquefaction mitigation is implemented to verify the stability of critical structures for the project design earthquake motions.**
- **AES's LNG tank and foundation final design should comply with Part I of the draft Seismic Guidelines. Submittals that demonstrate compliance should be provided prior to initial site preparation after the final pile design has been selected. Details of the types of piles finally selected for supporting the LNG tanks and results of indicator pile program, including load tests, should be submitted for review and approval prior to construction/pile installation.**
- **The Quality Control and Assurance procedures, as described in section 3.11 of Part II of the draft Seismic Design Guidelines, that AES will use for design and construction should be submitted for review prior to the end of the DEIS comment period.**
- **AES's Final Seismic Design Criteria should be provided for all Seismic Design Category I, II, and III structures, systems, and components as described in section 3.7 of Part II of the draft Seismic Design Guidelines prior to the end of the DEIS comment period. The Seismic Design Criteria should satisfy Part I of the draft Seismic Design Guidelines.**
- **Prior to final design, AES should submit seismic specifications to be used in conjunction with the procuring equipment as described in section 3.10 of Part II of the draft Seismic Design Guidelines.**
- **Prior to construction, AES should submit all other items identified in the filed geotechnical/seismic reports that were proposed to be addressed during the detailed design.**
- **Prior to construction, AES should submit final foundation design recommendations including pile foundation design and/or liquefaction mitigation (if it is determined that soils will liquefy) measures for all other structures.**
- **AES should provide a seismic instrumentation plan as described in section 3.12 of Part II of the FERC's draft Seismic Design Guidelines prior to construction.**
- **AES should provide the results of the hydrostatic load tests on the LNG storage tanks, including settlement data as described in section 7.4.1 of the FERC's draft Seismic Design Guidelines prior to commissioning.**

Flooding and Groundwater

The terminal site is proposed to be located in a coastal setting and therefore the terminal site is subject to tidal fluctuations in surface and groundwater levels. NMFS tidal data for the 1983 to 2001 indicate that the Mean Higher High Water (MHHW) level is Elevation 0.506 m (1.66 feet). The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map indicates the 500-year (Zone "B") flood limits do not encroach onto the proposed terminal site (FEMA, 1996). In addition, the grade of the terminal site would be raised during construction, and a bulkhead would be installed at the waterline, which would further reduce the potential for any flooding impacts at the terminal site. AES would also construct an earthen floodwall, approximately 8 feet in height, that would surround the LNG tanks and the process area.

Hurricane flooding has been known to occur in the area of the terminal site. The terminal site would incorporate appropriate flood control design elements, including establishment of shore protection features, to protect against hurricane flooding, and site storm water collection and drain systems, to allow collection and removal of rain and flood waters from the terminal site. Specifically, shore protection would be installed to protect against flooding and storm surges resulting from hurricanes and severe weather.

Initial groundwater levels obtained from cased boreholes ranged from approximately elevation 5.5 to -20 feet. These readings may not be representative of ground water conditions due to the lack of well pumping or bailing prior to obtaining the groundwater readings.

In 2005, six pairs of groundwater monitoring wells were installed across the terminal site and two surface water gauging stations were installed on pier structures on the west side of the terminal site. March 2005 data indicates that groundwater generally flows westward and southwestward toward the shoreline (GZA GeoEnvironmental Inc., 2005). Southwest of the terminal site, a graving dock operates groundwater pumps that depressed the local water table up to 20 feet. Based on 2005 and 2006 monitoring data, groundwater levels at the terminal site are anticipated to vary less than 1 to 2 feet due to tidal fluctuations.

A database search of private and public water supply wells in the area of the LNG terminal indicates that the nearest active water supply wells are at approximately MP 6. Therefore, it is unlikely that water supply wells would influence groundwater levels in the vicinity of the terminal site.

In May 2006 AES conducted offshore geotechnical investigations to evaluate conditions for dredging and spoil material management. The vibracore borings were drilled to depths ranging from approximately 34 feet to 63 feet below the water surface. Each core encountered black or gray silt deposits beginning at the mudline. Borings performed closer to shore also encountered interbedded sand and clay below the initial silt layers. Borehole data indicates that the clay layer thickens in proximity to the shore while the occurrence of sand was generally greatest in the borings located centrally between the shore and the shipping channel. Geotechnical testing performed on soil cores included measurements of soil settlement characteristics, bearing capacity, dynamic loading response and other foundation design related factors.

Construction of the proposed project would somewhat alter the topographic conditions in the area of the LNG terminal; AES would raise the grade of the terminal site during construction except inside the bermed area surrounding the LNG tanks and a sheetpile bulkhead would be constructed along the waterline.

4.1.1.2 Pipeline Facilities

The topography along the pipeline route can be characterized as generally low to moderate relief and flat to gently-sloping. Along the 88-mile pipeline route, topography ranges from less than 20 feet above msl at MP 0.0 to 650 feet msl at MP 87.6. The relief ranges up to 100 feet at the point where the Coastal Plain Province transitions into the Piedmont Plateau Province. Within the Piedmont Plateau Province, elevations range from 100 to 200 feet (at MP 18 to MP 20) and to points further north, elevations generally range from 150 to 650 feet (MP 20 to MP 87.6). The Lowlands Section of the Piedmont Plateau Province (MP 79.4 to MP 81.3) is characterized as gently-sloping hills with shallow valley with an elevation of approximately 250 feet. Slopes along the pipeline route include: 0 to 8 percent slope in 67 percent of the area; 8 to 25 percent slope in 25

percent of the area; 15 to 25 percent slope in 7 percent of the area; and greater than 25 percent slope in one percent of the area.

Geologic units along the pipeline route generally include the following:

- Unconsolidated Deposits – primarily consist of clays, sands and gravels from the Talbot, Patapsco, Arundel, and Patuxent Formations with some areas of artificial fill and alluvium at or near water bodies. These deposits are present from MP 0 to MP 18 within the Coastal Plain Province Section.
- Bedrock with overlying soils – present within the Piedmont Plateau Province (MP 18 to MP 87) primarily consisting of folded and faulted crystalline igneous and metamorphic bedrock, including schist, gneiss, gabbro and quartzite. There are also mapped surficial deposits of upland gravels (along higher hilltop elevations MP 18 to MP 20) and alluvium (generally present in stream flood plains) present.
- The Lowlands Section of the Piedmont Plateau Province (at MP 79.4 to MP 81.3) is generally characterized as carbonate-based (limestone or dolomite) and metamorphic (marble, schist or quartzite) rock with overlying soils (of varying thickness locally).

Construction and operation of the proposed project would not significantly alter the topographic conditions in the project area. Over most of the area, natural topographic slope and contours would be temporarily altered. Mid-Atlantic Express would restore topographic contours and drainage conditions along the pipeline corridor to preconstruction conditions to the extent practicable.

Blasting

Along the pipeline route, shallow bedrock conditions may require the use of alternative trenching techniques or blasting during excavation activities. Depending on rock characteristics, alternative trenching methods employed could include: backhoe ripping and cutting; hoe-ramming, trenching equipment and non-explosive agents (such as S-Mite).

During construction, controlled blasting techniques may be employed to facilitate construction in a manner that would impact only near-surface materials, i.e., blasting would be limited in intensity to confine fracturing to shallow rock. Based upon soil surveys for Baltimore, Harford, and Cecil Counties, Maryland, and Lancaster and Chester Counties, Pennsylvania, there could be shallow bedrock along various segments of the pipeline (USDA/NRCS 2006a and USDA/NRCS 2006b). These areas of potential bedrock include the following milepost segments: MP 20.6 – 26.8; MP 32.2 – 33.0; MP 34.3 – 35.6; MP 36.0 – 43.9; MP 44.4 – 49.2; MP 70.4 – 72.1; MP 74.2 – 74.3; MP 79.5 – 81.0; and MP 82.5 – 83.1.

The use of explosives and blasting would be performed by a licensed blasting contractor in accordance with applicable federal, state and local regulations and the AES Project Blasting Plan. All authorizations required by federal, state and local regulations would be obtained prior to any construction-phase blasting activities.

The Project Blasting Plan would conform to the following federal and state regulations:

- Occupational Safety And Health Administration (OSHA) 1910.109, “Explosives and Blasting Agents”;
- OSHA 1926.900 through 914, “Blasting and The Use of Explosives”;
- Maryland Code, Public Safety Article, Title 11, Subtitle 1, “Explosives”; and,
- Pennsylvania Code, Title 25, Part I, Subpart D, Article IV, Chapters 87.127, 210 and 211.

Blasting activities would also conform with local (county, town, etc.) ordinances or permit conditions, as appropriate.

Under the Project Blasting Plan, the blasting contractor would be required to evaluate potential resources existing in proximity to the locations requiring blasting, and would develop measures for avoiding or minimizing potential impacts. Any blasting activities would include the following safety measures:

- contractor development of a site-specific Project Blasting Plan;
- written notice to affected landowners one week prior to blasting, along with a confirmation notice at least 24 hours before any blasting;
- periodic meetings between affected landowners and M.A.E., as needed, to provide relevant information to the landowners, either as a scheduled group meeting or individual;
- survey and location of buried utilities in the work area;
- use of matting to contain fly-rock;
- use of warning signs; site access control; audible warning signals before and after a blast;
- procedures for safe blasting materials handling, storage and use;
- performance of blasting in accordance with applicable guidelines and regulations;
- pre- and post-blast condition surveys on the exteriors and interiors of structures or utilities within 150 feet of the blasting locations (with permission of the landowners);
- seismograph vibration monitoring during blasting to assess vibrations generated by a blast;
- optimization of blast charge size and delay timing to minimize vibration; and
- pre- and post-blast surveys of water supply wells within 150 feet of the blasting area. This would include water quality sampling and an attempt to obtain readily-available information on well yield or other well data.

Pending selection of a pipeline contractor and determination of specific areas where blasting may be employed, **we recommend that:**

- **<u>Prior to initiating any blasting activities</u>, Mid-Atlantic Express file a site-specific Project Blasting Plan with the Secretary for the review and written approval of the Director of OEP.**

Additional mitigative efforts may be employed on a case-by-case basis to respond to unusual issues or landowner concerns, including providing temporary alternative lodging accommodations during the period of actual blasting.

In the unlikely event that damage to structures or utilities occurs in connection with any blasting activities during construction of the pipeline, Mid-Atlantic Express would be required to repair or restore such structures or utilities to pre-blast conditions, including repair or replacement of water supply wells.

Mineral Resources

Sand, gravel, clay and rock are mined for construction purposes along portions of the project area. Six unconsolidated material (sand, gravel or clay) pits or rock quarries (for aggregate production) occur within 0.25 mile of the project area. Three inactive mines within 0.25 mile of the project area include:

- the clay pit located at MP 12.9 is located about 600 feet west of the pipeline construction right-of-way. The pipeline right-of-way in this area is within or adjacent to the Baltimore Gas & Electric transmission corridor; and
- the other two facilities (at MP-48.9) are privately-owned rock quarries approximately 100 feet south of the pipeline construction right-of-way. These facilities presently generate coarse serpentinite aggregate.

There were no resources such as oil or gas production, exploration or storage areas, bituminous coal or anthracite mining fields, or mineral mining sites (including gold mining) identified within 0.25 mile of the project area.

In general, construction and operations of the proposed pipeline would not impact any current mineral resource operations. No potential expansion plans are planned for these mines. Inactive mines would not impact pipeline construction and operation activities.

Earthquakes

The pipeline route is located in an area of low earthquake activity. Within Maryland, all recorded earthquakes have been of magnitude 3.7 or less, and have not caused appreciable damage (Maryland Geologic Survey, 2006). The faults identified in Maryland are not known or suspected to be active.

Within Pennsylvania, historical earthquakes have been related to faults in the basement complex and have been generally minor, although a few have caused minor to moderate damage. The largest earthquake in Pennsylvania history had a magnitude of 5.2 and occurred in the northwestern part of the state in 1998. No observable displacement at the surface has occurred as a result of any earthquakes in eastern North America. The observed earthquake activity may represent reactivation of faults formed during the Cenozoic/Mesozoic extension that are now under regional compression. (Pennsylvania Geologic Survey, 2005).

No mapped surface faults or active surface faults are known to exist within the terminal site or pipeline route. Seismic activity in Maryland is not associated with active faults and historically has been associated with shaking from local small magnitude earthquakes or larger distant earthquakes. Published literature indicates the faults mapped along the pipeline route in Pennsylvania as well as other regional faults are primarily basement rock faults and were likely formed during the Paleozoic and Cenozoic eras (Pennsylvania Geologic Survey, 2005).

The pipeline would be designed to meet or exceed applicable codes and standards, including the DOT's regulations at Title 49, CFR Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards," as well as other industry standards (ASCE, ASME, ANSI, etc.), and applicable codes typically employed for the design of buried pipe. If necessary, to meet or exceed these codes, engineering measures would be incorporated into the Pipeline design. Engineering measures could include: increased pipe wall thickness, increased yield strength, modified welding requirements, or modified installation techniques.

The potential for surface faulting to occur in the project area is low and the pipeline facilities would be constructed to meet or exceed applicable engineering and seismic design standards, further reducing any potential damage that could occur in the highly unlikely event of surface faulting in the project area. We believe that the potential for seismicity and faulting does not represent a significant risk to the stability or safety of the proposed project.

Landslides

The potential for landslides or slope failures vary in the project area. The pipeline route is identified as having a moderate/low susceptibility for landslides (USGS, 1997). Several factors influence the potential for landsides and include slope steepness, soil type and thickness, soil and bedrock structure and lithology, climate, hydrology, and geomorphic history.

Along the pipeline route, three areas were identified as potentially steep or susceptible to landslides. On the basis of topography and soil conditions, these three areas include: north of Little Gunpowder Falls (MP 22.4); immediately south of Deer Creek (MP 35.4); and immediately south of the Susquehanna River (MP 43.9). The approximate slope at the MP 22.4 area north of Little Gunpowder Falls is about 20 percent; the approximate slope for the MP 35.4 area south of Deer Creek is about 30 percent. Approximate slopes at MP 43.9 south of the Susquehanna River are about 30 percent.

Mid-Atlantic Express has proposed to cross the Susquehanna River using an HDD, effectively eliminating any consideration of landslides as a potential impact. The HDD crossing method would drill beneath these areas of steep slopes, therefore avoiding slopes and issues associated with surficial soil slumping or landslides. At the other two locations localized factors such as apparent bedrock competency and heavy vegetative cover should reduce the potential for slope failures. Geotechnical investigations are planned to support the HDD crossing analysis at the Susquehanna River crossing, but Mid-Atlantic Express has indicated that no additional geotechnical investigations are planned for the Deer Creek or Little Gunpowder Falls crossings. Shallow bedrock soils and heavy vegetative cover at these crossings indicate a low potential for slope failure during construction. Mid-Atlantic Express is proposing to control the potential for landslides at MP22.4 and MP35.4 via the use of construction mitigation measures, including erosion control procedures and appropriate grading techniques to limit undercutting or overloading slopes.

Karst Topography and Subsidence

Karst topography is characterized by surface depressions, caves or sinkholes caused by carbonate bedrock weathering by mildly-acidic soil, groundwater or precipitation. The surface expression of these features in the form of ground subsidence can include subtle surface depressions, and in extreme cases, sinkholes. Subsidence can also result if "loss of ground" occurs from underground mining operations.

No previously documented or mapped Karst features are directly crossed by the pipeline; however one area of potential karst features is crossed by the pipeline route (at approximately MP 79.5 to 81). This area has a reported mapped density of approximately one karst feature per 10 acres and is considered low density. Within in this area, bedrock is anticipated to be deeper than 5 feet except for the area between MP 80.58 to 80.80 where potential shallow bedrock was identified. A further review of the area of potential karst features on localized mapping identified details of sinkhole and karst features in Chester County, Pennsylvania (Pennsylvania Department of Conservation and Natural Resources, 1993). A review of this detailed localized mapping identified only one specific mapped feature in this zone present along the project area, a potential depression at MP 80.4 in the town of Downingtown was present and mapped as a potential karst feature. No evidence of subsidence or ground disturbance was recorded along the pipeline route during the field surveys in this area. The location is currently level agricultural land immediately east of Lloyd Avenue, and there was no documented data regarding interconnection of the inferred potential karst feature and local groundwater conditions. Three private water supply wells exist near the pipeline route between approximately MP 80 and MP 81. Details on the depth and construction of these wells are not known.

4.1.2 Other Natural Hazards

Other natural hazards include flooding and acid runoff generation.

4.1.2.1 Flooding

Along the pipeline route, areas adjacent to the stream and wetland crossings are susceptible to localized seasonal flooding. Additional evaluation of the waterbody and wetland crossings, with respect to potential for flooding impacts, would be undertaken during the detailed design phase. Where appropriate, specific design measures to minimize potential impacts related to flooding would be employed.

4.1.2.2 Acid Runoff Production

Acidic runoff can be generated by rainfall contacting exposed bedrock (or tailings) and is well documented for bedrock conditions that typically include formations rich in sulfur-containing minerals. While no testing has been performed to confirm the presence or absence of sulfur-rich bedrock, sulfur-rich bedrock conditions are not anticipated, as they would be associated with coal mines, none of which lie within 0.25 mile of the right-of-way. The exposure of excavated bedrock would be of a very short duration during pipeline construction. Thus, acid runoff production is not expected along the pipeline route.

4.1.2.3 Localized Scour and Shoreline Erosion

Waterway for LNG Marine Traffic

Proposed actions at the LNG terminal include deepening and widening the Marine Channel approach from Brewerton Channel, dredging a new turning basin, and dredging the berth areas for the LNG vessels. Also, a king pile steel sheet pile bulkhead would be constructed along the western limits of the LNG site. When the LNG vessels transit the approach channel, turning basin and unloading platform, they would be tug-assisted, and at slow speeds. These slow speeds will produce low wakes, and the steel bulkhead will protect the shoreline from localized scour and erosion. The distance from the Marine Channel to the shoreline at Sollers and Coffin Points, northwest of the LNG site, exceeds 4000 feet, and thus these shorelines should not receive wakes of appreciable size due to the intervening distance and the slow speeds of the vessels along this final approach to the berthing area.

During normal operation, the increase in vessel traffic along the marine route due to operations of the LNG terminal would have no adverse impact on geologic resources within the Zones of Concern. LNG marine traffic, including LNG tankers and associated escort vessels, would be far from shore for the majority of the route and operating at speeds of 12 to 18 knots. AES has indicated that the LNG vessels would be traveling at 15 -18 knots (or "sea speed") in the North Atlantic and in the Chesapeake Bay entrance and lower Chesapeake Bay. The vessels would slow to 12 to 15 knots past the Chesapeake Bay Bridge-Tunnel, and would slow to 12 to 14 knots to transit under the Bay Bridge. Within the Craighill Channel the vessels would travel at about 10 knots, and along the Brewerton Channel vessels would slow to about 5 knots. The vessels would embark a Maryland Pilot in the Precautionary Zone of Chesapeake Bay, and would embark a docking pilot at the Cut-Off Channel before entering Brewerton Channel. Because vessel traffic would be operating at lower speeds in the portion of the waterway where the ship channel is a shorter distance to shore (i.e., the Brewerton Channel and Marine Channel), wakes would not increase the potential for shoreline erosion along this portion of the transit waterway. Along the portions of the waterway where the LNG vessels are traveling at higher speeds, the wakes created by these vessels could contribute incrementally to the whatever portion of shoreline erosion is attributable to energy from ship wakes; however this would be a small increment, since the portion of the Chesapeake Bay ship traffic attributable to the proposed Sparrows Point LNG vessels would be a small percentage of the total. That is, using the port calls at Port of Baltimore in 2005, 2,119 ships, the vessel traffic due to the Sparrows Point LNG ships, assuming 150 vessels per year (AES's high end estimate), the Sparrows Point Project would account for 7% of the total ship traffic to the Port of Baltimore area.

In addition, for the shoreline closest to the LNG ship traffic, that is the final approach along the Marine Channel, AES performed a desktop study of likely impacts due to ship wakes. AES used the methods developed by the Navy (Kreibel et al., 2003) to predict wave height at the adjacent shorelines to the channel.

Regarding the impacts from LNG spills, because LNG is less dense than water and would vaporize upon contact with water and air, there would be no significant adverse impacts to geologic resources along the transit route from intentional or accidental, ignited or unignited LNG spills.

4.1.3 Paleontological Resources

Construction of the LNG terminal would not impact important paleontological resources. The LNG site is not known to contain any sensitive paleontological resources although noteworthy specimen fossils found in Maryland include *Astrodon johnstoni* and *Ecphora gardnerae gardnerae*.

The pipeline route construction would not likely impact important paleontological resources. Fossil ferns such as seeded ferns have been identified in northeastern Maryland including Harford and Cecil Counties. In Pennsylvania, the trilobite, *Phacops rana*, is the Pennsylvania state fossil and is found in Devonian age formations. Except for a few Triassic age fossils found near Gettsyburg, no significant vertebrate fossils such as dinosaur bones have been encountered in Pennsylvania. Mastodon bones have not been found in the vicinity of the proposed pipeline route. Thus, paleontological finds are not anticipated along the pipeline route.

In Maryland or Pennsylvania, no requirements exist for notification for discovery of any type of fossils are found in an excavation unless apparently significant paleontological resources are found. Potential significant paleontological resources may include: bones, rare plants or animals species, or undiscovered invertebrate fossils in the rock record.

4.2 SOILS

4.2.1 LNG Terminal Site

Soils at the proposed LNG terminal site are highly variable with textures ranging from fill material to fine-silty, mixed soils. The western portion of the terminal site (70 percent of the terminal site, or 32 acres) is "made land" or land which consists of anthropogenic fill, spoil material from excavations, or hydraulic fill from historic harbor and channel deepening (USDA, 1976; USDA, 2005a). The eastern portion of the terminal site (approximately 30 percent of the terminal site, or 13 acres) is characterized as Mattapex-Urban land complex, 0 to 5 percent slopes. The Mattapex-Urban complex is defined as soils that have been graded, cut, filled or otherwise disturbed for non-farm uses (USDA, 1976; USDA, 2005a). Soils from the Mattapex series are deep, moderately well drained, and nearly level to gently sloping soils. These soils are strongly acid to very strongly acid and have a high available moisture capacity. Also, permeability is moderately slow, and seasonal wetness and impeded drainage impose moderate to severe limitations on these soils for many non-farm uses. Erosion is a moderate hazard in sloping areas of this soil series (USDA, 1976; USDA, 2005a). However, given the relatively flat topographic surface locally observed at the terminal site, erosion hazard potential would be relatively low for this soil at the site.

There are no designated prime or unique farmlands or farmlands of statewide importance associated with the terminal site.

During the 2006 geotechnical investigation at the terminal site, selected cores were subsampled for chemical analyses to characterize the potential soil contamination present at the site. Soil sample locations and a summary of results are presented in figure 4.2.1-1 and table 4.2.1-1, respectively. Five cores (HA-204, HA-212, HA-215, HA-216, and HA-217) were analyzed for EPA priority pollutants, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs), phenols, cyanide, total petroleum hydrocarbons (TPHs) and metals. Two of the cores (HA-216 and HA-217) were subsampled at both at surface and at depth (12.5 to 14 feet for one core; 7 to 9 feet for the second core) for a total of seven sets of chemical analyses for PAHs. Also, additional surface soil samples (HA-207, HA-208, and HA-213) were analyzed for metals and cyanide. In addition, the sample analyses from a previous investigation at Sparrows Point in 2005 (samples GZ-15S, T-7 and T-9) were made available for comparison. The combined results of these samples collected at the LNG site are given below:

- Selected SVOCs, benzo(a)pyrene, benzo(a)anthracene and benzo(b)fluoranthene, were detected at three locations (HA-204, HA-217, GZ-15S) at levels above either the Maryland soil cleanup standards for protection of groundwater or non-residential cleanup values. The balance of the samples was below Maryland soil SVOC cleanup standards.
- Surface samples at HA-216 and at the 2005 sample locations T-7, and T-9 contained PCBs at concentrations (30 mg/kg, 49 mg/kg, and 5 mg/kg, respectively), which are above the Maryland soil non-residential cleanup standards of 2.9 mg/kg. The balance of the surface or at depth samples were below Maryland soil PCB cleanup standards.

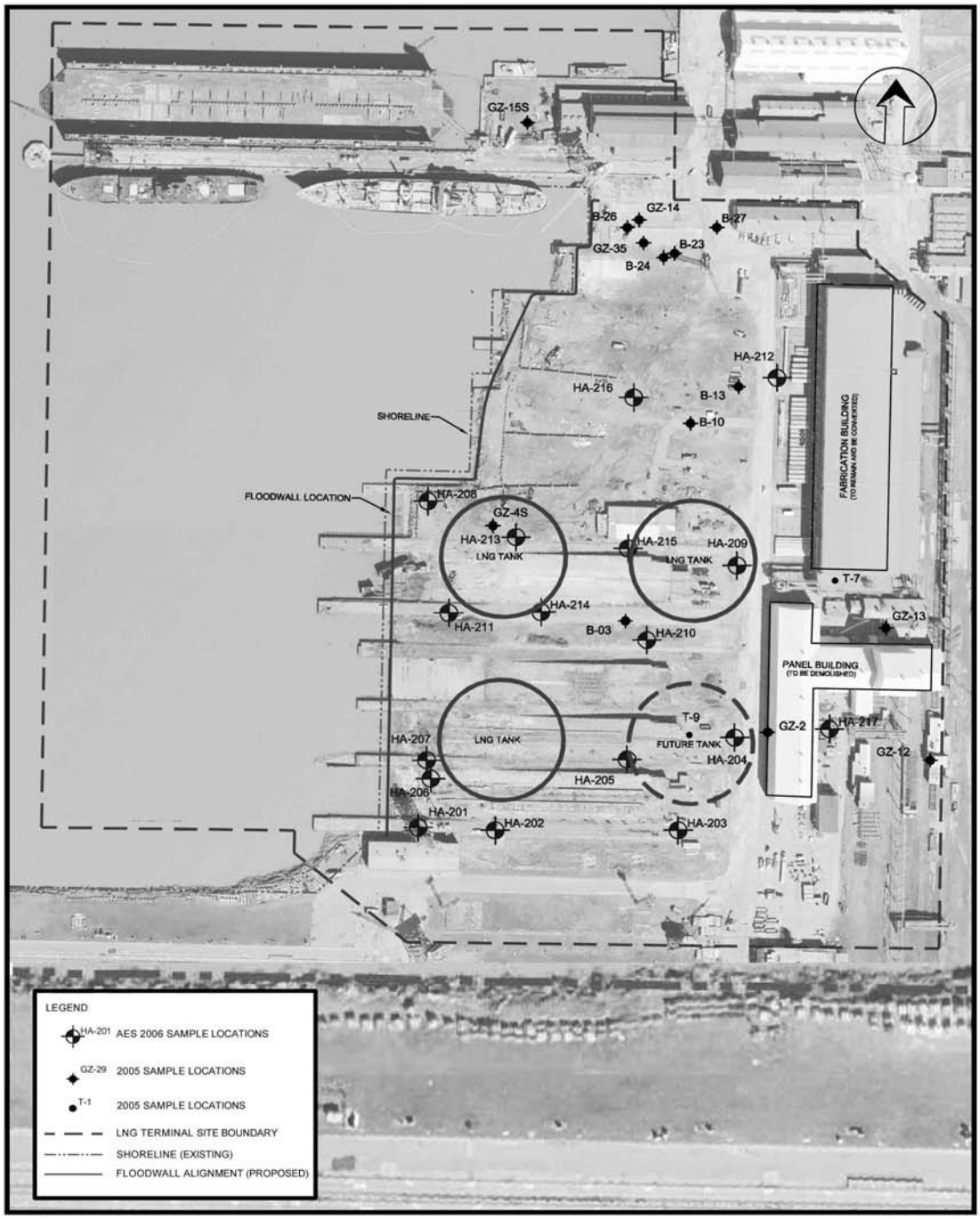


Figure 4.2.1-1
Sparrows Point LNG Project
Soil Investigation Sample Locations

- Several metals (such as arsenic, hexavalent chromium, lead, and mercury) were detected at various locations across the terminal site, in both 2005 and 2006 samples, at concentrations greater than the Maryland non-residential clean-up standards. The highest concentrations of these four metals found at the site (with the MD non-residential clean-up standard in parentheses) were: arsenic, 170 mg/kg (3.8 mg/kg standard); hexavalent chromium, 1600 mg/kg (610 mg/kg); lead, 3210mg/kg (400 mg/kg); and mercury, 0.935 mg/kg (0.12 mg/kg). None of the other metals analyzed exceeded the Maryland non-resident clean-up standards.

The LNG terminal soil conditions were observed to include relatively limited concentrations of SVOCs, PCBs (at the surface beneath or adjacent to transformers), and selected metals presence in soils. Also, the LNG terminal plans to continue as industrial/commercial land use and planned construction activities would have relatively few soil disturbances (generally utilities and tank/building foundations) below the current grade level. The final draft 2005 GZA GeoEnvironmental report (prepared for the current owner of the Sparrows Point site) recommended a comprehensive site risk evaluation to determine potentially applicable engineering controls (such as asphalt capping areas to further limit risk if necessary).

TABLE 4.2.1-1

Analytical Results of Soil Samples Collected Within the Proposed LNG Terminal Site

Type of Analyte Parameter	Units	Maryland Standard Non-Residential Clean-up Std	Analytical Results Maxima Exceeding Standard	Sampling Location (collected in 2006 unless noted otherwise)
Semivolatile Organics				
Benzo[a]anthracene	ug/kg	7,800	4,300 a/	HA-217
	ug/kg	7,800	2,000 a/	GZ-15S (2005 sample)
Benzo[a]pyrene	ug/kg	780	680 b/	HA-204
	ug/kg	780	3,100	HA-217
	ug/kg	780	1,000	GZ-15S (2005 sample)
Benzo[b]fluoranthene	ug/kg	7,800	6,700 c/	HA217
PCBs				
Aroclor 1260	mg/kg	2.9	30	HA-216
	mg/kg	2.9	49	T-7 (2005 sample)
	mg/kg	2.9	5	T-9 (2005 sample)
Metals				
Arsenic	mg/kg	3.8	5.1	HA-04
	mg/kg	3.8	9.9	HA-207
	mg/kg	3.8	14	HA-214
	mg/kg	3.8	7.2	HA-216 (0-1.5 ft)
	mg/kg	3.8	170	HA-216 (12.5-14 ft)
	mg/kg	3.8	15	HA-217 (1-3 ft)
	mg/kg	3.8	28	HA-217 (7-9 ft)
Chromium	mg/kg	610	1600	HA-208
	mg/kg	610	830	HA-215

TABLE 4.2.1-1

Analytical Results of Soil Samples Collected Within the Proposed LNG Terminal Site

Type of Analyte Parameter	Units	Maryland Standard Non-Residential Clean-up Std	Analytical Results Maxima Exceeding Standard	Sampling Location (collected in 2006 unless noted otherwise)
Lead	mg/kg	400	630	HA-204
	mg/kg	400	820	HA-216
	mg/kg	400	500	HA-217 (1-3 ft)
	mg/kg	400	1600	HA-217 (7-9 ft)
	mg/kg	400	613	GZ-15S (2005 sample)
Mercury	mg/kg	0.12	0.2	HA-204
	mg/kg	0.12	0.73	HA-207
	mg/kg	0.12	0.21	HA-208
	mg/kg	0.12	0.19	HA-213
	mg/kg	0.12	0.15	HA-215
	mg/kg	0.12	0.24	HA-216
	mg/kg	0.12	0.39	HA-217 (1-3 ft)
	mg/kg	0.12	0.272	GZ-15S (2005 sample)

a/ Exceeds MD Protection of Groundwater Standard of 1,500 ug/kg.
b/ Exceeds MD Protection of Groundwater Standard of 370 ug/kg.
c/ Exceeds MD Protection of Groundwater Standard of 4,500 ug/kg.
2006 samples were collected by AES
2005 samples were collected on behalf of current site owner; 2005 samples shown include only 3 sampling sites; there were numerous other exceedances of arsenic, lead and mercury MD Non-residential Clean-up Standards.

Construction and Operation

In portions of the LNG terminal, some areas of impacted soils, as expressed in the section above, should be managed during construction consistent with the overall Sparrows Point Shipyard VCP program recommendations. In areas of no construction, excavation or disturbance, environmentally-impaired soils may be capped with asphalt to further mitigate any potential exposure risks, if necessary, based on risk assessment results. In areas where impacted soil is excavated or disturbed, soil management activities would need to be employed as part of the LNG terminal construction to mitigate any potential exposure risks (for example, replacement on site under asphalt capped areas or disposal offsite).

AES has filed a "Potentially-Contaminated Soils Management Plan." Although this plan has addressed some of the issues necessary to protect the workers at the site and the public from construction involving potentially contaminated soils, the FERC staff finds that some items are missing or lacking detail. This includes:

- adding ranges of SVOCs, PCBs, and metals that have been detected;
- specify an 11.7eV probe if PID is to be used;
- since a PID will not detect low concentrations of SVOCs, PCBs, and metals in soils, field test kits should be used in the sampling program; and
- state that all soils from areas with documented exceedances will be handled as contaminated.

Therefore**, we recommend that:**

- **<u>Prior to construction</u>, AES file an amended "Potentially-Contaminated Soils Management Plan" with the Secretary. This amended plan should be developed in consultation with the appropriate agencies and should include:**
  - **a. ranges of detected concentrations of SVOCs, PCBs, and metals;**
  - **b. use of an 11.7eV probe photo-ionization detector;**
  - **c. use of field test kits to detect low concentrations of SVOCs, PCBs, and metals in soils; and**
  - **d. a commitment that all soils from areas with documented exceedances should be handled as contaminated.**

AES and Mid-Atlantic Express have compiled modified construction techniques, BMPs and engineering controls into the ECP and BMP drawings in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012). The ECP and BMPs for the project would provide the measures to avoid or minimize impacts to soils in non-contaminated areas during construction and operation.

4.2.2 Waterway for LNG Marine Traffic

LNG ship operations could impact shoreline soils along the marine waterway in three possible ways: 1) shoreline erosion from ship wake energy, 2) soil impact in the case of an unignited LNG spill reaching the shore, and 3) soil moisture and structure impacts from fire originating from an LNG release. The potential contribution of LNG traffic to shoreline erosion is discussed in section 4.1.2.3 Other Natural Hazards -- Localized Scour and Shoreline Erosion.

An unignited marine spill of LNG that contacted soils along the waterway for LNG marine traffic would temporarily affect these soils. The extremely cold temperature of LNG would significantly lower the soil temperature, affecting its ability to support vegetation; however, these effects would be temporary as the LNG would vaporize quickly and disperse in the atmosphere. An unignited marine spill would not significantly affect shoreline erosion potential. Based on the low probability of an unignited marine spill and temporary impacts associated with such event, we conclude that an unignited marine spill would not result in significant effects to soil resources.

If a pool fire were to occur in association with a marine LNG spill, soil surfaces in Zones 1 and 2 (see section 4.12.5.3 and figure 4.12-1, sheets 1 through 4 in Appendix K) could be impacted from radiant heat. The increased temperature would briefly raise soil surface temperatures; damage or destroy vegetation exposing soils to increased erosion potential; and contribute to nutrient loss, a short-term suspension of biological activity, and evaporation of available water from the surface of the soil. No significant or long-term soil impacts would result. The impacts from an LNG marine spill and an associated pool fire within Zone 2 would be expected to be less than those in Zone 1. No impacts would be expected to occur to soils within Zone 3. However, the maximum flammable range for a vapor cloud could extend to the outer limits of Zone 3. If the vapor cloud were to come in contact with an ignition source, resulting flash fire could burn back to the spill and temporarily impact any soils it came in contact with in the Zones of Concern. Because of the extensive operational experience of LNG shipping, the structural LNG vessel design, and the navigational safety and security controls further described in section 4.12, the above marine LNG spill scenarios are not high probability events that would impact soil resources along the waterway for LNG marine traffic.

4.2.3 Pipeline Route

Soil associations are groups of soils geographically associated in a characteristic pattern. These associations have been defined and delineated as a single map unit. Each association is named for the predominant soil series that defines the soil pattern, but includes soils of other series that occur with less frequency across the association. The soil associations are not highly erodible unless otherwise stated in the individual soil

association description. United States Department of Agriculture (USDA) and Natural Resource Conservation Service (NRCS) soil surveys and databases were used to characterize the soils affected by the Sparrows Point Project. The databases utilized include the State Soil Geographic (STATSGO) and Soil Survey Geographic (SSURGO) information.

Based on the STATSGO database, there are 10 soil associations traversed by the pipeline. These soil associations are characterized as follows (along with associated Map Unit ID for each state in parentheses):

- Othello-Elkton-Mattapex (MD005) - This association consists of moderately well drained and poorly drained fine-silty, mixed soils that are nearly level or are gently sloping. These soils are deep and have moderately slow to slow permeability. Soil acidity is strongly acidic to extremely acidic unless limed (USDA 1994a). Approximately 12.2 percent of the pipeline crosses this soil association.
- Sunnyside-Christiana-Muirkirk (MD007) - This association consists of very deep, well drained to somewhat excessively drained, moderately slow to slowly permeable soils on uplands. These soils have slopes from zero to fifty percent and are well drained to somewhat excessively drained. Most of this association lies in wooded or idle fields (USDA 1994a). About 7.2 percent of the pipeline crosses this soil association.
- Beltsville-Croom-Leonardtown (MD002) - This association consists of deep to very deep soils which range in drainage from poor to well drained and have variable permeability. These soils are found in coastal plains and uplands. Slopes range from nearly level to moderately sloping. Most of the association is not used as cropland and there is high erosion potential for much of this association (USDA 1994a). Approximately 12.2 percent of the pipeline crosses this soil association.
- Neshaminy-Lehigh-Glenelg (MD029) - Soils in this association are deep to very deep and well drained to somewhat poorly drained fine-loamy. Permeability is moderately slow to slow. This association ranges from forested and very stony to cultivated soils. Soils are nearly level to steep. Most of this association has high erosion potential (USDA 1994a). About 18.7 percent of the pipeline crosses this soil association.
- Manor-Glenelg-Chester (MD011) - This association consists of deep to very deep, steep to gently sloping, somewhat excessively drained and well drained soils. This association occurs on hilly uplands. Most of this association has high erosion potential. Most of the soils are used for farming and a limited amount for pasture (USDA 1994a). Approximately 8.1 percent of the pipeline crosses this soil association.
- Chrome-Conowingo-Neshaminy (MD030, PA086) - Soils in this association are moderately deep to very deep, somewhat poorly drained to well drained soils. Much of this association has high erosion potential. This association consists of nearly level to moderately sloping soils in well dissected uplands. Much of this association is used for farming and pasture. Other areas are wooded or used for urban and suburban communities (USDA 1994a, b). Approximately 4.7 percent of the pipeline crosses this soil association in Maryland and another 1.3 percent of the pipeline crosses the association in Pennsylvania.
- Chester-Glenelg-Manor (PA061) - This association consists of deep to very deep, gently sloping to steep soils. These soils are well drained to excessively drained. Most of the land area is used as cropland and to a limited extent, pasture. There is a high potential of erosion for approximately fifty percent of the association (USDA 1994b). Approximately 38.5 percent of the pipeline crosses this soil association.
- Hagerstown-Duffield-Clarksburg (PA058) - This association consists of deep and very deep, well drained soils with moderate permeability. Some areas are less well drained with slow to moderately slow permeability. These soils weathered mostly from limestone. Most of this

association is used as cropland or pasture (USDA 1994b). Approximately 3.7 percent of the pipeline crosses this soil association.

- Edgemont-Highfield-Buchanan (PA066) - This association consists of deep and very deep, well drained soils. These soils formed from light colored rocks, notably quartzite. They have moderate to moderately rapid permeability. This association is located on sloping to steep hills, ridges, and valleys and can be stony. Land use is a mixture of wooded areas and cleared areas for crops and orchards (USDA 1994b). Approximately 1.4 percent of the pipeline crosses this soil association.

Table 4.2.3-1 provides a summary of significant soil characteristics and limitations found along each segment of the pipeline.

TABLE 4.2.3-1

Soils Characteristics for the Proposed Pipeline Right-of-Way

State/ County/ MP	Soil Association Name	Potential Shallow Bedrock	Potential for Poor Revegetation	Potential for Wet Soils & Compaction	Highly Erodible Soils
MARYLAND					
Baltimore Co.					
0.0- 8.6	Othello-Elkton-Mattapex	No	No	Yes	No
8.9-10.8	Othello-Elkton-Mattapex	No	No	Yes	No
10.8-12.0	Sunnyside-Christiana-Muirkirk	No	No	No	No
12.0 12.1	Othello-Elkton-Mattapex	No	No	Yes	No
12.1-17.2	Sunnyside-Christiana-Muirkirk	No	No	No	No
17.2-18.1	Beltsville-Croom-Leonardtown	No	No	No	Yes
18.1-18.4	Neshaminy-Lehigh-Glenelg	No	No	Yes	Yes
18.4-20.5	Beltsville-Croom-Leonardtown	No	No	No	Yes
20.5-22.2	Neshaminy-Lehigh-Glenelg	Yes	No	Yes	Yes
Harford Co.					
22.2-26.8	Neshaminy-Lehigh-Glenelg	Yes	No	Yes	Yes
26.8-32.3	Manor-Glenelg-Chester	No	No	No	Yes
32.3-33.0	Neshaminy-Lehigh-Glenelg	Yes	No	Yes	Yes
33.0-34.3	Manor-Glenelg-Chester	No	No	No	Yes
34.3-35.6	Neshaminy-Lehigh-Glenelg	Yes	No	Yes	Yes
35.6-36.0	Manor-Glenelg-Chester	No	No	No	Yes
36.0 37.3	Neshaminy-Lehigh-Glenelg	Yes	No	Yes	Yes
37.3-40.3	Chrome-Conowingo-Neshaminy	Yes	No	No	Yes
40.3-43.9	Neshaminy-Lehigh-Glenelg	Yes	No	Yes	Yes
Cecil Co.					
44.4-47.0	Neshaminy-Lehigh-Glenelg	Yes	No	Yes	Yes
47.0-48.1	Chrome-Conowingo-Neshaminy	Yes	No	No	No

TABLE 4.2.3-1 **Soils Characteristics for the Proposed Pipeline Right-of-Way**					
State/ County/ MP	**Soil Association Name**	**Potential Shallow Bedrock**	**Potential for Poor Revegetation**	**Potential for Wet Soils & Compaction**	**Highly Erodible Soils**
PENNSYLVANIA					
Lancaster Co.					
48.1-49.2	Chrome-Conowingo-Neshaminy	Yes	No	No	No
48.1-49.2	Chrome-Conowingo-Neshaminy	Yes	No	No	Yes
49.2-70.	Chester-Glenelg-Manor	No	No	No	Yes
Chester Co.					
70.4-72.1	Hagerstown-Duffield-Clarksburg	Yes	No	No	No
72.1-79.5	Chester-Glenelg-Manor	No	No	No	Yes
79.5-80.9	Hagerstown-Duffield-Clarksburg	Yes	No	No	No
80.9-81.5	Edgemont-Highfield-Buchanan	Yes	No	No	Yes
81.5-82.5	Chester-Glenelg-Manor	No	No	No	No
82.5-83.1	Edgemont-Highfield-Buchanan	Yes	No	No	Yes
83.1-87.6	Chester-Glenelg-Manor	No	No	No	No

The project would be constructed and operated in a manner to avoid or minimize soils impacts to the maximum extent practicable, and to restore agricultural crop productivity to original or better conditions. Steps would be taken as indicated in the ECP in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012) to avoid or minimize erosion impacts during construction and operation and, for agricultural or residential land usage, soil compaction or shallow bedrock impacts.

Prime Farmland Soils

Approximately 0.4 acre of soils classified as prime farmland or farmland of statewide importance would be affected by construction of aboveground facilities (mainline valves) in Maryland. These facilities would permanently impact about 0.2 acre of prime farmland soils. The pipeline aboveground facilities would temporarily impact about 0.3 acre of soils classified as prime farmland or farmland of statewide importance, and would permanently impact about 0.15 acre in Pennsylvania. No large parcels of prime farmland soils would be permanently impacted by the construction or operation of the Mid-Atlantic Express Pipeline. Any temporary impacts to prime farmlands during construction of the pipeline would be mitigated by the application of the AES and Mid-Atlantic Express ECP (AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012)), which is based on the FERC's Plan and Procedures.

Hydric Soils

Hydric soils are defined as "soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register, July 13, 1994). Hydric soils include poorly and very poorly drained soils and some somewhat poorly drained soils. The following table 4.2.3-2 is a summary of hydric soils along the pipeline route, with mileposts and acreage by county and state.

TABLE 4.2.3-2 **Summary of Hydric Soils Along the Pipeline Route**			
County	**State**	**Hydric Soils Miles**	**Hydric Soils Acreage**
Baltimore (22.23 miles)	Maryland	6.28	66.54
Harford (21.41 miles)	Maryland	4.85	42.88
Cecil (1.81 miles)	Maryland	0.25	0.91
Lancaster (6.70 miles)	Pennsylvania	0.92	7.69
Chester (28.93)	Pennsylvania	4.23	41.89
Total Hydric Soils Impacted		**16.53**	**159.91**

About 10% of the soils impacted by pipeline construction along the pipeline route are hydric. Hydric soils can be susceptible to compaction, as discussed below. The actions that would minimize or mitigate against compaction would work to minimize impacts to hydric soils as well.

Compaction Potential

During construction activities, heavy construction equipment traveling over wet soils could reduce soil pore space or change soil structure – two actions that result in soil compaction. Compaction is sometimes evidenced by rutting. The degree of compaction would be dependent on soil moisture content and soil texture. Within the project area, two soil associations crossed by the pipeline (Neshaminy-Lehigh-Glenelg, and Othello-Elkton-Mattapex) meet the characteristics for potential compaction susceptibility. Soil associations with greater than 25 percent of their soils makeup reported with compaction potential are included in table 4.2.3-1.

During the restoration phase of the project, decompaction of the soils would be performed to restore soil porosity and permeability. Restoration methods to mitigate soil compaction would include plowing areas where soil has been over-compacted during construction. Alternatively, planting and plowing under of a "green manure" crop may be performed if appropriate and acceptable to the landowner. Mid-Atlantic Express has indicated in their ECP in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012) that the topsoil and subsoil would be tested for compaction in agricultural and residential areas disturbed by construction activities.

In residential areas, soil compaction may affect both rooting depth of grasses and shrubs and water percolation through the soil. Excessive watering of lawns can lead to water-logged soils and may increase the occurrence of insects and disease. Mid-Atlantic Express would segregate topsoil in residential areas or haul in approved topsoil. In addition, Mid-Atlantic Express would test for compaction in residential areas as specified above. Thus the potential impacts of compaction would be minimized in residential areas.

Erosion

Erosion is a natural process that can be accelerated by human activities and disturbance. Factors that influence the degree of erosion potential include soil texture, soil structure, length and percent of slope, vegetative cover, and rainfall or wind intensity. Soil erosion by water generally occurs to the greatest degree in areas of loose soils, particularly on un-vegetated moderate to steep slopes, and particularly during heavy rain events. Areas of severe wind-induced erosion generally occur in dry, fine textured, exposed (un-vegetated) soil deposits. The clearing and grading activities of the pipeline construction could accelerate natural erosion and, without adequate protection, could result in the discharge of sediment into waterbodies and wetlands.

Given the nature of the climate, soils, vegetative cover and topography in the project area, the potential for erosion hazard has been identified by reviewing the SSURGO-designated highly erodible soils (see table 4.2.3-1). Highly erodible soils account for approximately 70 percent of the pipeline route, primarily in northern Baltimore County, Maryland and Harford County, Maryland. Specifically, these areas include almost the

entire pipeline route between mileposts MP 17.2 and MP 43.9, and several shorter sections between MP 44.4 and MP 83.1.

Methods used during construction to limit erosion potential would include those discussed in the ECP in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012), such as temporary slope breakers/diversion ditches, sediment barriers, and mulching. Permanent measures such as trench breakers and slope breakers/diversion ditches would also be employed. Following construction, Mid-Atlantic Express would regrade and reseed disturbed areas to minimize erosion. After restoration and clean up, Mid-Atlantic Express would monitor disturbed areas and would maintain erosion control measures until the erosion potential areas are stabilized.

Stony Rocky Soils and Shallow-to-Bedrock Soils

Activities such as grading, trenching, backfilling, ripping and blasting may allow for rock fragments to surface and possibly interfere or damage agricultural equipment and hamper revegetation efforts by reducing soil moisture capacity. Along the pipeline route, soil associations with greater than 25 percent of their soils makeup reported as having shallow bedrock (less than five feet deep) are included in table 4.2.3-3. Approximately 30 percent of soil associations along the pipeline route have the potential for shallow bedrock.

In accordance with Mid-Atlantic Express's ECP, topsoil would be segregated from the subsoil in croplands, residential areas, hayfields, and other areas at the owner's request, to minimize potential soil impacts. Segregated topsoil would then be redeposited as topsoil when the pipeline construction is finished. Large stones or excavated blasted rock material may be used to backfill the trench only to the top of the existing bedrock profile. Excess rock not returned to the trench would be considered construction debris, unless approved for use as ground cover or rip-rap, or for some other use on the construction work areas as directed by the landowner or land managing agency. If necessary, further mitigation efforts, such as rock raking, would be conducted to remove excess rock from at least the top 12 inches of soil in all actively cultivated or rotated cropland and pastures, hayfields, and residential areas. Rock would be removed until the size, density, and distribution of rock in surface soils on the construction work area are similar to adjacent areas not disturbed by construction.

There are selected areas along the BGE corridor that have soils with mapped shallow bedrock. As part of detailed design, Mid-Atlantic Express would collect geotechnical samples in various representative locations targeting these mapped soils with reported shallow bedrock along the pipeline to assess whether or not blasting may be required in any areas associated with BGE's Powerline (also see section 4.1.1.2 for additional information on blasting and required blasting plans).

Table 4.2.3-3 is a more detailed listing of all shallow bedrock locations at the soil series level by milepost, excluding soft bedrock which is described as "excavation can be made with trenching machines, backhoes, or small rippers.

Revegetation Potential

Revegetation and restoration are important aspects of the construction sequence in order to maintain productivity and prevent erosion. The revegetation potential of soils crossed by the pipeline was evaluated on a general suitability rating (STATSGO database) to support various types of plant growth. If the soil conditions for grasses, grain and legumes, wild herbaceous upland plants, wetland food and cover plants exhibited poor or very poor ability to support growth, these conditions would indicate susceptibility to poor revegetation. As indicated in table 4.2.3-1, none of the soil associations crossed by the pipeline exhibit characteristics of poor revegetation potential.

TABLE 4.2.3-3 **Potential Shallow Bedrock Locations**				
State	**County**	**Mileposts**		
Maryland	Baltimore	22.30-22.93*	24.98-25.05*	40.85-40.94
		22.98-23.05*	26.09-26.15*	41.50-41.75
		23.12-23.15*	35.26-35.45	41.85-42.10
		23.46-23.48*	35.45-35.51	42.14-42.22
		23.48-23.53*	36.97-37.06	42.64-42.78
		23.53-23.61*	37.65-37.72	42.89-43.20
		23.61-23.67*	37.81-38.02	43.63-43.69
		24.31-24.35*	38.33-38.48	43.72-43.90
Maryland	Harford	47.08-47.45	47.53-47.62	
Pennsylvania	Chester	70.68-70.78	71.72-71.89	80.58-80.80

*Locations parallel to BG&E electric corridor

Soil Contamination

Normal construction activities can result in spills or leaks of fuel, lubricants or coolant from construction equipment along the right-of-way, in extra workspaces, and in pipeyards and staging areas. These releases can contaminate and adversely affect soils. The volume and frequency of such spills is expected to be low. Mid-Atlantic Express has prepared a Spill Prevention, Control and Countermeasure Plan (SPCC Plan) that defines equipment, supplies, and clean-up and disposal methods for handling contamination of soils. (See the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012). Implementation of the SPCC Plan would minimize contamination of soils during construction.

Mid-Atlantic Express conducted a database enquiry to search for hazardous waste sites listed by various federal and state agencies. They looked at an area within 0.25 mile of the pipeline route. The databases included 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, PCB generation, or similar factors. Twenty-one hazardous or potentially hazardous sites occur within 0.25 mile of the pipeline.

There are several properties located within 0.25 mile of the pipeline route that were listed as Leaking Underground Storage Tank (LUST) spill sites or solid waste (SW) landfill sites. Two National Priority List (NPL) sites are located within the search area: the 68th Street Dump is approximately 0.25 mile east of the pipeline at MP 8.8 in Baltimore County, Maryland; the Strasburg Landfill is crossed by the pipeline construction at MP 77.55 in Chester County, Pennsylvania. The Strasburg Landfill covers 22 acres near Coatesville in western Newlin Township, Chester County, Pennsylvania. In 1983, PDEP identified 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. The landfill was closed in 1983 by PDEP. In 1989, EPA launched an investigation of the landfill and discovered that numerous VOCs, including vinyl chloride, benzene, trichloroethene, and tetrachloroethene, had been detected in groundwater from on-site and off-site monitoring wells.

The pipeline route parallels the existing Columbia right-of-way past the north side of the landfill property outside a barrier fence that surrounds the landfill property. The pipeline would not go through the landfill. 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, is outside the fenceline of the landfill, and is at a higher elevation than 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 landfill stability or the 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. Hazardous substances detected at the 68th Street site include: VOCs, SVOCs, PCBs, and metals.

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. At the Back River, at a point downstream from the Dump, Mid-Atlantic Express anticipates that the pipeline crossing would be installed by HDD, with the pipeline alignment paralleling the existing powerline and pipeline corridor. Thus the crossing method for Back River should minimize the risk of disturbing any contaminated sediments that might exist from previously documented releases from the Dump.

In case Mid-Atlantic Express must use the open-cut crossing method as an alternative for the HDD method in an area with potential contamination from the upstream 68th Street Dump, **we recommend that:**

- **<u>Prior to crossing the Back River</u>, Mid-Atlantic Express should file with the Secretary, for review and written approval by the Director of OEP, a report containing:**
  - **a. the results of sediment quality testing at the location of the Back River crossing for SVOCs, PCBs, and metals (i.e., known contaminants from the 68th Street Dump);**
  - **b. an assessment of the risk to crossing this waterbody with either HDD or open-cut crossing methods; and**
  - **c. a site-specific crossing plan for this location that minimizes disturbances of the above-mentioned contaminants for both types of crossing methods.**

  If historical data are available from this stretch of the river, and are less than 5-years old, these data may be interpreted and the risks assessed from historical data.

Other potential, but less probable sites of soil contamination for the pipeline, such as leaking underground storage tanks and landfills are discussed in section 4.8.4 (Hazardous Waste Sites). Mid-Atlantic Express has prepared a Plan for the Unanticipated Discovery of Hazardous Wastes or Contaminated Sites, which is available in Appendix N.

4.3 WATER RESOURCES

4.3.1 Groundwater

4.3.1.1 Regional Groundwater Quality and Quantity

The proposed LNG terminal site and the first 21 miles of the pipeline route are located within the limits of the Potomac aquifer. This aquifer is part of the Northern Atlantic Coastal Plain aquifer system of six regional aquifers underlying an area of approximately 50,000 square miles and extending from North Carolina north to Raritan Bay, New Jersey (Trapp and Horn, 1997). The western limit of the aquifer system is the Fall Line that is the boundary between the Atlantic Coastal Plain and Piedmont Physiographic Provinces; the eastern limit is effectively the Atlantic Ocean (Trapp and Horn, 1997).

The Potomac aquifer is the lowermost, and most widespread, aquifer of the Northern Atlantic Coastal Plain aquifer system. It consists mostly of permeable sands in the Potomac Formation (or Group) and their

stratigraphic equivalents but also includes younger, hydraulically connected, permeable sediments. The top of the aquifer is above sea level only in a narrow band near its western limit from New Jersey southward to Northampton County, North Carolina. The aquifer is more than 2,500 feet below sea level in southern New Jersey and on the easternmost part of the Delmarva Peninsula and more than 4,500 feet below sea level in easternmost North Carolina. It is mostly covered by confining units and thus receives little direct recharge by precipitation and loses little water by evapotranspiration. In Maryland, the Potomac aquifer consists of the local Patapsco aquifer and the underlying local Patuxent aquifer, which are characterized by lenticular deposits of fine to coarse sand that are primarily of fluvial and deltaic origin (Trapp and Horn, 1997). Water in the Potomac Aquifer shows a variable composition from west to east transitioning from calcium/magnesium bicarbonate composition, to sodium bicarbonate to sodium chloride at the ocean. Withdrawals from the regional Potomac aquifer have resulted in saline water encroachment into the aquifer around Baltimore Harbor because of the lowered hydraulic heads (Trapp and Horn, 1997). Over 50% of the groundwater from the Potomac Aquifer is used for public water supply systems, with lesser amounts for industry, mining, thermoelectric power, and domestic/commercial/agricultural uses (COE, 1983; USGS, 1998). The USGS (1998) reports that withdrawal rates for the greater Baltimore vicinity are in the 50,000 to 15 million gallons-per-day (gpd) range.

The pipeline route lies within the Piedmont Plateau physiographic province from approximately MP 21 in Maryland to its terminus at MP 88 in Pennsylvania. The Piedmont Plateau province is composed of hard, crystalline igneous and metamorphic rocks consisting of schist, gneiss, gabbro, and other highly metamorphosed sedimentary and igneous rocks of probable volcanic origin. In Baltimore County and parts of adjacent counties, several domal uplifts of Precambrian gneiss mantled with quartzite, marble, and schist are present (Maryland Geological Survey, 2001). Between MP 79.5 and MP 81.0, the Pipeline Route crosses a relatively narrow east-west oriented band of subcropping carbonate (limestone and dolostone) rock units referred to as the Piedmont Carbonate Aquifer. This aquifer comprises only a fraction of the Piedmont Plateau but can be a significant local source of water. Primary porosity in the crystalline bedrock units of the Piedmont Plateau is essentially zero; therefore, groundwater is found in rock fractures with low storage capacity due to low secondary porosity. In general, yields are typically less than ten gallons per minute (gpm) (14,400 gpd). Groundwater yields in the carbonate areas can be significantly higher than in the crystalline rock units due to open joints or even solution cavities and faulted zones in the rock. Yields of 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. Water from the Piedmont formations is generally soft in these areas whereas groundwater in the Piedmont Carbonate Aquifer can be very hard due to dissolution of solids in the slightly acidic groundwater (Trapp and Horn, 1997).

Sole Source Aquifers

EPA-designated sole source aquifers are those that contribute more than 50 percent of the drinking water to a specific area and for which there are no reasonably available alternative sources of water should the aquifer become contaminated. Neither the proposed LNG terminal site nor the pipeline route would cross any land overlying an EPA-designated sole source aquifer in either Pennsylvania or Maryland (EPA, 2007a).

Public and Private Water Supply Wells

Mid-Atlantic Express identified locations of water wells near the project sites via a database search performed by FirstSearch™ (2006). Fifty public and private water supply wells were identified within 150 feet of the proposed construction right-of-way. The locations, and distances from the pipeline centerline are provided in table 4.3.1-1. No springs occur within 150 feet of the proposed construction right-of-way, based on a Mid-Atlantic Express field survey and the USGS National Hydrography Dataset (USGS, 2000).

TABLE 4.3.1-1

Water Supply Wells Located Within 150 Feet of the Mid-Atlantic Express Pipeline Route

Milepost	Location (County, State)	Supply Type	Approximate Distance From Construction Right-of-Way (feet)
6.5	Baltimore, MD	Private/Domestic	131
7.6	Baltimore, MD	Private/Industrial	13
8.5	Baltimore, MD	Private/Domestic	27
10.9	Baltimore, MD	Private/Domestic	145
12.8	Baltimore, MD	Private/Domestic	92
15.5	Baltimore, MD	Private/Domestic	141
16.8	Baltimore, MD	Private/Domestic	< 10
18.3	Baltimore, MD	Private/Domestic	32
24.1	Harford, MD	Private/Domestic	91
24.7	Harford, MD	Private/Domestic	28
27.5	Harford, MD	Private/Domestic	157
34.1	Harford, MD	Private/Domestic	56
35.1	Harford, MD	Private/Domestic	125
35.8	Harford, MD	Private/Domestic	80
36.3	Harford, MD	Private/Domestic	42
37.8	Harford, MD	Private/Domestic	148
37.9	Harford, MD	Private/Domestic	90
37.9	Harford, MD	Private/Domestic	98
37.9	Harford, MD	Private/Domestic	104
37.9	Harford, MD	Private/Domestic	104
38.5	Harford, MD	Private/Domestic	66
38.6	Harford, MD	Private/Domestic	56
39.5	Harford, MD	Private/Domestic	97
41.0	Harford, MD	Private/Domestic	147
41.0	Harford, MD	Private/Domestic	147
43.7	Harford, MD	Private/Domestic	23
46.2	Cecil, MD	Private/Domestic	202
46.5	Cecil, MD	Private/Domestic	42
47.3	Cecil, MD	Private/Domestic	73
51.1	Lancaster, PA	Private/Domestic	97
51.2	Lancaster, PA	Private/Domestic	18
56.3	Chester, PA	Public Supply	12
58.7	Chester, PA	Private/Domestic	147
64.0	Chester, PA	Private/Domestic	78
66.9	Chester, PA	Private/Domestic	169
67.7	Chester, PA	Private/Domestic	259
74.2	Chester, PA	Private/Domestic	184
74.4	Chester, PA	Private/Domestic	42
74.6	Chester, PA	Private/Domestic	170
74.6	Chester, PA	Private/Domestic	126
77.6	Chester, PA	Public Supply	< 10
78.4	Chester, PA	Private/Domestic	112
78.5	Chester, PA	Private/Domestic	< 10
79.5	Chester, PA	Private/Industrial	64
80.1	Chester, PA	Private/Domestic	184

TABLE 4.3.1-1

Water Supply Wells Located Within 150 Feet of the Mid-Atlantic Express Pipeline Route

Milepost	Location (County, State)	Supply Type	Approximate Distance From Construction Right-of-Way (feet)
83.3	Chester, PA	Private/Domestic	248
86.0	Chester, PA	Private/Domestic	48
86.5	Chester, PA	Private/Domestic	33
87.1	Chester, PA	Private/Commercial	98

Information derived from publicly-available data (via an Environmental FirstSearch™ [2006] report) supplemented with data from Mid-Atlantic Express's field surveys.

Mid-Atlantic Express has indicated that they would evaluate the alignment of the proposed pipeline at wells reported or observed within 10 feet of the pipeline construction right-of-way, or within the right-of-way, in order to avoid or minimize impacts to existing wells. Therefore, **we recommend:**

- **<u>Prior to construction</u>, Mid-Atlantic Express should file the results of its evaluations of the pipeline alignment relative to water wells within or within 10 feet of the construction right-of-way. Any alignment changes resulting from its evaluation should be reflected on revised alignment sheets to be filed with the Secretary for review and written approval by the Director of OEP.**

The pipeline route would cross two wellhead protection areas in Maryland (MDE, 2003). The pipeline crosses the St. Stephens Elementary wellhead protection area in Baltimore County, Maryland from MP 19.82 to 19.95. It also crosses the Fallston Pre-Kindergarten wellhead protection area in Harford County, Maryland from MP 24.46 to MP 24.83. Neither of the wells is located within 150 feet of the proposed construction area or work spaces. There are no public water systems within a wellhead protection area within 150 feet of the proposed pipeline route in Pennsylvania (DRBC, 2007). Mid-Atlantic Express would not store fuel or refuel vehicles or equipment within the wellhead protection areas. The proposed access roads would neither cross nor impact wellhead protection areas in Chester or Lancaster counties in Pennsylvania.

Groundwater Conditions at the LNG Terminal & Pipeline

AES would characterize groundwater conditions during the preliminary subsurface exploration program that it proposes to conduct for the LNG terminal and pipeline right-of-way. Groundwater quality beneath the LNG terminal is presently unknown. However, AES would conduct limited environmental monitoring, sampling, and analyses during the geotechnical investigation to characterize the groundwater quality. Mid-Atlantic Express has indicated that it would characterize groundwater quality along the pipeline route subsequent to Project certification, during final pipeline construction design but prior to the start of construction.

The proposed LNG terminal would not need to use groundwater sources of water.

A review of various environmental databases for hazardous waste sites (CERCLA or Superfund sites), facilities managing or generating hazardous waste (Resource Conservation and Recovery Act [RCRA] sites), air emissions, PCBs generation, and LUST indicates that several properties with 0.25 mile of the pipeline route are listed as LUST sites or solid waste landfill sites (FirstSearch, 2006) (see section 4.8.4 for additional discussion). Two National Priority List (NPL) sites are located along but not within the pipeline route; none are located within or adjacent to the LNG terminal site. According to the EPA, the Strasburg Landfill, located in Newlin Township, Pennsylvania at MP 74.55 would not impact the project as the pipeline route would be sited beyond the landfill footprint (EPA, 2006a). The 68th Street Dump/Industrial Enterprises is located near Rosedale, Maryland 1400 feet west of the pipeline at MP 8.8 (EPA, 2006b). The pipeline route would not impact the landfill as it does not cross the landfill footprint.

Groundwater Resources Impacts and Mitigation

The construction, operation, and maintenance of the LNG terminal and pipeline facilities would not have any significant long-term impacts on groundwater resources but may result in short-term impacts.

LNG Terminal

Groundwater quality or quantity would not be significantly impacted by construction or operation of the LNG terminal as potential groundwater impacts would be diminished or avoided through the use of standard construction techniques as described in the ECP in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012). The use of hazardous substances, oils, and lubricants during construction would be minimized in compliance with federal regulations related to fuel transport, handling, and spill response procedures through the implementation of a project-specific SPCC Plan (also see the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012) for the draft SPCC Plan). The SPCC Plan would be finalized following the completion of the final Project design and selection of a construction contractor.

If contaminated groundwater is encountered, limited soil and groundwater sampling would be conducted as part of the geotechnical design investigation program. Additionally, the appropriate local, state, and federal agencies would be notified for the management and/or disposal of the contaminated media.

Construction activities at the LNG terminal would include construction of sheet pile bulkheads, demolition of portions of the existing shipyard, and dredging of sediments in the approach channel and turning basin. Salt water encroachment into the Potomac Aquifer has occurred around Baltimore Harbor (Trapp and Horn, 1997); however, these construction activities at the terminal would not involve the use of groundwater.

Potential impacts on groundwater associated with the use of oils, lubricants, and other hazardous substances during construction and operation of the LNG terminal would be minimized by AES's compliance with federal regulations related to fuel transport, handling, and spill response procedures and its implementation of a project-specific SPCC Plan. Therefore, **we recommend:**

- **<u>Prior to construction</u>, AES should file the final version of its Spill Prevention, Control, and Countermeasures Plan for the LNG terminal with the Secretary for review and written approval by the Director of OEP.**

AES would prepare and file procedures to mitigate and monitor aquatic organisms such as turtles, marine mammals or schools of game fish prior to construction. Aquatic species are addressed in detail in sections 4.6.2 and 4.6.3; threatened and endangered species are addressed in detail in section 4.7.

Pipeline Facilities

Construction of the pipeline would create ground disturbances, and thus potential groundwater impacts, at depths no greater than six feet below the existing ground surface, with the exception of HDD segments. Minor fluctuations in localized shallow aquifer groundwater levels and/or increased turbidity in areas adjacent to the project area may be caused by certain construction activities (e.g., trenching, dewatering, and backfilling). Pipeline trench dewatering activities that would be required during construction of the pipeline are described in Mid-Atlantic Express's Project-specific ECP in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012).

Mid-Atlantic Express would develop a SPCC Plan that would describe methods to avoid or minimize the potential for significant leaks or spills of petroleum products or other hazardous materials during construction. This plan would include specific measures to minimize and mitigate potential impacts to groundwater such as:

- trench breakers and trench dewatering;
- alternative rock excavation techniques, if warranted;
- re-routing if potential impacts to wells or water supplies are identified;

- monitoring of existing drinking water wells within 150 feet of the construction right-of-way;
- restricted use and storage of hazardous materials and implementation of a site-specific Stormwater Pollution Prevention Plan accordance with federal and state regulations; and
- performance of environmental inspections.

Therefore, **we recommend:**

- **<u>Prior to construction</u>, Mid-Atlantic Express should file the final version of its Spill Prevention, Control, and Countermeasures Plan for pipeline construction with the Secretary for review and written approval by the Director of OEP.**

Should the removal of bedrock outcrops be necessary during construction, Mid-Atlantic Express would perform a feasibility study of rock excavation techniques to avoid or minimize potential impact to wells or water supplies. The evaluation would consider:

- rock depth as determined by field data;
- rock type;
- rock conditions with respect to weathering, fracturing, etc.;
- length of trench affected;
- volume of rock requiring removal; and
- conditions of the surrounding work areas such as the presence of structures, roads, utilities, etc.

Once each location has been evaluated, a site-specific blasting plan (SSBP) would be prepared for each area requiring rock removal and where blasting is the preferred rock removal technique. A rock removal technique evaluation would be incorporated into the SSBP. Potential rock removal techniques, in order of least to greatest impact, are:

- ripping with a backhoe;
- hydraulic hoe-ramming;
- hydraulic rock splitting;
- chemical expanders; and
- drilling and blasting.

Any water wells within 150 feet of the construction right-of-way would be monitored. If drinking water wells would be impacted (defined as greater than 10% deviation from pre-construction conditions or exceeding drinking water criteria), Mid-Atlantic Express would provide a temporary potable water source until water quality or yield has been restored.

4.3.1.2 Impacts along the Waterway for LNG Marine Traffic

No significant impacts to ground water would be expected from the terminal out to the territorial sea from the normal operations associated with the LNG marine traffic for the Sparrows Point facilities. Further, no significant impacts would be expected to occur to groundwater from an accidental release of LNG or an associated pool fire within the Zones of Concern (described in section 4.12.5.3 of this EIS) along the LNG marine transit route.

4.3.2 Surface Water

4.3.2.1 Watershed Description

The proposed LNG terminal and the proposed pipeline are located within the Upper Chesapeake (HUC 0206), Susquehanna (HUC 0205), and Delaware (HUC 0204) Subregions all of which are part of the Mid-Atlantic Watershed Region[6] (HUC 02) (USGS, 2007).

Upper Chesapeake Subregion (HUC 0206)

The proposed pipeline from MP 0.00 to MP 30.34 and MP 63.46 to MP 65.75 would be in the Upper Chesapeake Subregion, specifically the Gunpowder-Patapsco (HUC 02060003) and Chester-Sassafras (02060002) Cataloging Units within the Upper Chesapeake Accounting Unit (020600).

The Chesapeake Bay basin encompasses 64,000 squares miles of land including portions of six states (Maryland, Virginia, New York, Pennsylvania, West Virginia, and Delaware) and the District of Columbia. Approximately 94% of Maryland drains to Chesapeake Bay (USGS, 2007). In 2000, Chesapeake Bay was listed as an impaired waterbody by the EPA due to excess nutrients and sediment (EPA, 2004).

Gunpowder-Patapsco Cataloging Unit (HUC 02060003)

The proposed LNG terminal site is situated in the Gunpowder-Patapsco Cataloging Unit which drains approximately 630 square miles of Maryland. The pipeline also would be in this cataloging unit from MP 0.00 to MP 30.34. This sub-basin includes the City of Baltimore and portions of Anne Arundel, Baltimore, Carroll, and Howard Counties. Given that the watershed area surrounding the LNG terminal is primarily urban with a population of nearly 1.5 million people (MDNR, 2005a), it has been impacted by point source and non-point source pollution resulting in water quality degradation.

The Gunpowder-Patapsco Unit includes the Atkisson, Pretty Boy, Loch Raven, and Liberty Reservoirs (see section 4.3.2.3). Many of the rivers in this basin are impaired due to biological and nutrient loadings and suspended solids (EPA, 2007c). It encompasses 911,430 acres with nearly 26% used for agricultural purposes (EPA, 2001).

Chester-Sassafras Cataloging Unit (02060002)

Pipeline MPs 63.46 to 65.75 would be in the Chester-Sassafras Cataloging Unit. This cataloging unit includes approximately 344,917 acres that are situated mostly in Maryland but also includes some portions of Delaware and Pennsylvania. Land use is approximately 58% agriculture, 32% forests and wetlands, and 10% urban (USDA, 2005). The watershed is listed by the EPA as impaired, primarily due to nutrient loading, suspended solids, and fecal coliforms from agriculture (EPA, 2007b).

Susquehanna Subregion (HUC 0205)

The proposed pipeline from MP 30.34 to MP 63.46 would cross the Susquehanna Subregion, specifically the Lower Susquehanna Cataloging Unit (HUC 02050306) within the Lower Susquehanna Accounting Unit (020503). The Susquehanna River drains about 27,000 square miles of New York, Pennsylvania, and

[6] Watersheds are classified (in descending order) as Region (two digits), Subregion (four digits), Accounting Unit (six digits), and Cataloging Unit (eight digits) (USGS, 2007).

Maryland. Agriculture is the dominant land use in the Susquehanna Subregion at approximately 35%. More than 50% of the cataloging unit is forested and about 15% is urban, residential, or other land uses (USGS, 2007b).

Lower Susquehanna Cataloging Unit (HUC 02050306)

The Lower Susquehanna basin drains approximately 9200 square miles from Sunbury, Pennsylvania downstream to Havre de Grace, Maryland in Chesapeake Bay (USGS, 2007). Approximately 47% of the basin is forested, 47% is used for agriculture, 4% is urban, and 1% is barren land (Lindsay et al., 1998).

Delaware River Subregion (HUC 0204)

Within the Delaware subregion, the pipeline from MP 65.75 to MP 87.57 would be in the Schuylkill (HUC 02040203) and Brandywine/Christina Cataloging Units (HUC 02040203) within the Lower Delaware accounting unit (020402). The Delaware River Subregion encompasses more than 12,700 square miles and includes parts of Pennsylvania, New Jersey, New York, and Delaware. The river is tidally influenced downstream of Trenton, New Jersey, but the saline wedge stops around Philadelphia. 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, PA (USGS, 2007a).

Brandywine/Christina Cataloging Unit (HUC 02040203)

Pipeline MPs 65.75 to 85.38 would be in the Brandywine/Christina Cataloging Unit. The area at the project terminus in Eagle, Pennsylvania drains to Brandywine Creek, a tributary of the Christiana River. The Christiana River drains approximately 45,000 square miles with over 24% of the area designated as impervious surface, 20% residential/commercial, 16% agriculture, 24% forested, and 5% wetlands. Water quality has been impacted greatly due to the presence of 62 CERCLA sites, three treatment and disposal facilities, 155 LUST sites, 354 hazardous waste generators, 14 solid waste landfills, and two resource recovery facilities within the cataloging unit (DNREC, 1998).

Schuylkill Cataloging Unit (HUC 02040203)

Pipeline MPs 85.38 to 87.87 would be in the Schuylkill Cataloging Unit. The Schuylkill Cataloging Unit is located around the Philadelphia area with approximately 41% of the land forested, 40% used for agricultural purposes, and 13% of the land developed. The basin serves as a surface water and groundwater resource for drinking water for over three million people. Water quality along the upper basin is good; however, water quality along the lower basin, which encompasses the main stem of the Schuylkill River is fair to poor (Stroud Center, 2007).

4.3.2.2 Waterbody Classifications

LNG Terminal

The LNG Terminal would be situated on Sparrows Point along the Patapsco River. MDE (2005) has designated the Patapsco River is as Classification II for Tidal Water indicating migratory spawning and nursery use (February 1 through May 31), shallow water submergent aquatic vegetation use (April 1 through October 30), open water fish and shellfish use (January 1 through December 31), seasonal deep water fish and shellfish use (June 1 through July 30), and seasonal deep channel refuge (June 1 through September 30).

Pipeline Facilities

The proposed pipeline route crosses 177 waterbodies as listed in Appendix I. The applicable Maryland stream classifications (MDE, 2007b) for these waterbodies include:

- I water contact recreation and protection of aquatic life,
- I-P water contact recreation, protection of aquatic life, and public water supply
- III natural trout waters
- IV recreational trout waters
- IV-P recreational trout waters and public water supply

Classifications of Maryland streams that would be crossed by the proposed pipeline are 17 Class I, 11 class I-P, five Class III, 15 Class IV, and 57 Class IV-P (Appendix I) (MDE, 2005).

The applicable Pennsylvania stream classifications (PDEP, 2007) for streams within the project area are:

- WWF warm water fishes
- TSF trout stocking
- CWF cold water fishes
- HQ high quality waters
- EV exceptional value waters

Classifications of Pennsylvania streams that would be crossed by the proposed pipeline are seven WWF, 40 TSF, three CWF, 14 HQ, and six EV waterbodies (Appendix I).

4.3.2.3 Sensitive Waterbodies

Fourteen sensitive surface waters were identified within the project area due to water quality impairments as noted in the Maryland and Pennsylvania 303d lists, which catalog streams that do not meet their designated uses with water quality designations of poor or very poor (MDE 2007c).

Some of the pipeline water crossings have threatened and endangered species associated with them. Details are in section 4.7.

The proposed pipeline facility would cross 133 waterbodies that support coldwater fisheries and 42 that support warmwater fisheries (water use and water quality designations can be found in Appendix I). The following five waterbodies support spawning by anadromous fish (NMFS, 2006a):

- White Marsh Run at approximate MP 15.5 – Maryland water quality use IV (can be either warmwater or coldwater);
- Gunpowder Falls at approximate MP 18.28 – Maryland water quality use I (warmwater);
- Deer Creek at approximate MP 35.54 – Maryland water quality use IV-P (can be either warmwater or coldwater);
- Susquehanna River/Conowingo Pool at approximate MP 44.23 – Maryland water quality use I-P (warmwater); and
- Octoraro River at approximate MP 56.31 – Pennsylvania water quality use WWF (warmwater).

Aquatic life is discussed in section 4.6.2.

Baltimore Harbor, which includes portions of the Patapsco River and Bear Creek, is impaired due to contamination by chlordane, PCBs, metals, low oxygen, and bacteria in tidal waters. Siltation in non-tidal waters, a consequence of urban runoff, habitat alteration, and channelization, results in the failure of some areas to meet all designated uses. Fish consumption advisories are in place for Baltimore Harbor, which is on the Maryland 303d list, as it is part of the Patapsco River (EPA, 2007c).

The following waterbodies are included on the Maryland 303d list due to the impairments listed:

- Bread and Cheese Creek and Stemmers Run – biological impairments;
- Back River – fecal coliform, zinc, nutrient, and PCBs contamination and biological and sediment impairments;
- Doe Run, Little Gunpowder Falls, and an unnamed tributary of Little Gunpowder Falls – nutrient loading;
- Winters Run – biological and nutrient impairments;
- Susquehanna River – nutrient, cadmium, PCBs contamination and biological and sediment impairments; and
- Conowingo Creek – biological, nutrient, and sediment impairments.

The following waterbodies are included on the Pennsylvania 303d list due to the impairments listed:

- West Branch Brandywine Creek – nutrient and sediment impairments;
- Broad Run – biological, nutrient, dissolved oxygen, sediment, and flow alteration impairments;
- Beaver Creek – sediment impairments; and
- East Branch Brandywine Creek – sediment and flow alteration impairments.

Five reservoirs have been identified that are located within three miles of the project area:

- The Fullerton Reservoir is upstream, approximately 2.7 miles northwest of proposed pipeline MP 13. It will be the water supply for the Fullerton Filtration facility scheduled to be operational in 2008. This reservoir would not be impacted by the construction or operation of the pipeline.
- Loch Raven reservoir, along with the Liberty and Pretty Boy reservoirs, supplies water to 1.8 million people in the City of Baltimore. It is located within the Gunpowder River basin, approximately 6.4 miles northwest upstream of proposed pipeline MP 18. Due to its distance upstream of the Project, this reservoir should not be impacted by the construction or operation of the pipeline.
- The Atkisson reservoir is a water supply for Bel Air, Maryland and is located in the Patapsco watershed. It is also designated for fish, shellfish, and wildlife protection and propagation. It is located about 2.9 miles east (down gradient) of proposed pipeline MP 23. Due to the distance to this reservoir, the water quality of the reservoirs should not be impacted by the construction or operation of the pipeline.
- The Conowingo Reservoir, an impoundment of the Susquehanna River, is a water supply for the City of Baltimore (250 million gpd maximum withdrawal) and for the Chester Water Authority (30 million gpd maximum withdrawal) and is also a water supply for the Conowingo hydroelectric power plant. It is located in the Baltimore Harbor watershed. The proposed pipeline route crosses the Conowingo Reservoir at approximately MP 44.2.

In order to lessen the impacts from pipeline construction, Mid-Atlantic Express would use HDD to cross the Conowingo Reservoir (also see section 2.3.2.2). The Conowingo Reservoir HDD entry point would be located at MP 43.6 on the south side of the river and the HDD exit point would be located at MP 44.6 on the north side of the river. The pipeline would run approximately 3,200 linear feet under the Conowingo Reservoir.

There are no potential impacts to the three water intakes as both the Baltimore City intake and the Chester Water Authority intakes are located approximately 2 miles downstream of the proposed crossing location at the Conowingo Dam on the south and north sides of the reservoir, respectively. The Peach Bottom intake is located approximately 2 miles upstream of the proposed crossing location.

- Octoraro Lake supplies water to Chester County, Pennsylvania. The lake is about 0.2 mile north (upstream) of the proposed pipeline route at approximately MP 56. However, the pipeline crosses Tweed Creek at MP 56.93 and Leech Run at MP 58.09, both of which flow west into Octoraro Lake. The Tweed Creek crossing is within 2000 feet of the lake and the Leech Run Crossing is within 4000 feet of the lake. Thus, during pipeline construction, accidental hydrocarbon spills within these two creek basins could enter Octoraro Lake. The water intake for the Chester Water Authority in Octoraro Lake is northwest of pipeline MP 56.6; it is just below the confluence of the impounded East and West branches of Octoraro Creek.

Potential impacts to these waterbodies include inadvertent release of fuels or oils from drilling equipment, potential excessive turbidity (e.g., bottom sediment disturbance or surface water turbidity) in the event of a frac-out during pipeline installation, or potential disturbance or water quality impacts from hydrotesting water withdrawal or discharge. Mid-Atlantic Express would perform crossings of all other waterbodies during the dry season to minimize or avoid potential impacts. Dry crossing methods would be scaled to prevent stream flow interruption and maintain water quality. If water is encountered, trench dewatering would be conducted in accordance with the ECP in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012). Areas for temporary access roads and workspaces have yet to be identified. Once identified, mitigation would be planned, as necessary.

Mid-Atlantic Express has prepared and filed a "Horizontal Directional Drill Monitoring and Contingency Plan." The HDD Monitoring and Contingency Plan identifies measures to mitigate fluids releases from a frac-out or from failure and abandonment of the HDD borehole. However, this Plan does not present a contingency for how the waterbody crossings would be accomplished if the HDD method of crossing fails. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Mid-Atlantic Express should file its final version of the HDD Monitoring and Contingency Plan with the Secretary for review and written approval by the Director of OEP. This Plan should address specific procedures to be followed in the event of a failure of the HDD method at any of the waterbody crossings where HDD is proposed.**

4.3.2.4 Sediment

The preparation of the approach channel, the turning basin and the berthing areas for the LNG ships would require dredging approximately 3.7 million CY of sediment. In anticipation of this dredging at the marine terminal, in June 2006 AES collected 15 vibracores and analyzed a total of 16 samples for a suite of chemical compounds and elements including SVOCs, PCBs, metals, cyanide, and tributyl tin. Samples were collected from locations as indicated on figure 4.3.2.4-1. The cores were stratified into subsamples from shallow horizons (0 – 2 ft), intermediate horizons (2 – 10 ft) and deep horizons (14 – 30 ft). In all there were 9 shallow samples, 3 intermediate samples and 4 deep samples. Dredging operations impacting this sediment would be conducted in accordance with COE permit conditions, and may include utilization of a mechanical (clamshell), or as warranted an environmental dredge bucket to reduce potential environmental impacts.

Because the configuration of the turning basin and approach channel was changed later in 2006, and at the request of the COE and MDE, in August 2007 AES performed additional sampling of the sediments to be dredged at Sparrows Point. Although the overall pattern of results between these two sampling set results is similar, there are differences in the maximum concentrations of organic compounds and metal between the two data sets. Therefore, we present the results separately below so that we can discuss the differences.

Physical Analyses – June 2006 Samples

Only two physical parameters of the sediment composition were measured and reported by AES for the 16 sediment core samples. These parameters – percent solids and bulk density – were analyzed for all vibracore samples. Percent solids ranged from 28% to 89% within the samples. Bulk density values ranged from 1.24 to 1.43 grams per milliliter (g/mL). These bulk density values would imply that the sediments were composed primarily of clay particles as opposed to sand particles.

Chemical Analyses

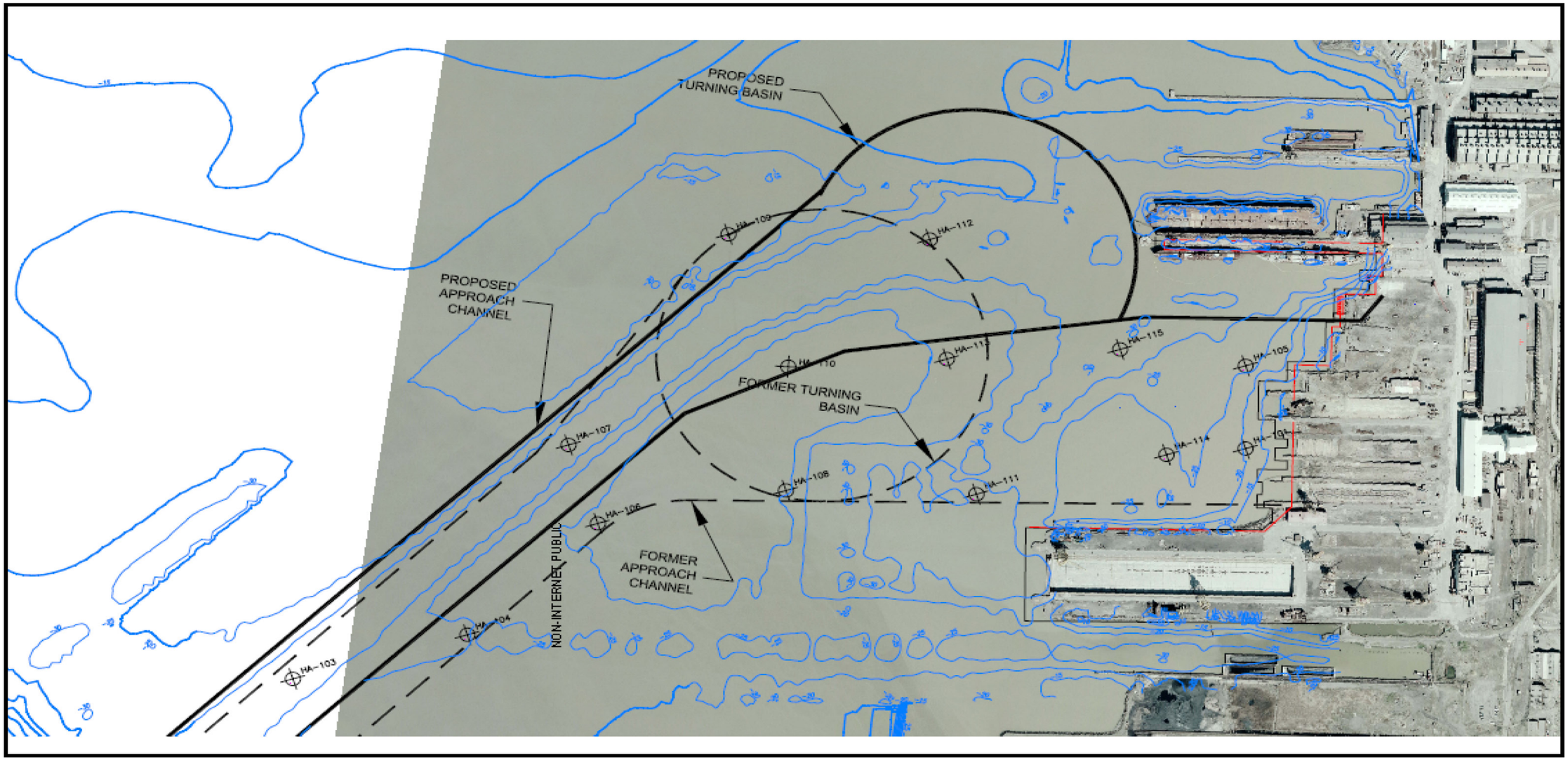
Each sample was submitted under an intact chain of custody to a Maryland certified laboratory for the analysis of organic and inorganic parameters in accordance with EPA promulgated methods for VOCs; (EPA Method 8260B), SVOCs (EPA Method 8270C), chlorinated pesticides and PCBs (EPA Method 8081A), priority pollutant metals (EPA Methods 6020A), and total cyanide (EPA Method 9012). 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 were analyzed based on community input received relative to sediment quality and industrial practices in the area.

June 2006 Samples – Analytical Results

Table 4.3.2-1 presents a summary of the laboratory results for the June 2006 shallow, intermediate, and deep samples. This table also presents selected studies of sediment analyses for Baltimore Harbor and for the Sparrows Point area collected in previous years.

Summary results regarding the June 2006 samples are shown in figures 4.3.2.4-2, -3, and -4 for the AES-collected shallow, intermediate, and deep samples respectively. In both the table and the figures there is reference to "Marine Sediment Guidelines." These guidelines are not legally enforceable limits but rather guidance developed from scientific studies of the effects of various chemical compounds on a variety of aquatic and marine animals. The guidance values were developed by the EPA and have been summarized by NOAA in a presentation known as Screening Quick Reference Tables (SQuiRT) (Buchman, 1999). These guidance values tell the reader if a given concentration of a chemical may have an effect or will probably have an effect on a population of animals. The two values we used for comparison were the Threshold Effects Level (TEL) and the Probable Effects Level (PEL). According to NOAA, the TEL "represents the concentration below which adverse effects are expected to occur only rarely" whereas the PEL "is the level above which adverse effects are frequently expected." In summary:

- neither pesticides nor PCBs were detected in any of the sediment samples collected;
- VOC compounds were detected in six samples (HA-101; HA-102; HA-105; HA-110; HA-111; and HA-114). All but HA-114 were shallow samples. All VOC compounds analyzed were detected in at least one sample;
- polyaromatic hydrocarbons (PAHs) (included with the SVOC analyses) were detected in each of the sediment samples collected from the shallow (0 – 2 ft) and intermediate (2-10 ft) sampling depths. The PEL was exceeded at multiple surface locations for the following chemical compounds: acenaphthylene, anthracene, benzo[a]anthracen, benzo[a]pyrene, benzo[b]fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene. All vibracores collected from the originally planned turning basin (cores HA-108, HA-109, and HA-112) and to the east (cores HA-111, HA-115, HA-105, and HA-101) exceeded the PELs for multiple PAH compounds. The locations with the most elevated concentrations of PAHs were cores HA-105 and HA-101, each close to shore along the finger docks of the historic shipbuilding docks. Of the three vibracores that were sampled for intermediate depths (2.0 to 10 ft), core HA-114 (nearshore off the historic shipbuilding docks) exceeded the PELs for multiple PAHs. Current AES plans do not call for this area to be dredged, since the turning basin and the unloading platform have been relocated further to the north. PAH compounds did not exceed the PELs within any of the four vibracores sampled at depth (figure 4.3.2.4-4);



LEGEND

HA- 101 LOCATION AND DESIGNATION OF WATER-BASED VIBRACORES (HA-101 THROUGH HA-115) DRILLED BY ALPINE OCEAN SEISMIC SURVEY, INC. OF NORWOOD , NEW JERSEY DURING THE PERIOD 22 THROUGH 24 MAY 2006.

NOTES:

1. COORDINATE SYSTEM IN FEET AND REFERS TO MARYLAND STATE GRID, BASED ON NAD83.

2. THE BATHYMETRY SURVEY WAS PERFORMED BY WATERWAY SURVEYS & ENGINEERING, LTD OF VIRGINIA DURING THE PERIOD APRIL 2004 AND FEBRUARY 2006. THE SOUNDINGS ARE IN FEET AND REFER TO THE MEAN LOWER LOW WATER (MLLW) BASED ON N.O.S RECORDING TIDE GAGE AT FORT McHENRY . (USC&G MLLW + 0.84FT= NAVD88).

0 500 1000
SCALE IN FEET

Figure 4.3.2.4-1
Sparrows Point LNG Project
Vibracore Sediment Sampling Locations

TABLE 4.3.2-1

Results of June 2006 Sediment Chemical Analyses from the Sparrows Point Marine Sediments and Comparison to Previous Area Studies and to Marine Sediment Guidelines

Compounds (units of measure)	AES Data (2006) a/						Baltimore Harbor Anchorages & Channels (1997) b/		Sparrows Point Marine Channel (1985) c/		Baltimore Harbor/Patapsco River/Back River (1997) d/		Marine Sediment Guidelines e/	
	Shallow Min	Shallow Max	Inter Min	Inter Max	Deep Min	Deep Max	Min	Max	Min	Max	Min	Max	TEL f/	PEL g/
Semivolatile Organics (ug/kg)														
2-Methlnaphthalene	870	3300	1300	1300	ND	ND	ND	ND	N/A	N/A	331.4	293.6	N/A	N/A
Acenapthene	620	1700	780	780	ND	ND	N/A	N/A	1260	1260	102.3	113.6	6.71	88.9
Acenaphthylene	570	760	550	550	ND	ND	N/A	N/A	450	450	101.6	75.3	5.87	127.87
Anthracene	520	3800	2000	2000	ND	ND	ND	ND	500	1100	278.3	309.4	46.85	245
Benzo[a]anthracene	490	8800	500	6300	ND	ND	N/A	N/A	600	3100	610.6	875.9	74.83	692.53
Benzo[a]pyrene	620	8300	500	5800	ND	ND	217	786	N/A	N/A	929.3	1410.9	88.81	769.22
Benzo[b]fluoranthene	1200	15000	500	12000	ND	ND	N/A	N/A	N/A	N/A	982.1	1508.7	N/A	N/A
Benzo[g,h,i]perylene	470	2700	1700	1700	ND	ND	N/A	N/A	N/A	N/A	658	1114.7	N/A	N/A
Benzo[k]fluoranthene	660	7900	420	4900	ND	ND	N/A	N/A	N/A	N/A	698.3	933	N/A	N/A
Bis (2-ethylhexyl) phthalate	600	2900	8300	8300	ND	ND	177	1390	N/A	N/A	N/A	N/A	182.16	2646.51
Chrysene	590	7900	530	6000	ND	ND	N/A	N/A	420	3500	632.6	964.8	107.77	845.98
Fluoranthene	980	22000	460	17000	ND	ND	118	319	700	4800	971.2	1157.2	112.82	1493.54
Fluorene	1300	2100	1400	1400	ND	ND	N/A	N/A	390	560	137.9	128.6	21.17	144.35
Indeno[1,2,3-cd]pyrene	480	2700	1700	1700	ND	ND	N/A	N/A	N/A	N/A	766.2	1406.8	N/A	N/A
Phenanthrene	490	8700	640	7800	ND	ND	ND	ND	960	2400	677	725.6	86.68	543.53
Pyrene	850	15000	820	18000	ND	ND	194	369	640	4100	933.9	1136.5	152.66	1397.6
Metals (mg/kg)														
Arsenic	26	82	3.2	63	3.5	8.1	5.35	21.8	27	74	N/A	N/A	7.24	41.6
Cadmium	7.2	16	7.8	7.8	ND	ND	1.55	1.6	1.8	12	0.44	0.6	0.676	4.21
Chromium	180	820	9.8	780	36	36	42.4	119	193	1110	270.4	285.2	52.3	160.4
Copper	100	320	7	290	13	13	23.4	140	15	36	85.7	94.2	18.7	108.2

TABLE 4.3.2-1

Results of June 2006 Sediment Chemical Analyses from the Sparrows Point Marine Sediments and Comparison to Previous Area Studies and to Marine Sediment Guidelines

Compounds (units of measure)	**AES Data (2006) a/**						**Baltimore Harbor Anchorages & Channels (1997) b/**		**Sparrows Point Marine Channel (1985) c/**		**Baltimore Harbor/Patapsco River/Back River (1997) d/**		**Marine Sediment Guidelines e/**	
	Shallow Min	Shallow Max	Inter Min	Inter Max	Deep Min	Deep Max	Min	Max	Min	Max	Min	Max	TEL f/	PEL g/
Lead	210	3900	84	520	18	18	10.4	106	183	804	260.4	265.9	30.24	112.18
Mercury	0.43	3.5	0.16	0.93	ND	ND	0.12	0.85	0.36	1.36	0.56223	0.32	0.13	0.696
Nickel	24	58	2.9	51	1.9	23	19.3	37.7	N/A	N/A	61	49.6	15.9	42.8
Selenium	4.2	11	8.6	8.6	ND	ND	1.11	3.34	0.7	6.14	N/A	N/A	N/A	N/A
Silver	5.7	5.7	0	0	ND	ND	0.57	0.59	0.6	1.16	N/A	N/A	0.73	1.77
Zinc	520	3100	110	1400	5.7	58	60.9	238	N/A	N/A	1016.7	1204.1	124	271

a/ For the AES 2006 study, all samples collected by vibracore: Shallow = samples collected with top 0-2 ft of core; Intermediate = samples collected from 2 – 10 ft in the core; Deep = samples from deeper than 10 ft (typically 14 ft or deeper); depth measured in the core from the mudline down.

b/ Baltimore Harbor Anchorages and Channels, Maryland and Virginia. Integrated Feasibility Report and EIS. COE, Baltimore district. March 1997.

c/ 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.

d/ Registered Toxic Study. Spatial Mapping of Sedimentary Contaminates in the Baltimore Harbor/Patapsco River/Back River System.

e/ MDE, August 1997.

f/ Threshold Effects Level

g/ Probable Effects Level

ND = Non-detected result (below detection limit of method)

N/A = Data Not Available

- elevated levels of several metals were detected in the shallow and intermediate samples collected (see table 4.3.2-1). Sediment concentrations of cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc exceeded the PEL at some locations. Concentrations of the metalloid arsenic exceeded the PEL at 6 of the 9 surface samples. Similar to the pattern for PAHs, the concentrations of metals generally decreased with depth with fewer exceedances of the PELs in the intermediate and deep samples. The exception was core HA-114 (near the shipbuilding docks) which showed elevated concentrations for most metals from the intermediate depth. For the deep samples, none of the metals exceeded the PELs;
- tributyl tin was detectable in 10 of the 16 samples, but exceeded 10 nanograms/gram (ng/g) in only four samples. The maximum value of 75 ng/g was recorded for core HA-115, a shallow sample, collected approximately 800 feet south of Pier 1 and the existing dry dock; and
- analyses conducted for dioxins showed concentrations in the part-per-trillion (ppt) range, and are comparable to values reported in literature for the Baltimore and Chesapeake Bay area, and may be a result of atmospheric deposition (Derrick et. al., 2001; Van den Burg et al., 2005). Based on the conversion of congeners to 2-, 3-, 7-, and 8-TCDD, no samples exceed the apparent effects threshold (AET) included in the NOAA SQuiRT (Buchman, 1999), with the exception of one sample in core HA-114. This sample was taken from an area no longer subject to potential dredging due to relocation of the planned approach channel and turning basin.

In figures 4.3.2.4-2, 4.3.2.4-3 and 4.3.2.4-4, the samples with detectable compounds are presented relative to Marine Sediment Guidelines from the NOAA SQuiRT values, (Buchman, 1999). If a compound was both detected and exceeded a SQuiRT guideline, it is shown relative to its associated vibracore boring location. PCBs were analyzed using EPA Method 8081A, appropriate for evaluation of PCB content for innovative recycling treatment and disposal methods MDNR was consulted regarding the test methods performed and 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. AES had indicated that if deemed necessary by COE guidance documents or regulations for the final dredged depth, they would perform additional sampling and lower detection limit analysis for PCB toxicity evaluation. As such, additional sampling was performed in August, 2007.

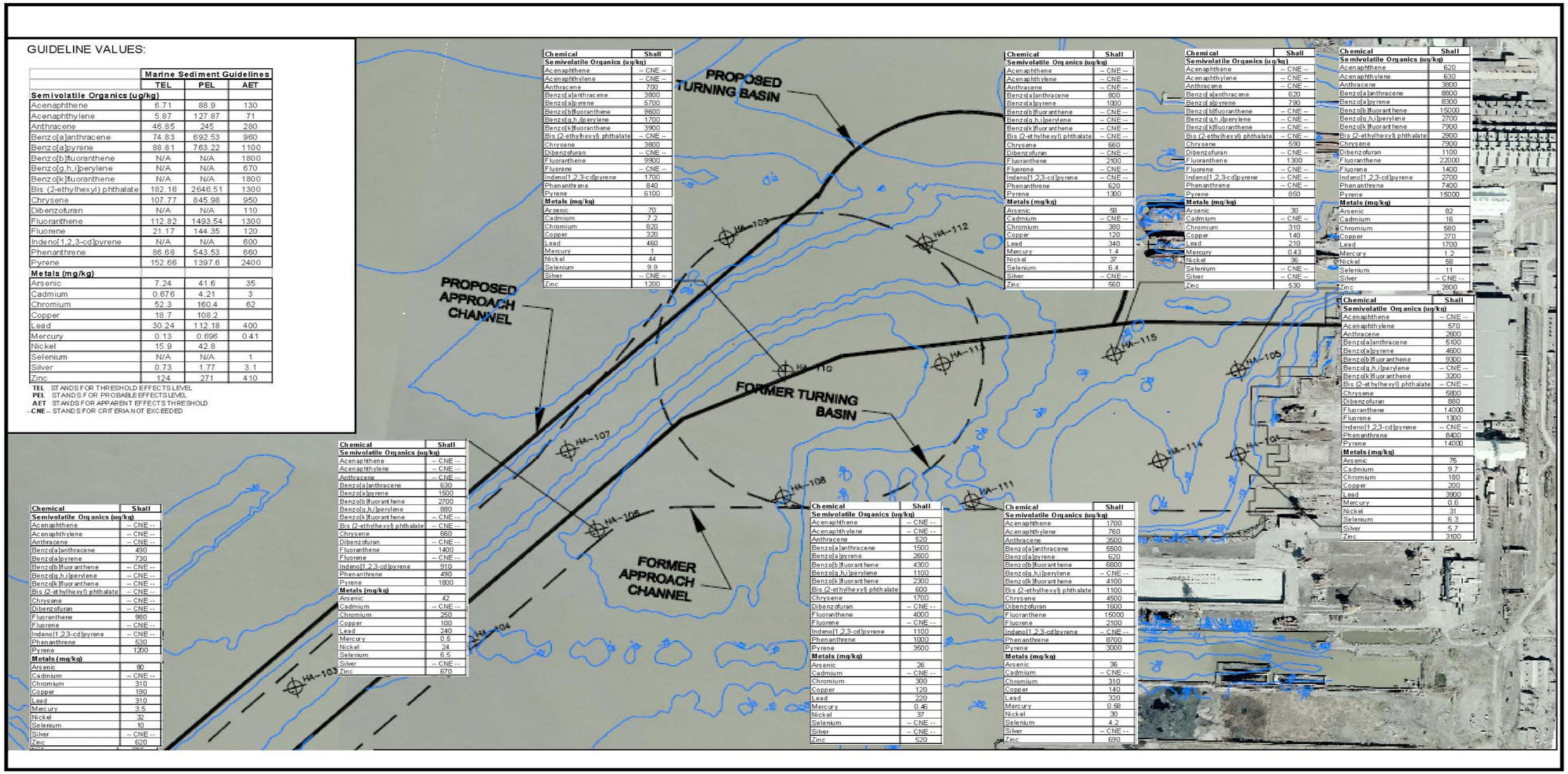
For historical comparison, we have referred to three previous sediment sampling programs that have occurred in the Patapsco estuary or in Baltimore Harbor: 1) a study of the Sparrows Point marine channel (EA Engineering, Science and Technology, Inc., 1985); 2) a study of the Baltimore Harbor/Patapsco River/Back River (MDE, 1997); and 3) a study of Baltimore Harbor anchorages and channels (COE, 1997). Results of these previous studies are summarized in table 4.3.2-1. Inspection of the data (maximum or extreme values, not averages) leads to several observations:

- generally, the results obtained by AES sampling effort in 2006 were comparable to the results in the Sparrows Point marine channel for samples collected in 1985. The maximum concentrations of the SVOCs were typically higher for many compounds in 2006 than in 1985. The maximum values for the metals were similar between the studies, but slightly higher in 1985 for arsenic, chromium, lead, and mercury. Copper concentrations were higher in the AES samples than in the historic 1985 samples;
- both the 2006 and the 1985 samples from the Sparrows Point have maximum concentrations of SVOCs that are noticeably higher than the SVOCs maximums found in the 1997 Baltimore Harbor/Patapsco River/Back River or the 1997 Baltimore Harbor Anchorages and Channels samples. Some individual PAH compounds that were much higher (5-fold to 10-fold increase in concentration) in the June 2006 vibracore samples than the comparison studies included the compounds acenaphthene, acenaphthylene, 2-methylnaphthalene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexl)phthalate, chrysene, fluoranthene, fluorene, and pyrene;

GUIDELINE VALUES:

	Marine Sediment Guidelines		
	TEL	PEL	AET
Semivolatile Organics (ug/kg)			
Acenaphthene	6.71	88.9	130
Acenaphthylene	5.87	127.87	71
Anthracene	46.85	245	280
Benzo[a]anthracene	74.83	692.53	960
Benzo[a]pyrene	88.81	763.22	1100
Benzo[b]fluoranthene	N/A	N/A	1800
Benzo[g,h,i]perylene	N/A	N/A	670
Benzo[k]fluoranthene	N/A	N/A	1800
Bis (2-ethylhexyl) phthalate	182.16	2646.51	1300
Chrysene	107.77	845.98	950
Dibenzofuran	N/A	N/A	110
Fluoranthene	112.82	1493.54	1300
Fluorene	21.17	144.35	120
Indeno[1,2,3-cd]pyrene	N/A	N/A	600
Phenanthrene	86.68	543.53	660
Pyrene	152.66	1397.6	2400
Metals (mg/kg)			
Arsenic	7.24	41.6	35
Cadmium	0.676	4.21	3
Chromium	52.3	160.4	62
Copper	18.7	108.2	
Lead	30.24	112.18	400
Mercury	0.13	0.696	0.41
Nickel	15.9	42.8	
Selenium	N/A	N/A	1
Silver	0.73	1.77	3.1
Zinc	124	271	410

TEL STANDS FOR THRESHOLD EFFECTS LEVEL
PEL STANDS FOR PROBABLE EFFECTS LEVEL
AET STANDS FOR APPARENT EFFECTS THRESHOLD
--CNE-- STANDS FOR CRITERIA NOT EXCEEDED



Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	700
Benzo[a]anthracene	3800
Benzo[a]pyrene	5700
Benzo[b]fluoranthene	9600
Benzo[g,h,i]perylene	1700
Benzo[k]fluoranthene	3900
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	3800
Dibenzofuran	-- CNE --
Fluoranthene	9900
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	1700
Phenanthrene	840
Pyrene	6100
Metals (mg/kg)	
Arsenic	70
Cadmium	7.2
Chromium	820
Copper	320
Lead	460
Mercury	1
Nickel	44
Selenium	9.9
Silver	-- CNE --
Zinc	1200

Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	800
Benzo[a]pyrene	1000
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	660
Dibenzofuran	-- CNE --
Fluoranthene	2100
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	620
Pyrene	1300
Metals (mg/kg)	
Arsenic	68
Cadmium	-- CNE --
Chromium	380
Copper	120
Lead	340
Mercury	1.4
Nickel	37
Selenium	6.4
Silver	-- CNE --
Zinc	560

Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	620
Benzo[a]pyrene	790
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	590
Dibenzofuran	-- CNE --
Fluoranthene	1300
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	-- CNE --
Pyrene	850
Metals (mg/kg)	
Arsenic	30
Cadmium	-- CNE --
Chromium	310
Copper	140
Lead	210
Mercury	0.43
Nickel	36
Selenium	-- CNE --
Silver	-- CNE --
Zinc	530

Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	620
Acenaphthylene	630
Anthracene	3800
Benzo[a]anthracene	6800
Benzo[a]pyrene	8300
Benzo[b]fluoranthene	15000
Benzo[g,h,i]perylene	2700
Benzo[k]fluoranthene	7900
Bis (2-ethylhexyl) phthalate	2900
Chrysene	7900
Dibenzofuran	1100
Fluoranthene	22000
Fluorene	1400
Indeno[1,2,3-cd]pyrene	2700
Phenanthrene	7400
Pyrene	15000
Metals (mg/kg)	
Arsenic	82
Cadmium	16
Chromium	580
Copper	270
Lead	1700
Mercury	1.2
Nickel	58
Selenium	11
Silver	-- CNE --
Zinc	2800

Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	570
Anthracene	2600
Benzo[a]anthracene	5100
Benzo[a]pyrene	4600
Benzo[b]fluoranthene	9300
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	3200
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	5800
Dibenzofuran	880
Fluoranthene	14000
Fluorene	1300
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	8400
Pyrene	14000
Metals (mg/kg)	
Arsenic	75
Cadmium	9.7
Chromium	180
Copper	200
Lead	3900
Mercury	0.6
Nickel	31
Selenium	6.3
Silver	5.7
Zinc	3100

Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	490
Benzo[a]pyrene	730
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	-- CNE --
Dibenzofuran	-- CNE --
Fluoranthene	980
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	530
Pyrene	1200
Metals (mg/kg)	
Arsenic	80
Cadmium	-- CNE --
Chromium	310
Copper	190
Lead	310
Mercury	3.5
Nickel	32
Selenium	10
Silver	-- CNE --
Zinc	620

Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	630
Benzo[a]pyrene	1500
Benzo[b]fluoranthene	2700
Benzo[g,h,i]perylene	880
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	660
Dibenzofuran	-- CNE --
Fluoranthene	1400
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	910
Phenanthrene	490
Pyrene	1800
Metals (mg/kg)	
Arsenic	42
Cadmium	-- CNE --
Chromium	250
Copper	100
Lead	240
Mercury	0.5
Nickel	24
Selenium	6.5
Silver	-- CNE --
Zinc	670

Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	520
Benzo[a]anthracene	1500
Benzo[a]pyrene	2600
Benzo[b]fluoranthene	4300
Benzo[g,h,i]perylene	1100
Benzo[k]fluoranthene	2300
Bis (2-ethylhexyl) phthalate	600
Chrysene	1700
Dibenzofuran	-- CNE --
Fluoranthene	4000
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	1100
Phenanthrene	1000
Pyrene	3500
Metals (mg/kg)	
Arsenic	26
Cadmium	-- CNE --
Chromium	300
Copper	120
Lead	220
Mercury	0.46
Nickel	37
Selenium	-- CNE --
Silver	-- CNE --
Zinc	520

Chemical	Shall
Semivolatile Organics (ug/kg)	
Acenaphthene	1700
Acenaphthylene	760
Anthracene	3500
Benzo[a]anthracene	5500
Benzo[a]pyrene	620
Benzo[b]fluoranthene	6600
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	4100
Bis (2-ethylhexyl) phthalate	1100
Chrysene	4500
Dibenzofuran	1600
Fluoranthene	15000
Fluorene	2100
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	8700
Pyrene	3000
Metals (mg/kg)	
Arsenic	36
Cadmium	-- CNE --
Chromium	310
Copper	140
Lead	320
Mercury	0.58
Nickel	30
Selenium	4.2
Silver	-- CNE --
Zinc	690

LEGEND

HA-101 LOCATION AND DESIGNATION OF WATER-BASED VIBRACORES (HA-101 THROUGH HA-115) DRILLED BY ALPINE OCEAN SEISMIC SURVEY, INC. OF NORWOOD , NEW JERSEY DURING THE PERIOD 22 THROUGH 24 MAY 2006.

NOTES:

1. THE RESULTS LISTED FOR EACH BORING LOCATION SHOW ONLY THOSE RESULTS FOR COMPOUNDS DETECTED ABOVE THE METHOD QUANTITATION LIMIT THAT ALSO EXCEED THE COMPARISON CRITERIA FOR THE COMPOUNDS DETECTED (IE. IF A COMPOUND WAS DETECTED ,BUT NOT SHOWN, IT IS BECAUSE IT DOES NOT EXCEED ITS COMPARISON CRITERION).
2. MARINE SEDIMENT GUIDELINES FROM NOAA SCREENING QUICK REFERENCE TABLES (SQUIRT), BUCHMAN 1999.
3. SHALLOW REFERS TO 0.0-2.0 FEET BELOW SURFACE.
4. COORDINATE SYSTEM IS IN FEET AND REFERS TO MARYLAND STATE GRID, BASED ON NAD83.
5. THE BATHYMETRY SURVEY WAS PERFORMED BY WATERWAY SURVEYS & ENGINEERING, LTD OF VIRGINIA DURING THE PERIOD APRIL 2004 AND FEBRUARY 2006. THE SOUNDINGS ARE IN FEET AND REFER TO THE MEAN LOWER LOW WATER (MLLW) BASED ON N.O.S RECORDING TIDE GAGE AT FORT McHENRY . (USC&G MLLW + 0.84FT= NAVD88).

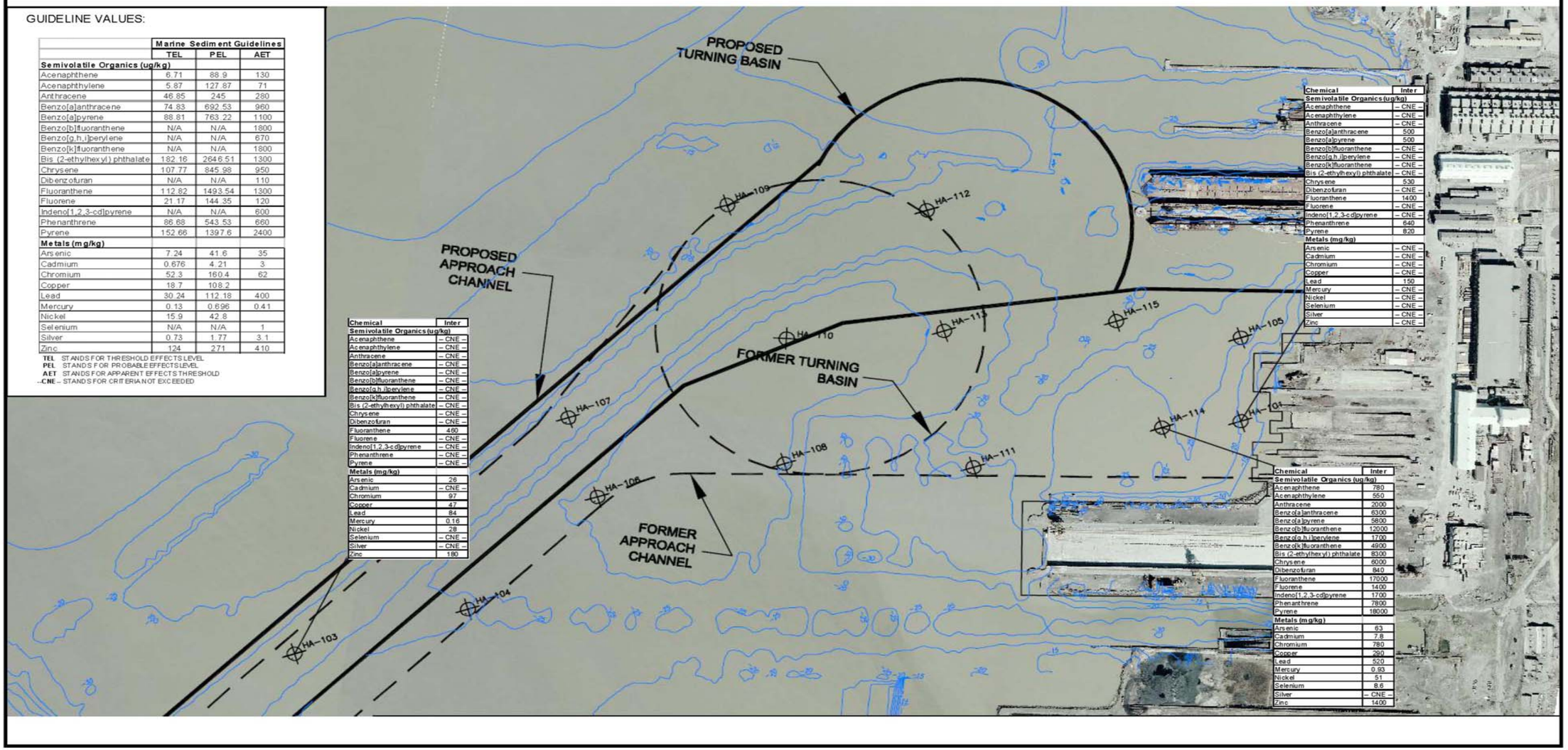
0 500 1000
SCALE IN FEET

Figure 4.3.2.4-2
Sparrows Point LNG Project
Sediment Analytical Results
Shallow Samples June 2006

GUIDELINE VALUES:

	Marine Sediment Guidelines		
	TEL	PEL	AET
Semivolatile Organics (ug/kg)			
Acenaphthene	6.71	88.9	130
Acenaphthylene	5.87	127.87	71
Anthracene	46.85	245	280
Benzo[a]anthracene	74.83	692.53	960
Benzo[a]pyrene	88.81	763.22	1100
Benzo[b]fluoranthene	N/A	N/A	1800
Benzo[g,h,i]perylene	N/A	N/A	670
Benzo[k]fluoranthene	N/A	N/A	1800
Bis (2-ethylhexyl) phthalate	182.16	2646.51	1300
Chrysene	107.77	845.98	950
Dibenzofuran	N/A	N/A	110
Fluoranthene	112.82	1493.54	1300
Fluorene	21.17	144.35	120
Indeno[1,2,3-cd]pyrene	N/A	N/A	600
Phenanthrene	86.68	543.53	660
Pyrene	152.66	1397.6	2400
Metals (mg/kg)			
Arsenic	7.24	41.6	35
Cadmium	0.676	4.21	3
Chromium	52.3	160.4	62
Copper	18.7	108.2	
Lead	30.24	112.18	400
Mercury	0.13	0.696	0.41
Nickel	15.9	42.8	
Selenium	N/A	N/A	1
Silver	0.73	1.77	3.1
Zinc	124	271	410

TEL STANDS FOR THRESHOLD EFFECTS LEVEL
PEL STANDS FOR PROBABLE EFFECTS LEVEL
AET STANDS FOR APPARENT EFFECTS THRESHOLD
--CNE-- STANDS FOR CRITERIA NOT EXCEEDED



Chemical	Inter
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	-- CNE --
Benzo[a]pyrene	-- CNE --
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	-- CNE --
Dibenzofuran	-- CNE --
Fluoranthene	460
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	-- CNE --
Pyrene	-- CNE --
Metals (mg/kg)	
Arsenic	26
Cadmium	-- CNE --
Chromium	97
Copper	47
Lead	84
Mercury	0.16
Nickel	28
Selenium	-- CNE --
Silver	-- CNE --
Zinc	180

Chemical	Inter
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	500
Benzo[a]pyrene	500
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	530
Dibenzofuran	-- CNE --
Fluoranthene	1400
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	640
Pyrene	820
Metals (mg/kg)	
Arsenic	-- CNE --
Cadmium	-- CNE --
Chromium	-- CNE --
Copper	-- CNE --
Lead	150
Mercury	-- CNE --
Nickel	-- CNE --
Selenium	-- CNE --
Silver	-- CNE --
Zinc	-- CNE --

Chemical	Inter
Semivolatile Organics (ug/kg)	
Acenaphthene	780
Acenaphthylene	550
Anthracene	2000
Benzo[a]anthracene	6300
Benzo[a]pyrene	5800
Benzo[b]fluoranthene	12000
Benzo[g,h,i]perylene	1700
Benzo[k]fluoranthene	4900
Bis (2-ethylhexyl) phthalate	8300
Chrysene	6000
Dibenzofuran	840
Fluoranthene	17000
Fluorene	1400
Indeno[1,2,3-cd]pyrene	1700
Phenanthrene	7800
Pyrene	18000
Metals (mg/kg)	
Arsenic	63
Cadmium	7.8
Chromium	780
Copper	290
Lead	520
Mercury	0.93
Nickel	51
Selenium	8.6
Silver	-- CNE --
Zinc	1400

LEGEND

HA-101 LOCATION AND DESIGNATION OF WATER-BASED VIBRACORES (HA-101 THROUGH HA-115) DRILLED BY ALPINE OCEAN SEISMIC SURVEY, INC. OF NORWOOD , NEW JERSEY DURING THE PERIOD 22 THROUGH 24 MAY 2006.

NOTES:

1. THE RESULTS LISTED FOR EACH BORING LOCATION SHOW ONLY THOSE RESULTS FOR COMPOUNDS DETECTED ABOVE THE METHOD QUANTITATION LIMIT THAT ALSO EXCEED THE COMPARISON CRITERIA FOR THE COMPOUNDS DETECTED (IE. IF A COMPOUND WAS DETECTED ,BUT NOT SHOWN, IT IS BECAUSE IT DOES NOT EXCEED ITS COMPARISON CRITERION).
2. MARINE SEDIMENT GUIDELINES FROM NOAA SCREENING QUICK REFERENCE TABLES (SQUIRT), BUCHMAN 1999.
3. SHALLOW REFERS TO 0.0-2.0 FEET BELOW SURFACE.
4. COORDINATE SYSTEM IS IN FEET AND REFERS TO MARYLAND STATE GRID, BASED ON NAD83.
5. THE BATHYMETRY SURVEY WAS PERFORMED BY WATERWAY SURVEYS & ENGINEERING, LTD OF VIRGINIA DURING THE PERIOD APRIL 2004 AND FEBRUARY 2006. THE SOUNDINGS ARE IN FEET AND REFER TO THE MEAN LOWER LOW WATER (MLLW) BASED ON N.O.S RECORDING TIDE GAGE AT FORT McHENRY . (USC&G MLLW + 0.84FT= NAVD88).

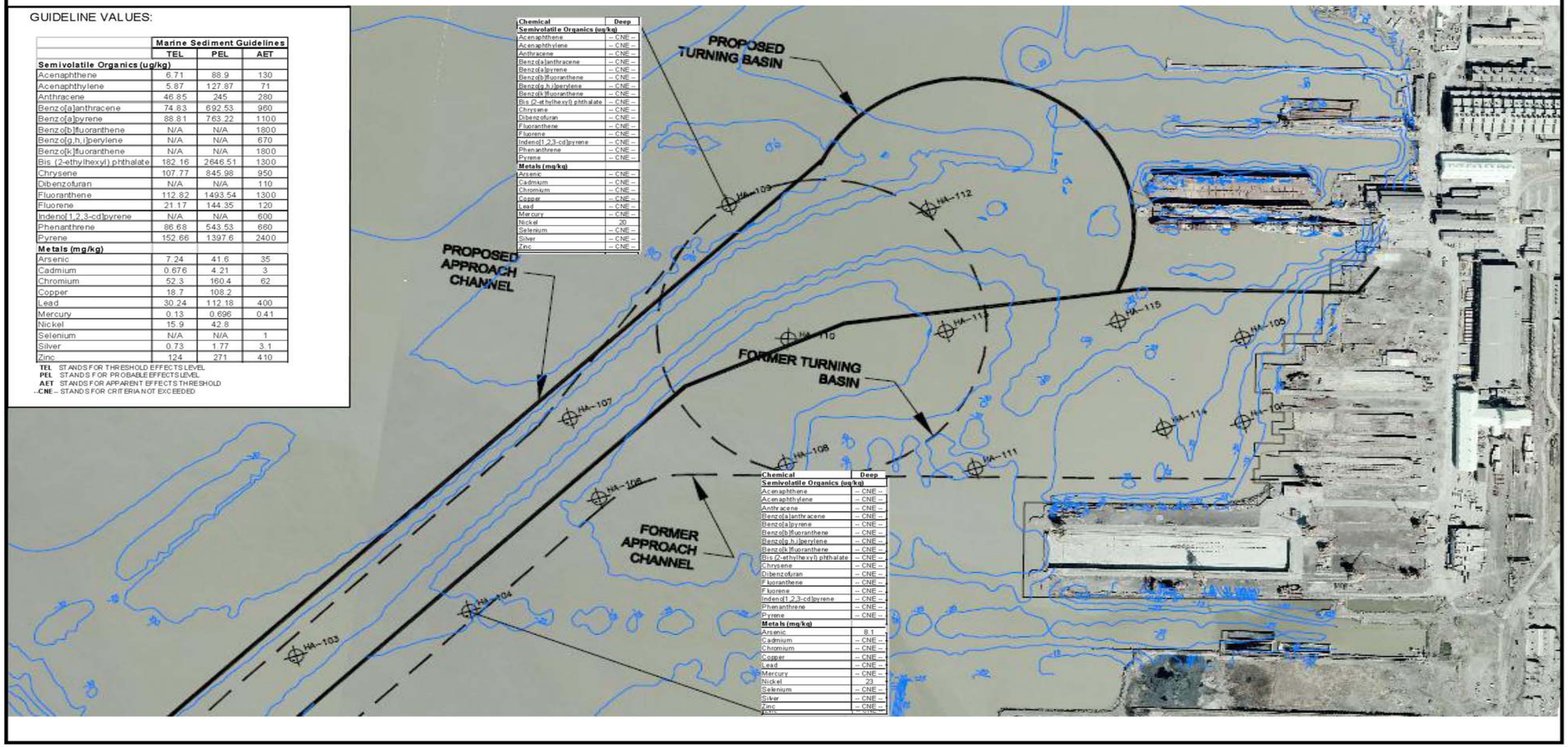
0 500 1000
SCALE IN FEET

Figure 4.3.2.4-3
Sparrows Point LNG Project
Sediment Analytical Results
Intermediate Depth Samples
June 2006

GUIDELINE VALUES:

	Marine Sediment Guidelines		
	TEL	PEL	AET
Semivolatile Organics (ug/kg)			
Acenaphthene	6.71	88.9	130
Acenaphthylene	5.87	127.87	71
Anthracene	46.85	245	280
Benzo[a]anthracene	74.83	692.53	960
Benzo[a]pyrene	88.81	763.22	1100
Benzo[b]fluoranthene	N/A	N/A	1800
Benzo[g,h,i]perylene	N/A	N/A	670
Benzo[k]fluoranthene	N/A	N/A	1800
Bis (2-ethylhexyl) phthalate	182.16	2646.51	1300
Chrysene	107.77	845.98	950
Dibenzofuran	N/A	N/A	110
Fluoranthene	112.82	1493.54	1300
Fluorene	21.17	144.35	120
Indeno[1,2,3-cd]pyrene	N/A	N/A	600
Phenanthrene	86.68	543.53	660
Pyrene	152.66	1397.6	2400
Metals (mg/kg)			
Arsenic	7.24	41.6	35
Cadmium	0.676	4.21	3
Chromium	52.3	160.4	62
Copper	18.7	108.2	
Lead	30.24	112.18	400
Mercury	0.13	0.696	0.41
Nickel	15.9	42.8	
Selenium	N/A	N/A	1
Silver	0.73	1.77	3.1
Zinc	124	271	410

TEL STANDS FOR THRESHOLD EFFECTS LEVEL
PEL STANDS FOR PROBABLE EFFECTS LEVEL
AET STANDS FOR APPARENT EFFECTS THRESHOLD
-CNE- STANDS FOR CRITERIA NOT EXCEEDED



Chemical	Deep
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	-- CNE --
Benzo[a]pyrene	-- CNE --
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	-- CNE --
Dibenzofuran	-- CNE --
Fluoranthene	-- CNE --
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	-- CNE --
Pyrene	-- CNE --
Metals (mg/kg)	
Arsenic	-- CNE --
Cadmium	-- CNE --
Chromium	-- CNE --
Copper	-- CNE --
Lead	-- CNE --
Mercury	-- CNE --
Nickel	20
Selenium	-- CNE --
Silver	-- CNE --
Zinc	-- CNE --

Chemical	Deep
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	-- CNE --
Benzo[a]pyrene	-- CNE --
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	-- CNE --
Dibenzofuran	-- CNE --
Fluoranthene	-- CNE --
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	-- CNE --
Pyrene	-- CNE --
Metals (mg/kg)	
Arsenic	8.1
Cadmium	-- CNE --
Chromium	-- CNE --
Copper	-- CNE --
Lead	-- CNE --
Mercury	-- CNE --
Nickel	23
Selenium	-- CNE --
Silver	-- CNE --
Zinc	-- CNE --

LEGEND

HA-101 LOCATION AND DESIGNATION OF WATER-BASED VIBRACORES (HA-101 THROUGH HA-115) DRILLED BY ALPINE OCEAN SEISMIC SURVEY, INC. OF NORWOOD , NEW JERSEY DURING THE PERIOD 22 THROUGH 24 MAY 2006.

NOTES:

1. THE RESULTS LISTED FOR EACH BORING LOCATION SHOW ONLY THOSE RESULTS FOR COMPOUNDS DETECTED ABOVE THE METHOD QUANTITATION LIMIT THAT ALSO EXCEED THE COMPARISON CRITERIA FOR THE COMPOUNDS DETECTED (IE. IF A COMPOUND WAS DETECTED ,BUT NOT SHOWN, IT IS BECAUSE IT DOES NOT EXCEED ITS COMPARISON CRITERION).
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3. SHALLOW REFERS TO 0.0-2.0 FEET BELOW SURFACE.
4. COORDINATE SYSTEM IS IN FEET AND REFERS TO MARYLAND STATE GRID, BASED ON NAD83.
5. THE BATHYMETRY SURVEY WAS PERFORMED BY WATERWAY SURVEYS & ENGINEERING, LTD OF VIRGINIA DURING THE PERIOD APRIL 2004 AND FEBRUARY 2006. THE SOUNDINGS ARE IN FEET AND REFER TO THE MEAN LOWER LOW WATER (MILLW) BASED ON N.O.S RECORDING TIDE GAGE AT FORT McHENRY . (USC&G MILLW + 0.84FT= NAVD88).

0 500 1000
SCALE IN FEET

Figure 4.3.2.4-4
Sparrows Point LNG Project
Sediment Analytical Results
Deep Samples June 2006

- both the 2006 and 1985 samples from Sparrows Point have metals concentrations that are higher than the 1997 Baltimore Harbor/Patapsco River/Back River or the 1997 Baltimore Harbor Anchorages and Channels samples, typically by a factor of 2 or 3 for arsenic, cadmium, chromium, copper, and lead; and
- all four data sets have multiple exceedances of the PEL for both SVOCs and metals.

Within the 2006 samples collected by AES, there are apparent depth related trends for all PAH compounds and metals. For most measured constituents, the maximum values were recorded in the shallow samples (0 – 2 feet). The exceptions were for bis (2-ethylhexl) phthalate and pyrene, for which maximum concentrations were measured in intermediate samples (2 – 10 feet). For the deep samples (>10 feet), all PAH compounds were non-detectable. All metals in the deep samples essentially reached background levels for marine sediment; that is, the maximum concentrations were at or below levels of metals concentrations measured in the fine particles (silt and clay) of nearshore, non-contaminated sediments (Wedepohl, 1960). Thus, there is a strong correlation of increasing contamination from deeper sediments (deposited many years ago) to shallower sediments (deposited more recently). Below 10 feet in the sediments, there is little or no evidence of contamination in the Sparrows Point nearshore sediments.

August 2007 Samples – Analytical Results

The exceedances of the NOAA SQuirRT guideline values are shown in figures 4.3.2.4-5, 4.3.2.4-6, and 4.3.2.4-7. Our observations and conclusions about the August 2007 sampling analytical results are:

- all of the samples at all sample depth intervals were below detection limits (non-detection, or ND) for VOCs and pesticides;
- using the higher detection limit for PCBs (EPA Method 8082) for the shallow and intermediate depth samples, analytical results showed low levels of PCBs at locations HA-118 (inner half of Sparrows Point Ship Channel) and HA-121 (northern portion of the proposed turning basin) – in the shallow samples at each location;
- using the lower detection limit analyses for congener-specific PCBs (EPA Method 1668A), PCBs were detected at the parts per trillion range in each of the 12 deep interval samples. However, using the "Aroclor-based" total PCB summary values, none of the 12 samples exceeded the AET of 3.6 mg/kg. The highest value recorded was at location HA-122 (north of the proposed LNG pier) – with a concentration of 0.000315 mg/kg, which is four orders of magnitude below the AET;
- there were no measured dioxins above the NOAA SQuiRT guideline values (TEL, PEL, or AET) for any of the shallow or intermediate depth samples. There were two samples with dioxin concentrations at or above the AET of 3.6 ng/kg toxic equivalents. These were at location HA-121 (northern portion of the turning basin) for the deep interval sample, with a toxic equivalents value of 3.67 ng/kg, and at location HA-120 (southern portion of the turning basin) for the shallow interval sample, with a toxic equivalents value of 4.96 ng/kg;
- SVOCs (including PAHs) concentrations were somewhat similar to the June 2006 sampling but generally displayed lower mean values and lower maxima for individual constituents when compared to the June 2006 sampling results, particularly for the shallow depth interval samples. Many shallow depth samples of August 2007 had PAH constituent means that were a third or less in concentration compared to average values from 2006 samples. Some PAHs, such as anthracene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, fluoranthene, and phenanthrene, were approximately an order of magnitude lower in August 2007 than the analogous June 2006 samples. Only bis(2ethylhexyl) phthalate had higher concentrations in August 2007 than in June 2006;

- there were still three shallow sample locations that had multiple exceedances of NOAA SQuiRT criteria (PEL, TEL, or AET) for PAHs. These were locations HA-118, HA-121, and HA-120. The sample collected at HA-120 had the highest concentrations of PAHs, dioxins, and some metals, of any of the 12 sample locations;
- the lower PAH concentrations across the study area might indicate that the Barletta-Willis dredging event of late 2006 may have removed some of the more heavily contaminated sediments from the footprint of the dredging. Only 4 of the August 2007 sampling stations were outside the footprint of the Barletta-Willis dredging area - location HA-118 (along the Sparrows Point Ship Channel), locations HA-119 and HA-120 (the southern portion of the proposed turning basin), and location HA-126 (south of the proposed LNG offloading pier). As noted above, location HA-120 had the highest concentrations of multiple constituents, and location HA-118 had the next highest number of PAHs exceeding the NOAA SQuiRT criteria;
- regarding metal constituents within the shallow sample intervals, there were multiple exceedances of NOAA SQuiRT criteria throughout the sampling area in August 2007. The highest concentrations of individual metals and the most exceedances appear to be concentrated in the turning basin locations (HA-120 and HA-121) and the inner portion of the Sparrows Point Shipping Channel (locations HA-118 and HA-119). Sample location HA-123 (north of the proposed LNG offloading pier) had fewer metal exceedances, but had the highest values of barium, chromium, and copper. The other five sampling locations surrounding the proposed offloading pier (HA-122, -124, -125, -126, and -127) had the fewest exceedances of the NOAA SQuiRT criteria for metals; and
- regarding the deeper samples (both intermediate depth and deep interval samples), only dioxin (at location HA-121), arsenic (at multiple intermediate and deep interval locations), barium (at multiple intermediate and deep interval locations) and chromium (at location HA-117, deep sample) exceeded the NOAA SQuiRT criteria.

In comparing the August 2007 sample results to the June 2006 sample results, we have concluded the following:

- the entire area still shows various levels of organic (PAHs) and inorganic (metals) contamination in the surface sediments; but the concentrations in August 2007 indicate that the contaminant levels at the surface may have been reduced by the 2006 BWI dredging event;
- although the PCB results may be biased by the analytical method used for surface and intermediate samples (i.e., higher detection limit for EPA Method 8082), the congener specific analytical method (EPA Method 1668A) used for the deeper samples showed that there is no significant PCB contamination at depth across the sampling area; and
- the concentrations of analytes from the August 2007 sampling period appear to reach background values (for Patapsco sediments) for all constituents within the intermediate and deep sample intervals, with the possible exception of arsenic and barium.

Elutriate Testing

Elutriate testing is a method developed by EPA and used by the COE to test sediments for suitability for ocean disposal and also for so-called inland disposal (EPA and COE, 1991). It is a procedure to determine the amount of chemical constituents that are released to the water column when sediments are mixed with water. AES performed elutriate testing on four sets of sediment composites collected from the Sparrows Point nearshore sediment vibracores in June 2006. AES also conducted elutriate testing on all 12 sample cores collected in August 2007. The elutriate test results were compared to EPA-developed “marine acute” and “marine chronic” criteria, which were developed as values, below which constituents are essentially non-

harmful to marine organisms. These criteria have been developed for metals, but are not available for some of the organic compounds. The results of the elutriate testing are presented in the following sections of this EIS.

June 2006 Samples – Analytical Results of Elutriate Testing

- VOCs were non-detectable for all samples with the exception of the composite from the approach channel and southern portion of the turning basin; naphthalene was detected at 3 ug/L in this composite;
- SVOCs were non-detectable for all composite samples;
- PCBs were not detected in any samples, using EPA Method 8081A;
- tributyl tin was detected at 3 ng/L in the sample that was composited from the nearshore samples closest to the historical shipbuilding portion of the Sparrows Point site; and
- metals, particularly zinc, were detected in all composite, elutriate samples. None of the metal concentrations exceeded the EPA marine acute criteria, but lead (37 ug/L) and nickel (8.9 ug/L) exceeded the marine chronic criteria for one sample each.

August 2007 Samples – Analytical Results of Elutriate Testing

- there were no elutriate concentrations of any VOCs, SVOCs, or pesticides from any of the samples analyzed;
- there were detectable levels of dioxins within numerous samples, particularly from the intermediate depth sample at location HA-120 and from the shallow and deep interval samples at location HA-124. The toxic equivalents measured 12.3 picograms per liter (pg/L) at the intermediate depth of location HA-120 and 3.5 pg/L at the deepest interval of location HA-124. Since there are no EPA marine criteria for dioxins, it is difficult to predict how much if any impact this level of dioxins would have during a dredging event. The freshwater criteria are 100,000 pg/L and 10 pg/L for acute and chronic exposure, respectively. Since dioxin is a known carcinogen, there is no known safe level of exposure to dioxin; and
- there were detectable quantities of tributyltin in three samples: these samples measured 4 ng/L in the shallow interval of location HA-121; 18 ng/L for the deep interval for location HA-122; and 43 ng/L for the shallow interval of location HA-123. There are no EPA marine criteria against which to compare these analytical results.

Based upon the review of these analytical results by the COE and MDE, the permit process may impose conditions on the dredging permit if, in their opinion, conditions are warranted to protect the marine environment or to protect human health.

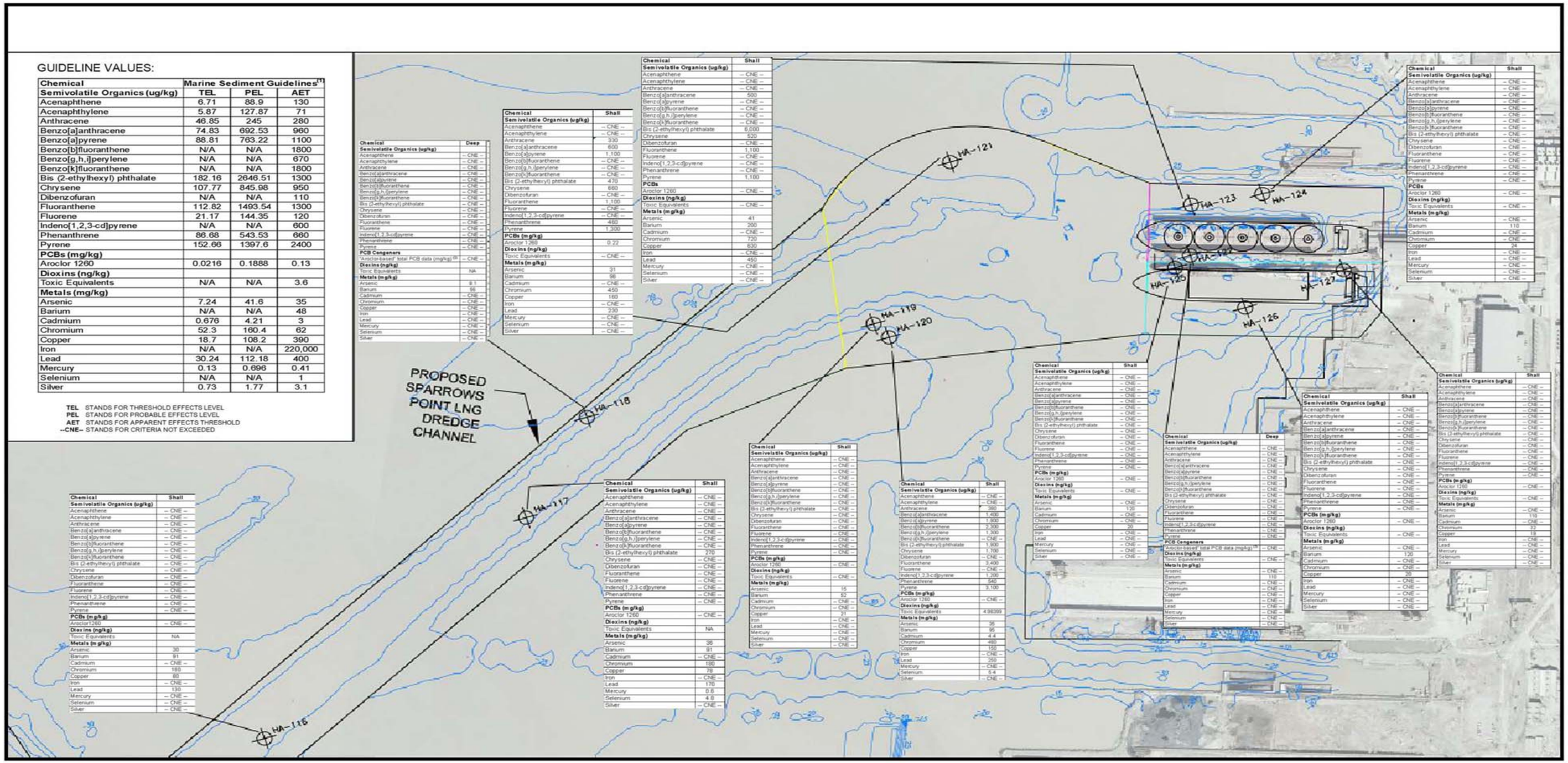
Fate and Transport of Contaminants in the Marine Environment

This section supplies a brief discussion concerning how chemical constituents (contaminants) are partitioned or may be transported between various media: the sediments, the aqueous phase in the water column, and biological matter. Neither chemical concentrations nor chemical structures remain constant in the natural environment. Chemicals may be transported, transformed, and/or accumulated in one or more media. These processes, collectively known as natural attenuation, consist of 1) physical transport, which occurs when chemicals volatilize from soil, sediment, or surface water and diffuse into pore spaces or into the atmosphere and 2) chemical transformation, which involves natural chemical reactions in soil, sediment, or surface water to change the structure of the compounds (e.g., photolysis, sorption, biodegradation (EPA, 1985). Processes that may affect contaminants detected in sediments are:

GUIDELINE VALUES:

Chemical	Marine Sediment Guidelines[1]		
Semivolatile Organics (ug/kg)	**TEL**	**PEL**	**AET**
Acenaphthene	6.71	88.9	130
Acenaphthylene	5.87	127.87	71
Anthracene	46.85	245	280
Benzo[a]anthracene	74.83	692.53	960
Benzo[a]pyrene	88.81	763.22	1100
Benzo[b]fluoranthene	N/A	N/A	1800
Benzo[g,h,i]perylene	N/A	N/A	670
Benzo[k]fluoranthene	N/A	N/A	1800
Bis (2-ethylhexyl) phthalate	182.16	2646.51	1300
Chrysene	107.77	845.98	950
Dibenzofuran	N/A	N/A	110
Fluoranthene	112.82	1493.54	1300
Fluorene	21.17	144.35	120
Indeno[1,2,3-cd]pyrene	N/A	N/A	600
Phenanthrene	86.68	543.53	660
Pyrene	152.66	1397.6	2400
PCBs (mg/kg)			
Aroclor 1260	0.0216	0.1888	0.13
Dioxins (ng/kg)			
Toxic Equivalents	N/A	N/A	3.6
Metals (mg/kg)			
Arsenic	7.24	41.6	35
Barium	N/A	N/A	48
Cadmium	0.676	4.21	3
Chromium	52.3	160.4	62
Copper	18.7	108.2	390
Iron	N/A	N/A	220,000
Lead	30.24	112.18	400
Mercury	0.13	0.696	0.41
Selenium	N/A	N/A	1
Silver	0.73	1.77	3.1

TEL STANDS FOR THRESHOLD EFFECTS LEVEL
PEL STANDS FOR PROBABLE EFFECTS LEVEL
AET STANDS FOR APPARENT EFFECTS THRESHOLD
--CNE-- STANDS FOR CRITERIA NOT EXCEEDED



LEGEND

HA-101 LOCATION AND DESIGNATION OF WATER-BASED VIBRACORES (HA-101 THROUGH HA-115) DRILLED BY ALPINE OCEAN SEISMIC SURVEY, INC. OF NORWOOD , NEW JERSEY DURING THE PERIOD 22 THROUGH 24 MAY 2006.

NOTES:

1. THE RESULTS LISTED FOR EACH BORING LOCATION SHOW ONLY THOSE RESULTS FOR COMPOUNDS DETECTED ABOVE THE METHOD QUANTITATION LIMIT THAT ALSO EXCEED THE COMPARISON CRITERIA FOR THE COMPOUNDS DETECTED (IE. IF A COMPOUND WAS DETECTED ,BUT NOT SHOWN, IT IS BECAUSE IT DOES NOT EXCEED ITS COMPARISON CRITERION).

2. MARINE SEDIMENT GUIDELINES FROM NOAA SCREENING QUICK REFERENCE TABLES (SQUIRT), BUCHMAN 1999.

3. SHALLOW REFERS TO 0.0-2.0 FEET BELOW SURFACE.

4. COORDINATE SYSTEM IS IN FEET AND REFERS TO MARYLAND STATE GRID, BASED ON NAD83.

5. THE BATHYMETRY SURVEY WAS PERFORMED BY WATERWAY SURVEYS & ENGINEERING, LTD OF VIRGINIA DURING THE PERIOD APRIL 2004 AND FEBRUARY 2006. THE SOUNDINGS ARE IN FEET AND REFER TO THE MEAN LOWER LOW WATER (MLLW) BASED ON N.O.S RECORDING TIDE GAGE AT FORT McHENRY . (USC&G MLLW + 0.84FT= NAVD88).

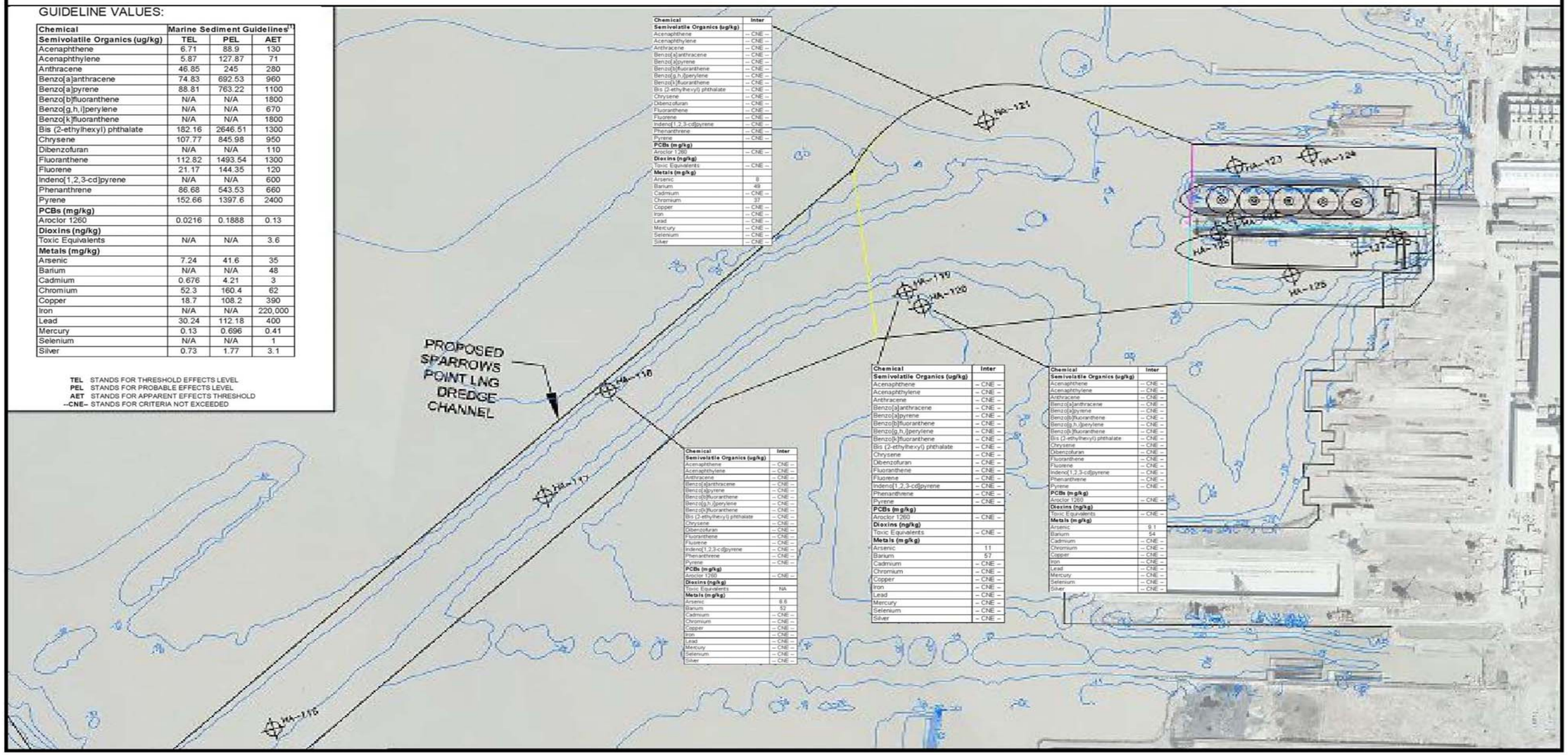
0 500 1000
SCALE IN FEET

Figure 4.3.2.4-5
Sparrows Point LNG Project
Sediment Analytical Results
Shallows Samples
August 2007

GUIDELINE VALUES:

Chemical	Marine Sediment Guidelines[1]		
Semivolatile Organics (ug/kg)	**TEL**	**PEL**	**AET**
Acenaphthene	6.71	88.9	130
Acenaphthylene	5.87	127.87	71
Anthracene	46.85	245	280
Benzo[a]anthracene	74.83	692.53	960
Benzo[a]pyrene	88.81	763.22	1100
Benzo[b]fluoranthene	N/A	N/A	1800
Benzo[g,h,i]perylene	N/A	N/A	670
Benzo[k]fluoranthene	N/A	N/A	1800
Bis (2-ethylhexyl) phthalate	182.16	2646.51	1300
Chrysene	107.77	845.98	950
Dibenzofuran	N/A	N/A	110
Fluoranthene	112.82	1493.54	1300
Fluorene	21.17	144.35	120
Indeno[1,2,3-cd]pyrene	N/A	N/A	600
Phenanthrene	86.68	543.53	660
Pyrene	152.66	1397.6	2400
PCBs (mg/kg)			
Aroclor 1260	0.0216	0.1888	0.13
Dioxins (ng/kg)			
Toxic Equivalents	N/A	N/A	3.6
Metals (mg/kg)			
Arsenic	7.24	41.6	35
Barium	N/A	N/A	48
Cadmium	0.676	4.21	3
Chromium	52.3	160.4	62
Copper	18.7	108.2	390
Iron	N/A	N/A	220,000
Lead	30.24	112.18	400
Mercury	0.13	0.696	0.41
Selenium	N/A	N/A	1
Silver	0.73	1.77	3.1

TEL STANDS FOR THRESHOLD EFFECTS LEVEL
PEL STANDS FOR PROBABLE EFFECTS LEVEL
AET STANDS FOR APPARENT EFFECTS THRESHOLD
--CNE-- STANDS FOR CRITERIA NOT EXCEEDED



Chemical	Inter
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	-- CNE --
Benzo[a]pyrene	-- CNE --
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	-- CNE --
Dibenzofuran	-- CNE --
Fluoranthene	-- CNE --
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	-- CNE --
Pyrene	-- CNE --
PCBs (mg/kg)	
Aroclor 1260	-- CNE --
Dioxins (ng/kg)	
Toxic Equivalents	-- CNE --
Metals (mg/kg)	
Arsenic	8
Barium	49
Cadmium	-- CNE --
Chromium	37
Copper	-- CNE --
Iron	-- CNE --
Lead	-- CNE --
Mercury	-- CNE --
Selenium	-- CNE --
Silver	-- CNE --

Chemical	Inter
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	-- CNE --
Benzo[a]pyrene	-- CNE --
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	-- CNE --
Dibenzofuran	-- CNE --
Fluoranthene	-- CNE --
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	-- CNE --
Pyrene	-- CNE --
PCBs (mg/kg)	
Aroclor 1260	-- CNE --
Dioxins (ng/kg)	
Toxic Equivalents	-- CNE --
Metals (mg/kg)	
Arsenic	11
Barium	57
Cadmium	-- CNE --
Chromium	-- CNE --
Copper	-- CNE --
Iron	-- CNE --
Lead	-- CNE --
Mercury	-- CNE --
Selenium	-- CNE --
Silver	-- CNE --

Chemical	Inter
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	-- CNE --
Benzo[a]pyrene	-- CNE --
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	-- CNE --
Dibenzofuran	-- CNE --
Fluoranthene	-- CNE --
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	-- CNE --
Pyrene	-- CNE --
PCBs (mg/kg)	
Aroclor 1260	-- CNE --
Dioxins (ng/kg)	
Toxic Equivalents	-- CNE --
Metals (mg/kg)	
Arsenic	9.1
Barium	54
Cadmium	-- CNE --
Chromium	-- CNE --
Copper	-- CNE --
Iron	-- CNE --
Lead	-- CNE --
Mercury	-- CNE --
Selenium	-- CNE --
Silver	-- CNE --

Chemical	Inter
Semivolatile Organics (ug/kg)	
Acenaphthene	-- CNE --
Acenaphthylene	-- CNE --
Anthracene	-- CNE --
Benzo[a]anthracene	-- CNE --
Benzo[a]pyrene	-- CNE --
Benzo[b]fluoranthene	-- CNE --
Benzo[g,h,i]perylene	-- CNE --
Benzo[k]fluoranthene	-- CNE --
Bis (2-ethylhexyl) phthalate	-- CNE --
Chrysene	-- CNE --
Dibenzofuran	-- CNE --
Fluoranthene	-- CNE --
Fluorene	-- CNE --
Indeno[1,2,3-cd]pyrene	-- CNE --
Phenanthrene	-- CNE --
Pyrene	-- CNE --
PCBs (mg/kg)	
Aroclor 1260	-- CNE --
Dioxins (ng/kg)	
Toxic Equivalents	NA
Metals (mg/kg)	
Arsenic	8.6
Barium	52
Cadmium	-- CNE --
Chromium	-- CNE --
Copper	-- CNE --
Iron	-- CNE --
Lead	-- CNE --
Mercury	-- CNE --
Selenium	-- CNE --
Silver	-- CNE --

LEGEND

HA- 101 LOCATION AND DESIGNATION OF WATER-BASED VIBRACORES (HA-101 THROUGH HA-115) DRILLED BY ALPINE OCEAN SEISMIC SURVEY, INC. OF NORWOOD , NEW JERSEY DURING THE PERIOD 22 THROUGH 24 MAY 2006.

NOTES:

1. THE RESULTS LISTED FOR EACH BORING LOCATION SHOW ONLY THOSE RESULTS FOR COMPOUNDS DETECTED ABOVE THE METHOD QUANTITATION LIMIT THAT ALSO EXCEED THE COMPARISON CRITERIA FOR THE COMPOUNDS DETECTED (IE. IF A COMPOUND WAS DETECTED ,BUT NOT SHOWN, IT IS BECAUSE IT DOES NOT EXCEED ITS COMPARISON CRITERION).

2. MARINE SEDIMENT GUIDELINES FROM NOAA SCREENING QUICK REFERENCE TABLES (SQUIRT), BUCHMAN 1999.

3. SHALLOW REFERS TO 0.0-2.0 FEET BELOW SURFACE.

4. COORDINATE SYSTEM IS IN FEET AND REFERS TO MARYLAND STATE GRID, BASED ON NAD83.

5. THE BATHYMETRY SURVEY WAS PERFORMED BY WATERWAY SURVEYS & ENGINEERING, LTD OF VIRGINIA DURING THE PERIOD APRIL 2004 AND FEBRUARY 2006. THE SOUNDINGS ARE IN FEET AND REFER TO THE MEAN LOWER LOW WATER (MLLW) BASED ON N.O.S RECORDING TIDE GAGE AT FORT McHENRY . (USC&G MLLW + 0.84FT= NAVD88).

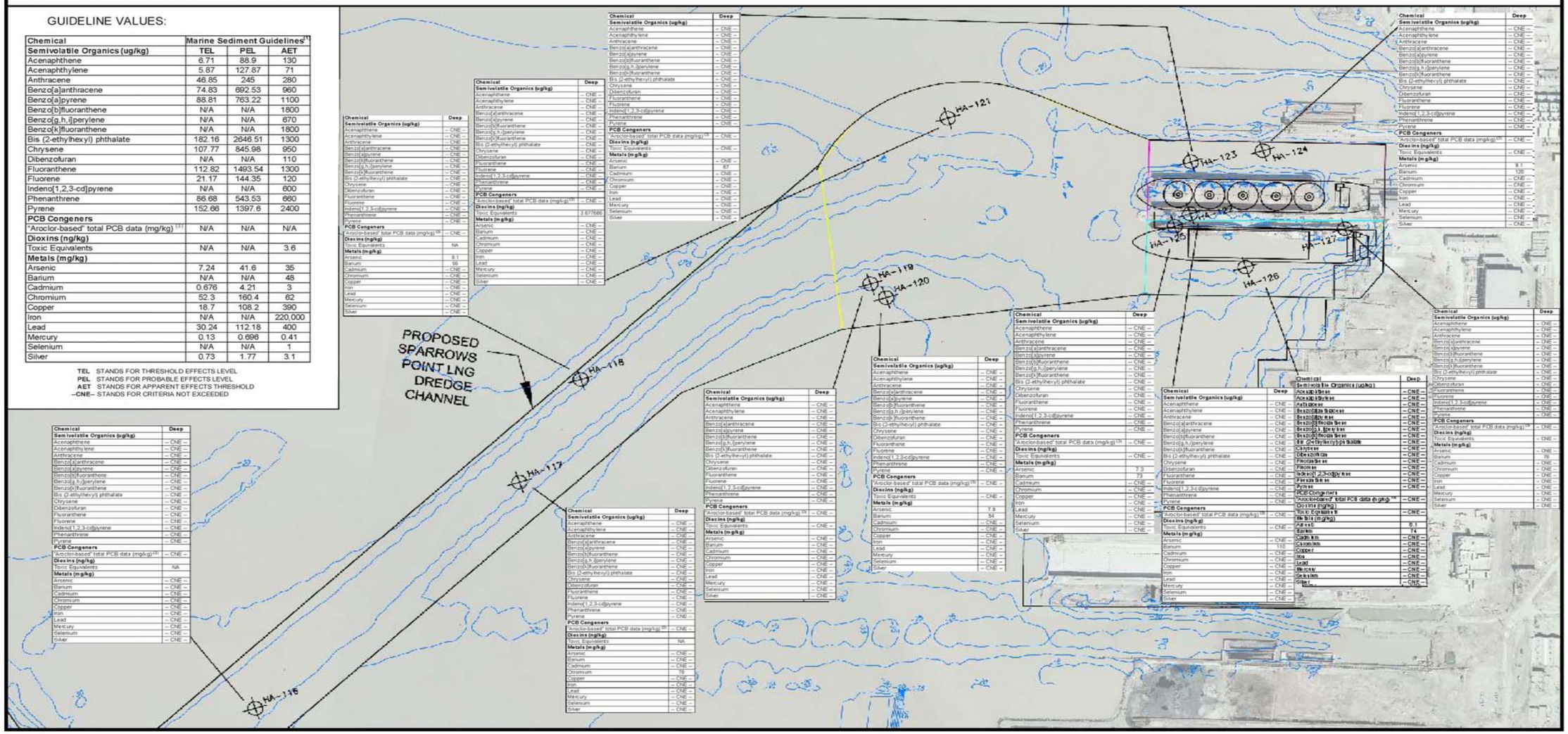
0 500 1000
SCALE IN FEET

Figure 4.3.2.4-6
Sparrows Point LNG Project
Sediment Analytical Results
Intermediate Depth Samples
August 2007

GUIDELINE VALUES:

Chemical	Marine Sediment Guidelines[1]		
Semivolatile Organics (ug/kg)	**TEL**	**PEL**	**AET**
Acenaphthene	6.71	88.9	130
Acenaphthylene	5.87	127.87	71
Anthracene	46.85	245	280
Benzo[a]anthracene	74.83	692.53	960
Benzo[a]pyrene	88.81	763.22	1100
Benzo[b]fluoranthene	N/A	N/A	1800
Benzo[g,h,i]perylene	N/A	N/A	670
Benzo[k]fluoranthene	N/A	N/A	1800
Bis (2-ethylhexyl) phthalate	182.16	2646.51	1300
Chrysene	107.77	845.98	950
Dibenzofuran	N/A	N/A	110
Fluoranthene	112.82	1493.54	1300
Fluorene	21.17	144.35	120
Indeno[1,2,3-cd]pyrene	N/A	N/A	600
Phenanthrene	86.68	543.53	660
Pyrene	152.66	1397.6	2400
PCB Congeners			
"Aroclor-based" total PCB data (mg/kg) [17]	N/A	N/A	N/A
Dioxins (ng/kg)			
Toxic Equivalents	N/A	N/A	3.6
Metals (mg/kg)			
Arsenic	7.24	41.6	35
Barium	N/A	N/A	48
Cadmium	0.676	4.21	3
Chromium	52.3	160.4	62
Copper	18.7	108.2	390
Iron	N/A	N/A	220,000
Lead	30.24	112.18	400
Mercury	0.13	0.696	0.41
Selenium	N/A	N/A	1
Silver	0.73	1.77	3.1

TEL STANDS FOR THRESHOLD EFFECTS LEVEL
PEL STANDS FOR PROBABLE EFFECTS LEVEL
AET STANDS FOR APPARENT EFFECTS THRESHOLD
–CNE– STANDS FOR CRITERIA NOT EXCEEDED



LEGEND

HA-101 LOCATION AND DESIGNATION OF WATER-BASED VIBRACORES (HA-101 THROUGH HA-115) DRILLED BY ALPINE OCEAN SEISMIC SURVEY, INC. OF NORWOOD , NEW JERSEY DURING THE PERIOD 22 THROUGH 24 MAY 2006.

NOTES:

1. THE RESULTS LISTED FOR EACH BORING LOCATION SHOW ONLY THOSE RESULTS FOR COMPOUNDS DETECTED ABOVE THE METHOD QUANTITATION LIMIT THAT ALSO EXCEED THE COMPARISON CRITERIA FOR THE COMPOUNDS DETECTED (IE. IF A COMPOUND WAS DETECTED ,BUT NOT SHOWN, IT IS BECAUSE IT DOES NOT EXCEED ITS COMPARISON CRITERION).
2. MARINE SEDIMENT GUIDELINES FROM NOAA SCREENING QUICK REFERENCE TABLES (SQUIRT), BUCHMAN 1999.
3. SHALLOW REFERS TO 0.0-2.0 FEET BELOW SURFACE.
4. COORDINATE SYSTEM IS IN FEET AND REFERS TO MARYLAND STATE GRID, BASED ON NAD83.
5. THE BATHYMETRY SURVEY WAS PERFORMED BY WATERWAY SURVEYS & ENGINEERING, LTD OF VIRGINIA DURING THE PERIOD APRIL 2004 AND FEBRUARY 2006. THE SOUNDINGS ARE IN FEET AND REFER TO THE MEAN LOWER LOW WATER (MLLW) BASED ON N.O.S RECORDING TIDE GAGE AT FORT McHENRY . (USC&G MILLW + 0.84FT= NAVD88).

0 500 1000
SCALE IN FEET

Figure 4.3.2.4-7
Sparrows Point LNGProject
Sediment Analytical Results
Deep Samples
August 2007

Photolysis/Photooxidation is the result of the decomposition of molecules through the absorption of light (EPA, 1985). PAHs are readily photooxidized and the most important factor in the decay of particle-sorbed PAHs in the atmosphere. Degradation times ranging from seven days [benzo(a)pyrene] to 30 days (phenanthrene) (ATSDR, 1995; Howard, 1991).

Sorption is the binding of chemical residuals to sediment particles. The relative strength of this bond is measured by the organic carbon partition coefficient (K_{oc}), such that the higher the K_{oc}, the greater the affinity the compound has to bind to soil particles. In general, adsorption of contaminants increases with increasing organic content (Dragun, 1998).

- PAHs have log K_{oc} values greater than three indicating the affinity to sorb to sediments. Low molecular weight PAHs (acenaphthene, acenaphthylene, anthracene, fluorene, phenanthrene) have a moderate potential to adsorb to soil while high molecular weight PAHs [benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(ghi)perylene, chrysene, indeno(1,2,3-cd)pyrene] have a greater tendency to sorb to sediments.
- Metals generally adsorb to organic material, clays, and iron and manganese compounds or form insoluble precipitates with other compounds. Sorption usually increases with increasing pH and increasing salinity. The adsorption materials and factors affecting sorption are summarized in table 4.3.2-2.

TABLE 4.3.2-2

Sorption and Affecting Factors for Metals in Sediments

Metal	Adsorption							
	Adsorbs to:				Forms insoluble precipitates	Sorption affected by:		
	Clays	Iron Compounds	Mn Compounds	Organic Material		pH	salinity	Eh
Arsenic	X	X	X	X	X a/	Y c/*	Y	Y b/
Cadmium	X	X	ND	X	X	Y c/	Y	Y
Chromium d/	X	X	ND	X	X	Y c/	Y f/	ND
Copper	X	X	X	X	X	Y c/	N	Y g/
Lead	X	X	X	X	X	Y c/	ND	Y
Mercury	ND	X	ND	X	ND	Y c/	Y h/	Y b/
Nickel	X	X	X	X	X	Y c/	Y h/	Y
Selenium	ND	ND	ND	X e/	X	Y i/	ND	Y
Silver	X	X	X	X	X	Y c/	Y f/	Y b/
Zinc	X	X	X	X	X	Y c/	Y f/	Y g/

Sources: ATSDR, 1992, 1993, 1999, 2000, 2003, 2004, 2005a-d; Eisler, 2000; Irwin et al., 1997; Schlekat, et al., 2000

Y – yes: N – no: ND – no data.

a/ Precipitates with barium, calcium, sulfur, and aluminum.
b/ Oxidizing conditions increase adsorption.
c/ Sorption increases w/increasing pH.
d/ Trivalent chromium.
e/ Selenium is sorbed as selenoanions.
f/ Increasing salinity increases sorption.
g/ Reducing conditions increase adsorption.
h/ Increasing salinity decreases adsorption.
i/ Decreasing pH increases adsorption.
* In acidic/neutral waters, pentavalent arsenic is strongly adsorbed, trivalent is weakly adsorbed.

Biodegradation is the process whereby microorganisms, such as bacteria and fungi, use organic chemicals as food sources resulting in decreased contaminant concentrations and usually, decreased toxicity. Biodegradation of organic compounds, such as PAHs has been extensively reported in the scientific literature. PAHs undergo biotransformation and biodegradation by benthic organisms with degradation decreasing directly related to decreasing ultraviolet (uV) light and oxygen. Biodegradation of some PAHs (e.g., fluoranthene) is dependent on the presence of other PAHs (Eisler, 2000). The aqueous biodegradation half-life for BbF is approximately 30 days (ATSDR, 1995).

Bioavailability is the amount of chemical available for systemic circulation within the organism and is not necessarily the environmental concentration. Bioavailability is determined by the chemical-specific physico-chemical properties. For example, bioavailability is lessened due to sorption because the contaminant is bound to soil/sediment or the gastrointestinal (GI) tract lining; therefore, it is not available for systemic circulation and would preclude toxicological effects.

- PAHs, thought to be acutely toxic to some aquatic organisms, have limited bioavailability due to high K_{oc} factors. Sorption to sediments renders the PAHs less toxic than those in solution (Eisler, 2000). Various investigations indicate that pitch and/or coke globules from smelters and coal and coal leachates have limited or no bioavailability, do not leach, and are not toxic to aquatic life (Chapman et al., 1996; Paine et al., 1996). Studies from Norway also indicate limited bioavailability of PAHs in sediments originating from smelters (Paine et al., 1996).

A study of microbial transformation of PAHs in sediments downstream from the BSC coal-coking plant in Bethlehem, Pennsylvania (Herbes, 1981) documented biodegradation rates (turnover times) of PAHs in sediment ranging from several hours for lower molecular weight PAHs to 120 days for higher molecular weight molecules such as BaP (Herbes, 1981; Baumann and Harshbarger, 1995). Herbes and Schwall (1978) also found that biodegradation rates were faster for PAHs originating from pyrogenic sources (derived from processes involving heat, like those PAHs at Sparrows Point) than for PAHs from petroleum sources.

- Bioavailability of metals is metal-specific; however, factors affecting bioavailability of metals in sediments near Sparrow Point (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc - table 4.3.2-3) include salinity, pH, and redox potential (Eh) as well as the affinity for metals or metal complexes to adsorb to organic or inorganic material are summarized in table 4.3.2-2. All the metals detected in sediments bioaccumulate in aquatic organisms; however, only mercury and selenium biomagnify up the food chain appreciably. Cadmium and silver biomagnify only slightly. Factors that affect bioaccumulation are the same as those affecting sorption with the addition of organism age and its ability to molt. Arsenic, lead, and mercury are all methylated by aquatic microorganisms; however, arsenic is detoxified by methylation while the toxicity of lead and mercury increase with methylation (ATSDR, 1992, 1993, 1999, 2000, 2003, 2004, 2005a-d; Eisler, 2000; Irwin et al., 1997; Schlekat, et al., 2000).

TABLE 4.3.2-3

Factors Affecting Bioavailability and Bioaccumulation of Metals

Metal	Bioavailability affected by				Bio-accumulate	Bio-magnify	Factors affecting bioaccumulation a/	Microbial methylation
	pH	Salinity	Eh	Adsorption				
Arsenic	Y	ND	Y	Y	Y	N	S-,T+,C+,A+,M-	Y b/, h/
Cadmium	Y	Y	Y	Y	Y	Y-low	S+,T,pH, A	N
Chromium	Y b/	ND	Y	Y	Y	N	T+, pH c/	N
Copper	Y	ND	Y	Y	Y	N	A-	N
Lead	Y c/	Y	ND	Y	Y	N	M-	Y d/, e/
Mercury	Y	Y i/	Y	Y	Y	Y	pH, S-, A+	Y e/, h/
Nickel	Y	Y f/	Y	Y	Y	N	S, A+, pH	N
Selenium	Y	ND	Y	Y	Y	Y	A+, T	N
Silver	Y	ND	Y	Y f/	Y	Y-low	A,	N
Zinc	Y c/, g/	Y	Y	Y	Y	N	A, S-	N

Sources: ATSDR, 1992, 1993, 1999, 2000, 2003, 2004, 2005a-d; Eisler, 2000; Irwin et al., 1997; Schlekat, et al., 2000

ND - no data

a/ Factors affecting bioaccumulation;
+ = increases accumulation or absorption/- = decreases accumulation or absorption
S = salinity/T = water temperature/C = concentration/A = age of organism/M = molting

b/ Methylation detoxifies organo-metallic compounds.

c/ Decreased pH increases effects.

d/ Tetra-alkyl lead concentrations are <10% in sediments.

e/ Methylation increases toxicity.

f/ Toxicity increases with salinity from 0.5 to 3.5% and temperatures from 5° to 15°C.

g/ Dissolved zinc is in the form of the aquo ion $[Zn(H_2O)_6)^{2+}]$ which is the predominant and most bioavailable species. However, aquo concentrations decreases under conditions of high alkalinity (>pH7.5) and increasing salinity.

h/ Temperature increases methylation; occurs only in acidic conditions.

i/ Salinity (chloride) reduces methylation which reduces bioavailability.

Contaminated Sediments

Sediments from several waterbodies within the project area have been classified as "impaired" by MDE (2007a). Specific contaminants for various waterbodies are:

- Baltimore Inner Harbor — PCBs, PAHs, chlordane, mercury, nickel
- Sparrows Point — PAHs, metals
- Bear Creek — PCBs, PAHs, chromium, mercury, zinc
- Curtis Creek — PCBs, copper, mercury
- Northwest Branch — chromium, copper, zinc
- Back River — mercury
- Colgate Creek — metals

In June 2006, AES collected 16 sediment samples from 15 locations in the immediate area of the proposed LNG Terminal at three depth intervals (0 to 2 feet below sediment surface, 2 to 10 feet, and 10 to 45 feet). Samples were analyzed for VOCs, SVOCs, chlorinated pesticides, PCBs, metals, total cyanide, tributyl tin, TOC, and hexavalent chromium. The results indicated neither pesticides nor PCBs in any of the sediment samples. PAHs were limited to depths of 10 feet with concentrations ranging from 0.47 mg/kg to 22 mg/kg

for specific compounds in shallow sediments and 0.42 mg/kg to 18 mg/kg for specific compounds at the two to ten foot interval. All metals exceeded NOAA SQuiRTs at the shallow depth and most exceeded at the intermediate depth interval. Only arsenic and mercury exceeded sediment criteria at depth. Dioxins, PAH, and metals concentrations are consistent with other areas of the Port of Baltimore.

4.3.2.5 Surface Water Resources Impacts and Mitigation

LNG Terminal Construction Impacts

Construction of the LNG terminal would adversely affect surface water quality within the Baltimore Harbor during emplacement of sheet piles and associated structures for bulkheads, demolition of existing slips, finger piers, and low-level relieving platforms, repair of existing piles, and dredging of the approach channel, the turning basin and the LNG vessel berthing areas. In addition, surface water runoff during clearing and grading may impact water quality.

AES would mitigate these impacts using BMPs for minimizing/localizing turbidity (e.g., limiting incidental propeller wash in shallow sediments) and limiting dredging activities during certain seasons (e.g., complying with COE permit seasonal restrictions) to mitigate potential impacts to biota (see section 4.6.2 for additional details). In particular, installation of the sheet pile bulkhead wall would occur between March and September and take approximately six months to complete. During the installation of the sheet pile bulkhead wall, silt curtains would be positioned in the shallow water area to prevent sedimentation impacts. Filling activities would be conducted on the landward site of the sheet pile wall so that there would be minimal impact to the marine environment.

In order to square off the berthing area and bulkhead, 1.03 acre of uplands would be removed north of the pier and 0.53 acre would be removed south of the pier. Thus, 1.56 acres of upland would be converted to open bay bottom. The area of upland to be converted to open water would slope from approximately ten feet deep next to the bulkhead to the design depth of the berth, which is 45 feet deep.

Stormwater discharges from the LNG terminal construction site would be covered under Maryland's General Permit for Construction Activity (COMAR 26.08.04) for Storm Water Discharges Associated with Industrial Activity. Storm water controls for the LNG terminal and the DMRF would be developed during the final design and incorporated into the Project's Storm Water Pollution Prevention Plan.

Dredging

Similar dredging projects in the area of the proposed facility have been permitted by COE and the State of Maryland and include the Brewerton Channel, which is the existing approach channel, certain areas offshore of the proposed Terminal Site, and BWI-Sparrows Point LLC. These dredging projects also allow for maintenance and waterfront operations to a depth of -39 feet. In addition, the BWI Sparrows Point project was permitted to place approximately 600,000 CY of dredge material at the Hart-Miller Island disposal site (phase one) and to allow approximately 2.6 million CY of dredging (phase two) to be deposited at disposal sites yet to be determined. Phase one of the BWI permit was completed in December 2006. However, the COE has conditioned the additional phase two dredging under the BWI permit to require COE approval of the final disposal site, prior to dredging. BWI phase two dredging has not occurred as of the date of this EIS. Given these other dredging projects in the Project Area, the actual volumes of dredged and material handling requirements for the Sparrows Point LNG facility may diminish if the future phase two dredging actions of BWI under the existing COE permit are achieved.

The primary impact on water quality associated with dredging would be the resuspension of sediment into the water column. The suspended sediment could reduce light penetration and lower the rate of photosynthesis and aquatic productivity in the area; introduce organic material and/or nutrients which could lead to an increase in biological oxygen demand and reduce dissolved oxygen; and release chemical constituents, such as metals, contained in the sediment. In general, these impacts are temporary and localized to the near vicinity of the dredging activities. Previous dredging operations conducted in the area by COE indicated that dredging

would not cause a decrease in dissolved oxygen. MDNR and NMFS may require dredging activities to take place between November and February when DO levels are highest. However, these restrictions have not been imposed on recent dredge projects in Baltimore Harbor. AES has indicated that it may implement a perimeter-based DO monitoring program and to temporarily suspend dredging activities if DO levels dropped below 5 mg/L, however it has not committed to such a program.

In researching a related matter, AES conducted modeling related to the re-suspension of sediments and the dispersion and settling of sediments related to the use of tugs at the LNG terminal (*Sparrows Point LNG Terminal – Propeller Wash Sediment Impact Study*, October 2006). The model anticipated that up to three high-powered tugs (up to 5,000 KW power and 90 ton bollard pull) would be used for the berthing and de-berthing operations at the terminal. The erosion rate by a tugboat was estimated to be 0.14 Kg/s when operating at full power and 0.065 Kg/s when operating at half power near shallow areas of the turning basin. This study showed that the disturbance and subsequent settling of sediment particles in the vicinity of the Sparrows Point terminal would be affected by tidal currents in the waters of the Patapsco River and the entrance to Bear Creek. Nearly all of the disturbed sediments would be deposited back to the river bottom within 7 to 8 days. In general terms, the model indicated that re-suspended sediments would remain in the near-field Patapsco River-Bear Creek area, that no sediments would be transported far upstream in Bear Creek, and that only very low amounts of sediments would potentially be transported far into Chesapeake Bay. The sediment deposition field would extend a maximum of 1.5 and 2.0 kilometers (km) upstream into Bear Creek, approximately as far north as the I-695 bridge across Bear Creek. The area of greatest deposition of resuspended sediments would extend from 1.0 to 1.8 km upstream and approximately 0.5 km downstream of the LNG terminal, or approximately to Fort Carroll to the southwest. Depositions to the outer limits of the model were measured as range of 0.00075 g/m^2 to 0.01 g/m^2, a very small amount of deposition. We expect that the results of these modeled impacts from tug propeller wash can also be applied to dredging activities in a general sense. The increased turbidity and deposition of sediment from the dredging should follow the same pattern of distribution as this study has shown in figure 4.3.2.5-1.

In addition, an accidental release of fuel or other hazardous materials during construction could degrade water quality. AES would minimize and mitigate impacts from fuel spills by following and enforcing their SPCC Plan.

Construction activities associated with the LNG terminal would include widening and deepening of the existing approach channel from the Brewerton Channel and the creation of a turning basin immediately offshore from the site. AES estimates that approximately 3.7 million CY of material would be generated when the areas are dredged from 36 feet to a depth of 45 feet below MLLW. Indirect impacts, such as impacts to tidal wetlands and aquatic biota, have been discussed in sections 4.4 and 4.6, respectively. Potential impacts to water circulation and quality are discussed below.

AES proposes to use a mechanical (clamshell) dredge. However, if required by the COE permit, an environmental bucket or suitable alternative may be used. FERC has consulted with the COE, EPA and MDE regarding the methods that might be employed during the dredging to mitigate potential impacts to water quality. The relative merits of alternative dredging methods are addressed in section 3.2.7. In addition, we are requesting comments from agencies, the applicant, and individuals on which dredging method is appropriate.

Approximately 7,613 CY of material would be produced daily and continue for about 24 months, with a dredging season of approximately 243 working days in a dredging year. Scows and containers used to collect dredge spoils would be of solid hull construction and would be completely sealed and watertight to avoid releases of spoils. See section 4.6.3 for additional discussion of different dredges relative to turbidity. Dewatering of dredge spoils would occur at the DMRF located on 5 acres of the upland portion of the terminal facility. The raw dredged materials would be transformed into PDM and transported to the 30-acre temporary PDM storage area, south of the LNG Terminal site. The total capacity of the storage area is 870,000 CY, based on material stockpiling with 3:1 side slopes to a height of 20 feet. AES proposes to ship PDM offsite at an average rate of approximately 5000 CY per day, 365 days per year. In the event the PDM cannot be removed at this rate, a contingency plan would be implemented whereby additional upland storage adjacent to

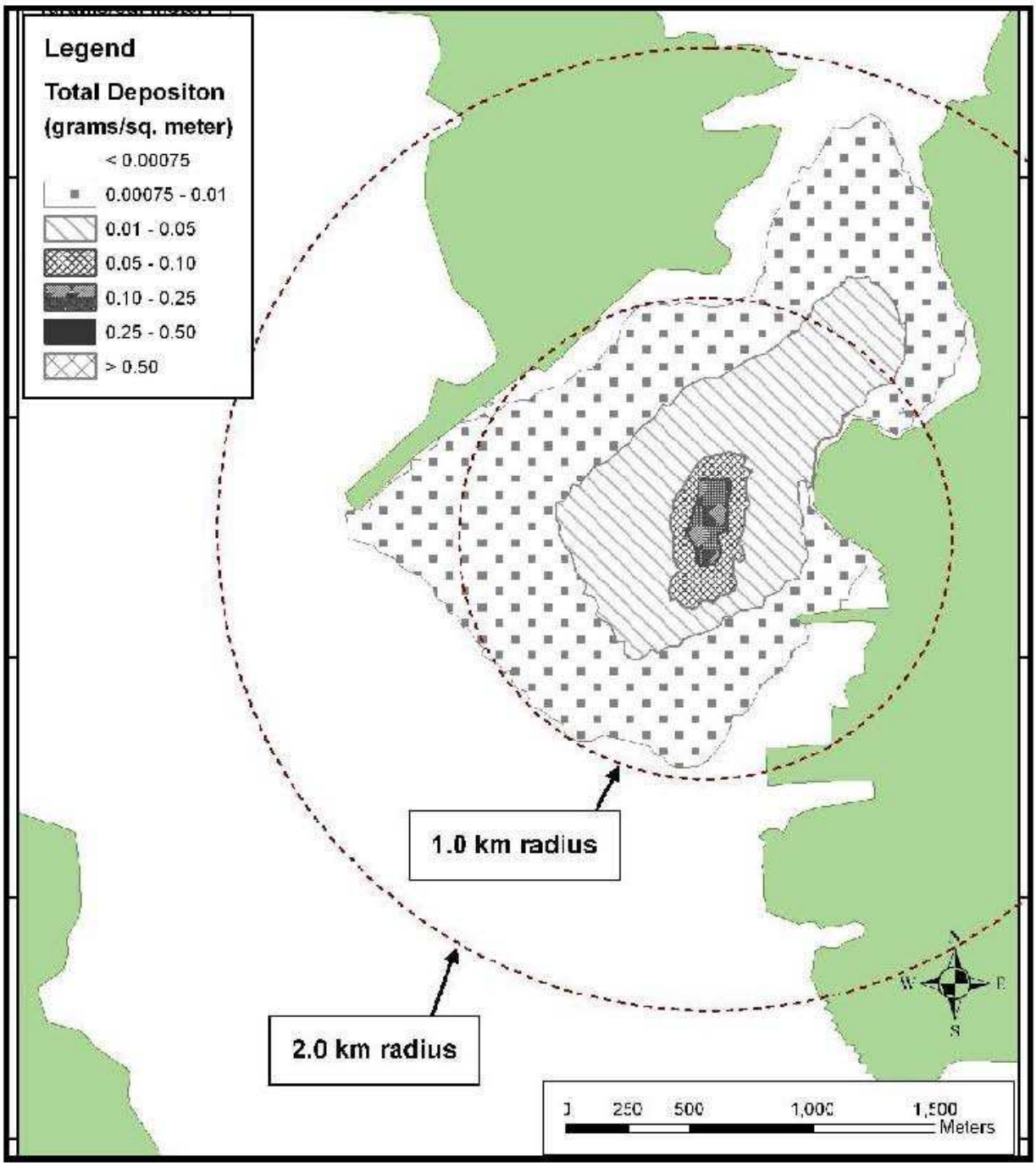


Figure 4.3.2.5-1
Sparrows Point LNG Project
Sediment Transport Model : Accumulated Sediment Deposition, for 12.5 days after Tug Propeller Wash Re-Suspension of Sediments

the DMRF may be utilized, the rate of dredging may be modified, the haul away capacity may be modified, or other measures specific to the facility design and/or location of upland disposition would be implemented which would be determined at the time of final design and construction. The DMRF and the temporary PDM area would be paved with stormwater management controls linked to existing facilities.

Decanted water from the dewatering process would be pumped to a dedicated dewatering barge. Water would pass through a settling tank system and undergo filtration as well as chemical and physical analysis prior to discharge back to the harbor in accordance with the MDE Industrial Water Discharge permit. Both the EPA and MDE have indicated that decant water or supernatant water released from processing the dredge material would only be discharged through a permitted process.

Based on a siltation rate of approximately four inches per year, maintenance dredging would occur about every six years for the access channel, the turning basin, and the marine area adjacent to the unloading pier.

Dredging this area would result in the generation of approximately 500,000 CY. AES would coordinate with local authorities to determine if placement in the POB Dredge Material Containment Facilities is a feasible option for disposal. If not, the AES would identify other sources of disposal available such as innovative or beneficial reuse with the continued use of the DMRF. AES has submitted a draft Dredging Management Plan (Appendix D). Issues regarding the number of trucks and traffic impacts are discussed in section 4.9.4.1 of this DEIS. The issues concerning dredged material processing, disposal and transport were raised by numerous commenters and agencies, alike. Additional project-specific information in one organized plan would facilitate the discussion of potential impacts associated with dredged material placement. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, AES should file with the Secretary a comprehensive Dredged Material Placement Plan. This plan should address:**
  - **a. where the PDM is going;**
  - **b. the capacity of the temporary placement areas onsite;**
  - **c. the daily takeaway capacity for the PDM;**
  - **d. how many daily truck trips would be necessary to haul the PDM, the impacts of those trucks on the traffic in the area, and the probable routes the trucks would take; and**
  - **e. a contingency plan for the PDM after it is processed should there be no buyers.**

After processing, it is expected that all material would be suitable for reuse such as reclamation of abandoned mines, capping of landfills, disposal in hazardous landfills, use as construction or road bed material, and/or use as clean fill for development such as for golf courses.

If however, analytical testing indicates the dredge material is contaminated and unsuitable for beneficial use, AES or the third party seeking to use the PDM would characterize the dredge material to determine its disposition in accordance with the regulations of the State of Maryland (COMAR 26.13). Depending on the type and level of contamination, the sediment may be used as daily cover at a landfill, incinerated, or treated. The proper method of treating the waste material would be determined in consultation with MDE.

Water quality impacts from the proposed dredging would include increases in turbidity, releases of chemical and nutrient pollutant from sediments, and the introduction of chemical contaminants. Turbidity releases would be controlled by alternative dredge methods, such as the environmental buckets, as necessary. Additionally, the suspension of organic materials and sediments could cause an increase in biological and chemical use of oxygen, resulting in a decrease of dissolved oxygen concentrations in the affected area. Lower dissolved oxygen concentrations could cause adverse effects on benthic organisms within the affected area. These benthic organisms are a food source for finfish and therefore, dredging may indirectly influence the abundance of higher trophic level organisms (see section 4.6.2). However, AES would develop sampling and mitigation measures to limit impacts from low dissolved oxygen during the dredging process, as necessary. AES indicates that their dredging actions would increase oxygen levels in the area by increasing

water circulation through widening and deepening the existing channel of the old Bethlehem Shipyard and connecting it with the deeper channels of the Patapsco River and the downstream Chesapeake Bay. Although the FERC staff does not necessarily agree that this would be the outcome, the additional channelization would probably result in a similar habitat and water chemistry as that of adjoining channels such as the Brewerton Channel. If the Brewerton Channel has periods of low dissolved oxygen, then the proposed approach channel and turning basin would probably experience these same periodic depressed dissolved oxygen levels.

Cumulative impacts from the Project, along with existing, approved, or proposed activities/projects along the Patapsco River within the next 3-5 years are provided in table 4.13.3-1.

Other potential water quality impacts from dredging may include the resuspension of contaminants in sediments. As mercury was one of the metals exceeding sediment quality criteria, a summary of fate and transport processes is provided. Under anaerobic conditions in surface waters, mercury is converted to methylmercury by microorganisms such as sulfur-reducing bacteria that produce methyl cobalamine compounds that aid in the methylation process. Methylmercury formation is dependent on methyl cobalamine concentrations, inorganic mercuric ions, and the oxygen concentration of the water; the rate increases as the conditions become anaerobic. Yeasts (e.g., *Candida albicans*, *Saccharomyces cerevisiae*) are also capable of mercury methylation and the reduction of ionic mercury to elemental mercury under low pH conditions (ATSDR, 1999).

Sediments are the primary source of the mercury in surface waters. Elemental mercury may be formed through either methylmercury demethylation under anaerobic conditions or the reduction of inorganic mercury and may volatilize to saturate surface waters. During the summer months, surface concentrations of methyl and elemental mercury decline as a result of evaporation, although they remain relatively constant in deeper waters (ATSDR, 1999).

Mercury methylation is inhibited with increased dissolved organic carbon levels in the water column. Alternatively, low pH, high mercury sediment concentrations, and reduced sulfide and oxygen concentrations favors the methylation of mercury in the water column (ATSDR, 1999; USGS, 2007).

The average mercury concentration in sediments of Baltimore Harbor is of the same order as other large East Coast estuarine systems with large urban environments and active harbors (Mason and Lawrence, 1999).

In sediments, methylmercury distribution and fate in surface sediments is controlled by redox chemistry as it appears in overlying water in conjunction with increased iron concentrations and the presence of sulfide and other redox sensitive compounds, such as ammonia and arsenic (Mason and Lawrence, 1999). Mercury methylation is reduced by elevated levels of chloride ions; however, a chloride ion concentration around 700 mg/L (0.07%) may accelerate the release of mercury from sediments (ATSDR, 1999). Increased levels of organic carbon and sulfate ions increase methylation in sediments (ATSDR, 1999; Mason and Lawrence, 1999); however, there is no correlation between percent carbon and percent methylmercury (Mason and Lawrence, 1999).

For comparison with sediments in estuaries near the project, methylmercury concentrations and the percent methylmercury in the Back River, Maryland, are high compared to other Baltimore Harbor locations, even when normalized to carbon. The high methylmercury concentrations in the Back River can be attributed to the high carbon content discharged by the sewage treatment plant. This is substantiated because methylmercury concentrations in sediments near the Patapsco Sewage Treatment Disposal Area also have elevated concentrations of methylmercury and percent methylmercury (Mason and Lawrence, 1999). Thus there are multiple sources of mercury in the Baltimore Harbor and Patapsco River estuary.

Since the bulk chemistry analyses of sediments exceeded the EPA PEL of 0.696 µg/kg for mercury at 4 of the 9 surface samples (0-2 ft depth) analyzed and at 1 of the 4 intermediate samples (2 – 10 ft depth), there is some potential for mobilizing mercury into the water column, at least temporarily, during dredging. AES was instructed by the COE in August of 2007 to perform additional sampling and analysis of contaminants for the areas to be dredged in order to provide a more complete picture of the concentrations and distribution of contaminants, including mercury. AES has provided these additional samples and we have reviewed the

analytical results and have commented on the results in this EIS. It is also possible that by dredging these sediments, binding the sediments in the PDM process, and then transporting the PDM to an innovative use site, or for upland disposal, the project may actually provide a benefit to the estuarine system.

The distribution patterns and levels of contamination for other chemical constituents are similar to that of mercury (see section 4.2.2). That is, many of the surface samples exhibited multiple exceedances of EPA criteria, such as the PEL. This was true primarily for PAHs and for metals. To mitigate the potential for these chemical constituents to be resuspended or dispersed through the water column, AES would follow prescribed methods of dredging (clam shell or environmental bucket), and prescribed methods of restricting the transport of sediments out of the dredging area (e.g. deployment of silt curtains, or specific methods to prevent water from washing out of the dredge bucket) as specified in the final COE permit. Before this dredging permit is issued by the COE, it will have been reviewed – at a minimum by MDE, EPA and the FERC – and commented on by other resource agencies such as MDNR, FWS and NMFS.

Dredging for the Project would not impact existing maintenance dredging operations in the Brewerton Channel, or the shipping channels that lead into the Port of Baltimore.

Ship Unloading Facilities

AES has proposed to rehabilitate the existing pier, install an elevated unloading platform, pipeway, and associated spillway to reduce potential seabed impacts. However, construction of the sheet pile bulkhead would result in a temporary increase in turbidity levels, which may adversely impact benthic organisms and indirectly affect higher trophic level organisms (see section 4.6.2). Additionally, limiting the need for construction vessels and limiting bottom-disturbing activities by imposing seasonal windows would minimize impact to biotic communities (see section 4.6.2).

Demolition would impact the underlying, previously disturbed sediments as approximately 45,000 square feet of material would be dredged to create new bottom area at the bulkhead. As previously stated, dredging of sediments would have direct adverse impacts on benthic organisms and indirect affects on higher trophic level organisms. However, AES would mitigate the effects of dredging through the emplacement of silt curtains, to prevent sedimentation impacts in the area of construction. AES anticipates this construction would take approximately six months to complete, and would be conducted from March to September. Additionally, all filling activities would be conducted on the landward side of the sheet pile wall, resulting in no filling of marine areas.

4.3.2.6 LNG Terminal Operation Impacts

Potential impacts to surface water resulting for operations adjacent to the pier include:

Intake and discharge of ballast/ship boiler cooling water. LNG carriers entering the port would be full and thus would not need to empty ballast on arrival at the proposed LNG terminal. Once empty, vessel ballasting would occur, and vessel displacement would determine ballasting water usage. LNG carriers around 217,000 m^3 have a maximum ballast capacity of 80,000 m^3. Intake pumps would be screened to prevent foreign objects or fish from entered ballast tanks. In general, LNG vessels have inlet screens on the ballast water and cooling water intakes. Typical inlet screens are bar type grids that use 4.5mm bars spaced 25mm apart. The inlets are located 8.4 meters (top of the screen) to 9.5 meters (bottom of the screen) below the waterline. Section 4.6.2 addresses in more detail the potential impacts from and mitigation from such water intakes.

All LNG carriers entering the port would be required to have a Ballast Water Management Plan in accordance with the International Maritime Organization (IMO). The Plan provides information on ballast water exchange design and control standards, design and construction to facilitate sediment control on ships, designation of areas for ballast water exchange, sediment reception facilities, and ballast water reception facilities (IMO, 2007. www.imo.org).

There is a potential for boiler cooling water to be withdrawn or discharged while the ship is in port. All cooling water intake use would be limited to non-contact cooling water to minimize the thermal change in the

cooling water discharge. Cooling water intake and discharge are regulated by Maryland (COMAR 26.08.03, COMAR 26.08.03.05); however, facilities such as the LNG carriers with withdrawal rates less than 10 million gpd and less than 20% of stream or net flow by the intake are exempt.

LNG carriers would not discharge seawater (ballast water) nor sewage while in port.

Tug and vessel movements. A Propeller Wash Sediment Impact Study (available in AES's application, Resource Report 2, Appendix 2G [Docket No. CP07-62-000, Accession #20070109-40012]) conducted by AES (see discussion above) indicated that resuspended sediments due to tugboat operations would not be transported into Bear Creek north of the I-695 bridge, due to a small downstream current and net tidal transport toward the Patapsco River that precludes significant upstream transport.

Water quality along the vessel transit route is mostly influenced by land use and population density. The Project would add a limited number of vessels into the Chesapeake, approximately two to three ships per week, or 120 to 150 ship visits total per year. This additional traffic comprises approximately five to seven percent of the overall traffic to the Port of Baltimore, and a lesser percentage to the Chesapeake. Therefore, water quality impacts would be negligible.

Stormwater discharges. Stormwater discharges would be covered under a Maryland General Permit for Stormwater Discharge associated with industrial activity. Stormwater would be pumped from site impoundments and pass through an oil-water separator prior to flowing into the existing water treatment system. Any stormwater that comes in contact with industrial process areas would be routed separately and would gravity flow to the existing system. All stormwater would be treated prior to discharge to the Baltimore County Publicly Owned Treatment Works (POTW). Discharges would be monitored and tested. In accordance with Coastal Zone Management Areas regulations, the redirection of the process area stormwater runoff would result an approximate 50% reduction of stormwater discharged to the Patapsco River.

Fire water intake. Impacts from intake of boiler cooling and fire water would be similar to those described previously for ballast and ship boiler cooling water intake. The firewater system would be a private, freshwater system, and its source would be the municipal water supply. The LNG storage tank deluge system would be fed from waters from the Patapsco River. The system would be constructed to prevent ingress of debris and would maintain inlet velocities below 2 fps to minimize flow effects on marine life. Additional details are presented in section 4.6.

No oil may be discharged within the water of the State of Maryland (COMAR 26.10.01.02A). No solid debris may be discharged from vessels (30 CFR 250.40).

If an unignited marine LNG spill were to occur along the transit route, given that LNG is lighter than water, the LNG would float on the water until it had vaporized. No significant impacts to water quality would be expected from an unignited release of LNG because LNG is not soluble in water and the cryogenic liquid would vaporize rapidly upon contact with the warm air and water.

If the vapor cloud were to come in contact with an ignition source, the resulting fire could burn back to the spill and impact any vegetation within its path. However, because of the marine transit safety and security measures, the probability of an LNG carrier spill from collisions, allisions and terrorist attacks would be unlikely. The potential surface water impacts are considered not significant due to the low probability of a spill.

4.3.2.7 Pipeline Construction and Operation Impacts

When crossing waterbodies, construction activities would have short-term impacts such as temporary, localized increase in turbidity levels and downstream sediment deposition during in-stream construction, trench dewatering, and/or construction on slopes. The extent of the impact from waterbody crossing construction would depend on sediment loads, stream velocity, turbidity, bank composition, and sediment particle size. These factors would determine the density and downstream extent of sediment migration. Instream construction could cause the resuspension and transport of channel bed sediments and the alteration

of stream contours. Changes in the bottom contours could alter stream dynamics and increase downstream erosion or deposition, depending on site-specific circumstances. Turbidity resulting from resuspension of sediments from in-stream construction or erosion of cleared right-of-way areas could reduce light penetration and photosynthetic oxygen production. In-stream work could also introduce chemical and nutrient pollutants from sediments. Resuspension of deposited organic material and inorganic sediment could cause an increase in biological and chemical use of oxygen, potentially resulting in a decrease of dissolved oxygen concentrations in the affected area. Lower dissolved oxygen concentrations could cause temporary displacement of motile organisms and could kill non-motile organisms within the affected area.

The list of all waterbody crossings, their water quality classifications, the crossing method proposed, and the potential length of stream impact is provided as Appendix I. A quantitative measure of temporary impacts to waters of the US crossed by the pipeline is presented in this appendix. The table includes columns for the width of each waterbody crossed, the linear feet of stream or creek or lake to be impacted, and the total area of waterbody to be impacted. The total length of waterbodies that would be temporarily impacted by construction would be 14,002 linear feet. The total amount of waterbody area that would be impacted during construction would be 4.07 acres. The impacts would primarily be temporary, and limited to the construction period and subsequent time for the waterbody to recover after restoration activities are competed. As Mid-Atlantic Express would follow their ECP and associated BMPs, and the waterbodies would be returned to their pre-construction condition, there would be no permanent impacts from pipeline construction at waterbody crossings. Third-party monitors would be responsible for reporting back to the Commission that all stream bank restoration and waterbody restoration actions are completed in a timely and effective manner.

The clearing and grading of streambanks would expose soil to erosional forces and would reduce riparian vegetation along the cleared section of the waterbody. The use of heavy construction equipment could cause compaction of surface and near-surface soils, and effect that could increase runoff into surface waters. The increased runoff could transport additional sediment into the waterbodies, increasing the turbidity levels and sedimentation rates of the receiving waterbody.

Refueling of vehicle and storage of fuel, oil, or other hazardous materials (e.g., materials used in welding and coating of the pipe) near surface waters could create a potential for contamination. If a spill were to occur, immediate downstream users of the water could experience degradation in water quality. Acute and chronic toxic effects on aquatic organisms could also result from such a spill.

Mid-Atlantic Express evaluated the 177 waterbody crossings along the Pipeline route (see Appendix I) and proposes to use a wet open-cut (see the AES Application, Resource Report 2, Appendix 2A, [Docket Number CP07-62-000, Accession No. 20070109-4012], figure 19, for a diagram in Mid-Atlantic Express's ECP) or flumed dry open-cut (figure 18) for all perennial waterbody crossings with the following exceptions:

- HDD crossings of Back River, Little Gunpowder Falls (still being evaluated by Mid-Atlantic Express), and the Susquehanna River (Conowingo Reservoir);
- dam and pump dry open-cut (AES Application, Resource Report 2, Appendix 2A, [Docket Number CP07-62-000, Accession No. 20070109-4012], figure 17) at Humphrey Creek, Conowingo Creek and Octoraro Creek, and possibly at the White Marsh Run crossings at MPs 15.09 and 15.50 (however, Mid-Atlantic Express has indicated that a dry flumed crossing is preferred to avoid impacts to spawning/migrating anadromous fish should the crossing occur during the spawning season; Mid-Atlantic Express also has indicated that it would select the crossing methods at MPs 15.09 and 15.50 following completion of its final field survey and during its final construction design);
- Cofferdam dry open-cut (AES Application, Resource Report 2, Appendix 2A, [Docket Number CP07-62-000, Accession No. 20070109-4012], figure 18a) at Gunpowder Falls, possibly at the White Marsh Run crossing at MP 14.38 (however, Mid-Atlantic Express has indicated that a flumed dry open-cut crossing would be the preferred method at the MP 14.38 crossing when the intermittent waterbody is dry, as such a crossing would limit the timing of disturbance to the

shortest duration and facilitate its most rapid restoration; Mid-Atlantic Express also has indicated that it would select the crossing method at MP 14.38 following completion of its final field survey and during its final construction design); and

- flume and pump (dry open-cut, modification of AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012), figure 18, using pumping to supplement the flow through flumes) at Deer Creek.

The typical flumed equipment crossing is diagrammed in AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012), figure 16.

We have included a recommendation in section 4.6.2.2 in order to ensure that Mid-Atlantic Express's stream crossing methods are seasonally appropriate. However, the COE may not authorize stream crossing "in the wet." Therefore, for open-cut stream crossings, the COE may require that an approved stream diversion method be used.

In order to reduce impacts at stream crossings, the pipeline right-of-way would be prepared on stream banks to limit the time of the actual stream crossing (between 24 and 48 hours). Stream flow would be maintained at all times, except at open-cut crossings, and the stream capacity would not be altered. Mid-Atlantic Express would implement time-of-year constraints, as required by conditions imposed by the COE, MDE, PDCNR, FWS or NMFS during the COE/MDE permitting process, to aide in impact mitigation. **With this DEIS, we are requesting that Mid-Atlantic Express consult with the FWS and NMFS regarding seasonal construction restrictions in waterbodies (see section 4.6.2.2).**

Mid-Atlantic Express would use HDD to cross the Back River (MP 8.71) and Susquehanna River (MP 44.23) and potentially the Little Gunpowder Falls (MP 22.22) to avoid aquatic and riparian impacts. In addition, based on the results of the COE field investigations to be conducted in the Spring/Summer 2008, along the proposed pipeline alignment, the COE may require additional stream crossings using trenchless construction techniques to avoid and minimize impacts to waters of the US. Additional information on each proposed HDD is also presented in Mid-Atlantic Express's HDD Contingency Plan (available in AES's application, Resource Report 2, Appendix 2E [Docket No. CP07-62-000, Accession #20070109-4012]). This plan prescribes corrective actions should a drilling fluid release, drill bit breakage, or failure of various aspects of the drill occur. Specifically in the event of a drilling materials release, Mid-Atlantic Express would implement containment and cleanup measures. Measures in the event of equipment failure include suspending operations if continuing would risk a drilling fluid release.

To prevent, mitigate, and clean up potential releases from HDD operations, Mid-Atlantic Express would install berms or barriers (e.g., hay bales, sand bags, silt fences) around the site to contain any releases. Collected or contained drilling fluids would be removed by pump or vacuum truck positioned landward of any waterbody system so as not to disturb any wildlife habitat.

The drill operators would perform the following contingency measures as necessary to stop discharges of drilling fluids:

- decrease the drilling fluid circulation pressures;
- size the drill hole to remove blockages (i.e., cleaning the drill hole to remove potential blockages, thereby allowing the fluid to flow within the drill hole and not into the geologic formation);
- thicken the drilling fluid properties by adding bentonite pellets; and
- if necessary, make adjustments to the drilling alignment.

For waterbody crossings where HDD would not be employed, erosion and sediment controls such as temporary slope breakers (soil, silt fence, staked hay or straw bales, or sand bags) would be employed on slopes greater than 5% where the base of the slope is less than 50 feet from waterbody, wetland, and road

crossings. Sediment barriers (e.g., silt fence, staked hay or straw bales, compacted earth, sand bags) would preclude sediment flow and prohibit sediment deposition into sensitive resources.

Mid-Atlantic Express would follow its ECP, as indicated in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012). This plan includes requirements for preconstruction planning, environmental inspection, construction methods at waterbody and wetland crossings, streambank stabilization, sediment and erosion control, restoration, decompaction, and post-construction maintenance. The ECP stipulates that all extra work areas (such as staging area and additional spoil storage areas) would be at least 50 feet from the waters edge. It includes provisions to handle stormwater and to protect waterbodies and wetlands from accidental spills of fuels or hazardous materials. In addition, Mid-Atlantic Express would implement the measures contained in their SPCC Plan (also see the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012).

Subsequent to pipeline construction, any impacted streambeds would be restored to former elevations and grades. Materials related to the construction (e.g., cofferdams, spoil, debris, pilings, etc.) would be removed to preclude interference with water flow. Stream bank vegetation would be restored to prevent erosion within 10 to 20 days of rough backfilling. Vegetation would be monitored for at least two growing seasons following final restoration or longer if needed until final restoration goals are achieved (see section 4.5 for additional details). Given that the pipeline facilities would be buried underground, additional impacts to water from the operation of the pipeline are not anticipated.

4.3.2.8 Hydrostatic Testing

LNG Tank Hydrotesting

Hydrostatic testing would be completed on the inner container of each LNG storage tank. Test water would come from the Patapsco River after approval of a Water Appropriation and Use Permit by MDE Water Management Administration in accordance with COMAR 26.17.06. Each tank would require approximately 28 million gallons of water. This water would be withdrawn from a depth of 6 to 8 feet below the surface of the Patapsco River at a rate of approximately 17,800 gpm over a period of at least 25 hours. To achieve this withdrawal rate, multiple pumps would be used. Pumps intakes would be equipped with 2 mm wedgewire fish entrainment screens and restrictions would be imposed to mitigate disturbance of bottom sediments. For example, flow velocity would be restricted to 0.5 fps screen face velocity with a flow rate of approximately 1200 to 3600 gpm per pump to minimize biota entrainment. The screening used at the intakes would be sized to minimize the rate of impingement on the screens during pumping. However, the potential still exists for fish eggs and larvae to be entrained through the intake filter and to be destroyed during the testing process.

Mid-Atlantic Express's ECP generally prohibits the use of waterbodies such as the Patapsco River, which contain federally listed endangered and/or threatened species, as hydrostatic test water sources or discharge locations except where permitted in writing by appropriate permitting and resource agencies. However, in this case, the Patapsco River appears to be the only practicable source capable of providing the necessary volume of water for testing the LNG tanks. Therefore, AES and Mid-Atlantic Express would consult with appropriate permitting and resource agencies to obtain authorization to use the Patapsco River as a hydrostatic test water source and discharge receiving body.

Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, AES and Mid-Atlantic Express should file with the Secretary the results of their consultation with the MDNR and NMFS regarding LNG tank and pipeline hydrostatic test water withdrawals and discharges, including the least damaging time of year to conduct these activities.**

Water would be filtered, sampled and tested for compliance in accordance with API requirements, prior to tank testing. Corrosion inhibitors would be added to test water, as necessary.

After hydrotesting of the tanks, test water would be pumped from the tank, tested for compliance with the Maryland General Permit for Discharge of Hydrostatic Test Waters (COMAR 26.08.04.09.K; General Permit No 06HT), treated as necessary and discharged to the Patapsco River, in locations and in a manner described in the discharge permit. Mid-Atlantic Express would be required to consult with the appropriate permitting and resource agencies to obtain authorization to use the Patapsco River as a hydrostatic test water source and discharge receiving body as it contains federally listed endangered and/or threatened species. In compliance with the General Permit, there would be discharge limits for flow rate, oil and grease, total iron, total residual chlorine, total suspended solids, dissolved oxygen, temperature difference, temperature, and pH. Solid residue collected during tank cleaning would be disposed at a licensed facility. Thermal impacts from the discharge of hydrostatic test water are not anticipated.

Because of the typical timing of the construction of multiple tanks, AES has indicated that it is unlikely that the same water can be reused for testing multiple tanks. According to the initial construction schedule filed by AES, the completion and testing of each successive tank would be about 2 months apart. After each tank is hydrotested, the test water would be discharged to the Patapsco River as stated above.

If analysis of the test water from the LNG tanks indicates that it can be discharged without pretreatment in compliance with applicable permit limits, AES would discharge the test water in an upland location, and it would be allowed to flow overland into the Patapsco River. An energy dissipater would be used to reduce the water velocity and thus minimize the erosive force of the water. Therefore, the discharge of hydrostatic test water would be expected to create only minor, localized, and temporary increases in turbidity in the proposed LNG terminal area. AES would dispose of any solid residue recovered during cleaning at a licensed disposal site. The hydrostatic testing process would not involve significant changes in the temperature of the test water and would not result in any thermal impacts as a result of its discharge to the Patapsco River. Following hydrotesting, the inner tank inside wall, floor and internal structures would be rinsed with fresh water from. The rinse water would 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.

Pipeline Hydrotesting

Hydrostatic pressure testing is required prior to placing pipelines in service. Mid-Atlantic Express anticipates that a total of approximately 7,600,000 gallons of water would be withdrawn from the Susquehanna River for use in flooding, cleaning and hydrotesting of the pipeline. Prior to that test, water to test the HDD crossing of the Susquehanna River would be taken from the Susquehanna River; water used for testing the HDD crossing of the Back River would be potable water hauled to the test site by transport trucks. The water source for the Little Gunpowder Falls HDD would likely be potable water hauled to the test site by transport trucks. Mid-Atlantic Express would consult with appropriate permitting and resource agencies to obtain authorization to use the Susquehanna River as a water source and discharge location. The impacts on these waterbodies would be similar to those impacts described above for hydrotest water for the LNG storage tanks.

The potential impact to waterbodies has been considered such that the hydrostatic test water intake structures would be designed to prevent fish entrainment through the use of a screen on the intake and avoid disturbance of bottom sediments through restrictions on bottom draw and velocity controls consistent with EPA guidance and permits from local agencies. Screen intakes would consist of a 2 mm wedgewire screen and the intake velocity would be limited to 0.5 feet per second with a flow rate of approximately 1,200 to 3,600 gpm.

Additionally, surface water withdrawal would be coordinated with the Susquehanna River Basin Commission (SRBC), and AES and/or Mid-Atlantic would obtain a Permit to Appropriate and Use Waters of the State from the MDE. AES is evaluating an alternate water supply from the Baltimore County POTW or another public water supply; potential sources of hydrostatic test waters, including alternatives, would be evaluated upon completion of the final design.

Water discharges would be conducted at the locations provided in table 4.3.2-4.

TABLE 4.3.2-4 **Hydrotest Water Discharge Locations and Volumes**				
Purpose of Discharge	**Discharge Location**	**Volume (gal.)**	**Discharge MP**	**Receiving Water Name**
Susquehanna HDD Hydrotest water	Well-vegetated upland area (Tract 655) at Directional Drill Site, Susquehanna River	149,000	43.6	Susquehanna River (West Bank)
Back River HDD Hydrotest water	Local POTW	21,175	Not applicable	Test water would be hauled offsite by transport truck
Little Gunpowder Falls Nontidal Wetland of Special State Concern (NTWSSC) HDD Hydrotest water	Potential Directional Drill Site, South Side Little Gunpowder Falls	82,000	22.22	Area of considerable vegetation; South Bank of Wild Cat Branch
Pipeline Test Section #1 MP 43.6 – MP 87.6 Hydrotest water	Pipeline Test Segment #2 for re-use	7,315,000	Not applicable	Test water would be pumped into Test Section #2; no discharge to waterbody
Pipeline Test Section #2 MP 0 – MP 43.6 Hydrotest water	Well-vegetated upland area (Tract 655) in the vicinity of the Susquehanna River	7,400,000	43.6	Susquehanna River (West Bank)

Discharged water would be sampled and treated as necessary to meet the Maryland General Permit discharge requirements as described above for the LNG tank hydrostatic test water discharge.

In order to confirm that Mid-Atlantic Express's pipeline hydrostatic testing would be acceptable with the MDNR and NMFS, we have included a recommendation in earlier in this section (under the "LNG Tank Hydrotesting" heading) requiring AES and Mid-Atlantic Express to consult with these agencies regarding hydrostatic test water withdrawal and discharge.

4.3.2.9 Impacts from Operations along the Waterway for LNG Marine Traffic

LNG ship activity at the berthing area and along the transit corridor, including LNG carriers and associated tugs and escort vessels, may result in minor resuspension of bottom sediments into the water column resulting in a temporary increase in turbidity within the berthing area, the turning basin, the approach channel, and the channelized portions of the Chesapeake Bay. For much of the marine transit within the southern portion of the Chesapeake Bay (i.e., the non-channelized portion of the marine transit), the waters of the bay are too deep for bottom sediments to be resuspended by shipping activities. Resuspension of bottom sediments and resulting increases in turbidity would be temporary and localized.

Accidental spills or releases of hazardous materials (including fuel) could impact the waterway. However, no oil or mixtures containing more than 15 parts of oil per million may be purposely discharged within 50 miles of the shore (MARPOL 73/78). No solid debris may be discharged from vessels (30CFR 250.40 and MARPOL, Annex V, Public Law 100-220 [101 Statute 1458]). Therefore, although debris may enter the water column incidentally from the increased vessel traffic in the Chesapeake Bay ship channels, the anticipated amount of additional debris would be small and not significant.

In the event that an unignited spill of LNG was to occur along the marine transit route, given that LNG is lighter than water, the LNG would float on the water until it had evaporated. No significant impacts to water quality would be expected from an unignited release of LNG because LNG is not soluble in water and the cryogenic liquid would vaporize rapidly upon contact with the warm air and water. Within Zone 1 (described within section 4.12.5.3 of this DEIS), the water's surface with the LNG pool may be temporarily impacted by the sudden lowering of temperature until the LNG had vaporized. If an associated fire were to occur with the release of the LNG, the water's surface temperature could increase within Zone 1 in the vicinity of the fire. Upon ignition, LNG would burn rapidly, intensely, and with no residual unburned product. Therefore, the fire would not result in any unburned residual product mixing with the water. If the radiant heat were to burn

shoreline vegetation (unlikely throughout most of the waterway, since Zone 2 does not contact the shoreline except at a few locations such as the tip of Sandy Point, Hawkins Point, Sollers Point and Sparrows Point – see figure 4.12-1 in Appendix K), this could result in increased sedimentation in Zone 2 from burned organic matter. Overall, impacts to Zone 2 would be expected to be considerably less than to Zone 1. No surface water impacts would be expected within Zone 3 from an LNG pool fire. The maximum flammable range for a vapor cloud could extend to the outer limits of Zone 3. If the vapor cloud were to come in contact with an ignition source, the resulting fire could burn back to the spill and impact any vegetation within its path, thus increasing the likelihood of increased sedimentation. However, because of the marine transit safety and security measures, the probability of an LNG vessel spill from collisions, allisions, and terrorist attacks would be unlikely. The potential surface water impacts are considered not significant due to the low probability of a spill.

4.4 WETLANDS

4.4.1 Regulatory Permits

The proposed Sparrows Point Project would be constructed in areas that support numerous wetlands. Wetlands are defined by the COE and EPA as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetlands impacted by the Project would be regulated by federal, state, and local agencies. At the federal level, the COE has authority under Section 404 of the CWA to review and issue permits for activities that would result in the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands. The COE also has authority under Section 10 of the Rivers and Harbors Act to review and issue permits for work and/or structures in, over, or under navigable waters of the United States. AES filed a revised Joint Application for COE Section 404/10 Permit for the States of Maryland and Pennsylvania on April 13, 2007.

In Maryland, tidal and non-tidal wetlands are regulated under the Tidal Wetlands Act (Environmental Code Ann. §1-101 to 1-503), the Waterway and 100-year Flood Plan (COMAR 26.17.04), and the Chesapeake Bay Critical Area Act (Environmental Code Ann. §8-1801 to 1816).

The Tidal Wetlands Act prohibits regulated activities in tidal wetlands or within a 25-foot buffer without MDE permits or a letter of authorization. Applicants must submit a non-tidal wetlands delineation. Mitigation or mitigation banking is required as a condition of a permit, or if mitigation is not feasible, monetary compensation may be allowed. Regulated activities include removal, excavation or dredging; changing existing drainage characteristics, flow patterns and flood retention characteristics; disturbance of water levels; discharging, filling, driving piles and placing obstructions; grading and removing material that alters topography; and destruction of wetland plants and animals.

The Water and 100-Year Construction Regulations requires that activities in a waterway or its floodplain do not create flooding on upstream or downstream properties, fish habitat and migration is maintained and waterways are protected from erosion. Authorization is required for construction or repair of dams and reservoirs, bridges an culverts, excavation, filling or construction, channelization, changing the course, current, or cross-section of any stream, temporary construction (e.g., utility lines) or a similar project.

The Chesapeake Bay Critical Area Act requires local jurisdictions to develop and implement enforceable land use plans which minimize adverse impacts on water quality resulting from point and nonpoint source water pollution, conserve fish, wildlife and plant habitats, and establish land use policies for development. Additionally, these local programs must contain provisions which control the amount of land covered by impervious structures, establish shoreline buffers and minimum setbacks and designate areas for recreational, commercial, and conservations uses. Proposed projects must conform to all applicable pollution laws, local land use planning ordinances, and state development plans. All proposed projects must have no adverse effect on the natural environment, public water supply or public health, safety, or welfare.

In Pennsylvania, construction activities within wetlands and waterbodies would be regulated by the PDEP under the Chapter 105 Water Obstruction and Encroachment Permit Program. The Chapter 105 Program regulates obstructions and encroachments located in, along, across, or projecting into a watercourse, floodway or body of water, whether temporary or permanent, and is the nexus for determining whether the activity complies with the state's water quality standards as required by Section 401 of the CWA. These authorizations include General Permits and Individual Permits. General Permits are used to streamline the permitting of activities that are sufficiently similar in design or construction to warrant general requirements or conditions, such as utility line stream crossings. The Water Obstruction & Encroachment General Permit BWM-GP-11 and Clean Water Act Section 404 Permits are jointly administered by the COE and PDEP (PDEP, 2005).

The discharge of dredged or fill material into waters of the United States (as defined by 33 CFR Part 328), including jurisdictional wetlands, would require compliance, at a minimum, with the requirements of Sections 401 and 404 of the CWA and the respective state permitting programs. As part of complying with federal, state, and/or local regulatory requirements, Mid-Atlantic Express must demonstrate that impacts on wetlands have been avoided and minimized to the maximum extent practicable. Where unavoidable wetland impacts would occur, the agencies would require measures to mitigate the effects of construction. We believe that Mid-Atlantic Express's compliance with federal, state, and local requirements would be consistent with the CEQ Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR 1508.20), which defines mitigation to include the following criteria:

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- compensating for the impact by replacing or providing substitute resources or environments.

4.4.2 Wetland Types Impacted by the Proposed Project

As part of its environmental studies of the LNG Terminal Site, pipeline right-of-way, temporary workspaces, and aboveground facility locations, AES and Mid-Atlantic Express reviewed USGS 7.5-minute series topographic maps to determine the presence, type, and size of wetlands; hydric soils lists and soil surveys (obtained from the United States Department of Agriculture Natural Resources Conservation Service in Harford and Cecil Counties, Maryland, and Lancaster and Chester Counties, Pennsylvania.) to determine presence and extent of hydric and upland soils; and National Wetlands Inventory (NWI) maps and MDNR maps to determine the presence of mapped, state-designated wetlands and Wetlands of Special State Concern. In addition, digital orthophoto imagery from aerial photographs dated 2005 was used to identify drainage and other hydrologic features. Mid-Atlantic Express also conducted wetland delineations along approximately 71 miles of the approximately 88-mile proposed pipeline corridor. These field surveys included the proposed LNG terminal site, pipeline right-of-way, additional temporary workspace, and aboveground facility locations to identify wetlands in the project area where access was allowed. Wetlands were delineated in accordance with the 1987 *Corps of Engineers Wetlands Delineation Manual* (COE, 1987) and classified according to the FWS classification scheme (Cowardin et al., 1979). The remaining approximately 16.57 miles have yet to be surveyed due to access issues. Surveys of these portions of the proposed route may not be completed until after issuance of a FERC Certificate if access permission continues to be denied. If FERC approves the project and issues a Certificate, Mid-Atlantic Express would be able to complete landowner agreements and obtain access to all properties for surveys. Currently, classification of wetlands for these 16.57 miles is based on NWI maps, USGS topographic maps, remote sensing data, and desktop analysis. If the project is certificated by FERC, on-the-ground surveys would be required to confirm the wetlands characterization information, as required by state and federal permits, prior to the authorization of any ground disturbance.

Table 4.4.2–1 lists the wetlands that would be impacted along the proposed pipeline route, including the milepost, wetland classification, wetland identification number, crossing length, acreage that would be affected during construction and acreage that would be affected during operation. Wildlife in wetlands is addressed in section 4.6.

TABLE 4.4.2-1

Wetlands Impacted by Construction and Operation of the Proposed Sparrows Point Pipeline Facility

Approximate Beginning Milepost	Mid-Atlantic Express's Wetland Survey ID Number	Wetland Classification a/	Total Length Crossed at Centerline (feet)	Total Area Impacted During Construction (acres) b/,c/	Area Occupied During Operation (acres) d/	Permanently Impacted Wetlands (acres) e/
1.59	Desktop f/	PEM1FH	334	0.06	0.05	0.00
4.15	47.1WA1	PEM	0	0.03	0.00	0.00
4.21	47.1WA2	PEM	0	0.00	0.00	0.00
4.37	47.1WA3	PFO	238***	0.42	0.31	0.17
4.67	47.1WA4	PEM	0	0.03	0.00	0.00
4.7	47.1WA6	PEM	75	0.12	0.09	0.00
5.04	52WA1	PFO	259	0.46	0.3	0.18
5.12	56WA1	PEM	0	0.08	0.00	0.00
5.33	61WA1	PEM	538	0.76	0.53	0.00
5.8	87.4WA1	PEM	197	0.29	0.23	0.00
5.98	95WA4	PEM	12	0.03	0.02	0.00
6.03	95WA3	PEM/PFO	77	0.23	0.16	0.05
6.31	95WA1	PFO	54	0.04	0.04	0.04
6.38	94WA1	PFO	30***	0.04	0.04	0.02
6.86	104WA8	PFO	90	0.05	0.05	0.06
7.27	104WA1	PEM/PFO	837	1.18	0.79	0.58
8.36	118.1WA1	PEM	97	0.16	0.11	0.00
8.62	Desktop f/	E1OWL6/E2EM5P6	762	0.03	0.03	0.00
9.76	138WA2	PFO	42	0.11	0.05	0.03
10.09	139.4WA1	PFO	38	0.06	0.06	0.03
10.25	140WA1	PEM	228	0.35	0.26	0.00
10.56	144DPA1	PEM	0	0.08	0.08	0.00
11.23	160WB1	PEM/PSS	361	0.42	0.41	0.00
11.35	166WB1	PEM/PSS	460***	0.68	0.53	0.00
11.88	175WB2	PSS	52	0.05	0.05	0.00
12.67	181WB1	PEM	0	0.05	0.00	0.00
14.49	214WA2	PFO	0	0.03	0.00	0.03
14.52	215WA1	PFO	19	0.03	0.03	0.01
14.63	214.1WA1	PEM	93	0.40	0.14	0.00
15.06	220WB1	PEM	52	0.05	0.05	0.00
15.12	221.1WA1	PFO/PEM	0	0.02	0.02	0.02
15.23	222WA1	PFO	199	0.32	0.23	0.14
15.47	226WA1	PEM	105	0.12	0.11	0.00
15.52	229WA1	PEM/PSS	19	0.03	0.03	0.00
15.67	229WA3	PEM/PFO	710	1.24	0.81	0.49
16.36	249.1WA2	PEM	19	0.02	0.02	0.00
19.18	304WA2	PEM	315	0.57	0.37	0.00
20.66	324.2WA1	PEM	37	0.04	0.04	0.00
21.22	340WA2	PEM	176	0.17	0.17	0.00

TABLE 4.4.2-1

Wetlands Impacted by Construction and Operation of the Proposed Sparrows Point Pipeline Facility

Approximate Beginning Milepost	Mid-Atlantic Express's Wetland Survey ID Number	Wetland Classification a/	Total Length Crossed at Centerline (feet)	Total Area Impacted During Construction (acres) b/,c/	Area Occupied During Operation (acres) d/	Permanently Impacted Wetlands (acres) e/
22.23	351WB1	PEM	377	0.65	0.44	0.00
23.85	373.4WA2	PEM	211	0.25	0.17	0.00
25.32	383WA1	PFO/PEM	34	0.14	0.05	0.02
32.28	475WA1	PEM	0	0.02	0.00	0.00
33.31	484WA2	PFO/PSS	35	0.03	0.03	0.02
34.46	497WA3	PEM	0	0.04	0.00	0.00
34.72	498WA2	PFO	0	0.03	0.00	0.00
35.99	527WA4	PEM	74	0.08	0.08	0.00
38.19	566WA5	PEM	21	0.05	0.03	0.00
38.71	574WA5	PEM	8	0.02	0.02	0.00
38.76	574WA6	PEM	11	0.02	0.02	0.00
39.01	576WA2	PEM	104	0.21	0.16	0.00
39.15	577WA2	PEM	45	0.07	0.07	0.00
39.39	582WA1	PEM	2	0.04	0.01	0.00
39.84	587WA1	PFO	181	0.81	0.57	0.12
40.19	588.1WA1	PFO	345	0.54	0.39	0.24
41.6	618WA1	PFO	1485	2.43	1.68	1.02
44.87	661WA1	PFO	10	0.04	0.02	0.00
45.27	662.1WA1	PFO	20	0.1	0.07	0.01
47.01	683WA1	PEM	274	0.37	0.28	0.00
47.24	683.1VP1	POW/PEM	25	0.03	0.03	0.00
61.14	830WA1	PEM	219	0.24	0.21	0.00
62.38	845WA1	POW/PEM	29	0.06	0.03	0.00
63.94	859WA3	PFO	631	1.13	0.73	0.43
64.23	864WA1	PFO	172	0.28	0.20	0.12
65.16	873WA2	PEM	216	0.60	0.28	0.00
66.03	879WA1	PEM	30	0.03	0.03	0.00
66.23	880WA4	PEM/PFO	353	0.63	0.40	0.24
70.34	908WA2	POW	0	0.01	0.00	0.00
74.31	944WA1	PEM/PSS	13	0.02	0.02	0.00
75.13	949WA1	PFO/PEM	192	0.33	0.22	0.13
76.54	983WA2	PFO/PEM	16	0.03	0.02	0.01
79.22	Desktop f/	PFO1A/PFO1/EM5A	700	0.10	0.07	0.05
79.53	Desktop f/	PSS1/EM5A	535	0.08	0.04	0.00
82.18	1178WB2	PEM	249***	0.25	0.25	0.00
82.35	1180WA2	PEM	119***	0.16	0.16	0.00
84.39	Desktop f/	PEM5A	61	0.01	0.01	0.00
86.16	1264.1WA1	PEM	185	0.19	0.19	0.00
86.63	1298WA1	PEM	332	0.36	0.36	0.00
86.76	1295.1WA1	PEM	76	0.07	0.07	0.00
86.93	1303WA1	PEM/PFO	22	0.03	0.02	0.20
	Maryland Subtotals			14.81	10.31	3.28

TABLE 4.4.2-1

Wetlands Impacted by Construction and Operation of the Proposed Sparrows Point Pipeline Facility

Approximate Beginning Milepost	Mid-Atlantic Express's Wetland Survey ID Number	Wetland Classification a/	Total Length Crossed at Centerline (feet)	Total Area Impacted During Construction (acres) b/,c/	Area Occupied During Operation (acres) d/	Permanently Impacted Wetlands (acres) e/
	Pennsylvania Subtotals			4.62	3.33	1.18
	Project Totals		13937	19.43	13.64	4.46

a/ Cowardin Classification System (multiple codes listed indicate an intergrade between wetland types):
E1OW = Estuarine Subtidal Open Water Wetland
PEM = Palustrine Emergent Wetlands
PFO = Palustrine Forested Wetlands
POW = Palustrine Open Water
PSS = Palustrine Scrub–Shrub Wetlands

b/ Based on a 75-foot-wide construction right-of-way and all additional temporary work spaces.

c/ The values in the "Total Area Impacted" column are **all-inclusive** temporary impacts and **include** the totals in the columns to the right.

d/ Based on a 50-foot-wide permanent right-of-way. Acreage affected during operation includes permanent impacts such as vegetation cover type conversions (e.g., forested wetland to emergent or scrub–shrub wetland) in 30 feet of the permanent right-of-way; that is, the 30-ft centered over the centerline that is kept maintained free of trees. Emergent and scrub-shrub wetlands that are allowed to recover are not considered to be affected by operation of the pipeline.

e/ Acreage where forested wetlands would be converted to another wetland type (emergent and/or scrub-shrub). Acreage of emergent and scrub-shrub wetlands within the permanent right-of-way is not included as part of the permanent impact as these wetlands would be restored and/or allowed to recover naturally to their pre-construction state.

f/ "Desktop" indicates wetlands classified using National Wetlands Inventory (NWI)/USGS topographic maps and/or remote sensing data; Mid-Atlantic Express was not able to field survey these areas due to access issues.

4.4.2.1 Wetlands Located at the Proposed LNG Terminal Site and Along the Proposed Pipeline Route

No wetlands were identified at the proposed LNG terminal site.

Construction of the proposed pipeline would impact the following wetland types:

- palustrine (freshwater, non-tidal) emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens;
- palustrine scrub-shrub wetlands are characterized by woody vegetation less than six meters (20 feet) tall;
- palustrine forested wetlands consist of wooded swamps and floodplain forests with a strong shrub component;
- palustrine open water wetlands are shallow (less than 2 m at low water), low salinity (less than 0.5 parts per thousand due to ocean-derived salts), non-tidal habitats (Cowardin et al., 1979) dominated by much of the same vegetation as the shallow emergent wetlands; and
- estuarine subtidal open water wetlands occur in higher salinity waters (greater than 0.5‰ due to ocean-derived salts, i.e., brackish and salt waters) and include adjacent tidal emergent and scrub-shrub wetland (Cowardin et al., 1979).

The majority of the wetlands potentially impacted by the proposed pipeline are palustrine, freshwater wetlands, with small amounts of estuarine wetlands at the southern terminus along the Patapsco River. The freshwater wetlands include several types of emergent wetlands, scrub-shrub wetlands, and forested wetlands, and a small number of open water marshes. Identified wetlands also encompassed estuarine subtidal open water wetlands and habitats classified as open water by the FWS classification scheme (Cowardin et al., 1979). Plant species associated with each of these wetlands types is provided in table 4.4.2-2. Wetland types and

acreages that would be affected by the proposed Mid-Atlantic Express Pipeline are summarized in table 4.4.2-3.

TABLE 4.4.2-2

Representative Wetland Plant Species (Listed by Wetland Type) Identified in the Sparrows Point LNG Terminal and Mid-Atlantic Express Pipeline Areas

Common Name	Scientific Name	Common Name	Scientific Name
Palustrine Emergent Wetlands			
awl sedge	*Carex stipata*	woolgrass	*Scirpus cyperinus*
tussock sedge	*Carex stricta*	manna grass	*Glyceria striata*
lurid sedge	*Carex lurida*	eastern joe-pye weed	*Eupatoriadelphus dubius*
fringed sedge	*Carex crinita*	New England aster	*Aster novae-angliae*
rice cutgrass	*Leersia oryzoides*	boneset	*Eupatorium perfoliatum*
creeping spike rush	*Eleocharis acicularis*	blueflag iris	*Iris versicolor*
soft rush	*Juncus effusus*	sweetflag	*Acorus calamus*
reed canary grass	*Phalaris arundinacea*	sensitive fern	*Onoclea sensibilis*
common reed	*Phragmites australis*	cinnamon fern	*Osmunda cinamomea*
fowl meadow grass	*Poa palustris*		
Palustrine Scrub-Shrub Wetlands			
awl sedge	*Carex stipata*	woolgrass	*Scripus cyperinus*
tussock sedge	*Carex stricta*	manna grass	*Glyceria striata*
lurid sedge	*Carex lurida*	eastern joe-pye weed	*Eupatoriadelphus dubius*
fringed sedge	*Carex crinita*	New England aster	*Aster novae-angliae*
rice cutgrass	*Leersia oryzoides*	boneset	*Eupatorium perfoliatum*
creeping spike rush	*Eleocharis acicularis*	blueflag iris	*Iris versicolor*
soft rush	*Juncus effusus*	sweetflag	*Acorus calamus*
reed canary grass	*Phalaris arundinacea*	sensitive fern	*Onoclea sensibilis*
common reed	*Phragmites australis*	cinnamon fern	*Osmunda cinamomea*
fowl meadow grass	*Poa palustris*	speckled alder	*Alnus rugosa*
silky dogwood	*Cornus amomum*	swamp rose	*Rosa palustris*
winterberry	*Ilex verticillata*	buttonbush	*Cephalanthus occidentalis*
common elderberry	*Sambucus canadense*		
Palustrine Forested Wetlands			
red maple	*Acer rubrum*	arrowwood viburnum	*Viburnum dentatum*
American elm	*Ulmus americana*	witch hazel	*Hamamelis virginiana*
pin oak	*Quercus palustris*	highbush blueberry	*Vaccinium corymbosum*
green ash	*Fraxinus pennsylvanica*	winterberry	*Ilex verticillata*
black gum	*Nyssa sylvatica*	silky dogwood	*Cornus amomum*
sweetgum	*Liquidambar styraciflua*	skunk cabbage	*Symplocarpus foetidus*
common reed	*Phragmites australis*	sensitive fern	*Onoclea sensibilis*
cinnamon fern	*Osmunda cinnamomea*		
Palustrine Open Water			
arrowhead	*Sagittaria latifolia*	reed canary grass	*Phalaris arundinacea*
arrow arum	*Peltandra virginica*	fowl meadow grass	*Poa palustris*
narrow-leaf cattail	*Typha angustifolia*	woolgrass	*Scirpus cyperinus*
broad-leaf cattail	*Typha latifolia*	manna grass	*Glyceria striata*
awl sedge	*Carex stipata*	eastern joe-pye weed	*Eupatoriadelphus dubius*
tussock sedge	*Carex stricta*	New England	*Aster novae-angliae*

TABLE 4.4.2-2 **Representative Wetland Plant Species (Listed by Wetland Type) Identified in the Sparrows Point LNG Terminal and Mid-Atlantic Express Pipeline Areas**			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
lurid sedge	*Carex lurida*	boneset	*Eupatorium perfoliatum*
fringed sedge	*Carex crinita*	blueflag iris	*Iris versicolor*
rice cutgrass	*Leersia oryzoides*	sweetflag	*Acorus calamus*
creeping spike rush	*Eleocharis acicularis*	sensitive fern	*Onoclea sensibilis*
soft rush	*Juncus effusus*	cinnamon fern	*Osmunda cinnamomea*
Estuarine Subtidal Open Water Wetlands			
common reed	*Phragmites australis*	marsh elder	*Iva frutescens*
groundsel tree	*Baccharis halimifolia*		

Thus, from the information presented in table 4.4.2-3, we conclude that:

- 19.43 acres of wetlands (of all types) would be temporarily impacted by construction;

13.64 acres of wetlands (of all types except forested) would be within the operational, maintained right-of-way of the pipeline, but not impacted in a permanent way, since these wetlands would revert to their former condition;

- 4.46 acres of forested wetland would be permanently impacted because these areas would be within the permanent pipeline right-of-way and would not be allowed to re-establish as forested wetland; and
- 1.33 acres of habitat cleared during construction is neither in the permanent right-of-way, nor forested wetland, and is thus not permanently impacted by the operation of the pipeline.

TABLE 4.4.2-3

Summary of Wetland Types Impacted by the Mid-Atlantic Express Pipeline

Wetland Type	Total Area Impacted By Construction (acres) a/, b/, c/)	Area Permanently Occupied During Operation (acres) a/	Area Permanently Changed (Impacted) By Operation (acres) a/, d/
Emergent	7.14	5.11	0.00
Forested	6.92	4.77	2.65
Forested/Scrub-Shrub	0.03	0.03	0.02
Emergent/Forested	3.93	2.56	1.79
Coastal (Estuarine)	0.03	0.03	0.00
Emergent/Scrub-Shrub	1.23	1.03	0.00
Emergent/Other Waters	0.09	0.06	0.00
Scrub-Shrub	0.05	0.05	0.00
Open Waters	0.01	0.00	0.00
Total	**19.43**	**13.64**	**4.46**

a/ Acreages take into account avoidance of wetlands that would be crossed by the HDD construction method. These wetlands would not be affected by construction or operation of the proposed facilities.

b/ Construction impacts include the portions of the proposed 75-foot-wide ROW and additional temporary work spaces located within wetlands.

c/ Impact acreage in this column is all-inclusive of all areas cleared for construction; the areas of permanent impacts expressed in the columns to the right are subsets (i.e. are included in) the totals of this column.

d/ Acreage where forested wetlands would be converted to another wetland type (emergent and/or scrub-shrub). Acreage of emergent and scrub-shrub wetlands within the permanent right-of-way is not included as part of the permanent impact as these wetlands would be restored and/or allowed to recover naturally to their pre-construction state.

Aboveground Facilities/Pipe Yards/Temporary Roads/Workspace Areas

No wetlands have been identified at the proposed meter station locations, at the mainline valve sites, and along the access roads. Additional wetland delineation surveys of the proposed pipe yards/staging areas, temporary roads, and workspaces for temporary access roads would be performed once property access issues are resolved. Mid-Atlantic Express is coordinating with MDE and COE to field verify wetlands, wetland buffers, waters, and floodplain impacts.

Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express should file with the Secretary a report addressing any updates on wetland delineations for all proposed facilities including construction workspaces, pipe yards/staging areas, and temporary access roads.**

Unique or Sensitive Wetlands

In Maryland, designated Nontidal Wetland of Special State Concern (NTWSSC) are wetlands with rare, threatened, endangered species or unique habitat. The Code of Maryland Regulations (COMAR; Title 26, Subtitle 23, Chapter 06, Sections 01 & 02) identifies these NTWSSCs and affords them certain protections including a 100-foot buffer from development. MDE is responsible for identifying and regulating these special wetlands, with the FWS's National Wetlands Inventory wetlands providing the basis for identifying them. Activities pertinent to the construction of the pipeline within NTWSSCs are regulated under the Maryland State Programmatic General Permit-2 and include, but are not limited to, repair and maintenance activities, fill, shoreline/bank stabilization, return water, and hazardous materials remediation (COE, 2001b).

The proposed pipeline route would cross an NTWSSC at MP 22.23 on the north bank of Little Gunpowder Falls. At the NTWSSC at MP 22.23, Mid-Atlantic Express has evaluated, but not committed to, the option of utilizing an HDD to cross the Little Gunpowder Falls and the wetland. A second NTWSSC runs parallel to the pipeline right-of-way from MP 46.45 to 46.63 at a distance of approximately 130 feet to the northwest. The verification of wetlands — including both of these NTWSSCs — by the COE, MDE, and PDEP is still pending. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express should file with the Secretary the results of its consultation with the MDE regarding Nontidal Wetlands of Special State Concern at MPs 22.23 and 46.45.**

4.4.2.2 Waterway for LNG Marine Traffic

Only extremely limited amounts of shoreline, and thus potentially emergent wetlands, are within Zones of Concern 2 and 3. (Zones of Concern are described in section 4.12.5.3.) Zone 1 is primarily located within the open waters of Chesapeake Bay and contains open water wetlands. Wetlands identified within Zones of Concern 2 and 3 in Chesapeake Bay are predominantly tidal estuarine emergent wetlands. Salt-tolerant grasses, including smooth cordgrass, salt hay grass, giant cordgrass and switchgrass, generally dominate these wetlands; other herbaceous plants, such as black needlebrush, three-squares, narrow-leaved cattail and rose mallow, may be abundant, especially in brackish water areas (CBP, 2004a). All three Zones also contain some open bay bottoms that may support submerged aquatic plant species.

Potential increases to wave action and sedimentation rates resulting from LNG marine traffic would be expected to be consistent with current levels with a minimal overall impact given the limited increase in number of ships. No wetlands along the transit route in the Chesapeake Bay and the Patapsco River are expected to be significantly impacted by the proposed increase in marine vessel traffic.

If an unignited release of LNG were to occur along the LNG marine traffic route, given that LNG is lighter than water, the LNG would float on the water until it had vaporized. If the LNG were to contact any wetland plants along the transit route, those species above the water line could be impacted by the extremely low

temperatures. Submerged aquatic plants in the open bay would not be significantly affected by an unignited release.

If an associated fire were to occur with a marine LNG spill, submerged wetland vegetation would not be expected to experience any significant impacts from a pool fire, especially since Zones 1 and 2 are in waters too deep for submerged aquatic vegetation (SAV) to occur (also see figures 4.12.2, Sheets 1 though 9 in Appendix K). In Zone 2, wetland vegetation on land could be impacted from extreme radiant heat which could desiccate vegetation. These species would be expected to reestablish rapidly in the affected areas, given the resilience of wetland species in wet, warm climates and that their root systems would remain intact. The maximum flammable range for a vapor cloud could extend to the outer limits of Zone 3. Zone 3, which includes a few small SAV beds (see section 4.5.1), would not be expected to experience any significant impacts from a pool fire. If the vapor cloud were to come in contact with an ignition source, the resulting fire could burn back to the spill and impact any wetlands within its path. However, because SAV is submerged, it would be insulated from any heat effects. Thus, it is unlikely that SAV would be impacted by an LNG spill from an LNG carrier associated with the proposed Project.

Because of the marine transit safety and security measures, the probability of an LNG carrier spill from collisions, allisions and terrorist attacks would be unlikely. The potential impacts on wetlands are considered not significant due to the low probability of a spill.

4.4.3 Potential Impacts of the Mid-Atlantic Express Pipeline to Wetlands

Construction of the proposed Mid-Atlantic Express Pipeline would temporarily impact a total of approximately 19.43 acres of wetlands. Operation of the proposed Project would permanently impact approximately 4.46 acres of forested wetland (including forested/scrub-shrub wetlands and emergent/forested wetlands) which would be converted to and maintained as emergent and/or scrub-shrub wetlands. Affected acreages by wetland type are summarized in table 4.4.2-3.

Approximately 4.27 acres of forested wetlands, 0.01 acre of forested/scrub-shrub wetlands, and 2.14 acres of emergent/forested wetland would be impacted by construction and allowed to recover; however, because of the long period (perhaps 20 years or more) required for these wetlands to return to pre-existing conditions, these impacts would be considered long-term. Impacts on emergent wetlands would be considered temporary and short-term because herbaceous vegetation would likely regenerate within a few growing seasons following restoration of the right-of-way. Another 9.15 acres of emergent and scrub-shrub wetlands would be occupied by the permanent easement of the pipeline; however, because they would be restored and/or allowed to recover naturally to their pre-construction state, they would incur only short-term impacts.

The potential impacts of project-related construction and operation on the 19.43 acres of wetlands would vary depending on the timing of construction, construction techniques used, the sensitivity of the resources disturbed, and the length of time required for wetlands to be restored. These effects would be greatest during and immediately following construction. Soil disturbance and the removal of wetland vegetation within the project area could temporarily affect the capacity of wetlands to buffer flood flows and could increase the potential for erosion. Removal of wetland vegetation could also deprive wildlife of a valuable habitat component and encourage the recruitment of less desirable invasive species. Soil disturbance including rutting and inadequate topsoil segregation could adversely affect the success of post-construction reestablishment and the natural recruitment of native wetland vegetation via mixing of topsoil with subsoil, soil compaction, and disruption of wetland hydrology. In addition, the pipeline trench could act as a conduit for subsurface water flow which could impact wetland hydrology. Surface runoff from disturbed upland areas could transfer sediment into adjacent wetlands. Construction equipment fuel and lubricant leaks and spills could result in wetland contamination and some loss of wetland values/functions as wildlife habitat could be diminished during pipeline construction. However, Mid-Atlantic Express would implement mitigation procedures for such disturbances (see section 4.4.4).

No wetlands would be permanently filled or drained as a result of construction, and none of the access roads identified by Mid-Atlantic Express would permanently affect wetlands. An HDD crossing under the identified

NTWSSC located at Little Gunpowder Falls (if adopted by Mid-Atlantic Express), would avoid impacts to 378 feet of wetlands (approximately 0.65 acre). We have recommended above that Mid-Atlantic Express provide results of consultation with MDE regarding this NTWSSC during the DEIS comment period. The HDD crossing under the Back River would avoid approximately 760 feet of wetlands (approximately 0.03 acre). The HDD crossing at the Susquehanna, while avoiding impacts to the watercourse and adjacent forest, would not extend under wetlands.

4.4.4 Wetlands Construction and Maintenance Procedures and the Aquatic Resources Mitigation Plan

Mid-Atlantic Express has attempted to avoid and minimize impacts on wetlands to the maximum extent practicable during the selection of this proposed pipeline route, aboveground facility locations, and workspace requirements. Mid-Atlantic Express would further minimize wetland impacts by adhering to the measures specified in its ECP and described in section 2.3.2.2. In addition to the measures in its ECP, Mid-Atlantic Express would be required to comply with conditions established in applicable federal and state permits (see section 4.4.1). Mid-Atlantic Express is working with the COE to identify appropriate property and projects for mitigation, consistent with the COE district mitigation guidance.

Mid-Atlantic Express would restore wetlands to pre-construction contours according to permit conditions. Mid-Atlantic Express would further perform post-construction monitoring to ensure revegetation success in wetlands. Mid-Atlantic Express would conduct annual monitoring in accordance with its ECP for a minimum of three years after construction or until 80 percent cover is established. If, after six months, the wetlands do not appear to be recovering, Mid-Atlantic Express would replant or seed the disturbed area. Invasive species also would be monitored during this time, including in wetlands, in accordance with Mid-Atlantic Express's Exotic and Invasive Species Control Plan (see section 4.5.2 for details). As controlling the spread of invasive plant species is a regional initiative currently being pursued at the federal, state, and local levels, we are recommending in section 4.5.3 that Mid-Atlantic Express should file its finalized Exotic and Invasive Species Control Plan (including comments from appropriate federal, Maryland, and Pennsylvania agencies) for the review and written approval of the Director of OEP prior to the end of construction.

Mid-Atlantic Express would limit vegetation maintenance in wetlands to annual mowing of a 10-foot-wide strip centered over the pipeline and the periodic cutting of trees greater than 15 feet tall that are located within 15 feet of the pipeline centerline in accordance with its ECP.

Mid-Atlantic Express is in the process of developing a comprehensive, project-specific Aquatic Resources Mitigation Plan (ARMP) in consultation with the COE, NMFS, FWS, MDE, and PDEP to meet all of the above requirements and to address impacts on EFH and other aquatic resources. The final ARMP would include the specific mitigation measures to be implemented for project-related impacts, including avoidance, minimization and compensation.

Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, AES and Mid-Atlantic Express should file with the Secretary a draft ARMP developed in consultation with the COE, NMFS, FWS, EPA, MDE, and PDEP. The ARMP should describe impacts on wetlands, waterbodies, EFH, and other aquatic resources; evaluate potential dredged material placement area sites; and describe specific restoration, mitigation, and monitoring measures.**

With the mitigation measures proposed by Mid-Atlantic Express, project compliance with state and federal wetland regulations, and the development of an approved ARMP, we believe that impacts to wetlands can be minimized and impacts would not be significant over the long term.

4.5 VEGETATION

4.5.1 Vegetation Resources

LNG Terminal

The proposed LNG terminal would be located on an industrialized site that was recently used for shipbuilding. The entire area that would be affected by construction and operation of the proposed facilities is developed/industrial land occupied by buildings, other structures related to the former shipbuilding operation, equipment storage areas, roads, and railroad beds. There is essentially no natural vegetation on the site, and thus there would be no impacts to plant communities as a result of the Sparrows Point LNG Terminal construction.

The MDE waterbody classification for the Patapsco River has an SAV component (see section 4.3.2); however, studies in 2004 (Orth et al., 2005) and 2005 (Orth et al., 2006) found no SAV in the waters near the proposed LNG terminal. Additionally, in June 2006, AES conducted an SAV survey by visual observation and sampling of transects within and near the proposed project footprint in the Patapsco River estuary; no SAV was observed. Therefore, we expect no impacts to SAV.

Pipeline Facilities

The proposed Mid-Atlantic Express Pipeline would cross upland forest, riparian woodlands, open land, developed land, and agricultural land. The proposed pipeline would also cross forested, emergent, and scrub-shrub wetlands. Wetlands are addressed in detail in section 4.4. Plant species classified as endangered, threatened, or otherwise of concern are addressed in section 4.7.2.6 and table 4.7-2.

In Maryland, the pipeline route in Baltimore County passes through mostly developed (both residential and commercial) areas; farther north, the vegetation is mostly agricultural in Harford County, with the route becoming mostly forested in Cecil County. In Pennsylvania, the route crosses mostly agricultural and forest lands. Developed commercial and residential areas crossed by the pipeline generally have no natural vegetation and will not be addressed further in this section. A discussion of agricultural lands along the proposed pipeline route is in section 4.8.

Upland forest along the proposed pipeline route is a mixed deciduous community with dominant trees including red maple, tulip tree, black cherry, black walnut, American beech, red oak, and white oak. Woody understory species include arrowwood viburnum, witch hazel, bush honeysuckle, highbush blueberry, lowbush blueberry, and the invasives multiflora rose, Japanese honeysuckle, and oriental bittersweet. Common herbaceous species include Allegheny blackberry, field garlic, Virginia creeper, deertongue, goldenrods, Christmas fern, marginal wood fern, and wood aster.

Plant species commonly found in riparian woodlands are blackgum, silver maple, American elm, sycamore, river birch, and black willow in the overstory; winterberry and spicebush in the shrub layer; and spotted jewelweed, arrow-leaved tearthumb, halberd-leaved tearthumb, late goldenrod, Canada goldenrod, common greenbrier, and poison ivy among the herbaceous species. Forested land represents 22.7% of the acreage affected by the proposed pipeline in Maryland, 15.4% of the acreage affected by the proposed pipeline in Pennsylvania, and 19.4% of the total acreage affected by the proposed pipeline (see table 4.8.1-1).

Open areas (non-agricultural) along the proposed pipeline route include herbaceous and shrub plant communities. These are mainly successional old fields and existing utility rights-of-way where common plant species are orchard grass, crown vetch, partridge pea, common milkweed, slender bushclover, panic grass, deertongue, Canada goldenrod, hay-scented fern, Allegheny blackberry, and the invasive common reed.

During construction, existing vegetation would be temporarily removed from within the construction right-of-way and other necessary workspaces to facilitate the installation of the pipeline. After the pipeline is installed in the ground, Mid-Atlantic Express would decompact the soil, reseed to stabilize the construction right-of-way, and allow the right-of-way to revegetate naturally to preconstruction conditions. Vegetation would be

monitored for at least two growing seasons following final restoration or longer if needed until final restoration goals are achieved, pursuant to Mid-Atlantic Express's ECP. Mid-Atlantic Express has proposed seed mixes for restoration pursuant to Pennsylvania State University College of Agricultural Sciences guidelines (Landschoot, 1997). As needed, Mid-Atlantic Express would consult with local soil and water conservation district offices and private landowners to develop area-specific revegetation and restoration plans; these plans would provide specifications for appropriate seed mixes.

Impacts to vegetation from construction of the proposed Mid-Atlantic Express Pipeline facilities would result primarily from the cutting, clearing, and/or removal of existing vegetation within the construction work area. The degree of impact would depend on the type and amount of vegetation affected, the rate at which vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted on the right-of-way during pipeline operation. The relative impact of clearing would be greatest in forested areas because the removal of this vegetation would result in the greatest change in the structure and environment of the plant community. Moreover, the effect of clearing would be of longer duration in forested areas than in other areas and, in the case of the maintained right-of-way, would be permanent. On temporary work areas where forest regeneration would be allowed, the re-establishment of forest to preconstruction conditions could take between 25 and 150 years. In contrast, the re-establishment of open lands following construction would probably take one to three years. Species composition of adjacent habitats, particularly along the edges of the right-of-way, could be altered by changes in abiotic conditions such as sunlight and wind levels. Increased light would favor growth of shade intolerant species that typically do not inhabit the forest interior. Higher wind levels could lead to increased windthrow in adjacent forested areas.

The loss of vegetation could also have secondary impacts, including forest fragmentation and the loss of wildlife habitat (see section 4.6 for additional details). Other secondary impacts could include increased erosion from the conversion of deep rooted vegetation to shallow rooted vegetation on the right-of-way and increased solar radiation, which could dry the soil and stimulate the growth of early successional species within and immediately adjacent to cleared areas. The removal of trees on the right-of-way could also expose trees growing adjacent to the newly cleared areas to higher levels of wind, which may increase the risk of blow downs. The majority of these effects would be minor and temporary and would diminish upon restoration and revegetation of the right-of-way.

The right-of-way revegetation rate would depend on several factors, including local climate, soil type, vegetation maintenance practices, land use, and the existing and seeded vegetation. The amount of time required for complete recovery of cleared vegetation to pre-disturbance levels would depend on these factors as well as the size and age of pre-existing vegetation when cleared.

Conversion of forest to herbaceous cover would be a long-term to permanent effect of construction. Where its proposed pipeline would cross upland forest, Mid-Atlantic Express would maintain the entire permanent right-of-way (50 feet wide in most cases) in a generally low-growth condition by mowing it no more frequently than once every 3 years (except a 10-foot-wide corridor centered on the pipeline may be maintained annually in a herbaceous state), allowing the temporary work space to re-colonize with woody vegetation.. Of the 311.6 acres of forest that would be cleared during construction of the pipelines and aboveground facilities (including 45.9 acres in ATWSs), about 147.3 acres would be maintained in herbaceous cover following construction, and the remaining 164.3 acres would be allowed to revert to forest (see table 4.8.1-1). There would be minimal change in open lands because it would be maintained in vegetation similar to that found before construction.

Following installation of the pipeline and recontouring of the right-of-way, Mid-Atlantic Express would reseed all disturbed areas, with site-specific seeding rates in accordance with its ECP. Species composition of the right-of-way after construction and restoration could be different from pre-construction composition, although given sufficient time, species composition likely would resemble pre-construction conditions.

Operation and maintenance of the proposed pipeline facilities would have additional effects on vegetation after site clearing and right-of-way restoration are completed. Implementation of the measures provided in Mid-Atlantic Express's ECP would minimize potential long-term impacts by allowing annual maintenance of only a

10-foot-wide strip centered over the pipeline. Additionally, routine vegetation maintenance across the entire permanent right-of-way could occur only once every 3 years in uplands. No permanent impacts on vegetation would result from the use of contractor yards. Construction of aboveground facilities (meter stations and MLVs) would permanently convert about 0.5 acre of upland forest and 1.2 acres of open land to natural gas facility use (see table 4.8.1–1). Construction would permanently remove vegetation at each of these sites during the installation of buildings, equipment, and access roads and parking areas. We do not consider this to be a significant impact, as this represents a very small percentage of the total available land of similar types in the surrounding project area.

Waterway for LNG Marine Traffic

Plant communities occurring in and adjacent to the waterway for LNG marine traffic include salt and brackish marshes. Plant species within the Zones of Concern (described in section 4.12.5.3 of this EIS) along the Chesapeake Bay and the Patapsco River are consistent with species present in the general region of the terminal and along the pipeline route. Potential impacts to these plant communities resulting from increased LNG marine traffic would be similar to the impacts resulting from other ships using the navigation channel. No SAV is known to occur in Zones of Concern 1 and 2 (see figures 4.12.2, Sheets 1 though 9 in Appendix K).

If an unignited marine LNG spill were to result in a pool that contacted any vegetation along the Chesapeake Bay and Patapsco River shorelines, plants (or portions of plants) could be killed by the extremely cold temperature. However, given the resilience of plant species in temperate climates, and that root systems of many would remain in tact, vegetation would be expected to reestablish rapidly. Tree species would take longer to reestablish. No impacts to vegetation would be expected outside of Zone 1 from an unignited release of LNG.

If a fire were to occur with the release of LNG, plants within Zone 1 in the vicinity of the fire would either burn or combust due to the radiant heat. However, no land area is contacted by Zone 1 along the waterway for LNG marine traffic until the LNG vessels approach the dock (see figure 4.12-1 in Appendix K). Thus the only terrestrial area exposed to Zone 1 impacts would be within the Sparrows Point industrial area. There is no native vegetation within this industrial area. Impacts within Zone 2 would be expected to be less than those in Zone 1. Some plants within Zone 2 may be harmed by the radiant heat, while others would be unaffected. No impacts would be expected to occur to plant species within Zone 3 from a pool fire. There are some small SAV beds that fall within Zone 3 along the southern shoreline of the Patapsco River intermittently south to Sandy Point (figure 4.12-2, sheet 1 of 9 in Appendix K) and along the western shoreline of Kent Island (figure 4.12-2, sheet 2 of 9 in Appendix K). The nearest extensive SAV beds are over 1 mile beyond Zone 3, at the mouth of the Back River and on the western shoreline of Hart-Miller Island (figure 4.12-2, sheet 1 of 9 in Appendix K). The maximum flammable range for a vapor cloud could extend to the outer limits of Zone 3. If the vapor cloud were to come in contact with an ignition source, the resulting fire could burn back to the spill and impact any plant species within its path. However, because of the marine transit safety and security measures, the probability of an LNG carrier spill from collisions, allisions and terrorist attacks would be unlikely. Furthermore, because SAV is submerged it would be insulated from any heat effects. Thus, it is unlikely that SAV would be impacted by an LNG spill from an LNG carrier associated with the proposed Project. Based on the amount of existing marine traffic within the waterway for LNG marine traffic corridor, and the low probability of a LNG spill, no significant impacts to plant communities are expected within the waterway for LNG marine traffic corridor including the zones of concern.

4.5.1.1 Site Specific Impacts

Mid-Atlantic Express would minimize impacts to forest land and other riparian woodland vegetation adjacent to the Back River, potentially at the Little Gunpowder Falls and the associated wetland, and the Susquehanna River by using the HDD technique to install the pipeline at these stream crossings. Temporary impacts to vegetation would occur where HDD tracking cables and access paths are located.

At the Susquehanna River, vegetation impacts on the south side of the crossing would be confined to the 50-foot-wide permanent right-of-way resulting in disturbance of less then 1 acre. Activities for hydrostatic testing at this site typically would include minor clearing and grading to provide a travel lane for small equipment access to the river to place pumps, hoses, the intake structure, and the dewatering structure. Due to steep terrain, the railroad, and the road on the north side of the river, Mid-Atlantic Express anticipates that no construction activities, and thus no impacts to vegetation, would occur on the north side of the river.

At the Back River crossing, Mid-Atlantic Express anticipates that vegetation disturbance would be limited to minor clearing in one or two areas, each approximately 5 to 10 feet wide and less then 0.1 acre. Anticipated activities would be placing tracking cables for HDD directional guidance and possibly a small pump and hose to obtain water for use during the HDD.

4.5.1.2 Plant Communities of Special Concern

The PDCNR-PNDI has indicated that eastern serpentine barrens, a plant community of concern, may occur between MPs 48 and 49 along the pipeline route. The eastern serpentine barrens are globally imperiled and are also Pennsylvania State listed as imperiled (PNHP, 2007). This same community occurs in Maryland as well, although MDNR correspondence for this project has not explicitly noted it as a designated community of special concern. The band of eastern serpentine barrens along the Pennsylvania/Maryland border is one of three such areas in the eastern United States (Smithsonian Institution, no date). The eastern serpentine barrens are areas with soils low in nutrients such as calcium and potassium, and high in metals including nickel and chromium that are toxic to many plants (The Nature Conservancy, 2007). The barrens tend to appear desert-like with short pine trees and grasses. The dominant plant species is little bluestem, a grass (MDNR, 2004a). Most plants cannot survive in such conditions, and therefore the ecology of these barrens is unique, with many rare plants and animals. Such barrens contain the largest number of endangered plant and animal species in Pennsylvania and are under constant threat from development (PDCNR, no date). Vegetation in the eastern serpentine barrens is very diverse with over 1600 taxa of plants in the eastern United States (Reed, 1986). These include several state listed endangered and threatened plant species: Maryland golden-aster, elephant's foot, annual fimbry, few-flowered nutrush, serpentine aster, northern dropseed, broad-glumed brome, featherbells, fameflower, and Leonard's skullcap. Section 4.7.2.6 and table 4.7-2 provide more details about these listed plant species found in serpentine barrens. The potential impacts of the proposed pipeline on the eastern serpentine barrens habitat are to be determined, pending Mid-Atlantic Express's surveys of the special concern plant species near the Pennsylvania/Maryland border. Therefore, we have included a recommendation in section 4.7.2.6 that Mid-Atlantic Express file results of surveys for the above species and agency consultations (including approved mitigation plans) regarding the eastern serpentine barrens.

4.5.2 Vegetation Management Programs

The proposed LNG terminal and portions of the proposed pipeline route would be located within areas regulated by the State of Maryland's Critical Area Act. This act provides protection of resources, including plant habitat, in Maryland's coastal areas. The Critical Area Act is addressed in Section 4.8, as are roadside trees which are protected by Maryland's Roadside Tree Care Law.

The Maryland Forest Conservation Act (FCA) minimizes the loss of forest resources due to land development by making the identification and protection of forests and other sensitive areas an integral part of the site planning process. The FCA prioritizes areas adjacent to streams or wetlands, on steep or erodible soils, and within or adjacent to large contiguous blocks of forest or wildlife corridors. Any activity requiring an application for a subdivision, grading permit or sediment control permit on areas 40,000 square feet (approximately 1 acre) or greater is subject to the FCA and would require a Forest Stand Delineation (FSD) and a Forest Conservation Plan (FCP) unless the activity qualifies for one of a number of specific exemptions (MDNR, 2005b). An FSD identifies existing forest cover and environmental features of a proposed development site. An FCP describes and quantifies the extent of forest disturbance by the proposed project, identifies protection measures that would be implemented during and after development, and includes a tree replanting and/or long term tree maintenance/protection plan. Off-site mitigation may be required. The

MDNR Forest Service administers the FCA, however it is implemented on a local (i.e., county) level; local ordinances are required to meet the standards and intent of the FCA. The MDNR Forest Service plans to contact the local jurisdictions affected by the project and request delegation of authority. If Baltimore, Harford, and Cecil Counties delegate this authority, all FCA compliance for this project would be done at the state level. However, the counties are not required to delegate authority (MDNR, 2007g). Therefore, **we recommend that:**

- **<u>Prior to construction,</u> Mid-Atlantic Express should consult with the MDNR and/or appropriate local authority(-ies) to determine the need for a Forest Stand Delineation (FSD) and Forest Conservation Plan (FCP) and file with the Secretary the consultation results.**

4.5.3 Noxious Weeds

Noxious weeds and other invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out-compete desirable native species, thereby decreasing overall species diversity. Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [7 USC SS 2801-2814]), a noxious weed is defined as "any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment." The Federal Plant Protection Act contains a list of 137 federally restricted and regulated federal noxious weeds, as per CFR Title 7, Chapter III, Part 360, including 19 aquatic and wetland weeds, 62 parasitic weeds, and 56 terrestrial weeds. Each state is federally mandated to uphold the rules and regulations set forth by the Federal Plant Protection Act and manage its lands accordingly.

Noxious weeds are addressed by Executive Order 13112, which directs federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species can cause. The executive order further specifies that federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize the risk of harm would be taken in conjunction with the actions.

Vegetation removal and soil disturbance during construction could create optimal conditions for the establishment of invasive or noxious weed species. Construction equipment traveling from weed-infested areas into weed-free areas could disperse invasive or noxious weed seeds and propagates, resulting in the establishment of noxious weeds in previously weed-free areas.

Common reed and other invasive plant species such as multiflora rose, Japanese honeysuckle, and oriental bittersweet (Swearingen et al., 2002) are present on lands along the proposed pipeline route. Such species, once introduced into an ecosystem where they are not native (via seeds, spores or other biological material capable of propagating the species), are likely to cause environmental harm.

In accordance with its ECP, Mid-Atlantic Express is required to consult with the appropriate land management and/or state agencies to develop a project-specific wetland restoration plan that would include measures for controlling the invasion and spread of undesirable and exotic species and monitoring the success of revegetation and non-native species control efforts. Mid-Atlantic Express's ECP also requires post-construction monitoring for the first two growing seasons in uplands and for 3 years in wetlands to evaluate the success of revegetation. As part of this monitoring program, and in accordance with Mid-Atlantic Express's Exotic and Invasive Species Control Plan, Mid-Atlantic Express would be required to examine the right-of-way for the presence of invasive species. Pursuant to Mid-Atlantic Express's ECP, in non-agricultural upland areas, revegetation would be considered successful if the density and cover of non-nuisance species within the areas disturbed during construction are similar to the density and cover in adjacent undisturbed areas.

Mid-Atlantic Express has submitted a draft Exotic and Invasive Species Control Plan (Appendix O) but has not provided appropriate agencies' comments on that plan. As controlling the spread of invasive plant species is a regional initiative currently being pursued at the federal, state, and local levels, **we recommend that:**

- **<u>Prior to construction</u>, Mid-Atlantic Express should file with the Secretary its finalized Exotic and Invasive Species Control Plan developed in consultation with the COE and other federal and state agencies for the review and written approval by the Director of OEP.**

We believe that implementation of an Exotic and Invasive Species Control Plan developed with agency input would result in only insignificant effects related to the introduction of invasive and exotic species.

4.5.4 Vegetation Conclusions

Based on our review of the proposed project, mitigation measures and the implementation of agency-approved management plans, we believe that impacts to vegetation resulting from construction and operation of the LNG terminal, proposed pipeline and associated aboveground facilities would not be significant. We believe that implementation of an Exotic and Invasive Species Control Plan developed with agency input would result in only insignificant effects related to the introduction of invasive and exotic species.

4.6 TERRESTRIAL AND AQUATIC SPECIES

4.6.1 Terrestrial Species

The proposed facilities would affect a variety of terrestrial wildlife habitats. These terrestrial habitats exhibit a large degree of overlap with regard to wildlife communities, and many animal species utilize or require varying habitats throughout their life cycles. Table 4.6.1-1 lists wildlife species representative of terrestrial habitats that would be affected by the project. Species listed as representative of a particular habitat may readily utilize other adjacent habitats. Aquatic habitats and species, including those along the marine transit route, are described in section 4.6.2.

Terminal Site

The terminal site is a developed/industrial area with little native vegetation. Sites such as this typically support disturbance- and human-activity-tolerant wildlife species as well as habitat generalists. Waterbirds use the open water habitat adjacent to the site.

Pipeline Route

Terrestrial wildlife habitats along the proposed pipeline route are primarily a mix of wooded, open areas (including agriculture), and some developed areas and wetlands. Much of the wooded habitat along the pipeline route includes small woodlots and hedgerows. The open areas along the proposed pipeline route — some with dense grasses and forbs — include habitat such as cultivated fields, pastures, old fields, and utility rights-of-way. Similar to the terminal facility, the developed areas along the proposed pipeline route support species that are disturbance (e.g., human activity) tolerant and/or habitat generalists. Depending upon the size of these developed areas, and their proximity to the other terrestrial habitats along the pipeline route, these areas may also occasionally exhibit wildlife species atypical of developed lands. Wildlife in any of these habitat types may be in transit from one area of preferred habitat to another, or from one habitat type to another.

TABLE 4.6.1-1.

Terrestrial Wildlife Species Representative of Terrestrial Habitats That Would be Affected by the Proposed Project

Habitat	Proposed Facility	Mammals	Birds	Reptiles and Amphibians
Woodlands	Pipeline	white-tailed deer, eastern gray squirrel, eastern chipmunk, eastern cottontail, raccoon, gray fox, white-footed mouse, deer mouse, shrews, voles	eastern screech owl, downy woodpecker, eastern wood-peewee, black-capped chickadee, white-breasted nuthatch, red-eyed vireo, warblers	American toad, gray treefrog, eastern box turtle, eastern garter snake, black rat snake, five-lined skink
Open Land (including agriculture)	Pipeline	red bat, white-tailed deer, deer mouse, woodchuck, meadow vole, short-tailed shrew, red fox, striped skunk	barn swallow, eastern kingbird, American goldfinch, eastern meadowlark, sparrows, blackbirds, great horned owl, red-tailed hawk, American kestrel, mourning dove	eastern garter snake, eastern hognose snake, northern fence lizard
Developed Land (commercial and residential)	LNG Terminal; Pipeline	house mouse, Norway rat, raccoon	rock pigeon, house sparrow, European starling, American crow	American toad, eastern garter snake
Waterbodies and Wetlands (see Section 4.6.2 for aquatic species)	Waters adjacent to LNG Terminal; Pipeline	mink, river otter, beaver, muskrat	gulls, cormorants, ducks, wading birds, common yellowthroat, willow flycatcher, swamp sparrow	American toad, northern water snake, queen snake, common snapping turtle, eastern painted turtle, red-spotted newt

Waterway for LNG Marine Traffic

Seabirds likely to be found in the terminal vicinity and along the LNG marine traffic route within the Chesapeake Bay include gulls, terns, ducks such as scaup and scoters, double-crested cormorant, and brown pelican. These waters are historic waterfowl concentration areas.

Potential impacts on terrestrial wildlife habitats resulting from increased LNG marine traffic associated with the project along the transit corridor would be similar to those resulting from other ships using the navigational channel. No significant impact on terrestrial wildlife habitats as a result of increased LNG marine traffic is expected within the transit corridor. Habitats potentially affected along the transit route would be associated with aquatic habitats in Zones 1 through 3, with limited terrestrial habitat available in Zone 3.

Other than in the immediate vicinity of the proposed LNG terminal, terrestrial wildlife within Zones 1 and 2 would be limited to birds. (See Section 4.6.2 for a discussion of aquatic species.) If an unignited marine LNG spill were to occur along the transit route and contact any terrestrial wildlife within Zone 1, it could be injured or killed. However, any mobile species, such as birds, would generally move away from the LNG incident, thereby lessening any impacts the spill may cause. Because the vaporized gas that would be released would be a cold, heavier-than-air vapor cloud, birds flying low over the area at the time of release could experience asphyxiation from the lack of oxygen. No wildlife impacts outside of Zone 1 would be expected from an unignited release of LNG. If an associated fire were to occur with the release of LNG, wildlife within Zone 1 in the vicinity of the fire would likely be injured or killed. Impacts to wildlife offshore would be limited to individuals that may be on the water surface or flying overhead at the time of a release.

Impacts to wildlife within Zone 2 would be expected to be less than those in Zone 1. Some individuals may be impacted by radiant heat, while others may be impacted by being displaced temporarily from their home ranges. In the immediate vicinity of the proposed LNG terminal (where Zones 1 and 2 include some shoreline and onshore habitat), wildlife not directly impacted by the fire may lose foraging or mating habitat until the impacted area has recovered.

No impacts would be expected within Zone 3 from a pool fire. The maximum flammable range for a vapor cloud could extend to the outer limits of Zone 3. If the vapor cloud were to come in contact with an ignition source, the resulting fire could burn back to the spill and impact any wildlife within its path. However,

because of the marine transit safety and security measures, the probability of an LNG carrier spill from collisions, allisions and terrorist attacks would be unlikely. The potential wildlife impacts to terrestrial wildlife would be significant should a spill occur, but they would be mitigated by the aforementioned ability of mobile bird species to avoid the spill. However, since the probability of a spill is low, the probability of potential impacts to wildlife is also low. Additionally, wildlife would be expected to return to the affected area as the habitat reestablishes.

4.6.1.1 Sensitive Wildlife Areas

Sensitive wildlife areas are typically habitats that support breeding, rearing, nesting or calving, migration, overwintering, and/or foraging. These habitats are often associated with endangered and threatened wildlife species (see section 4.7).

The MDNR Wildlife Heritage Services (WHS) has indicated the presence of two colonial waterbird colonies in the vicinity of the terminal site. These two colonies are both located approximately 1.5 miles from the terminal site, one on Sparrows Point to the south and the other on Fort Carroll Island to the west. Species documented breeding at the Sparrows Point colony are herring gull and great black-backed gull (MDNR, 2007e). Species documented breeding at the Fort Carroll Island colony are great blue heron, little blue heron, great egret, snowy egret, cattle egret, black crowned night-heron, yellow crowned night-heron, glossy ibis, double-crested cormorant, herring gull, and great black-backed gull.

The WHS also has records of peregrine falcon (designated by Maryland as a Species In Need of Conservation) nesting on the Francis Scott Key Memorial Bridge (I-695) (MDNR, 2007f) approximately 1.4 miles from the proposed terminal site (as measured from the western end of the proposed LNG unloading pier).

Forest Interior Dwelling Species (FIDS) are those that require large forested tracts in order to live and reproduce. The loss of North American forest — fragmentation being the primary causal factor — has been the most significant contributor to the population declines of many of these species during the past 30 to 40 years (see Wildlife Resources Impacts and Mitigation, below). Specifically, FIDS habitat is defined as predominantly mature hardwood or mixed-hardwood-pine forest of at least 100 acres in size of which forest interior habitat composes at least 25% of the total forest area. The FIDS habitat must also contain one or more of the following:

- contiguous forest acreage of greater than 500 acres;
- riparian forest bordering a perennial stream or river and, on average, at least 600 feet in width;
- at least one highly area-sensitive species or black-and-white warbler, as probable or confirmed breeder;
- mature river terrace, ravine, or cove hardwoods, located at least 300 feet from the nearest forest edge; and
- at least five contiguous acres of old growth forest (as defined in the MDNR [1989] report “Old Growth Forest Ecosystems”) located at least 300 feet from the nearest forest edge.

The proposed pipeline route crosses bird habitat that has been classified as Maryland-designated FIDS habitat over a total of 40 distinct individual crossings. In addition, there are four access road crossings and one pipeyard with such designated habitats. FIDS habitats occurring within Maryland Critical Areas are protected as a Habitat Protection Areas (HPAs) under Maryland's Critical Area Law and Criteria. (See Section 4.8.3.2 for additional details regarding Maryland Critical Areas.) In contrast, protections for FIDS habitats occurring outside of Maryland Critical Areas are county-specific. For example, Harford County regulates FIDS habitat only within mapped Critical Areas (1,000 feet inland from tidal waters and tidal wetlands, with some expansion areas); outside of the Critical Areas, Harford County has no regulations addressing the protection of FIDS habitat (Harford County Department of Planning & Zoning, 2007). Baltimore and Cecil Counties have not responded to our inquiries regarding their county-specific regulations for FIDS habitat.

Table 4.6.1-2 below lists the individual pipeline crossings of sites designated by the State of Maryland as FIDS habitat for the protection of birds.

TABLE 4.6.1-2

Locations of Maryland-Designated Forest Interior Dwelling Species (FIDS) Habitat for Protection of Birds Crossed by the Proposed Pipeline Facilities

Starting MP	Ending MP	County	Starting MP	Ending MP	County
Mid-Atlantic Express Pipeline					
14.15	14.15	Baltimore	35.94	35.95	Harford
14.29	14.32	Baltimore	37.72	37.99	Harford
14.45	14.56	Baltimore	38.10	38.35	Harford
14.57	14.79	Baltimore	38.40	38.47	Harford
14.83	14.87	Baltimore	38.65	38.73	Harford
14.88	14.97	Baltimore	40.97	40.99	Harford
15.02	15.45	Baltimore	41.02	41.08	Harford
15.45	15.56	Baltimore	41.55	42.28	Harford
18.22	18.24	Baltimore	42.59	42.77	Harford
19.16	19.27	Baltimore	43.76	43.90	Harford
19.29	19.39	Baltimore	44.55	45.21	Cecil
19.39	19.64	Baltimore	45.25	45.66	Cecil
22.01	22.82	Baltimore/Harford	45.87	45.92	Cecil
27.04	27.33	Harford	46.20	46.20	Cecil
27.38	27.66	Harford	46.31	46.35	Cecil
27.67	27.84	Harford	46.48	46.52	Cecil
28.02	28.02	Harford	46.57	46.67	Cecil
31.65	31.69	Harford	46.68	46.72	Cecil
35.31	35.49	Harford	47.09	47.48	Cecil
35.56	35.62	Harford			
Access Roads					
14.90	14.92	Baltimore	45.00	45.32	Cecil
37.90	37.93	Harford	45.40	45.46	Cecil
42.70	42.77	Harford	47.30	47.38	Cecil
45.00	45.37	Cecil	47.30	47.32	Cecil
Pipe Yards					
38.00	N/A	Harford	45.00	N/A	Cecil

Portions of the project are located within Critical Areas designated under the Chesapeake Bay Critical Area Protection Program. Some of these are designated under that program as Limited Development Areas (LDAs), which contain natural plant and animal habitats with little impairment to the quality of runoff from these areas. The Maryland Designated Critical Areas are discussed in more detail in section 4.8.3.2.

The proposed pipeline crosses one NTWSSC at MP 22.23. A second NTWSSC is situated parallel to the pipeline right-of-way from MP 46.45 to MP 46.63 but would not be crossed. NTWSSCs are discussed in more detail in section 4.4.3.

No state game refuges, state wildlife management areas, or National Wildlife Refuges are located within 0.25 mile of the project area.

4.6.1.2 Wildlife Resources Impacts and Mitigation

Construction and operation of the Project would result in both short term and permanent alteration of wildlife habitat, directly impacting wildlife through disturbance, displacement, injury, and/or mortality.

Terminal Site

Vegetation clearing necessary to construct the LNG terminal would reduce wildlife cover, nesting, and foraging habitat. Of the wildlife species present in the terminal area, larger more mobile species would be temporarily displaced from the construction area to similar adjacent habitats, where available. Because most of the proposed terminal vicinity is developed, wildlife habitat in the terminal area is limited and does not support abundant wildlife populations. Wildlife displaced by construction would return to the temporarily disturbed construction areas soon after completion of construction and restoration. Construction and operation of the proposed terminal would result in the loss of wildlife habitat in any areas where open land would be permanently converted to industrial land use. Additionally, some individuals of less mobile species, such as small mammals, reptiles, and amphibians, as well as nesting birds located in the proposed construction areas, could be injured or killed by construction activities regardless of whether these activities are associated with temporary or permanent changes in land use.

Operation of low- and high-pressure flares associated with operation of the proposed LNG terminal could pose a threat to birds that utilize tall structures as perches as well as to migrating birds that may inadvertently fly through the plume of superheated gases. However, the risk of the flares to birds would be minimal and temporary since use of the flare would be limited to emergency situations. The risk can be reduced by installing perch guards on the flares to discourage or eliminate perching.

Construction activities typically produce a number of direct and indirect adverse impacts to wildlife and wildlife habitat ranging from alteration of the physical environment to noise and traffic impacts. Clearing and grading of vegetation directly removes the plant community from an area and may result in direct mortality to small wildlife species, or wildlife that cannot effectively retreat from construction equipment. The reduction of habitat may also increase crowding for individuals that remain. The increase in human activity and associated noise tends to displace some wildlife out of the construction area, which in some instances serves as a mitigating factor by reducing direct impacts. Following construction activities, displaced wildlife either would return to the area or, if the conditions are no longer suitable for that species, would move to other areas in search of suitable habitat.

Proposed terminal structures may present physical obstacles for flying wildlife (i.e., birds and bats) resulting in direct strikes, although most strikes occur with electric transmission lines, wind generators, communication towers, aircraft, and glass-sided buildings (ATSB, 2006; Cain et al., 2004; Grasso-Knight and Waddington, 2000; ICAO, 2001; Klem, 1989, 1990; Dove et al., 2003; Malakoff, 2004; O'Connell, 1998; USFWS 2002; Varga et al., 2006). Additionally, the open literature suggests that stationary structures such as those proposed for the terminal site are more of a hazard for birds than they are for bats which are more impacted by moving structures (e.g., wind turbines).

Terminal lighting (i.e., night illumination of the terminal) would most likely cause some degree of behavior alteration in terrestrial and avian wildlife. However, such impacts are anticipated to be minor considering the industrial nature of the surrounding area. Light pollution can cause increased or decreased orientation of wildlife as some animals are attracted to or repulsed by glare. This can result in alterations in behavior such as foraging, reproduction, communication, and other critical behaviors. Generally, disorientation tends to be associated with increased ambient lighting whereas attraction or repulsion tends to be associated with discrete light sources. Some organisms, such as amphibians, display dual reactions to light and may be repulsed then attracted to the same light sources (Salmon, 2003). Birds tend to become disoriented by strong light sources, then remain in the area, essentially "trapped" by the light where they are more prone to collision with other birds, collision with structures, exhaustion, or predation (Longcore and Rich, 2004) Migrating first-year birds tend to be the greatest victims of lighting effects (Batinsey, 1997). Lighting also reduces the amount of suitable hunting area for owls and other night-hunting birds (Batinsey, 1997).

Potential effects on reproduction from light include poor mate selection due to accelerated mating activity for fear of predation from increased visibility. Night lighting also inhibits amphibian movement to and from breeding areas by affecting phototactic behavior. Effects on communication and other ecological behavior such as competition and predator-prey interactions are more complex but have been documented (Longcore and Rich, 2004).

Shielding of lights is an effective control for reducing the amount of non-directed glare emanating from a light source, although down-shielding does not eliminate adverse effects of illuminating the ground -- such impacts are unavoidable short of eliminating the light source. Other recommended practices for minimizing light pollution include utilizing the lowest acceptable light levels for particular uses, reducing the amount of time that an area is illuminated (Batinsey, 1997).

The use of non-reflective paint on the surfaces of buildings and the use of low-level, pulsed lighting would decrease bird strikes. Recent research (Manville, 2000) indicates that solid or pulsating (beacon) red lights attract night-migrating birds at a much higher rate than white strobe lights. There is specific guidance from the FAA pertaining to the use of low-level, pulsed lighting for pilot warning and obstruction avoidance of tall structures. The FWS has subsequently incorporated this guidance into their recommendations for minimizing wildlife impacts from communication towers (FWS, 2000). The FWS recommendations do not specify a height at which non-reflective paint should be used, nor has any guidance on the use of non-reflective paint for specific building heights been found in the open literature. Therefore, the FWS recommendations for minimizing adverse impacts to wildlife from communication towers were used as guidance for developing recommendations for the terminal site. Therefore, **we recommend that:**

- **<u>Prior to the start of construction of the LNG terminal</u>, AES should file with the Secretary, for review and written approval by the Director of OEP, a final facility bird strike/impact minimization plan and operational procedures established to minimize impacts on birds. This plan should include, at a minimum, the following:**
  - **a. that AES downshield all lighting sources in the terminal site, including lighting used during construction activities;**
  - **b. that AES install perch guards on the flares to discourage or eliminate perching;**
  - **c. that AES paint the LNG storage tanks and the entirety of any structures 150 feet tall or taller above ground level with non-reflective paint; and**
  - **d. that on any structures 200 feet tall or taller above ground level, AES use the minimum amount of pilot warning and obstruction avoidance lighting required by the FAA, using only white (preferable) or red strobe lights at night, unless otherwise required by the FAA, and employ the minimum number and minimum intensity of flashes per minute (longest duration between flashes) permitted by the FAA.**

Pipeline Route

Construction and operation of the proposed project would result in temporary impacts to wildlife and wildlife habitats along the pipeline route, including vegetation clearing which would reduce wildlife cover, nesting, and foraging habitat. Similar to construction of the LNG terminal, some individuals of less mobile species, such as small mammals, reptiles, and amphibians, as well as nesting birds located in the proposed construction areas, could be injured or killed by construction activities. Most of these impacts would be localized and occur in previously developed or disturbed areas. Approximately 84 percent of the proposed pipeline route would parallel and partly or wholly overlap the permanent rights-of-way of the BG&E overhead transmission or Columbia pipeline corridors. The remaining pipeline route would utilize other existing right-of-way corridors such as roadways and railroads.

The widening of existing corridors through forest would not alter the amount of forest edge habitat. Clearing associated with construction of the proposed pipeline is not expected to permanently alter the wildlife

community inhabiting these existing corridors in most circumstances because the forest is already fragmented. However, in some locations, existing corridors through forest may be sufficiently narrow that forest interior species do not perceive them as uncrossable or unapproachable barriers (e.g., 8-meter-/26-foot-wide corridors as in Rich et al., 1994). Thus, widening of certain Columbia right-of-way segments that would be paralleled by the proposed Mid-Atlantic Express Pipeline may fragment currently functional forest interior habitat.

Proposed measures to minimize potential impacts to wildlife from construction along the proposed pipeline route include adherence to construction and mitigation methods identified in the project ECP. Such measures would include the restoration of vegetative cover, wetland and stream stabilization, and site-specific mitigation for sensitive or significant wildlife areas.

Long-term impacts on wildlife resources along the pipeline route would be minimized by AES's adherence to its ECP. These plans allow for annual maintenance of only a 10-foot-wide strip centered over the pipeline. Routine vegetation maintenance across the entire permanent right-of-way would occur only once every 3 years in uplands and would be restricted in wetlands to the periodic clearing of trees greater than 15 feet in height that are within 15 feet of the pipeline centerline. To further protect nesting birds and in accordance with AES's ECP, routine vegetation maintenance would only be conducted between August 1 and April 15, which is outside of the typical nesting season for most bird species.

Based on our review of the proposed project and mitigation measures, we believe that impacts to wildlife resulting from construction and operation of the LNG terminal, proposed pipeline and associated aboveground facilities would not be significant.

4.6.1.3 Impacts to Sensitive Wildlife Areas

As discussed above, forest interior dwelling bird species — including many songbirds such as tanagers, warblers, and vireos, as well as woodpeckers, hawks, and owls — require large tracts of unbroken forest to breed successfully and maintain viable populations. Therefore, a substantial area of unbroken forest is required in order to provide suitable forest interior habitat. Fragmentation results in smaller forest tracts which may no longer be suitable to accommodate a bird's territory, to provide a sufficient food supply, or provide the necessary physical structure for successful breeding. Fragmented forests also lose their capacity to buffer environmental factors such as humidity, noise, and physical structure (CAC, 2000). Fragmentation also increases the amount of forest edge within a previously unbroken forest. These edges are less favorable for wildlife species that require forest interiors, and they facilitate entry of invasive species that can outcompete the native, interior dwelling species. These various factors directly result in decreased habitat utilization and reproductive success of forest interior species (CAC, 2000). Many crossings of forested areas, including Maryland-designated FIDS habitat, along the proposed pipeline route would occur along existing access roads and utility corridors. Therefore, many of these FIDS habitats have pre-existing encroachments, and thus the proposed pipeline would not create new corridors in these locations. However, widening existing corridors through forest would decrease the overall forested area; this can have incremental adverse effects on those species requiring extensive forested land. In order to minimize impacts on FIDS habitat and sensitive bird species, **we recommend that**:

- **<u>Prior to construction</u>, Mid-Atlantic Express should consult with the appropriate FIDS habitat management entities in Maryland and file with the Secretary the results of the consultation, including any agency-required FIDS habitat mitigation plans.**

The MDNR has established guidelines for the protection of the colonial waterbird colonies on Sparrows Point and Fort Carroll Island. These protections are based on the establishment of protection zones around the colonies. The overall protection area is a 0.25-mile radius around the nesting colony's outer boundary. Since both waterbird colonies are located 1.5 miles from the terminal site, no adverse impacts to these nesting sites are expected.

Similarly, the MDNR has established timing restrictions as protection guidelines for nesting peregrine falcon on the Francis Scott Key Memorial Bridge. These protections extend for approximately 0.25 mile outward

from the nesting site. No adverse impacts to the nesting site are expected since the nesting site is located approximately 1.4 miles away from the terminal site.

4.6.2 Aquatic Species

Essential Fish Habitat species are addressed in section 4.6.3.

4.6.2.1 Affected Environment – Aquatic Species

LNG Terminal

There are two broad categories of aquatic habitat within the Patapsco River near the proposed LNG terminal site: open waters of the Marine Channel; and intertidal and subtidal shallows. These habitats include both the water column and benthic substrates.

Intertidal mudflats are not present in the immediate vicinity of the proposed LNG terminal as the area has been industrialized and the shoreline previously has been altered to accommodate large vessel traffic. The only intertidal substrates available are bulkheads, piers and other manmade structures. Subtidal substrates provide important feeding habitats for fish and benthic organisms that feed on aquatic invertebrates. The deeper bay and river bottoms are usually composed of softer mud, silt, and clay with little or no aquatic vegetation and limited light penetration. These deep areas may provide habitat for various invertebrates and demersal finfish.

The proposed terminal site provides habitat for aquatic resources from both the open waters of the Chesapeake Bay and the tidal Patapsco River, which borders the proposed terminal site (figure 2.1-1). The open waters of the Patapsco River provide a migratory corridor for anadromous (migrating from salt water to spawn in fresh water) and catadromous (spawning in the ocean but completing most of its life cycle in fresh water) fish that move between their respective spawning and nursery grounds in the non-tidal main stem of the river, and tributaries such as Gwynns Falls and Curtis Creek. These fish species include alewife, blueback herring, American shad, white perch, yellow perch (preceding species addressed in more detail in Section 4.6.3 Essential Fish Habitat), and American eel (O'Dell et al., 1975; NMFS, 2006a). The American eel is the only true catadromous fish that may occur in the project area. Several age classes of eels could be present at any given time. Like many of the fish present in the waters near the proposed LNG terminal, the American eel is a habitat generalist and thus may occur in both deep and shallow water.

The proposed LNG terminal would be located in a highly industrialized area with sediments consisting mainly of a soft mud and clay. Waters adjacent to the proposed terminal site have been characterized as estuarine, subject to change based on freshwater inflow, weather conditions, and other factors. Therefore, the fish assemblages in this area tend to consist of species that can tolerate a wide range of salinities (e.g., alewife, Atlantic croaker, Atlantic menhaden, bay anchovy, and white perch, among others). The riverine area near the proposed LNG terminal site supports an estuarine fish assemblage that includes anadromous, resident, and catadromous species. The project area in the vicinity of the proposed LNG terminal does not support any submerged aquatic vegetation (SAV) (see Section 4.5 for additional details on SAV). This section of the Patapsco River is considered impaired due to point and non-point sources throughout the watershed (MDE, 2007c) and was listed as an impaired waterbody under the CWA (USGS, 2007). However, the Chesapeake Bay Program (CBP) is attempting to reduce nutrient and sediment loads in the bay by 2010 (USGS, 2007). As water quality improves, the suitability of the general proposed LNG terminal area as potential spawning habitat increases. The discussion below of species occurring at or near the proposed LNG terminal site is based on current studies and recent literature. Future changes to water quality may alter species occurrence and distribution in this area.

The lower Patapsco River estuary also provides nursery habitat for young-of-the-year of species which are ocean-spawned or spawned in other areas of the bay. These species include striped bass, bluefish, summer flounder, winter flounder, spot, Atlantic croaker, and blue crab (Lippson, 1973; Cronin, 1971; COE, 2006; NMFS, 2006a). (Additional details regarding bluefish and summer flounder can be found in Section 4.6.3 Essential Fish Habitat.) AES sampling showed that the proposed LNG terminal area is dominated by the

amphipod *Leptocheirus plumulosus*, the bivalve *Macoma balthica*, and the polychaete worm *Streblospio benedict*. Sampling conducted at the proposed site indicated that the benthic community consisted of 13 species and was dominated by the polychaete *Nereis succinea* (47% of collected individuals) followed by the bivalve *Tellina agilis*, and the polychaete *Streblospio benedicti* (combined 15% of collected individuals).

The Chesapeake Bay supports a major blue crab fishery. AES found low numbers of blue crabs in bottom trawls in the vicinity of the proposed LNG terminal. They comprised less than 1% of the trawl catch in June, and 8% of the trawl catch in October. This indicates that the area in the vicinity of the proposed LNG terminal area may provide some suitable habitat for blue crabs.

Game and non-game fish species are regulated and protected under various federal laws, including the Fish and Wildlife Conservation Act of 1980 (16 U.S.C. §§ 2901-2911) and the Fish and Wildlife Coordination Act of 1958 (16 U.S.C. § 661 et seq.).

Table 4.6.2-1 lists fish species that are known to occur in or near the proposed LNG terminal area.

Pipeline

The waterbodies crossed by the pipeline that support anadromous fish species are White Marsh Run, Gunpowder Falls, Deer Creek, Susquehanna River, and Octoraro River. The anadromous fish species in these waterbodies include alewife, blueback herring, white perch, hickory shad, and American shad (NMFS, 2006a). River herring (alewife, blueback herring, hickory shad, and American shad), yellow perch, and white perch are important prey for many game species and are managed by the Atlantic States Marine Fisheries Commission. See section 4.6.3 (Essential Fish Habitat) for more information on these species. The Maryland darter is also suspected to occur in Deer Creek (see Section 4.7). Other fish species (i.e., non-anadromous) that may occur in waterbodies crossed by the proposed pipeline include brown trout, rainbow trout, largemouth bass, smallmouth bass, various species of sunfish, chain pickerel, rock bass, blacknose dace, common shiner, cutlips minnow, creek chub, and white sucker (MDNR, no date, 2008; Hocutt and Stauffer, 1975).

The waterbodies and associated habitats that would be crossed by the project also support numerous aquatic species other than fish. Amphibians and reptiles in these types of habitats include the spring peeper, green frog, northern leopard frog, wood frog, northern water snake, snapping turtle, and painted turtle. Bird species that commonly breed in these types of habitats include the red-winged blackbird, swamp sparrow, and common yellowthroat. Numerous other bird species that utilize surrounding terrestrial habitats are also expected to occur within these wetlands and stream corridors. Mammal species typically found in these wet habitats include muskrat, beaver, white-tailed deer, shrews, and moles.

Waterway for LNG Marine Traffic

Aquatic species expected along the waterway for LNG marine traffic that could potentially be impacted by an LNG spill would be open water species such as fish, seabirds, marine mammals, and sea turtles. Fish species found along the waterway would include those listed in Table 4.6.2-1 and further discussed in Appendix E. Waters along and near the LNG marine traffic route also provide breeding, foraging, and/or migration habitat for such species. Cetacean species (i.e., whales, dolphins, and porpoises) that may be encountered along the proposed LNG marine traffic route in Chesapeake Bay include the minke whale, pilot whale, Atlantic spotted dolphin, common dolphin, striped dolphin, bottlenose dolphin, and rarely the North Atlantic right whale, fin whale, humpback whale, and sperm whale. The harbor seal is the only pinniped species (i.e. seals, sea lions, and walruses) expected to be found along the LNG marine traffic route (NMFS, 2006a). Limited areas of intertidal mudflats are present in Zone of Concern 3; this habitat provides important nursery and feeding areas for birds, fish and invertebrates. Sea turtles, sturgeon, and marine mammals are federal- and/or state-listed endangered and threatened species; these are discussed in detail in section 4.7.

TABLE 4.6.2-1

Representative Game and Commercial Fish Species Known to Occur in the Proposed LNG Terminal Vicinity

Species a/	Commercial Fishery	Recreational Fishery	Nursery and/or Spawning Habitat	Fishery Management Plans b/
Fish				
Alewife	x	x		x
American eel	x	x		x
American shad	moratorium	x	x	x
Atlantic croaker	x	x		x
Atlantic menhaden	x	x		x
Atlantic sturgeon c/	closed	closed		x
Banded killifish				
Bay anchovy				
Black Sea Bass	x	x		
Blueback herring		x		x
Bluefish	x	x		x
Bluegill		x		
Chain Pickerel		x		
Channel catfish		x		
Gizzard shad	x	x		x
Hickory shad	moratorium	x		x
Hogchoker				
Pumpkinseed		x		
Shortnose sturgeon d/	closed	closed		x
Spot	x	x		x
Spotted hake				
Striped bass	x	x	x	x
Summer flounder	x			x
Weakfish				x
White catfish				
White perch	x	x		
Winter flounder	x			
Yellow perch	x	x		
Shellfish				
Blue crab	x	x		x
Horseshoe crab				x

a/ Sources:
(a) AES fish and invertebrate sampling in the proposed LNG terminal area, June and October 2006.
(b) Sampling at the H.A. Wagner Generating Station on the opposite shore of the Patapsco River from the proposed LNG terminal site between March and August 2006 (EA Engineering Science, Technology, Inc. 2007).
(c) NMFS, 2007.

b/ Indicates species for which Fishery Management Plans have been implemented. Plans can be accessed from http://www.asmfc.org/managedSpecies.htm

c/ Pennsylvania Endangered

d/ Maryland Endangered and Federal Endangered

Special Concern Aquatic Resources

The Susquehanna River provides key spawning and nursery habitat for the American shad along its entire length. The proposed LNG terminal site is located approximately 100 miles south of the confluence of the

Susquehanna River with the Chesapeake Bay. Mid-Atlantic Express plans to cross the Susquehanna River utilizing an HDD crossing to reduce any potential direct impacts (see section 4.6.2.2, Pipeline Construction and Operations subsection for additional details). American shad are addressed in more detail in Section 3.6.3 Essential Fish Habitat.

The Chesapeake Bay and the Susquehanna River once supported a commercial and recreational Atlantic sturgeon and shortnose sturgeon fishery; however the fishery was closed in 1998 by the Atlantic States Marine Fisheries Commission (ASMFC). The Atlantic sturgeon is listed as endangered in the state of Pennsylvania. The shortnose sturgeon is a federal endangered species according to the FWS and is also state listed as endangered in Maryland. Endangered and threatened species are discussed further in section 4.7.

NMFS has noted that Deer Creek (MP 35.54), which would be crossed by the proposed pipeline, has significant populations of yellow perch and white perch and is considered a sensitive stream by NMFS. The only known population of federal and state endangered Maryland Darter is in Deer Creek approximately 5 miles from where the pipeline would cross (see section 4.7.1.4).

Other aquatic species listed as endangered or threatened by the federal government, Maryland, Virginia, and/or Pennsylvania that may occur in the project area are North Atlantic right, humpback, fin, and sperm whales; green, Kemp's ridley, leatherback, and loggerhead sea turtles; Maryland darter; and logperch. These species and measures to mitigate impacts to them are addressed in detail in section 4.7.

Other cetaceans typically found along the proposed transit route in Chesapeake Bay include minke and pilot whales; and Atlantic spotted, common, striped, and bottlenose dolphins. The harbor seal is the only pinniped species expected to be found along the marine traffic transit route (NMFS, 2006e). All marine mammals are protected under the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361-1421; Public Law 92-522, as amended). Potential impacts to unlisted marine mammals are expected to be similar to those for the endangered whales described in section 4.7.1.1.

4.6.2.2 Impacts and Mitigation - Aquatic Species

LNG Terminal Construction

Dredging Impacts

Construction of the proposed LNG terminal would require the dredging of approximately 3.7 million CY of material from the Patapsco River, affecting approximately 118 aquatic acres. The dredging of the ship berth would affect aquatic species and their respective habitats. The extent of the impacts depends on project timing and duration, sediment texture and composition, and fish life stage and behavior. The direct and indirect effects on fish and their prey species include the alteration of water quality and removal of habitat. Specifically, the proposed dredging could contribute to degradation of water quality through increases in turbidity, releases of chemical and nutrient pollutants from sediments, and the introduction of chemical contaminants. Turbidity resulting from the suspension of sediments would also reduce light penetration and the corresponding primary production of aquatic plants, algae, and phytoplankton. Fish that are strong swimmers, such as bluefish, would avoid poor water quality conditions caused by dredging activities.

Additionally, the suspension of organic materials and sediments could cause an increase in biological and chemical consumption of oxygen, resulting in a decrease of dissolved oxygen concentrations in the affected area. Lower dissolved oxygen concentrations could temporarily displace aquatic organisms — for example, summer flounder can avoid low dissolved oxygen conditions (Festa, 1977) — and may stress or kill sessile benthic organisms within the affected area.

Dredging to create the berth and to deepen the shipping channel may result in both short-term (i.e., during construction) and long-term (i.e., for the life of the project from maintenance dredging of the channel) reductions in dissolved oxygen (DO) concentrations in the dredged areas.

AES has indicated that they believe that there would be an increase in dissolved oxygen in the shipping channel after dredging. AES believes that the removal of barriers to circulation of water would allow circulation to occur in the deeper areas of the channel where it currently does not take place. However, AES has indicated that it would consult with agencies and, if required by these agencies, would develop sampling and mitigation measures for possible low oxygen areas. We believe that this issue requires additional consultation with the appropriate agencies to determine the necessary mitigation. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, AES should consult with the NMFS, MDNR, and the ASMFC on the potential for depressed dissolved oxygen in the Patapsco River due to its dredging and maintenance of the ship channel, and file the results of the consultation and any agency-approved mitigation plan(s) with the Secretary.**

As described previously, dredging activities would result in the disturbance of about 118 acres of benthic substrate in the Patapsco River. As previously indicated, there is a commercial and recreational shellfishery for blue crabs in Chesapeake Bay. Dredging would negatively impact blue crabs by the direct physical action of the dredge on the bottom substrate creating potential for smothering. Also, the aforementioned dissolved oxygen decrease may indirectly impact blue crabs. Project dredging would also affect various polychaetes, bivalves, isopods, and amphipods. These benthic organisms are a food source for demersal finfish during part or all of their life cycles and therefore dredging may indirectly influence abundance of animals at higher trophic levels.

The direct alteration of the benthic substrate via dredging would remove the existing benthic community and may adversely affect finfish through loss of or changes in prey species abundance or availability. However, pioneering benthic invertebrates would likely colonize the dredged area soon after completion of dredging. Also, conversion of shallow benthic habitat to deeper, channel-like benthic habitat would not likely alter the benthic community in the vicinity of the proposed LNG terminal.

Dredging also has the potential to introduce deleterious compounds currently in the bottom sediments (e.g., metals) into the water column. High levels of polycyclic aromatic hydrocarbons (PAHs), dioxins, and heavy metals were identified in some sediment samples from the LNG terminal area (see section 4.2.2). In addition to potentially causing behavioral responses in fish (primarily avoidance), the introduction of these or other chemical contaminants could have acute and/or chronic growth and physiological effects on fish.

In addition to potentially releasing deleterious compounds into the water column, suspended sediments could have direct and indirect physical effects on pelagic and benthic communities in the Patapsco River. Direct impacts (e.g., interference with oxygen exchange across gills, or with vision needed for foraging) to aquatic species could result from the exposure to sediment particles and indirect impacts could result from habitat alteration caused by sediment deposition. AES sampling indicates that the deeper sediments in the proposed LNG terminal area have fewer and lower levels of contaminants than shallower sediments. Therefore, there may be a reduction in surface sediment contamination after dredging.

Dredging could affect all life stages of the smaller, common resident species (e.g., white perch, yellow perch, and spot), juveniles of the large resident species, and juveniles of anadromous species. (See Section 4.6.3 Essential Fish Habitat for additional details on white and yellow perch.) Because the proposed LNG terminal area does not currently contain any SAV, there would likely be little effect on the adults and juveniles of other finfish species.

The effects of re-suspension of sediments from dredging are considered to be temporary as sediments would fall out of the water column back to the benthos in a relatively short time period (usually within days). Dredging operations impacting contaminated sediment would be conducted in accordance with COE permit conditions, and may include utilization of a mechanical dredge bucket (clamshell), or as warranted an environmental dredge bucket to reduce potential environmental impacts (see section 4.3.2 for additional details).

Pier Construction and Pile Driving Impacts

AES proposes the use of an existing pier with its current pilings for building the unloading dock. Modification of the pier and the installation of marine dolphins would increase the structural complexity of the aquatic habitat, provide an additional hard substrate for colonization by sessile aquatic organisms, and provide eddy habitat downstream of the pilings that could be used by resident and migrating fish species during high flow periods.

Predatory species, especially those that forage primarily by sight, are often sensitive to intense sunlight and seek shade or deeper water during periods of intense sunlight. The aquatic habitat in the Patapsco River is almost devoid of aquatic vegetation in the offshore area of the proposed LNG terminal and lacks shaded areas where fish can avoid direct sunlight during the day. The proposed modifications to the pier could enhance the habitat for predators such as striped bass and other species that avoid intense direct sunlight during the day. However, these effects are only expected in the immediate vicinity of the terminal.

AES intends to use the existing pilings for the foundation of the unloading dock. The driving of hollow steel piles with impact hammers produces intense, sharp spikes of sound that can injure or kill fish. For example, on a recent project, NMFS (2007) has indicated that driving bridge piles (hollow steel more than 50 inches in diameter) produced shock waves that killed most fish up to approximately 150 feet away. In some cases, fish may be startled by the first few strikes of an impact hammer. However, this response can wane and the fish may remain in the area (NMFS, 2001). As such, the potential effect on fish from impact hammers could be magnified because fish would not only be exposed to intense sound waves but may not avoid pile-driving activities, which would prolong their exposure to the potentially harmful sounds and increase their risk of injury or death.

Although some fish may become acclimated to certain sounds, acoustic disturbance could cause other fish to avoid the construction area. If pile installation were to occur during anadromous fish migrations, the avoidance of nearshore areas could restrict migrating fish to deepwater areas that are less suitable for some species; this in turn could increase the susceptibility of some smaller species to predation. Given the small area that would be affected by acoustical disturbance, it seems unlikely that these effects would substantially alter migration patterns, the relationship of predator or prey species, or their abilities to find shelter or forage.

AES has proposed to use an observer to monitor construction activities on or near water to determine if critical aquatic organisms are near the work area. Work would be stopped or redirected to avoid impacts with the organisms if the organisms are within 50 feet of the work area. Work after sundown would be avoided whenever possible, and the observer would be equipped with night-vision goggles to minimize impacts at night. AES would implement a "soft start up" technique during sheet pile driving activities for bulkhead construction.

The NMFS (2007) has informed us that fishes found in areas near pile driving activities are adversely impacted or killed by the sound and pressure waves created from pile driving. NMFS (2007) described a casing and bubble curtain combination that has been used successfully for the Wilson Bridge project (over the Potomac River on the southern edge of Washington, DC) to reduce the pressure wave caused by pile driving. Other potential solutions may be available to reduce the impacts from pile driving. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, AES should file a construction plan for the unloading dock developed in consultation with the NMFS. The plan should include NMFS comments on the use of existing pilings and any recommended mitigation measures, including pressure and sound wave mitigation.**

Other Potential Impacts

Construction of the onshore portions of the LNG terminal would temporarily increase erosion, stormwater runoff, and the potential for sediments to reach the Patapsco River. If uncontrolled, this sediment could degrade water quality, increase turbidity, affect fish usage of the affected area, and smother aquatic life,

especially benthic invertebrates. To minimize the effects of erosion and sedimentation on the river, AES would construct the facility in accordance with its ECP.

Hydrostatic testing of the LNG tanks, including proposed measures to protect aquatic life, is described in section 4.3.2.8. In order to confirm that AES's LNG tank hydrostatic testing would be acceptable with the MDNR and NMFS, we are recommending in Section 4.3.2.8 that AES consult with these agencies regarding hydrostatic test water withdrawal and discharge.

Stormwater runoff during construction and operation of the LNG terminal also has the potential to adversely affect water quality and thereby indirectly affect aquatic resources. To minimize this potential impact, the LNG Terminal would operate under SIC Code 4922, and would apply for coverage under the Maryland General Permit for Stormwater Discharge associated with Industrial activity. As such, AES would 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 would be routed to the Baltimore County publicly-owned treatment works (POTW). AES would obtain a permit for discharge to the POTW prior to initiation of operations at the LNG Terminal. The discharges to the POTW would be monitored and treated to meet the pre-treatment standards required by the Baltimore County POTW.

Direct spills of petroleum products into the Patapsco River from construction equipment could be toxic to fish. To reduce the potential for direct surface water contamination during construction and dredging, AES would implement its SPCC Plan. This plan would include provisions that prohibit the storage of fuel and other potentially toxic materials within specified distances of waterbodies and procedures to minimize potential spills during the refueling of equipment. This plan would also outline procedures for containing, cleaning up, and reporting spills. Adherence to the SPCC Plan would reduce the potential of a spill and response time for control and cleanup of a spill, should one occur. Therefore, the probability of a spill of hazardous materials would be reduced and the temporary and permanent impacts to aquatic life are expected to be negligible.

LNG Terminal Operation

Maintenance Dredging Impacts

Approximately 500,000 CY of dredged material would be removed every six years from the area of the access channel, turning basin, and marine area adjacent to the unloading pier. Disposal of this material would be conducted in compliance with all federal and state permits and authorizations. Impacts associated with maintenance dredging would be similar to those described above for initial dredging activities, but would occur on a shorter and smaller scale compared to initial dredging operations.

AES is consulting with local authorities to determine if placement in Dredged Material Containment Facilities might be a feasible option for disposal of the maintenance dredged material. Consequently, AES is exploring other means of disposal including innovative reuse or beneficial uses of the dredged material via, as necessary, continued use of the Dredged Material Recycling Facility (DMRF). This facility reportedly has capacity to handle maintenance dredged material for many years.

Prop-Wash Impacts

During operation of the LNG terminal, prop wash from LNG ships and tugs could temporarily increase suspended sediments and turbidity within the ship channel and ship berth. As a vessel navigates through a waterway, it generates hydraulic disturbances in the form of waves and currents, mainly drawdown, return current, slope supply currents, wash waves, and jet wash (Wolter and Arlinghaus, 2003). These activities have the potential to suspend and redeposit sediments similar to but not necessarily on the same scale as dredging.

A study conducted by AES modeled a worst case scenario of sediment re-suspension during shipping activities, specifically from prop-wash of tugboats at the LNG terminal. The model indicated that re-suspended sediments would remain in the near-field Patapsco River-Bear Creek area, that no sediments would

be transported far upstream in Bear Creek, and that only very low amounts of sediments would potentially be transported downstream (1-2 km, or 0.6 – 1.2 mile) into the Patapsco River.

Ballast Water Impacts

LNG ships calling from international ports could potentially introduce aquatic invasive species into U.S. waters. Alternatively, visiting LNG ships could transport native species to other parts of the world. Although the potential for this to occur cannot be entirely eliminated, several factors, both general and specific to the project, tend to mitigate this potential impact. First, because the proposed facility would be a receiving terminal, LNG ships would arrive loaded and thus would not discharge ballast water into the Patapsco River; this would significantly reduce the potential to introduce invasive aquatic species into the project area. Second, the LNG ships that would visit the proposed terminal would arrive from ports located primarily throughout the Atlantic region, which is also where the project is located. Third, the Baltimore harbor vicinity is not a new port, and ships of all types originating from different ports have and will continue to visit the Patapsco River; thus the chances of LNG carriers' being a new source of invasive species is negligible. Fourth, legislation is currently being considered by the U.S. Senate that would require all ships entering U.S. ports to have on board an aquatic species management plan outlining actions to minimize the transfer and introduction of invasive species. Finally, in February 2004, the International Maritime Organization (IMO, 2007), the United Nations agency responsible for the safety and security of shipping and the prevention of marine pollution from ships, adopted a new international convention to prevent the potentially devastating effects of the spread of harmful aquatic organisms carried by ships' ballast water. The Convention requires all ships to implement a Ballast Water and Sediments Management Plan. All ships would be required to carry a Ballast Water Record Book and to implement ballast water management procedures to a given standard. Existing ships would be required to do the same, but after a phase-in period. However, 30 states representing 35% of world tonnage must ratify this convention before it is entered into force (IMO, 2007).

LNG vessels in the 217,000 m^3 range - a size representative of ships that would visit the proposed terminal - typically can carry up to 80,000 m^3 of ballast water, the maximum capacity of their ballast tank. These LNG vessels typically have two to three onboard pumps each with a 2,500 cubic meter per hour (m^3/hr) rated capacity. The ballast intake apertures of the LNG vessels would typically be located 25 to 30 feet below the water surface and outfitted with mesh screens to minimize entrapment, entrainment, and impingement.

To minimize impacts to aquatic organisms, NMFS has recommended that ballast water intakes be screened to 2 mm and the intake velocity be less than 0.5 fps where practical. Since AES does not own or expect to own any of the LNG vessels that would deliver product to the LNG terminal, AES cannot commit that ballast water would be screened through 2 mm mesh screens and an intake velocity of less than 0.5 fps would be maintained. However, AES would recommend these restrictions to the LNG vessel operators. AES would also request that vessels only take on sufficient water to ensure stability of the ship and to extend ballast intake times from the typical 10 hours to 12 hours or more as practical. If vessel operators are unable to meet these requirements, then they would be required to provide an explanation for their inability to meet the requirements and a description of the requirements that they are able to meet. That information would be shared with NMFS once received. If vessel operators cannot meet the requirement, impingement and entrainment of fish, larvae, and eggs would occur, resulting in direct mortality.

Tank Deluge System Impacts

AES proposes to use a double screen system for the tank deluge system to provide protection against large debris and the intrusion of mussel larvae. These screens would be cleaned regularly and periodically replaced. The intake screen design would reduce the water velocity passing through the screens to 2 fps or less. The velocity cap would not reduce the intake velocities to less than 0.5 fps; however, the tank deluge system would only be employed intermittently: in the rare event of a fire at the terminal facility as well as periodically to test the pumps. Operation of the tank deluge system would not result in significant impacts to aquatic resources.

Pipeline Construction and Operation

As described under the below subheadings, impacts to fishery resources, due to general disturbance, sedimentation and turbidity, destruction of stream bank cover, introduction of water pollutants, or entrainment of fish could result from construction activities. The impact of construction on fish and other aquatic organisms is expected to be localized and short term. NMFS may still require timing restrictions in order to avoid potential impacts to spawning fishes in the event of a frac-out.

Several streams crossed by the pipeline may support spawning by anadromous fishes including river herring species (American shad, hickory shad, alewife, and blueback herring), as well as yellow perch and white perch (see section 4.6.3 for further discussions of the preceding species) and other species noted in section 4.6.2.1. Mid-Atlantic Express's proposed crossing methods for sensitive streams such as Deer Creek, White Marsh Run, Octoraro Creek, Buck Run, and East and West Branches of Brandywine Creek (see "Special Concern Aquatic Resources" in section 4.6.2.1) are discussed in section 4.3.2.3. As Stated in Mid-Atlantic Express's ECP, unless expressly permitted or further restricted by the appropriate state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, would occur during the following time windows: 1) coldwater fisheries - June 1 through September 30; and 2) coolwater and warmwater fisheries - June 1 through November 30. Through consultation with MDNR and Pennsylvania Fish and Boat Commission (PFBC), Mid-Atlantic Express has also determined that additional seasonal restrictions (i.e., not starting stream crossing construction before June 15) would be necessary for certain streams including those listed above (see Appendix I). However, Mid-Atlantic Express has not indicated that either FWS or NMFS were consulted regarding seasonal construction restrictions to protect spawning fish in streams. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express should consult with the FWS and the NMFS regarding seasonal construction restrictions to protect spawning fishes in sensitive waterbodies, including the Back River, Little Gunpowder Falls, Susquehanna River, Deer Creek, White Marsh Run, Octoraro Creek, Buck Run, East Branch Brandywine Creek, and West Branch Brandywine Creek. Mid-Atlantic Express should file with the Secretary the results of these consultations and a seasonal waterbody crossing schedule developed in consultation with these agencies.**

Sedimentation and Turbidity

Increased sedimentation and turbidity as the result of construction activities have the greatest potential to adversely affect fishery resources. Sedimentation is known to bury demersal fish eggs, while turbidity affects juvenile and adult fish by reducing oxygen uptake by the gills. In-stream turbidity levels generally increase during construction but decrease rapidly after construction activities are completed (Vinkour and Shubert, 1987; Blais and Simpson, 1997). Turbidity also reduces photosynthesis of aquatic vegetation, which results in reduced dissolved oxygen levels in the water column and reduces the quality of habitat available for aquatic species.

Standard open-cut waterbody crossing techniques could elevate the concentration of suspended solids, but the elevated levels would only be high for relatively short periods and short distances downstream of the crossing. Increased sedimentation may affect fish nesting sites and areas where eggs and young fry concentrate, and may reduce access to some food sources. In the immediate area of disturbance, if construction occurs during the spawning period or immediately after, fish reproductive activities would be affected due to temporary destruction of spawning areas, disturbances to fish, and reduced egg survival from increased sedimentation. Mid-Atlantic Express would complete in-stream construction within a 24-hour period at each minor waterbody. Therefore, impacts would be temporary, and suspended sediment concentrations would be expected to return to preconstruction levels soon after construction in each stream is completed.

Mid-Atlantic Express proposes to install the pipeline across the Back River, possibly at the Little Gunpowder Falls, and the Susquehanna River using the HDD method, if feasible, pending geotechnical studies (see section 4.1.4.3). The use of this method would avoid direct disturbance of these waterbodies. To minimize impacts,

Mid-Atlantic Express would also adhere to the protective measures for crossing waterbodies outlined in its ECP. We also are recommending, in section 4.3.2.3, that Mid-Atlantic Express file its HDD Monitoring and Contingency Plan with the Secretary for review and written approval. This plan identifies measures to mitigate fluids releases from a frac-out or from failure and abandonment of the HDD borehole.

Impacts on fisheries from construction-induced sedimentation and turbidity would be short-term and temporary. Mid-Atlantic Express would minimize these impacts by implementing the measures contained in its ECP. For example, trench spoils would be stored on or above the stream banks for waterbodies that would be crossed using the open-cut construction method. Waterbodies would be protected with silt fence, hay bales, or other erosion control devices that would minimize the potential for sediment-laden water to enter the stream. Additionally, all staging areas would be located at least 50 feet back from the water's edge where topographic conditions permit (unless otherwise permitted). This setback distance would reduce the loss of riparian vegetation and minimize the potential for erosion and sedimentation along the stream banks.

Loss of Cover

Stream bank vegetation, in-stream logs and rocks, and undercut banks provide important cover for fish, offer shading, and help to control water temperature. Some in-stream cover would be altered or lost at open-cut stream crossings, and fish that normally reside in these areas would be displaced. However, these effects would be relatively minor because of the small area affected at each stream. In addition, Mid-Atlantic Express would limit vegetation maintenance on stream banks and require long-term revegetation of all shoreline areas with native herbaceous and woody plant species, except for a 10-foot-wide corridor over the pipeline maintained with herbaceous species.

Minimal impact on fisheries is expected from maintenance mowing or manual removal of woody vegetation in the vicinity of the pipeline right-of-way. Vegetation control would be conducted solely by mechanical means. No herbicides, which could be transported to and have detrimental effects on nearby aquatic resources, would be used.

Other Potential Impacts

Other potential effects of pipeline construction include interruption of fish migration and spawning and mortality from toxic substance (e.g., fuel) spills. Construction may cause temporary emigration of fish populations from the immediate area, and fish movements and migrations upstream or downstream may be temporarily disrupted by construction activities. However, it is unlikely that these temporary relocations or disrupted migrations would significantly affect fish populations because in-stream construction would be a short-term activity.

Direct spills of petroleum products into streams and rivers could be toxic to fish, depending on the type, quantity, and concentration of the spill. To reduce the potential for direct surface water contamination, Mid-Atlantic Express would implement its SPCC Plan, including restrictions on refueling equipment and storing fuel and other potentially toxic materials at least 100 feet from waterbodies.

Hydrostatic testing of the pipeline, including proposed measures to protect aquatic life, is described in section 4.3.2.8. In order to confirm that Mid-Atlantic Express's pipeline hydrostatic testing would be acceptable with the MDNR and NMFS, we have included a recommendation in Section 4.3.2.8 requiring Mid-Atlantic Express to consult with these agencies regarding hydrostatic test water withdrawal and discharge. The impact of construction on fish and other aquatic organisms is expected to be localized and short term.

Waterway for LNG Marine Traffic

Potential impacts to aquatic resources that could result from an increase in LNG marine traffic associated with the project would be similar to those resulting from current vessels using the navigation channel (i.e., entrainment, vessel strike, avoidance, noise). Entrainment of fish eggs and larvae would be possible during transit as a result of the withdrawal of water for vessel engine cooling and ballast. However, because vessels

would be constantly moving, this impact would be minimal at any specific location and insignificant along the waterway for LNG marine traffic. Prop-wash is not an issue along the waterway due to the long distance to shore and the water depth. (Prop-wash impacts in the shallower waters in the immediate vicinity of the proposed LNG terminal are discussed above.) Some behavioral effects could occur during vessel transit, particularly with cetaceans. Shipping vessels may increase the noise levels within the water column. These noise increases have been shown to impact a variety of species, such as whales, dolphins, and manatees. However, the transit corridor entering the Patapsco River is used quite heavily, and the incremental increase in shipping traffic would have minimal effects on those species. Further, AES has agreed to include the NMFS Vessel Strike Avoidance Policy as part of its Terminal Use Agreement with LNG vessel operators. This would reduce the possibility of marine mammals or sea turtles being impacted by the proposed project (either by collisions or noise impacts). Therefore, the small increase in vessel traffic associated with this proposed expansion would not be expected to significantly affect the aquatic habitat or biological resources of the Chesapeake Bay.

If an unignited LNG spill were to occur along the transit route, given that LNG is lighter than water, the LNG would float on the water until it had vaporized, possibly reaching shore. The primary impact on aquatic resources (i.e., fish, turtles, whales, etc.) would be LNG rapidly boiling upon contact with water, resulting in the rapid cooling of the water within the LNG pool, located within Zone 1. (Zones of Concern are described in section 4.12.5.3 of this EIS). Any individuals that were to be contacted by LNG within Zone 1 could be injured or killed. Further, because the colder water would be denser than the ambient water, it would sink to the bottom and could affect the benthos in the area of the incident. Mobile species would be expected to move from the area until water temperatures return to normal. However, non-mobile species, such as bivalves, could be subjected to the cold (the farther from the spill, the less water temperatures would be affected). Sea turtles however are sensitive to temperature changes and would be expected to avoid the area, if possible, until temperatures returned to ambient levels. If an associated fire were to occur with the release of LNG, impacts to individuals in Zone 1 would be limited to those on or near the water's surface in the vicinity of the fire. Radiant heat within Zone 2 may impact some individuals on the water surface. No impacts would be expected on species within Zone 3 from a pool fire. The maximum flammable range for a vapor cloud could extend to the outer limits of Zone 3. If the vapor cloud were to contact an ignition source, the resulting fire could burn back to the spill and impact any individuals on the surface within its path. However, because of the marine transit safety and security measures, the likelihood of a LNG vessel spill from collisions, allisions and terrorist attacks would be extremely remote. Further, species that reside in deep water would likely be unaffected or temporarily affected from a spill or resulting fire.

4.6.3 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation Management Act (MSFCMA) (Public Law 94-265, as amended through October 11, 1996) was established, along with other goals, to promote the protection of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. The MSFCMA mandates the identification of EFH which is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC 1802(10)). Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with the NMFS. The MSFCMA granted the NMFS legislative authority for fisheries regulation in the United States within a jurisdictional area located between 3 and 200 miles offshore, depending on geographical location.

The NMFS also was granted legislative authority to establish eight regional fishery management councils, each responsible for the proper management and harvest of finfish and shellfish resources within their respective geographic regions. These fishery management councils have developed Fisheries Management Plans (FMPs), which outline measures to ensure the proper management and harvest of the finfish and shellfish within these waters. The Mid-Atlantic Fishery Management Council (MAFMC) manages fishes that occur from 3 to 200 miles offshore, but the authority to manage those fishes extends throughout the range of

the fishery (it is not confined to political or geographical boundaries). The ASMFC oversees and manages fisheries along the eastern coast of the United States, including nearshore waters such as the Chesapeake Bay.

Although absolute criteria have not been established for conducting EFH consultations, NMFS recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as the NEPA, the Fish and Wildlife Coordination Act, and the ESA in order to reduce duplication and improve efficiency. Generally, the EFH consultation process includes the following steps:

1. Notification – The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into the EIS process, COE section 10 permitting, etc.).
2. EFH Assessment – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH should include: 1) a description of the proposed action; 2) an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species and major prey species; 3) the federal agency's views regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable.
3. EFH Conservation Recommendations – After reviewing the EFH Assessment, NMFS would provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.
4. Agency Response – Within 30 days of receiving the NMFS recommendations, the action agency must respond to NMFS. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. For any conservation recommendation that is not adopted, the action agency must explain its reason to NMFS for not following the recommendation.

FERC staff proposes to consolidate EFH consultations for the proposed Project with the interagency coordination procedures required under NEPA. For purposes of reviewing this project under NEPA, the FERC is the lead federal agency and the Coast Guard, COE, and EPA are cooperating federal agencies (see section 1.3). As such, the FERC requests that NMFS consider this draft EIS as notification of the initiation of EFH consultation. **The comprehensive analysis in this section of this DEIS is our EFH Assessment for the proposed Project. Supplemental data is provided in Appendix E of this DEIS in the form of AES's January 2007 EFH Assessment; AES prepared that assessment and submitted it to the FERC in support of its application. We will address NMFS's comments and/or conservation recommendations to the draft EIS and the EFH Assessment in the final EIS.**

The following additional sections of this DEIS are relevant to our EFH assessment and are incorporated by reference:

- Section 2.1 – Proposed Project Facilities (Description of the proposed action);
- Section 2.3.1.3 – Dredging and Dredged Material Disposal;
- Section 2.3.2 – Specialized Construction Techniques [for pipeline construction], Waterbody Crossings subsection;
- Section 2.5 – Environmental Compliance, Inspection, and Mitigation Monitoring;
- Section 4.3.2.4 – Sediment;
- Section 4.3.2.5 – Surface Water Resources Impacts and Mitigation;
- Section 4.4.2.2 – Waterway for LNG Marine Traffic (in Wetlands section);
- Section 4.4.4 –Wetlands Construction and Maintenance Procedures and the Aquatic Resources Mitigation Plan;

- Section 4.5.1 – Vegetation Resources, in particular the LNG Terminal and Waterway for LNG Marine Traffic subsections; and
- Section 4.6.2.2 – Affected Environment - Aquatic Species.

Table 1 in AES's January 2007 EFH Assessment (Appendix E) listed 99 bony finfish, 13 shark/skate species, and 5 invertebrate species in the project area that are designated as EFH species. (The 99 bony finfish includes the snapper-grouper complex that is composed of 73 species). However, the NMFS (2007) revealed that bluefish and summer flounder are the species for which EFH has been identified in the vicinity of the proposed LNG terminal.

The NMFS (2007) further indicated that important prey species of federally-managed species also should be included in the EFH Assessment. These prey species may be found near the proposed LNG terminal and also utilize streams crossed by the proposed pipeline route.

Table 4.6.3-1 lists the federally-managed fish species, including those for which EFH has been identified, in the vicinity of the proposed LNG terminal and along the proposed pipeline route, as well as the species considered to be ecologically important prey species of federally managed finfish.

TABLE 4.6.3-1

Fish Species for Which EFH has Been Identified and Ecologically Important Prey Species of Managed Finfish That Occur in the Vicinity of the Proposed LNG Terminal Area and Along the Proposed Pipeline Route

Bluefish (*Pomatomus saltatrix*) a/	Alewife (*Alosa pseudoharengus*) b/
Summer Flounder (*Paralichthys dentatus*) a/	Blueback herring (*Alosa aestivalis*) b/
American shad (*Alosa sapidissima*) b/	White Perch (*Morone americana*) c/
Hickory shad (*Alosa mediocris*) b/	Yellow Perch (*Perca flavescens*) c/

a/ Fishes managed by both the ASMFC and the MAFMC for which EFH has been identified in the vicinity of the proposed LNG terminal area.
b/ Fishes managed by the ASFMC and important prey species of managed finfish; these four species are collectively known as river herring.
c/ Additional ecologically important prey species of managed finfish.

4.6.3.1 EFH Species Accounts

Bluefish (*Pomatomus saltatrix*). Bluefish life stages that occur in the vicinity of the proposed LNG terminal are juveniles and adults. These life stages occur at both brackish waters (salinities of 0.5 - <25 ppt) as well as salt waters (salinities of ≥25 ppt). Eggs and larvae do not occur in the vicinity of the proposed LNG terminal.

The bluefish fishery in Chesapeake Bay is an important commercial and recreational fishery, with 20% of total U.S. bluefish landings coming from the Chesapeake Bay. Landings from the recreational fishery are five to six times that of commercial landings. In the Chesapeake Bay, bluefish ranked highest in both number and weight among sport fish nearly every year from 1970 to 1990. Due to the high recreational value, the conservation effort by anglers has been strong (CBP, 2003a).

Adult bluefish overwinter in warm southern waters off the coast of Florida and migrate north in the spring. Bluefish spawn offshore in open waters usually near the edge of the continental shelf. They travel in schools of like-sized individuals and undertake seasonal migrations, moving into the Middle Atlantic Bight (MAB) during spring and south or farther offshore during fall. Within the MAB they occur in large bays and estuaries as well as across the entire continental shelf. Juveniles are typically found near shorelines, including the surf zone, during the day and in open waters at night. Like adults, they are active swimmers and feed on small forage fishes which are commonly found in nearshore habitats (Shepherd and Packer, 2006). Juvenile stages have been recorded from all estuaries surveyed within the MAB, but eggs and larvae occur in oceanic waters (Able and Fahay, 1998; Shepherd and Packer, 2006).

The lower Patapsco River estuary provides nursery habitat for young-of-the-year bluefish. However, bluefish are present in the project area only in low numbers and only during a few months of the year. They were not collected in the project area in AES's June 2006 trawls and found in low abundance in October 2006 comprising only 1% of the total fish abundance and biomass in the samples collected. The results are comparable to those found at H.A. Wagner generating station located on the opposite shore of the Patapsco River from Sparrows Point. Fish were collected from the power plant's cooling water intake structure on a weekly basis from March-August, 2006. Bluefish were found to comprise only 0.16% of the total fish abundance during that period and were only collected from May-August with the greatest abundance (0.27%) in July (EA Engineering Science, Technology, Inc., 2007).

Summer Flounder (*Paralichthys dentatus*). Summer flounder life stages that occur in the vicinity of the proposed LNG terminal are larvae, juveniles, and adults. These life stages occur at both brackish waters (salinities of 0.5 - <25 ppt) as well as salt waters (salinities of ≥25 ppt). Eggs do not occur in the vicinity of the proposed LNG terminal.

Summer flounder are a major recreational and commercial species north of Cape Hatteras. Anglers catch summer flounder from the shore, piers and boats with hook and line. The recreational catch far exceeds the commercial catch in the Chesapeake Bay and near-shore coastal waters. The lower Bay and seaside inlets produce the bulk of the recreational landings. Since the mid-1980s commercial and recreational catches have declined precipitously because of over-fishing and year-class failure (CBP, 2003b).

The summer flounder is a bottom-dwelling predator, relying on its flattened shape and ability to change color and pattern on the upper (eyed) side of its body. A predator with quick movements and sharp teeth, the flounder is able to capture the small fishes, squid, sea worms, shrimp and other crustaceans that comprise the bulk of its diet. Summer flounder can live to 20 years of age with females living longer and growing larger than males (up to 95 cm total length [3ft]). Summer flounder exhibit strong inshore-offshore movements. Adults and juveniles typically move offshore in the fall and remain there through the winter. Adults and juveniles occupy shallow coastal and estuarine waters during spring and summer. Some juveniles remain inshore for an entire year before migrating offshore, while others move offshore in the fall and return the following spring (Packer et al, 1999).

The lower Patapsco River estuary provides nursery habitat for young-of-the-year summer flounder. No summer flounder were collected in the June 2006 trawls sampling in the project area, however summer flounder comprised 1% of the total number of fish captured and 7% of the biomass in October 2006 sampling. The average length of summer flounder collected was 283 mm (approximately 11 inches). Only one summer flounder was collected between May and August, 2006 at the H.A. Wagner generating station on the opposite shore of the Patapsco River from Sparrows Point during weekly sampling from the power plant's cooling water intake structure (EA Engineering Science, Technology, Inc., 2007). Packer et al. (1999) indicated that summer flounder are not likely to be found in polluted areas or areas with inadequate circulation in Maryland coastal bays. Therefore, summer flounder do not generally occur in the project area during winter or spring and they are present in the project area in low numbers during the late summer and early fall.

River Herring (*Alosa spp.*). River herring are not designated as EFH species but are important forage fish for managed game fish in the project area. River herring (also called alosine species) include American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), alewife (*Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*). The annual migration of river herring in the Chesapeake Bay and its tributaries occurs from late February through early June (CBP, 2003c; Mullen et. al., 1986). Because river herring is composed of several species, the habitat preferences for this group are varied; however, some generalities can be made with regards to habitat. In the geographical area of the project, spawning typically occurs in the main stems of rivers as well as small streams and over a variety of substrates. The larvae tend to remain in the river where the eggs were laid. Juveniles leave the river in the summer or fall and migrate from the bay (Mullen et. al. 1986).

These species are common prey of many game species such as the bluefish. The American shad itself is a popular sport fish. The fishery has had many restrictions placed on it including a moratorium on fishing in Maryland except in the Potomac River due to declining populations.

These fishes are managed by the ASMFC. The 1999 Amendment 1 to the Interstate Fishery Management Plan for Shad & River Herring states that, "Shad and river herring stocks along the Atlantic coast are greatly diminished compared to historic levels. Much of this reduction is related to spawning and nursery habitat degradation brought on by effects of human population increase (sewage and stormwater runoff, industrialization), increased erosion, sedimentation and nutrient enrichment associated with agricultural practices, and losses of riparian forests and wetland buffers." The plan further states that, "Thousands of kilometers of historic anadromous alosine habitat were lost due to development of dams and other obstructions to migration. These impediments take many forms including large hydroelectric darns on mainstems of rivers, water storage and flood protection projects, small dams erected in tributaries to supply water to historic mills or to meet local water supply or industrial needs, culverts at highway crossings, gauging station weirs, and others." Much of the current effort to rehabilitate the river herring is aimed at mitigating or removing obstructions to spawning grounds.

American shad were not captured in trawls conducted by AES in June and October 2006 in the vicinity of the proposed LNG terminal; no suitable habitat in the vicinity of the proposed LNG terminal was identified. River herring and other anadromous fishes spawn in the Patapsco River, which would be affected by LNG terminal construction, as well as Gunpowder Falls, Deer Creek, the Susquehanna River, White Marsh Run, and Octoraro Creek, which would be crossed by the proposed pipeline. These streams are listed as sensitive streams in this EIS due to the presence of anadromous species. In particular, the Susquehanna River provides key spawning and nursery habitat for the American shad along its entire length. The proposed LNG terminal site is located approximately 100 miles south of the confluence of the Susquehanna River with the Chesapeake Bay.

White Perch (*Morone americana*). White perch is not designated as an EFH species but is an important forage fish for managed game fish in the project area. White perch are ubiquitous in estuaries and freshwater ecosystems, preferring substrates with fairly level bottoms composed of compact silt, mud, clay, or sand. White perch spawn in estuaries, rivers, lakes, and marshes, typically in freshwater but may occur in brackish water at salinities up to 4.2 ppt. Preferred spawning habitats encompass a range of environmental conditions, including waters that are tidal and non-tidal, clear or turbid, fast or slow. Eggs are demersal and usually attach singly to detritus, although thin sheets occasionally occur. The preferred water temperature for white perch eggs ranges between 15 and 20°C. Newly hatched larvae remain in the general spawning area during the first couple of weeks. Larvae have a similar temperature tolerance as eggs, with a salinity tolerance of up to 3 to 5 ppt. Juveniles utilize inshore zones of estuaries and creeks as nursery grounds and may remain there for up to a year. Juveniles also exhibit a preference for demersal habitat, and occasionally migrate to offshore waters during the day, but return to the protected beach and shoal areas at night and during rough waters. The preferred water temperature of juveniles and adults ranges from 2.0 to 32.5°C, with a salinity tolerance ranging from fresh to sea water (Stanley and Danie, 1983).

Juvenile and adult white perch were the most abundant fish found in the terminal area during AES sampling in both June and October, 2006. White perch comprised 84% and 44% of the catch in June and October respectively. White perch are also expected to be encountered along the pipeline route. NMFS has noted that Deer Creek, which would be crossed by the proposed pipeline, has significant populations of white perch and is considered a sensitive stream by NMFS.

Yellow Perch (*Perca flavescens*). Yellow perch is not designated as an EFH species but is an important forage fish for managed game fish in the project area. This species is predominantly a freshwater species, although it has been found in brackish water at river mouths (up to 13 ppt) in the Chesapeake Bay. This species is frequently associated with shoreline (littoral) areas in lakes and reservoirs where there are moderate amounts of vegetation present (Krieger et al., 1983). This species requires freshwater for spawning and spawning migrations begin from deep water into tributaries, lake shallows, or low velocity areas of rivers as

early as late winter and extending into early summer in some areas of the fishes range when temperatures are between 5.6°C and 18.5°C (Auer, 1982). NMFS (2007) indicated that yellow perch spawning in Chesapeake Bay tributaries begins in mid February. NMFS has also has noted that Deer Creek, which would be crossed by the proposed pipeline, has significant populations of yellow perch and is considered a sensitive stream by NMFS.

4.6.3.2 Potential Impacts to EFH-Designated Species, Conservation Measures, and Mitigation Plans

Potential impacts to EFH-designated species are nearly identical to those described in Section 4.6.2.2 for aquatic species. These include potential impacts from construction dredging, pier construction and pile driving, hydrostatic testing, and stormwater runoff, and to a much lesser extent, impacts from operational activities such as maintenance dredging, prop washing, ship transport, and the intake of ballast water.

The conservation measures and mitigation plans presented below address the potential direct and indirect impacts to EFH species. In addition to the conservation measures discussed below, we are recommending that AES and Mid-Atlantic Express prepare an Aquatic Resources Mitigation Plan (ARMP – see Section 4.4.4) that would result in the development of agency-approved specific mitigation measures.

LNG Terminal

To reduce turbidity during dredging, AES proposes to use one of two dredging methods: mechanical dredging with a conventional clamshell bucket or mechanical dredging with an enclosed environmental bucket. Dredging utilizing an enclosed environmental bucket could be used in areas/types of material that exhibit elevated contaminant concentrations, and in accordance with permit conditions that may be applicable. No hydraulic dredging is proposed for the Project. The COE (2001) has published results of a dredge bucket comparison study that measured turbidity levels generated by the use of both a conventional clamshell bucket and an enclosed environmental bucket. The COE found that both technologies reduced turbidity in comparison with a conventional bucket and that the enclosed bucket reduced turbidity by 76% and total suspended solids (TSS) by 79%. (COE was uncertain about the reduction by the clamshell bucket because they did not have statistical significance because of too few samples taken; however it appeared to reduce turbidity by 46% when compared to a conventional bucket.) The article also noted that seals on the clamshell bucket would likely further reduce water quality impacts, but that maintaining the seals was difficult.

Dredge materials would not be returned to any waters or wetlands. The resulting materials would be assigned use classes for its final disposition which would be reused in upland areas. This disposition would also ensure that these materials would not impact the capacity of local dredge material disposal sites. A detailed discussion of dredged material handling and disposal is in section 2.3.1.3.

Turbidity may also be increased during and after construction of the LNG terminal due to run-off after rain events. AES would abide by the erosion control measures in its ECP. As such, AES would 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 would be routed to the Baltimore County POTW. AES would obtain a permit for discharge to the POTW prior to initiation of operations at the LNG Terminal. The discharges to the POTW would be monitored and treated to meet the pre-treatment standards required by the Baltimore County POTW.

AES would implement an approved SPCC Plan to minimize potential impacts associated with the use of oils, lubricants, and other hazardous substances during construction and operation of the LNG terminal. Operational stormwater discharges would be covered under a Maryland General Permit for Stormwater Discharge associated with industrial activity (see section 4.3.2.6 for additional details). Storm water controls for the LNG terminal and the DMRF would be developed during the final design and incorporated into the Project's Storm Water Pollution Prevention Plan.

Entrainment of aquatic organisms by dredging machinery could have significant impacts on EFH species directly or indirectly through the removal of prey species (e.g., benthic invertebrates) or food species (e.g.,

algae), disrupting energy flow and biotic interactions. Although entrainment of benthic and demersal organisms during dredging of the turning basin is expected, it would not be extensive enough to have a significant impact on the existing EFH resources given the small area involved compared to the availability of similar habitat in the surrounding lower Patapsco River and Chesapeake Bay estuary.

Although dredging would occur in open waters that provide habitat for a variety of finfish species, these activities would not have a measurable permanent impact on these species. For example, summer flounder can avoid low dissolved oxygen conditions (Festa, 1977) that could result from suspended sediments. Strong swimmers like bluefish would avoid poor water quality conditions caused by dredging activities. These fish would also be capable of avoiding LNG boat traffic and entrainment by hydrostatic test water withdrawals; however, it is unavoidable that some larval stages of fish may become entrained in the dredge. Because the proposed LNG terminal area does not currently contain any SAV, there would likely be little effect on the adults and juveniles of other finfish species that concentrate in SAV beds. Some of these species would recolonize the deeper water created by the dredged channel or adjust to the greater water depths while others would find similar suitable habitat in adjacent areas of the access channel and turning basin. The effects of the dredging, LNG terminal construction, and boat traffic at the proposed terminal are not expected to have significant impacts on EFH species in the Chesapeake Bay.

In section 4.6.2.2, we are recommending that AES develop a construction and mitigation plan for the unloading dock; this plan would include measures to minimize impacts from sound and pressure waves resulting from pile driving.

Vessel ballasting would occur at the LNG Terminal, with vessel displacement determining the amount of ballast water usage. LNG carriers around 217,000 m^3 have a maximum ballast capacity of 80,000 m^3. LNG carriers visiting the LNG Terminal would take in an estimated 2.2 - 2.8 million m^3 per month. Ballast water intake would generally occur while an LNG vessel is at or near the dock (i.e., while the ships are in slips), reducing impact since these areas are likely to provide less favorable fish habitat relative to areas remote from slips. The potential for adverse impacts from ballast water intake would be further minimized by utilizing intake pump screens to prevent foreign objects and fish from entering ballast tanks. In addition, all LNG carriers entering the port would have a Ballast Water Management Plan in accordance with the International Maritime Organization (IMO, 2007) (see section 4.3.2.6).

No potential impacts are expected from the cooling or heating systems for the regasification facility or the potential power plant since these are closed-loop systems and municipal water sources would be used for these purposes. No water would be directly withdrawn from the Patapsco River or any other natural open water bodies for this purpose.

Mitigation for potential adverse effects resulting from ship collisions or spills at the LNG Terminal are provided in detail in section 4.12 – Reliability and Safety, including engineering controls for the cryogenic system (see section 4.12.2), the design of the LNG storage and retention systems (see section 4.12.3), proper siting of the terminal, the design of impoundment systems, and the identification of safety zones (see section 4.12.4), compliance with the *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (IMO, 1993), the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974 as amended by the *International Ship and Port Facility Security [ISPS] Code*), the *Area LNG Vessel Management and Emergency Plan* developed by the Captain of the Port (COTP) Baltimore and Hampton Roads, and 46 CFR Part 154 (see sections 4.12.5.2 and 4.12.5.5).

Pipeline

Although the two EFH-designated species (bluefish and summer flounder) discussed above would not be expected to occur in the fresh waters crossed by the proposed pipeline, the aforementioned prey species (river herring, white perch, and yellow perch) would. Potential impacts to waterbodies crossed by the pipeline include sedimentation, turbidity, loss of cover, contamination from spills, and temporary disruption of movement (see section 4.6.2.2).

Mid-Atlantic Express's ECP contains best management practices to minimize sedimentation due to construction stormwater runoff at water and wetland crossings during construction, and during hydrostatic testing of the pipeline. For example, the ECP includes measures such as temporary slope breakers, sediment barriers, and mulch until permanent erosion controls or restoration is complete. It also contains a SPCC Plan for construction activities that includes preventive measures and details control measures to minimize impacts should a spill occur.

Mid-Atlantic Express plans to cross the Back River and the Susquehanna River using HDD to reduce any potential impacts (see section 4.6.2.2, Pipeline Construction and Operations subsection for additional details). Use of the HDD method would avoid direct impacts 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 of the waterbody (vegetation, stream banks, etc.) during or after construction. Potential negative impacts of HDD could occur in the unlikely event of a frac-out whereby drilling fluid may enter the waterbody. The impacts of a frac-out would be particularly harmful if it occurred during a spawning run of an important fish species. Mid-Atlantic Express would adhere to its HDD contingency plan to minimize the potential for a fluid release and mitigate the effects of any such release.

Gunpowder Falls, Deer Creek, and Octoraro Creek are additional streams that are considered to be sensitive. The crossings of these streams are discussed in more detail in Section 4.3.2.3 and 4.3.2.7. We are recommending in Section 4.6.2.2 (Pipeline Construction and Operation subsection) that Mid-Atlantic Express consult with NMFS regarding seasonal construction restrictions to protect spawning fishes in these and other sensitive watercourses.

Hydrostatic pressure testing of the pipeline that would cross the Susquehanna River would require the withdrawal of 7,600,000 gallons of water from the river. Testing of the pipeline crossings for Gunpowder Falls, Deer Creek, and Octoraro Creek would be conducted using potable water that would be trucked to those sites. As discussed in section 4.3.2.8, the potential impacts of fish entrainment from water withdrawals from the Susquehanna River would be mitigated through the use of a 2 mm wedgewire screen at the intake, and an intake velocity limited to 0.5 fps with a flow rate of approximately 1,200 to 3,600 gpm. Additionally, surface water withdrawal and subsequent release would be coordinated with the Susquehanna River Basin Commission (SRBC), and Mid-Atlantic Express would obtain a Permit to Appropriate and Use Waters of the State from the MDE. Mid-Atlantic Express also would implement best management practices to minimize impacts of hydrostatic testing pursuant to its ECP.

Waterway for LNG Marine Traffic

Other EFH-designated species occur along the proposed waterway for LNG marine traffic. Tables 4.6.3–2, 4.6.3–3, and 4.6.3–4 list the managed species by life stage for which EFH has been identified along the length of the waterway for LNG marine traffic through the upper Chesapeake Bay, the lower Chesapeake Bay, and the offshore region outside of the Chesapeake Bay, respectively. Figure 4.6.3–1 (plus its supplementary key) shows the areas that these regions encompass. The potential impacts of shipping include vessel strikes, petroleum product leaks or spills that may be toxic to fish, increased turbidity from prop wash, and changes to the environment from introductions of exotic species.

The overall safety and emergency measures to be followed by vessels along the transit route to avoid collisions and spills are as indicated above for the LNG Terminal. In addition, all LNG vessels entering US waters carrying hazardous cargo file a spill contingency plan with the US Coast Guard; implementation of such a plan would further mitigate any impacts should a release occur from an LNG vessel.

No ballast water would be released or drawn while in transit. The potential impacts of increased turbidity from prop wash and the potential introduction of exotic species are discussed in section 4.6.2.2. Managed species for which EFH is designated along the waterway for LNG marine traffic are generally expected to avoid vessel strikes either by swimming, or via bottom seeking behavior. Potential impacts due to an LNG spill are expected to be similar to those described for aquatic species in section 4.6.2.1 (Waterway for LNG Marine Traffic subsection). Because no SAV – which can serve as important shelter, feeding grounds, and/or

nursery habitat for many fish species – is within Zones of Concern 1 and 2, impacts to SAV and the species that inhabit it are not expected to be significant (see section 4.5.1 Waterway for LNG Marine Traffic subsection).

TABLE 4.6.3–2

Summary of Essential Fish Habitat by Life Stage Along the LNG Vessel Marine Transit Route, Upper Chesapeake Bay

Species a/ (see figure 4.6.3–1 for map showing Upper Chesapeake Bay)	**Eggs b/**	**Larvae b/**	**Juveniles b/**	**Adults b/**
Bony Fish				
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic sea herring (*Clupea harengus*)	--	--	--	S
black sea bass (*Centropristus striata*)	--	--	M,S	M,S
bluefish (*Pomatomus saltatrix*)	--	--	M,S	M,S
cobia (*Rachycentron canadum*)	X	X	X	X
king mackerel (*Scomberomorus cavalla*)	X	X	X	X
red drum (*Sciaenops occelatus*)	X	X	X	X
red hake (*Urophycis chuss*)	--	--	S	S
scup (*Stenotomus chrysops*)	--	--	S	S
Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
summer flounder (*Paralicthys dentatus*)	--	M,S	M,S	M,S
windowpane flounder (*Scopthalmus aquosus*)	--	--	M,S	M,S
Skates				
clearnose skate (*Raja eglanteria*)	X	n/a	X	X
little skate (*Leucoraja erinacea*)	X	n/a	X	X
winter skate (*Leucoraja ocellata*)	X	n/a	X	X

a/ Includes fish and invertebrates for Upper Chesapeake Bay according to NMFS (no date) and skates according to NEFMC (2003).

b/ X = EFH exists for this life stage.

M = EFH for this life stage exists in areas of mixed water salinity (0.5% < salinity < 25.0%).

S = EFH for this life stage exists in areas of salt water (salinity > or = 25.0%).

-- = Life stage not present in Project area.

n/a = No data available, or no such stage occurs in the species' life cycle; in scup and black sea bass, there is insufficient data for the life stages listed, and no EFH designation has been made as of yet (some estuary data is available for all the life stages of these species, and some of the estuary squares will reflect this).

TABLE 4.6.3–3

Summary of Essential Fish Habitat by Life Stage Along the LNG Vessel Marine Transit Route, Lower Chesapeake Bay

Species a/ (see figure 4.6.3–1 for map showing Upper Chesapeake Bay)	**Eggs b/**	**Larvae b/**	**Juveniles b/**	**Adults b/**
Bony Fish				
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic sea herring (*Clupea harengus*)	--	--	--	X
black sea bass (*Centropristus striata*)	n/a	--	X	X
bluefish (*Pomatomus saltatrix*)	--	--	X	X
cobia (*Rachycentron canadum*)	X	X	X	X
king mackerel (*Scomberomorus cavalla*)	X	X	X	X
red drum (*Sciaenops occelatus*)	X	X	X	X
red hake (*Urophycis chuss*)	X	X	X	X
scup (*Stenotomus chrysops*)	n/a	n/a	X	X
Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
summer flounder (*Paralicthys dentatus*)	--	X	X	X
windowpane flounder (*Scopthalmus aquosus*)	X	--	X	X
winter flounder (*Pleuronectes americanus*)	--	--	X	X
Sharks				
Atlantic sharpnose shark (*Rhizopriondon terraenovae*)	--	--	--	X
dusky shark (*Charcharinus obscurus*)	--	X	X	--
sand tiger shark (*Odontaspis taurus*)	--	X	--	X
sandbar shark (*Charcharinus plumbeus*)	--	HAPC	HAPC	HAPC
scalloped hammerhead shark (*Sphyrna lewini*)	--	--	X	--
spiny dogfish (*Squalus acanthias*)	n/a	n/a	X	X
tiger shark (*Galeocerdo cuvieri*)	--	X	--	--
Skates				
clearnose skate (*Raja eglanteria*)	X	n/a	X	X
little skate (*Leucoraja erinacea*)	X	n/a	X	X
winter skate (*Leucoraja ocellata*)	X	n/a	X	X
Invertebrates				
long finned squid (*Loligo pealei*)	n/a	n/a	X	--

a/ Includes fish and invertebrates for Lower Chesapeake Bay according to NMFS (no date) and skates according to NEFMC (2003).

b/ HAPC = Habitat of Particular Concern (HAPC) exists for this life stage.

X = EFH exists for this life stage.

-- = Life stage not present in Project area.

n/a = No data available, or no such stage occurs in the species' life cycle (e.g., spiny dogfish in which juveniles are born live); in long finned squid, stages known as pre-recruits and recruits correspond with juveniles and adults in the table; in scup and black sea bass, there is insufficient data for the life stages listed, and no EFH designation has been made as of yet (some estuary data is available for all the life stages of these species, and some of the estuary squares will reflect this).

TABLE 4.6.3–4

Summary of Essential Fish Habitat by Life Stage Along the LNG Vessel Marine Transit Route, Offshore Region

Species a/ (see figure 4.6.3–1 for map showing Offshore Region)	**Eggs b/**	**Larvae b/**	**Juveniles b/**	**Adults b/**
Bony Fish				
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic sea herring (*Clupea harengus*)	--	--	X	X
black sea bass (*Centropristus striata*)	n/a	X	X	X
bluefish (*Pomatomus saltatrix*)	--	--	X	X
cobia (*Rachycentron canadum*)	X	X	X	X
king mackerel (*Scomberomorus cavalla*)	X	X	X	X
monkfish (*Lophius americanus*)	X	X	--	--
red drum (*Sciaenops occelatus*)	X	X	X	X
red hake (*Urophycis chuss*)	X	X	X	--
scup (*Stenotomus chrysops*)	n/a	n/a	X	X
Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
summer flounder (*Paralicthys dentatus*)	X	--	X	X
windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
witch flounder (*Glyptocephalus cynoglossus*)	X	--	--	--
yellowtail flounder (*Pleuronectes ferruginea*)	--	X	--	--
Sharks				
Atlantic sharpnose shark (*Rhizoprionodon terraenovae*)	--	--	--	X
dusky shark (*Charcharinus obscurus*)	--	X	X	--
sand tiger shark (*Odontaspis taurus*)	--	X	--	X
sandbar shark (*Charcharinus plumbeus*)	--	HAPC	HAPC	HAPC
scalloped hammerhead shark (*Sphyrna lewini*)	--	--	X	--
spiny dogfish (*Squalus acanthias*)	n/a	n/a	X	X
tiger shark (*Galeocerdo cuvieri*)	--	X	X	X
Skates				
clearnose skate (*Raja eglanteria*)	X	n/a	X	X
little skate (*Leucoraja erinacea*)	X	n/a	X	X
winter skate (*Leucoraja ocellata*)	X	n/a	X	X
Invertebrates				
surf clam (*Spisula solidissima*)	n/a	n/a	X	--
long finned squid (*Loligo pealei*)	n/a	n/a	X	--

a/ Includes fish and invertebrates for the Offshore Region according to NMFS (no date) and skates according to NEFMC (2003).

b/ HAPC = Habitat of Particular Concern (HAPC) exists for this life stage.
X = EFH exists for this species life stage.
-- = Life stage not present in Project area.
n/a = No data available, or no such stage occurs in the species' life cycle (e.g., spiny dogfish in which juveniles are born live); in long finned squid, stages known as pre-recruits and recruits correspond with juveniles and adults in the table; in scup and black sea bass, there is insufficient data for the life stages listed, and no EFH designation has been made as of yet (some estuary data is available for all the life stages of these species, and some of the estuary squares will reflect this).

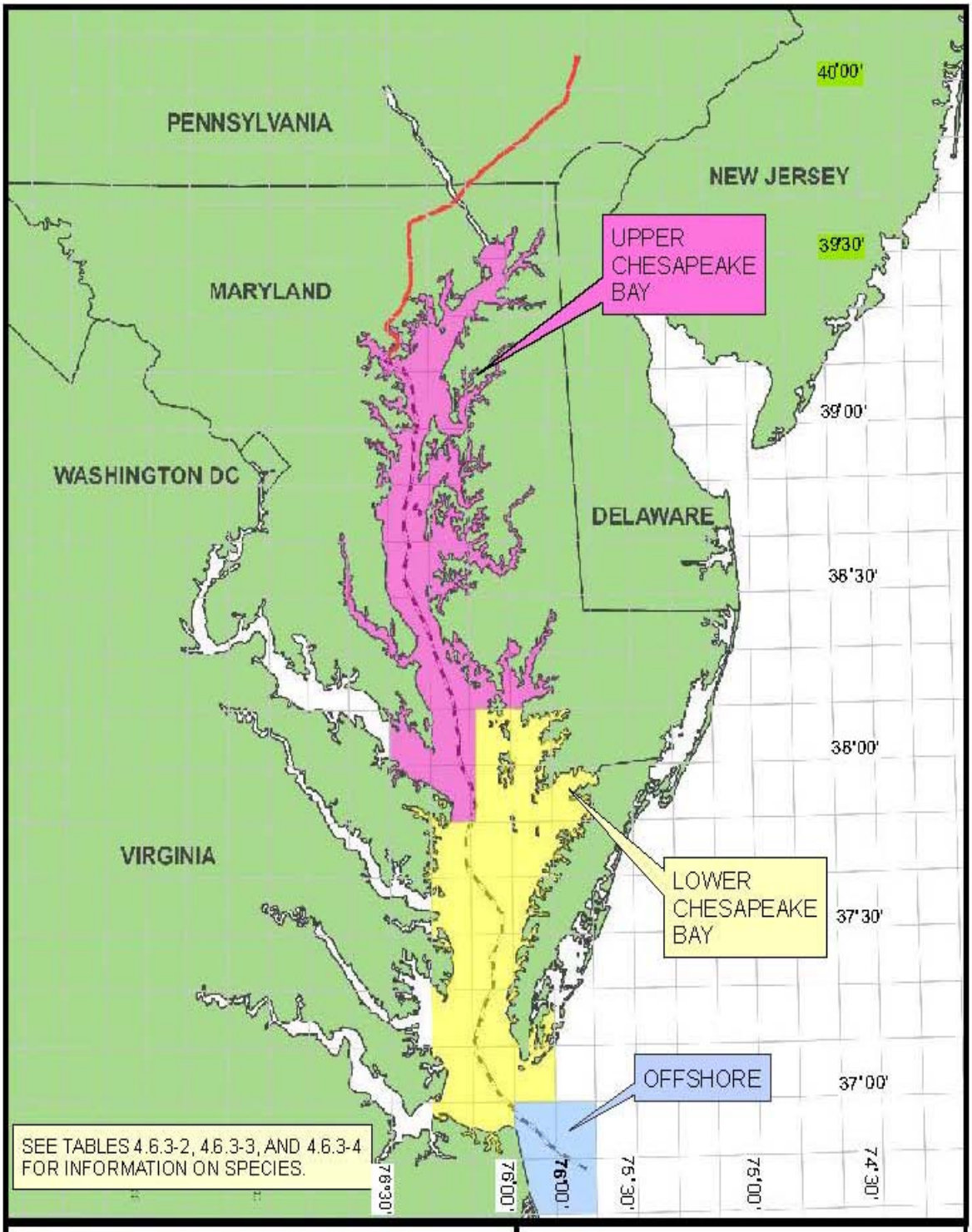


Figure 4.6.3-1
Essential Fish Habitat (EFH) Along The LNG Vessel Marine Transit Route

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TABLE 4.6.3-5

KEY TO MAP GRID IN FIGURE 4.6.3–1: NMFS QUADRANGLE NUMBERS AND NAMES.

Quadrangle Number a/	North	East	South	West	Quadrangle Name b/
Lower Bay					
19	38° 00.0' N	76° 00.0' W	37° 50.0' N	76° 10.0' W	3750/7600
20	38° 00.0' N	75° 50.0' W	37° 50.0' N	76° 00.0' W	3750/7550
30	37° 50.0' N	76° 10.0' W	37° 40.0' N	76° 20.0' W	3740/7610
31	37° 50.0' N	76° 00.0' W	37° 40.0' N	76° 10.0' W	3740/7600
32	37° 50.0' N	75° 50.0' W	37° 40.0' N	76° 00.0' W	3740/7550
44	37° 40.0' N	76° 10.0' W	37° 30.0' N	76° 20.0' W	3730/7610
45	37° 40.0' N	76° 00.0' W	37° 30.0' N	76° 10.0' W	3730/7600
46	37° 40.0' N	75° 50.0' W	37° 30.0' N	76° 00.0' W	3730/7550
58	37° 30.0' N	76° 10.0' W	37° 20.0' N	76° 20.0' W	3720/7610
59	37° 30.0' N	76° 00.0' W	37° 20.0' N	76° 10.0' W	3720/7600
60	37° 30.0' N	75° 50.0' W	37° 20.0' N	76° 00.0' W	3720/7550
72	37° 30.0' N	76° 10.0' W	37° 20.0' N	76° 20.0' W	3720/7610
73	37° 20.0' N	76° 00.0' W	37° 10.0' N	76° 10.0' W	3710/7600
74	37° 20.0' N	75° 50.0' W	37° 10.0' N	76° 00.0' W	3710/7550
83	37° 10.0' N	76° 10.0' W	37° 00.0' N	76° 20.0' W	3700/7610
84	37° 10.0' N	76° 00.0' W	37° 00.0' N	76° 10.0' W	3700/7600
85	37° 10.0' N	75° 50.0' W	37° 00.0' N	76° 00.0' W	3700/7550
93	37° 00.0' N	76° 10.0' W	36° 50.0' N	76° 20.0' W	3650/7610
94	37° 00.0' N	76° 00.0' W	36° 50.0' N	76° 10.0' W	3650/7600
Offshore					
95	37° 00.0' N	75° 50.0' W	36° 50.0' N	76° 00.0' W	3650/7550
96	37° 00.0' N	75° 40.0' W	36° 50.0' N	75° 50.0' W	3650/7540
101	36° 50.0' N	75° 50.0' W	36° 40.0' N	76° 00.0' W	3640/7550
102	36° 50.0' N	75° 40.0' W	36° 40.0' N	75° 50.0' W	3640/7540

a/ Pursuant to NMFS (1999) numbering convention. There is no NMFS numbering for the upper bay region.

b/ Pursuant to NMFS (no date) naming convention, the numbers represent the latitude and longitude of the southeast corner of each 10-minute latitude x 10-minute longitude quadrangle.

4.6.3.3 Conclusions

We have concluded that, overall, potential adverse impacts to EFH-designated species and EFH in the Project Area would be minimal. Most EFH-designated species are highly mobile and would not be impacted by ship movements along potential transit routes. In regard to the dredging component of the proposed Project, most EFH-designated species feed on more motile epifaunal organisms or on small forage fish and would not be seriously affected by temporary construction impacts. For any bottom-feeding EFH species, the impact of dredging on local forage habitat area would be temporary, lasting only until the dredged area is re-colonized by new benthic organisms, a process that is expected to take less than a year. AES's implementation of a construction and mitigation plan for the unloading dock would minimize impacts from sound and pressure waves resulting from pile driving. Mid-Atlantic Express would also implement best management practices to minimize aquatic impacts from construction of the proposed pipeline. For these reasons, we conclude that construction and operation of the proposed LNG Terminal and pipeline, the proposed dredging of Baltimore Harbor in the Project Area, and the proposed increase in vessel traffic would not cause adverse effects to EFH-designated species and EFH, as well as the migration and spawning of important prey species of federally managed finfish.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Federal agencies are required by Section 7 of the Endangered Species Act of 1973 (ESA) (Title 19 U.S.C. Part 1536(c)) as amended (1978, 1979, and 1982), to ensure that any actions authorized, funded, or carried out by the agency do not jeopardize the continued existence of a federally listed endangered or threatened species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. The FERC is required to consult with the FWS and the NMFS to determine whether federally listed endangered or threatened species or designated critical habitat are within the vicinity of the proposed project, and to determine the proposed action's potential effects on those species or critical habitats.

As required by Section 7 of the ESA, the action agency must prepare a biological assessment (BA) for actions involving major construction activities with the potential to affect listed species or designated critical habitat. The action agency must submit its BA to the FWS and/or NMFS, and if it determines that the proposed action may adversely affect a listed species, the agency must submit a request for formal consultation to comply with section 7 of the ESA. In response, the FWS and/or NMFS would issue a Biological Opinion as to whether or not the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

In compliance with Section 7 of the ESA, the FERC requests that the FWS and NMFS consider this draft EIS as the BA for the proposed Sparrows Point LNG Terminal, the waterway for LNG marine traffic, and Mid-Atlantic Express Pipeline Projects. Because we have requested that the FWS and the NMFS consider this EIS as our BA for the proposed Project and thus consultation with these agencies is ongoing, **we recommend that:**

- **AES and Mid-Atlantic Express <u>should not begin construction</u> of facilities for the proposed Project until:**
  - **a. the staff completes any necessary consultations with the FWS and NMFS; and**
  - **b. AES and Mid-Atlantic Express have received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of conservation measures) may begin.**

Construction of the project would not be allowed to begin until we complete our ESA Section 7 responsibilities with FWS and/or NMFS regarding federally listed species.

Various state laws also require that proposed actions be evaluated to ensure that those actions do not adversely affect state listed endangered or threatened species, or result in the destruction or adverse modification of the habitat for state listed species. State government entities responsible for protection of state listed species in the project area include the Maryland Department of Natural Resources (MDNR); Pennsylvania Department of Conservation and Natural Resources (PDCNR), Bureau of Forestry; Pennsylvania Fish and Boat Commission (PFBC), Division of Environmental Services, Natural Diversity Section; Pennsylvania Game Commission; and Virginia Marine Resource Commission, Habitat Management. In Virginia, through which only the marine transit route passes, state listed endangered and threatened species are under the purview of the Department of Inland Game and Fisheries.

AES's and Mid-Atlantic Express's informal agency consultations identified special status species that might occur in the project area. For purposes of this environmental analysis, special status species of plants and animals include:

- species that are listed by the federal government as endangered, threatened, or candidate species; and
- species that are listed by Maryland, Virginia, and/or Pennsylvania as endangered, threatened, or species of concern.

The endangered and threatened species potentially occurring in the project area and considered during our analysis of the project are listed in tables 4.7-1 (federally listed species) and 4.7-2 (state listed species).

4.7.1 Federally Listed Threatened and Endangered Species

No critical habitat for federally listed threatened and endangered species has been designated along the proposed pipeline route, in the vicinity of the proposed LNG terminal, and along the waterway for LNG marine traffic in the Chesapeake Bay.

4.7.1.1 Marine Mammals and Sea Turtles

Whales

North Atlantic Right Whale (*Eubalaena glacialis*). The North Atlantic right whale is a federal endangered species and a state endangered species in Maryland and Virginia. Once abundant throughout the western Atlantic Ocean, this species is now the most endangered whale off the east coast of the U.S. (Hain, n.d.). It has not recovered from commercial whaling, which ceased for this species in 1935, and it is estimated that only around 300 whales are alive today (OLI, 2004). In the Atlantic, the species has been divided into two hemispheric subspecies. North Atlantic right whales are generally found in the western North Atlantic of Canada and North America, while South Atlantic right whales are found in the waters of Chile, Argentina, Brazil, South Africa, southern Australia, certain south hemispheric islands, and Antarctica. Both the northern and southern populations can be found along coastlines, within large bays, and in the open ocean, but they do not mix (HSUS, 2007).

North Atlantic right whales move from wintering and calving grounds in coastal waters of the southeastern U.S. to summer feeding, nursery, and mating grounds in New England waters and in waters northward to the Bay of Fundy and the Scotian Shelf. New England waters are a primary feeding area for this species, where it feeds primarily on calanoid copepods during spring, summer, and fall (Hain, n.d.). Small crustaceans compose the majority of their diet (HSUS, 2007).

The NMFS (2006a) reports that although North Atlantic right whales are rare visitors to the Chesapeake Bay (including the proposed terminal site), the area outside of the bay where the LNG vessels would be traveling is a high use area for this species. The mid-Atlantic coast, including the area near the mouth of the Chesapeake Bay, is a seasonal migration corridor for female right whales and their calves.

Humpback Whale (*Megaptera novaeangliae*). The humpback whale is a federal endangered species and a state endangered species in Maryland and Virginia. It can be found in every ocean of the world, but is less common in artic regions. Humpbacks were heavily exploited by commercial whaling until the mid 1900's contributing to their status as the fourth most numerically depleted cetacean in the world. Prior to commercial whaling, humpback populations were estimated to exceed 125,000. Today only 10,000 to 12,000 humpbacks are thought to exist (NMFS, 1991). Humpback whales are broken down into populations called "stocks" based on their winter ranges. The stocks that inhabit US waters include the Western North Atlantic, Central North Pacific and the Eastern North Pacific (NMFS, 1991). The Western North Atlantic stock can be found along the east coast of the United States.

Humpback whales typically inhabit the waters over or on the edges of the continental shelf and around islands. Humpbacks spend their spring, summer, and autumn months off the coast of the eastern United States. The highest population densities are found near the Gulf of Maine. During these months they can be found relatively close to shore in waters with the highest biologic productivity where they feed intensively. Major food sources for humpbacks in the Northern Atlantic Ocean include; small schooling fish, such as herring, sand lance and capelin, and large zooplankton, such as krill (NMFS, 1991). During the winter months humpback populations migrate offshore to the West Indies; however some remain along the US Mid-Atlantic coast within the vicinity of the Chesapeake and Delaware Bays (NOAA, 2005). Reproductive activities (mating and giving birth) occur during migration periods and the winter months. Humpback whales do very little feeding while in their winter ranges.

TABLE 4.7-1

Federally Listed Endangered and Threatened Species Potentially Occurring in the Project Area

Species	Status a/		Project Component of Potential Occurrence			Project Location Where Listed	Preferred Habitat	Determination	Surveys Needed / Date Scheduled
	Federal	State b/	Marine Transit Route	Terminal	Pipeline				
Mammals									
North Atlantic Right Whale *Eubalaena glacialis*	E	MD-E VA-E	X	X		Offshore waters and mouth of Chesapeake Bay	Coastal and pelagic waters, and within large bays; range from wintering and calving areas in coastal water off southeastern United States to summer feeding, nursery and mating grounds in New England and north to the Bay of Fundy and Scotian Shelf.	Not likely to adversely affect	No, per NMFS (2006f)
Humpback Whale *Megaptera novaeangliae*	E	MD-E VA-E	X	X		Offshore waters and mouth of Chesapeake Bay	Waters along the continental shelf and around islands; range from wintering and calving areas in the West Indies, particularly the coast of Puerto Rico (although some remain along eastern coast of United States) to summer feeding, nursery and mating grounds along the eastern coast of the United States.	Not likely to adversely affect	No, per NMFS (2006f)
Fin Whale *Bafaenoptera physalus*	E	MD-E VA-E	X	X		Offshore waters and mouth of Chesapeake Bay	Pelagic, but have been spotted in coastal waters in depths >30 ft; range from Cape Hatteras, North Carolina northward to Canada along the Atlantic Coast.	Not likely to adversely affect	No, per NMFS (2006f)
Sperm Whale *Physeter macrocephalus*	E	MD-E VA-E	X	X		Offshore waters and mouth of Chesapeake Bay	Pelagic, prefer area at edge of continental shelf and into deeper waters; males migrate to polar waters to feed and return to sub-tropic waters along the eastern coast of the United States to breed. Females and calves reside in the sub-tropic waters of the Atlantic year round.	Not likely to adversely affect	No, per NMFS (2006f)

TABLE 4.7-1 (CONTINUED)

Federally Listed Endangered and Threatened Species Potentially Occurring in the Project Area

Species	Status a/		Project Component of Potential Occurrence			Project Location Where Listed	Preferred Habitat	Determination	Surveys Needed / Date Scheduled
	Federal	State b/	Marine Transit Route	Terminal	Pipeline				
Birds									
Bald Eagle *Haliaeetus leucocephalus*	Delisted August 8, 2007	MD-T PA-T VA-E			X	Baltimore, Harford and Cecil Counties, MD; Chester and Lancaster Counties, PA	Areas with large open water bodies such as bays, lakes, large rivers and sea coasts. Typically nest and perch in tall trees within 1-2 miles of water bodies. The Chesapeake Bay and its tributaries support the highest concentration of bald eagles in the continental United States.	Not likely to adversely affect	Yes / nest occupancy survey conducted April 2007 and planned for nesting season 2008
Fish									
Shortnose Sturgeon *Acipenser brevirostrum*	E	MD-E PA-E VA-E	X	X	X	Harford and Cecil County, MD; Chesapeake Bay and its tributaries	Near river mouths, estuaries, and large brackish coastal rivers along the Atlantic Ocean seaboard. Anadromous; spawns in freshwater areas then migrate downstream to summer foraging areas.	Not likely to adversely affect	No, per NMFS (2006f)
Maryland Darter *Etheostoma sellare*	E	MD-E			X	Harford County, MD	Endemic to Maryland. Only found in the riffle area at the fall line in the Deer Creek watershed.	No effect.	No, per FWS (2007e)
Reptiles									
Loggerhead Sea Turtle *Caretta caretta*	T	MD-T VA-T	X	X		Offshore waters and Chesapeake Bay	Coral reefs, rocky bottoms, shellfish beds, and boat wrecks and common in water <50 meters deep. Nests along the coast of Florida north to North Carolina. Juveniles are commonly found foraging in the Chesapeake Bay.	Not likely to adversely affect	No, per NMFS (2006f)
Kemps Ridley Sea Turtle *Lepidochelys kempi*	E	MD-E VA-E	X	X		Offshore waters and Chesapeake Bay	Water with low salinity, high turbidity, high organic content and abundance of shrimp. Forage in shallow embayments supporting submerged aquatic vegetation and on tidal flats. Nests along the coast of Mexico and juveniles are found in foraging in the Chesapeake Bay during the summer.	Not likely to adversely affect	No, per NMFS (2006f)

TABLE 4.7-1 (CONTINUED)

Federally Listed Endangered and Threatened Species Potentially Occurring in the Project Area

Species	Status a/		Project Component of Potential Occurrence			Project Location Where Listed	Preferred Habitat	Determination	Surveys Needed / Date Scheduled
	Federal	State b/	Marine Transit Route	Terminal	Pipeline				
Green Sea Turtle *Chelonia mydas*	T	MD-T VA-T	X	X		Offshore waters and Chesapeake Bay	High energy oceanic beaches (nesting), convergence zones in pelagic habitat (juvenile feeding), and benthic feeding grounds in shallow protected waters (adult feeding). Nests in Florida during the winter. Waters of Chesapeake Bay provide summer developmental habitat.	Not likely to adversely affect	No, per NMFS (2006f)
Leatherback Sea Turtle *Dermochelys coricea*	E	MD-E VA-E	X	X		Offshore waters and Chesapeake Bay	Pelagic, but are seasonally present in the Chesapeake Bay. Occupy large, open bays in the northeastern United States during summer and fall, and nearshore waters of Maryland and Virginia during winter and spring.	Not likely to adversely affect	No, per NMFS (2006f)
Bog Turtle *Clemmys muhlenbergii*	T	MD-T PA-E			X	Baltimore, Cecil, and Harford Counties, MD Lancaster and Chester Counties, PA	Wetlands such as sphagnum bogs, shallow fens, and marshy meadows with open canopies, slow flowing water and muddy bottoms; range from southern New England to northern Georgia with gap in Virginia.	Not likely to adversely affect	Yes Phase I Survey completed April 2007 and Phase II Survey completed May and June 2007.

a/ Virginia statuses are provided only for species that may be affected by activity along the proposed waterway for LNG marine traffic, the only portion of this project in Virginia. E = endangered; T = threatened

b/ PA = Pennsylvania; MD = Maryland; VA = Virginia

TABLE 4.7-2

State Listed Endangered and Threatened Species Potentially Occurring in the Project Area

(see table 4.7-1 for state listing statuses of federally listed species)

Species	Status a/	Project Component of Potential Occurrence			Project Location Where Listed	Preferred Habitat	Surveys Needed / Date Scheduled
		Marine Transit Route	Terminal	Pipeline			
Birds							
Least Tern *Sterna antillarum*	MD-T			X	Baltimore County, MD	Breeding colonies formed during spring/summer along the Atlantic coast of the United States on sandy or gravel beaches, dredge spoils or other open shoreline areas. Winters along coasts of Gulf of Mexico, Central and South America.	No, per MDNR (2007a)
Fish							
Atlantic Sturgeon *Acipenser oxyrinchus*	PA-E	X	X	X	Chesapeake Bay and its tributaries	Large estuaries and Atlantic coastal water along the entire east coast of the United States. Fast flowing, shallow (<3 ft) water bodies with clay, rubble, gravel or shell bottoms are used for spawning.	No, per NMFS (2006f)
Logperch *Percina caprodes*	MD-T			X	Harford and Cecil Counties, MD	Primarily freshwater lakes; also in other freshwater habitats from small fast-moving streams to large streams/rivers. Common in Great Lakes, Hudson Bay and Mississippi River Basins; rare in drainages of the Hudson River to the Potomac River.	No, per MDNR (2007a)
Invertebrates							
Regal Fritillary *Speyeria idalia*	MD-E			X	Harford, Cecil, and Baltimore Counties, MD	Tallgrass prairies or other open areas such as mountain pastures, wet fields, damp meadows and marshes. Current range is the Midwest. Rare or absent east of the Appalachian Mountains.	No, per MDNR (2007a)
Plants							
Maryland Golden-Aster *Chrysopsis mariana*	PA-T, PE			X	Lancaster and Chester Counties, PA	Dry sandy woods, clearings, roadside banks, and serpentine barrens.	Yes / July - October 2007
Elephant's Foot *Elephantopus carolinianus*	PA-T, PE			X	Lancaster and Chester Counties, PA	Open woods and serpentine barrens.	Yes / August - October 2007
Annual Fimbry *Fimbristylis annua*	PA-T			X	Lancaster and Chester County, PA	Moist depressions on serpentine barrens.	Yes / Summer 2007
Few-flowered Nutrush *Scleria pauciflora*	PA-T			X	Lancaster and Chester Counties, PA	Dry, open woods and serpentine barrens.	Yes / June - September 2007

TABLE 4.7-2

State Listed Endangered and Threatened Species Potentially Occurring in the Project Area

(see table 4.7-1 for state listing statuses of federally listed species)

Species	Status a/	Project Component of Potential Occurrence			Project Location Where Listed	Preferred Habitat	Surveys Needed / Date Scheduled
		Marine Transit Route	Terminal	Pipeline			
Eastern Blue-eyed Grass *Sisyrinchium atlanticum*	PA-E			X	Lancaster and Chester Counties, PA	Moist to dry, sandy, open ground of fields and thin woods.	Yes / Spring 2007
Tawny ironweed *Vernonia glauca*	PA-E			X	Lancaster and Chester Counties, PA	Dry fields, upland wooded slopes, or clearings.	Yes / July - October 2007
Broad-glumed Brome *Bromus latiglumis*	MD-E			X	Baltimore and Cecil Counties and Baltimore City, MD	Wet woods and prairies, low or rich woods over basic rocks, and alluvial soils along streams.	Yes / June - July 2007
Goldenseal *Hydrastis canadensis*	MD-T			X	Harford , Baltimore and Cecil Counties, MD	Rich woods; mature, moist, mixed deciduous forest.	Yes / May – August 2007
Hitchcock's Sedge *Carex hitchcockiana*	MD-E			X	Cecil, and Harford Counties, MD	Calcareous or rich moist woods.	Yes / May 2007
Porcupine Sedge *Carex hystericina*	MD-E			X	Baltimore and Cecil Counties, MD	Lowland forests, sedge meadows, wet depressions, along creek drainages, along hillside seeps, fens, seepage areas, and calcareous soils.	Yes / June 2007
Tufted Hairgrass *Deschampsia cespitosa*	MD-E			X	Baltimore and Cecil Counties, MD	Dry usually sandy or rocky soils in open woods, clearings, and plains.	Yes / July 2007
Ellisia *Ellisia nyctelea*	PA-T			X	Lancaster and Chester Counties, PA	Damp, shady banks and rich alluvial woods.	Yes / May 2007
Hoary Frostweed *Helianthemum bicknellii*	MD-E PA-E			X	Baltimore and Cecil Counties, MD; Lancaster and Chester Counties, PA	Sub-shrub layer in prairies, rocky open areas, dry sand soils, woodlands and glades.	Yes / May – June 2007
Umbrella Magnolia *Magnolia tripetala*	PA-T, PR			X	Lancaster and Chester Counties, PA	Rich wooded slopes and floodplains.	Yes / July 2007
Clammyweed *Polanisia dodecandra*	MD-E			X	Harford, and Baltimore Counties, MD	Dry sandy or gravelly soils, especially along streams; dry, open sandy or gravelly ground or waterside banks; sand spits, and gavel along railroad tracks.	Yes / May 2007
Seneca Snakeroot *Polygala senega*	MD-T			X	Baltimore, Harford, and Cecil Counties, MD	Dry rocky soils and hillsides (particularly with calcareous soils), lowland forests, prairies, and savannahs.	Yes / May – July 2007

TABLE 4.7-2

State Listed Endangered and Threatened Species Potentially Occurring in the Project Area

(see table 4.7-1 for state listing statuses of federally listed species)

Species	Status a/	Project Component of Potential Occurrence			Project Location Where Listed	Preferred Habitat	Surveys Needed / Date Scheduled
		Marine Transit Route	Terminal	Pipeline			
Leonard's Skullcap *Scutellaria leonardii*	MD-T			X	Cecil, Harford, and Baltimore Counties, MD	Dry rock soil, low woods and fields usually on basic soil, serpentine barrens, and shale barrens.	Yes / May – July 2007
Northern Dropseed *Sporobolus heterolepis*	MD-E PA-E			X	Cecil County, MD; Lancaster and Chester Counties, PA	Pine barrens over olivine (silicate mineral of iron and manganese), limestone or serpentine areas, and serpentine grasslands.	Yes / summer to fall 2007 for PA, and August – September 2007 for MD
Featherbells *Stenanthium gramineum*	MD-T			X	Harford, and Cecil Counties, MD	Thin woodlands, cut-over woodland borders and meadows, usually in small colonies, emergent wetlands, open sphagnum swales, seepage swamps, moist thickets, and floodplain forests. It is rarely found in upland habitats.	Yes, July 1 – August 15. 2007
Fameflower (Round-leaved Fameflower) *Talinum teretifolium (Phemeranthus teretifolius)*	MD-T			X	Baltimore, Harford and Cecil Counties,MD; Lancaster County, PA	Occupies sub-shrub layer in dry serpentine barrens, rock outcrops, dry rocks and sands, and serpentines, sandstone and gneiss glades.	Yes / May-June 2007

a/ Status: E = endangered; T = threatened; PE = proposed endangered; PDL = proposed for delisting; PR = proposed rare.
State: PA = Pennsylvania; MD = Maryland.
No Virginia state listed species (other than those also federally listed – see table 4.7-1) would be affected by the proposed project.

The NMFS (2006a) reports that although humpback whales are rare visitors to the Chesapeake Bay (including the proposed terminal site), the area outside of the bay where the LNG vessels would be traveling is a high use area for this species.

Fin Whale (*Balaenoptera physalus*). The fin whale is a federally listed endangered species and a state endangered species in Maryland and Virginia. Fin whale populations were depleted in the mid-twentieth century due to commercial whaling, which ended in 1987 in the North Atlantic. The North Atlantic currently supports abundant populations of fin whales, which is not the case in the North Pacific and Southern Oceans (NMFS, 2006b). Fin whale populations are present in all oceans of the world and are common along the Atlantic coast from Cape Hatteras, North Carolina northward. From October through January fin whales can be found in the Mid-Atlantic region where they mate and give birth. During the summer months there is evidence to suggest these populations migrate north to the colder waters of Canada to feed on krill and schooling fish (NMFS, 2005a). Mass migratory movements along well defined migratory corridors have not been documented by sightings; however, acoustic evidence suggests that migration does occur, but is highly variable from year to year and individual to individual (NMFS, 2006b). Fin whales are pelagic, but they have been spotted along coastal areas with water depths no less than 30 meters (NMFS, 2005a).

The NMFS (2006a) reports that although fin whales are rare visitors to the Chesapeake Bay (including the proposed terminal site), the area outside of the Bay where the LNG vessels would be traveling is a high use area for this species.

Sperm Whale (*Physeter macrocephalus*). The sperm whale is a federally listed endangered species and a state endangered species in Maryland and Virginia. Sperm whale populations were depleted worldwide by commercial whaling until the 1970's when commercial whaling was prohibited. Offshore distribution and long submergence times have made it impossible to accurately estimate the current number of sperm whales in the world. It is thought that that number may be several hundred thousands (NMFS, 2006c). Sperm whales are found in all of the world's oceans and reside on the continental shelf edge and into deeper waters of the ocean all along the eastern coast of the United States. Male sperm whales migrate to polar waters to feed, primarily on squid, and return to more tropical waters to breed (NMFS, 2005a). Females and calves do not migrate and reside in the tropic and sub-tropic waters of the Atlantic year round (ACS, 2007), although seasonal shifts have been observed (NMFS, 2005a). In the winter sperm whales are concentrated to the east and northeast of Cape Hatteras, North Carolina. In the spring they tend to be concentrated east and northeast of Delaware and Virginia. In the summer and fall they can be found throughout the Mid-Atlantic region (NMFS, 2005a).

The NMFS (2006a) reports that sperm whales are found farther offshore than the right whale, humpback whale, and fin whale; and their potential presence would be remote from the proposed terminal. However, the sperm whale may be present within the transit path of the vessels to and from the terminal.

Whale Impacts and Mitigation

Major potential risks to the North Atlantic right, humpback, fin and sperm whales along the east coast include the direct and indirect effects of ship traffic and noise, chemical pollution, vessel strikes, entanglement in commercial fishing equipment, and reduced prey abundance caused by over fishing (OLI, 2004). These impacts can affect reproductive success, decrease survival and disrupt habitats (NMFS, 1991).

The greatest potential for impacts to the North Atlantic right, humpback, fin and sperm whales resulting from construction and operation of the proposed project would be from ship strikes or disturbance from marine vessels carrying LNG to the proposed marine terminal.

The slow swimming speed, surface skim feeding, surface resting, and distribution in coastal water with high human activity of the North Atlantic right whale makes it especially susceptible to human interaction and disturbance, resulting in alterations in behavior, injury or death (NMFS, 1994). Vessel strikes are the leading cause of mortality of right whales, resulting in an average of 0.8 to 1.4 deaths per year (NMFS, 1994). Because the population of North Atlantic right whales is so small, a single death represents a significant

mortality rate. Disturbance from vessel traffic may alter the behavior of this species; however, studies have shown that low engine noise and limited maneuvering of the vessel may not have an impact on behavior. Other impacts from vessel activity may include displacement of cow/calf pairs from near shore areas or changes in migratory pathways. Vessels also have the potential to break up dense zooplankton patches, which is the primary food source of the North Atlantic right whale (NMFS, 1994).

As with the North Atlantic right whale, vessel strikes are the leading cause of human related deaths among fin, humpback and sperm whales. A study conducted in the Mid-Atlantic region estimated that approximately 30 percent of humpback whale deaths are a result of vessel strikes (NMFS, 2005b). Juvenile humpback whale stranding has increased along the coasts of Virginia and North Carolina suggesting that this area is important winter habitat for young humpback whales and additional human disturbance could negatively impact this species (NMFS, 2005b). Vessel strikes account for approximately one third of human related deaths among fin whales. Fin whale strikes have been documented along the eastern coast of the United States (NMFS, 2006b). Laist et al. (2001) found that fin whales are struck most often out of all large (baleen and sperm) whale species. It is estimated that less than one sperm whale is killed each year from a human cause (NMFS, 2005a). Due to the sperm whales offshore distribution it is thought that mortality or injury by vessel strikes are greater than what has been documented (NMFS, 2006c).

North Atlantic right whales are known to occur in or adjacent to many major shipping corridors along the eastern United States and collisions are the leading cause of mortality. To reduce the potential for vessel strikes to right whales, AES has agreed to incorporate NMFS's (2006d) "Endangered Fish and Wildlife, Proposed Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales", into its LNG Fuel Supply Agreement. The primary proposed regulatory measures to reduce ship strikes in the Mid-Atlantic region are the establishment of a uniform speed restriction of 10 knots or less, on vessels 65 feet or greater in overall length, within 20 to 30 miles (30 nautical miles) when approaching specific ports and areas, including the entrance to the Chesapeake Bay (Port of Hampton Roads and Baltimore). In the Mid-Atlantic region, speed restrictions would be enforced from November 1 through April 30 each year.

In addition to the proposed rule, the NMFS (2008) has developed the "Vessel Strike Avoidance Measures and Reporting for Mariners" document to reduce adverse impacts of vessel strikes to marine species. This document mandates training regarding identification of marine mammals and sea turtles, information and resources available regarding federal laws and regulations for protected species, ship strike information, critical habitat, migratory routes and seasonal abundance, and recent sightings of protected species. The document further specifies:

1. Vessel operators and crews must maintain a vigilant watch for marine mammals and sea turtles to avoid striking sighted protected species.
2. When whales are sighted, maintain a distance of 100 yards or greater between the whale and the vessel.
3. When sea turtles or small cetaceans are sighted, attempt to maintain a distance of 50 yards or greater between the animal and the vessel whenever possible.
4. When small cetaceans are sighted while a vessel is underway (e.g., bow-riding), attempt to remain parallel to the animal's course. Avoid excessive speed or abrupt changes in direction until the cetacean has left the area.
5. Reduce vessel speed to 10 knots or less when mother/calf pairs, groups, or large assemblages of cetaceans are observed near an underway vessel, when safety permits. A single cetacean at the surface may indicate the presence of submerged animals in the vicinity; therefore, prudent precautionary measures should always be exercised. The vessel should attempt to route around the animals, maintaining a minimum distance of 100 yards whenever possible.

6. Whales may surface in unpredictable locations or approach slowly moving vessels. When an animal is sighted in the vessel's path or in close proximity to a moving vessel, reduce speed and shift the engine to neutral. Do not engage the engines until the animals are clear of the area.

Vessel operators also must report any sightings of injured or dead protected species immediately whether or not it is a result of their vessel or another vessel. This document has set forth the following additional guidelines specifically for the North Atlantic right whale:

1. If a sighted whale is believed to be a North Atlantic right whale, federal regulation requires a minimum distance of 500 yards be maintained from the animal (50 CFR 224.103 (c)).
2. Vessels entering North Atlantic right whale critical habitat are required to report into the Mandatory Ship Reporting System.
3. Mariners should check with various communication media for general information regarding avoiding ship strikes and specific information regarding North Atlantic right whale sighting locations. These include NOAA weather radio, Coast Guard NAVTEX broadcasts, and Notices to Mariners.

NMFS (2006g) noted that the project should adopt the NMFS Ship Strike Proposed Rule that provides guidance for vessels within a 30-mile arc around the entrance to the Chesapeake Bay. Therefore, **to avoid whale strikes we recommend that:**

- **AES incorporate the NMFS's 2006 "Vessel Strike Avoidance Measures and Injured or Dead Protected Species Reporting" into its LNG Fuel Supply Agreement, and include a 30-mile arc around the entrance to the Chesapeake Bay into its implementation of NMFS's 2006 "Endangered Fish and Wildlife, Proposed Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales."**

The North Atlantic right, humpback and fin whales are rare visitors to the Chesapeake Bay, but the area outside of the Bay that would be used by LNG ships, is a high use areas for these species, especially during migration (NMFS, 2006a). Sperm whales could be present farther offshore, but still within the transit path of LNG vessels (NMFS, 2006a). Adherence of LNG ships to the recommended speed restrictions in the proposed rule and the vessel strike avoidance measures developed by NMFS would be expected to effectively minimize the potential for strikes of all whale species. Additionally, educating vessel operators on species identification and the guidelines, rules and regulations above would insure that all precautions are taken to minimize adverse impacts to right whales.

The NMFS (2006g) is satisfied with the vessel transit route for the project, and therefore no further endangered and threatened species consultation with NMFS is required for the vessel transit route.

Whales can also be disturbed by in-water construction activities such as noise and sediment plumes; however these activities would not take place in the vicinity of known North Atlantic right, humpback, fin, and sperm whale locations. The FWS (2006a) has indicated, with the exception of transient individuals, no federally listed or proposed endangered or threatened whale species are known to exist within the project area. Neither NMFS (2006f) nor FWS (2006a) requires surveys or further consultation for the four listed whale species; however if these species are observed during other surveys, AES should notify NMFS as soon as possible.

Whales that happen to be near an LNG spill may be unable to escape by submerging or swimming away and thus could be exposed to dangers associated with the "Zones of Concern" 1 and 2 (described in Section 4.12.5.3) such as a temperature drop from an LNG spill, fire, or vapor clouds. Within Zone 3, the potential impacts from a vapor cloud are expected to be low or non-existent for whales that may be unable to swim away. Additional details on LNG spills and federally listed species along the waterway for LNG marine traffic are in section 4.7.2.

LNG ships servicing the proposed terminal have the potential to strike whales within the vicinity of the Chesapeake Bay. However, species characteristics including habitat preferences and migration patterns, rarity

of the species in the Project Area, the proposed construction methods, speed restrictions and other measures agreed to by AES as described above, as well as AES's adherence to our recommendation would minimize the potential for strikes. Therefore, we have determined that construction and operation of the proposed project is *not likely to adversely affect* the North Atlantic right, humpback, fin, and sperm whales.

Sea Turtles

Four sea turtle species were identified by the NMFS as having the potential to occur near the project area; the Kemp's ridley (federal, Maryland, and Virginia endangered), leatherback sea turtle (federal, Maryland, and Virginia endangered), loggerhead sea turtle (federal, Maryland, and Virginia threatened), and green sea turtle (federal, Maryland, and Virginia threatened). The Kemp's ridley, loggerhead, and green sea turtles are known to be present in the Chesapeake Bay from April 1 to November 30, but mainly in the late spring, summer, and early fall when water temperatures are relatively warm. An estimated 3,000 to 10,000 loggerhead sea turtles and 500 Kemp's ridley sea turtles are found in the bay annually.

Loggerhead Sea Turtle (*Caretta caretta*). Juvenile loggerheads are the most common sea turtles in the Chesapeake Bay, with up to 10,000 loggerheads inhabiting the bay in the summer (Musick, 1988). Approximately 95 percent of the loggerhead sea turtles found in the Chesapeake Bay are juveniles, most commonly found foraging along channel edges from the mouth of the bay to the Potomac River. Loggerheads can be found in a variety of habitats such as coral reefs, rocky bottoms, shellfish beds, and boat wrecks, and are common in waters less than 50 meters deep (Shoop and Kenney, 1992). Crustaceans are the primary components of the loggerhead's diet in the Chesapeake (Burke et al., 1990).

Loggerhead sea turtle nesting in the U.S. occurs primarily on the beaches of Florida but has also been reported from North Carolina, South Carolina, and Georgia. Post-hatchling and juvenile habitat use is associated with sargassum and/or debris in pelagic drift lines. Subadult habitat usage is associated with nearshore and estuarine waters along continental margins, which are used as developmental habitat. Adult habitat selection is not well understood but it seems clear that adults can use a variety of habitats. Coastal development threatens nesting habitat and populations, while commercial fisheries and pollution pose significant threats to their marine environment.

Kemp's Ridley Sea Turtle (*Lepidochelys kempi*). In the Chesapeake Bay, Kemp's ridley sea turtles frequently forage in shallow embayments, particularly in areas supporting submerged aquatic vegetation and on tidal flats. Hundreds of juveniles have been reported to inhabit the bay during the summer months (Musick, 1988). The major nesting beach where Kemp's ridley sea turtles emerge in any concentration to lay eggs is on the northeastern coast of Mexico. Additional nesting areas have been reported from Texas, Florida, and South Carolina. Juveniles frequent bays, coastal lagoons, and river mouths. Although adults are sometimes found on the eastern seaboard of the northwestern Atlantic Ocean, they are typically confined to the Gulf of Mexico. This species is typically found in water with low salinity, high turbidity, high organic content, and where shrimp and crabs are abundant (FWS, 1970). Major threats to this species include incidental mortality in commercial shrimping, marine pollution, and dredging activities.

Green Sea Turtle (*Chelonia mydas*). Green sea turtles generally occupy three habitat types: high energy oceanic beaches (nesting), convergence zones in pelagic habitat (juvenile foraging), and benthic feeding grounds in relatively shallow, protected waters (adult foraging). The estuarine and coastal waters of the Chesapeake Bay provides summer developmental habitat for this species. Green sea turtles have occasionally been seen in nearshore waters from Massachusetts to Virginia from July to November (NMFS, 2001), and move southward in late fall as water temperatures decline. The primary green sea turtle nesting area within the U.S. is limited to a six-county area in east central and southeast Florida. Juvenile green sea turtles are benthic feeders, consuming a variety of plants and animals whereas adults feed almost exclusively on seagrasses and algae. Common adult foraging habitats are pastures of seagrasses and/or algae, although small green sea turtles can also be found over coral reefs, worm reefs, and rocky bottoms. Coastal development threatens nesting habitat and populations, while commercial fishing and pollution pose significant threats to the marine environment.

Leatherback Sea Turtle (*Dermochelys coricea*). Leatherback sea turtles are predominantly pelagic but are also seasonally present in the Chesapeake Bay. They undertake extensive migrations, mostly within the temperate zone. They occupy large, open bays in the northeastern U.S. from June to November; the southern migration to Maryland and Virginia occurs in nearshore waters from August to November (NMFS, 2001). Although considered an oceanic species, leatherback turtles are sometimes found in shallow waters (NMFS, 1992). Leatherback turtles have been sighted in the Chesapeake Bay, with one instance of nesting reported on the eastern shore of Maryland on Assateague Island (Rabon et al., 2003). The NMFS reports that they are seasonally present in the Bay (NMFS 2006a), and are likely present when in pursuit of prey (Musick, 1988). Their diet consists almost exclusively of jellyfish.

Recent data from sightings and incidental captures in fishing gear indicate that loggerhead and Kemp's ridley are the sea turtle species most likely to be found in the waters of the bay, while leatherback and green sea turtles are relatively less common. In general, sea turtles are less common in the upper bay; however, data from the MDNR sea turtle tagging program and data from the Sea Turtle Stranding Salvage Network indicates that sea turtles do occur near the mouth of the Patapsco River.

Sea Turtle Impacts and Mitigation

Sea turtles are vulnerable to direct and indirect adverse impacts from construction activities, ship traffic, dredging operations, and possibly noise. Additionally, direct impacts to prey species would result in indirect impacts to the sea turtles.

Sea turtle use of the Chesapeake Bay during the summer months is significant, with high numbers also observed in the spring and fall. Direct and indirect impacts to sea turtles and their prey/food items could be minimized by avoiding construction during the relatively warmer months when sea turtle activity in the Bay is the highest. With the exception of the leatherback sea turtle, large numbers of juvenile loggerhead, Kemp's ridley, and green sea turtles are expected to occur in the Bay during the summer months. These younger individuals are anticipated to be more susceptible to the direct and indirect impacts of construction because of their reduced size and strength relative to adults. Most of the prey items for these turtles are benthic species and construction activities that disturb the bottom sediments would eliminate many of the food sources for developing turtles. These impacts could be avoided or minimized by implementing a seasonal restriction on construction activities to avoid the late spring to early fall months when sea turtle use of the Bay is highest.

Sea turtles do not frequent the area around the Terminal Site where pile driving would take place so surveys for the four listed sea turtle species are not required (NMFS, 2006f); however, AES has agreed to take precautions during construction to avoid impacts to transient individuals. Prior to the start of construction, the Environmental Inspectors and other construction personnel would be trained on how to recognize critical aquatic organisms such as sea turtles, and procedures for protecting critical aquatic organisms and their habitat. An Environmental Inspector would be present during all pile construction activities (day or night). If a sea turtle is noted along the path of a construction vessel or within 50 feet of the area where pile driving is taking place, construction activities would be halted or redirected to avoid impacts to the sea turtles. The Environmental Inspector would maintain a log of all sea turtle sightings, which would be submitted to FERC and the MDNR bi-weekly. If a collision with or injury to a sea turtle occurs during construction activities, FERC and the MDNR must be notified immediately.

Sea turtles are vulnerable to entrainment in mechanical hopper and hydraulic dredges, typically resulting in injury and death. The NMFS has required that AES provide construction and engineering specifications on the proposed dredging. We have presented a discussion of sedimentation due to dredging in section 4.3.2.4, on the dredging options and associated impacts of each method in section 3.2.7, and on the impacts of the proposed dredging by mechanical means in section 4.3.2.5 (under Dredging subheading). In section 2.3.1.3 we have requested comments on alternative dredging methods, and we will present the results of our analysis in the final EIS. In accordance with NMFS's May 3, 2006 letter, AES has agreed to develop a NMFS-approved training program to qualify persons to be endangered species observers during project activities. AES would train and certify endangered species observers in accordance with the NMFS approved procedures. These

certified observers would be stationed on the dredge while it is in operation to monitor for and record the presence of listed species. If sea turtles are noted along the path of the dredge, dredging activities would be halted or redirected to avoid impacts to the sea turtles.

Sea turtles may occur throughout the Chesapeake Bay within all three Zones of Concern along the LNG vessel transit route. (The Zones of Concern are described in Section 4.12.5.3.) Sea turtles are highly mobile and the degree of the impact from an LNG spill would depend on how quickly the incident occurred and spread. Sea turtles within the immediate vicinity (Zone 1 and 2) of an LNG spill would be exposed to either a temperature drop from the LNG spill, and/or heat from a fire or a vapor cloud, unless they are able to swim/dive away. Sea turtles within Zone 3 would be exposed to a vapor cloud; however, the impact of the vapor cloud on sea turtles is expected to be very low. Additional details on LNG spills and federally listed species along the waterway for LNG marine traffic are in section 4.7.2.

Sea turtle mortality stemming from ship strikes can be significant. The potential for adverse impacts would be minimized by compliance with NMFS guidance, specifically, the NMFS (2008) Southeast Region's "Vessel Strike Avoidance Measures and Reporting for Mariners" (described above under "Whales"), and the NMFS (2006h) "Sea Turtle and Smalltooth Sawfish Construction Conditions." Provisions of the latter document applicable to this project are:

1. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles. All personnel are responsible for observing water-related activities for the presence of these species.
2. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles, which are protected under the ESA.
3. Siltation barriers shall be made of material in which a sea turtle cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment.
4. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times when in the construction area and wile in water depths where the draft of the vessel provides less than a 4-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.
5. If a sea turtle is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle. Operation of any mechanical construction equipment shall cease immediately if a sea turtle is seen within a 50-foot radius of the equipment. Activities may not resume until the protected species has departed form the area of its own volition.
6. Any collision with and/or injury to a sea turtle shall be reported to the NMFS's Protected Resources Division.
7. Any special construction conditions, specific to the project, will be addressed in the primary consultation with NMFS.

We agree that these measures could minimize potential impacts to sea turtles. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, AES should:**
  - **a. consult with the NMFS to determine appropriate seasonal construction windows for sea turtles and file the results of that consultation with the Secretary;**
  - **b. indicate that AES will incorporate the NMFS's 2006 "Sea Turtle and Smalltooth Sawfish Construction Conditions" into its LNG Fuel Supply Agreement;**

c. **submit to the NMFS construction and engineering specifications on its proposed dredging; and**

d. **file the training and monitoring program developed in consultation with the NMFS for threatened and endangered species with the Secretary.**

We also have included, in the "Whales" subsection above, a recommendation for AES to incorporate the NMFS 2008 "Vessel Strike Avoidance Measures and Reporting for Mariners" into its LNG Fuel Supply Agreement.

Implementation of these measures would minimize the potential for adverse impacts to sea turtles. Therefore, we have determined that the Project is *not likely to adversely affect* loggerhead, Kemp's ridley, green, and leatherback sea turtles.

4.7.1.2 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is a state listed threatened species in Pennsylvania and Maryland. Effective August 8, 2007, the bald eagle was delisted as a federal threatened species, reflecting significant recovery and indicating that threats to this species have been eliminated or reduced to the point that this species no long needs federal protection under the ESA (FWS 2007b). Until its delisting, the bald eagle was listed as threatened by FWS in all project counties. Although the bald eagle is no longer federally listed as a threatened species, it remains state listed as threatened in both Pennsylvania and Maryland. Bald eagles no longer receive federal protection under the ESA; however they still receive federal protection under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). Like the ESA, the BGEPA and MBTA prevent the take, disruption of, or harm to bald eagles resulting in an indirect protection of their habitat. Unlike the ESA the BGEPA and MBTA do not include provisions for "incidental take" of this species; however a proposed rule to create a permit for "incidental take" under the BGEPA is currently in the public comment period.

Bald eagles can be found in every state in the continental United States and Alaska. The Chesapeake Bay watershed supports one of the highest concentrations of bald eagles in the continental U.S., with most being found within 1 mile of the bay and its tidal tributaries (Olear, 2003). Bald eagles are also found along the shores and nontidal areas of the Chester, Choptank, Patuxent, Potomac, and Susquehanna Rivers. Large Maryland reservoirs such as Loch Raven and Tridelphia also support eagle populations (Olear, 2003). In these areas bald eagles usually nest in mature loblolly pines, tulip poplars, and oaks (FWS, 2006b). Historically, over 1,000 breeding pairs of bald eagles were recorded around the Chesapeake Bay each year. In the 1940's the population began to decline due to habitat destruction, loss of prey, direct killing, and the DDT contamination. With the banning of DDT in 1972 the bald eagle has made an impressive comeback (CBP, 2004b).

The presence of the bald eagle in the project vicinity was not noted in Mid-Atlantic Express's initial consultation with federal and state agencies. During Mid-Atlantic Express field surveys, a bald eagle nest was documented in Cecil County, Maryland near MP 44.8 approximately 500 feet from the centerline of the Pipeline. This nest was active during the 2006-breeding season. Mid-Atlantic Express requested guidance regarding this nest from the FWS Chesapeake Bay Office on January 25, 2007 and solicited recommendations to avoid or minimize impacts to the nesting bald eagles during the construction phase of the project (FWS, 2007d). Mid-Atlantic Express conducted an additional nest occupancy survey on April 26, 2007 to determine the presence or absence of bald eagles at this nest site. The survey indicated that this nest was actively being used by a breeding pair during the 2007 breeding season. Incubation behavior was not observed during the survey (adults were not observed in the nest); however, the pair was observed together near the nest, and behavior suggestive of prey deliveries was observed, in turn suggesting that hatchlings may be present. Mid-Atlantic Express anticipates conducting a similar nest occupancy survey at this site in 2008.

The MDNR indicated (2007d) that there are bald eagles within the vicinity of the Back River and the proposed pipeline route. The MDNR (2007d) has observed wintering bald eagles (non-nesting pairs) in this area. The MDNR also is aware of two bald eagle nests, both in Baltimore County, that are currently being used by

breeding pairs in this area. One nest is located along Millers Island Road in North Point State Park at the mouth of the Back River. The other nest is located near the Martin State Airport. The proposed Project facilities are well beyond the 0.25-mile protection zone of concern for the two nests noted. The MDNR (2007d) also indicated that bald eagles typically forage up to 3 miles from their nest site. However, MDNR requires no protective measures during project activities for foraging or wintering eagles.

Potential impacts to active bald eagle nests include: water quality degradation, impacts to food source, and disturbance from construction related activities. The FWS has developed the National Bald Eagle Management Guidelines (National Guidelines) to continue the protection of bald eagles after delisting and minimize adverse impacts to this species. The National Guidelines themselves are not law, but recommendations to avoid adverse impacts to bald eagles and provide information that would prevent violations of the federal laws (such as the BGEPA and MBTA) that protect bald eagles. The FWS (2007c) has provided the following National Guidelines for protecting bald eagle nests from "Category A" projects which include the construction of roads, trails, canals, power lines and other linear utilities (such as pipelines):

1. Keep a safe distance between the activity and the nest (distance buffers). If project related activities will be visible from the nest, a distance buffer of 660 feet is recommended. If activities of similar scope are occurring closer than 1 mile from the nest and are tolerated by the nesting bald eagles, project related activities may take place as close as the tolerated activities of similar scope. If project related activities will not be visible from the nest, a distance buffer of 330 feet or as close as exiting tolerated activity of similar scope is recommended.
2. Maintain preferably forested (or natural) areas between the activity and around nest trees (landscape buffers) to create a shield between the nest and project related activities. If project related activities will be visible from the nest landscape buffers are recommended.
3. Avoid certain activities during the breeding season. Clearing, external construction, and landscaping within 660 feet of the nest should be conducted outside of the breeding season.

The buffers recommended in the National Guidelines are intended to minimize visual and auditory impacts to nest sites caused by human related activity associated with construction and operation. The FWS states that ideally buffers should be large enough to protect the existing nest tree and provide alternative or replacement nest trees (FWS 2007c). The distances outlined in the National Guidelines may vary depending on the topography and other ecological characteristics that surround the nest site (FWS 2007c).

The FWS National Guidelines also include the following measures for avoiding disturbance at foraging areas and communal roost sites:

1. Minimize potentially disruptive activities and development in the eagles' direct flight path between their nest and roost sites and important foraging areas.
2. Locate long-term and permanent water-dependent facilities, such as boat ramps and marinas, away from important foraging areas.
3. Avoid recreational and commercial boating and fishing near critical eagle foraging areas during peak feeding times (usually early to mid-morning and late afternoon), except when eagles have demonstrated tolerance to such activity.
4. Do not use explosives within ½ mile (or within 1 mile in open areas) of communal roosts when eagles are congregating, without prior coordination with the FWS and your state wildlife agency.

In an April 3, 2007 letter, MDNR (2007a) provided the following guidelines for protecting bald eagle nests:

- establish a protection area of ¼ mile (1320 feet) radius of the nest tree. Within this area 3 zones of protection should be established: Zone 1 extends from the nest tree to a radius of 330 feet, Zone 2 extends from 330 feet to 660 feet in radius and Zone 3 extends from 660 feet to ¼ mile (1320 feet);

- no land changes, including development or timber harvesting should occur in Zone 1;
- construction activities, including clearing, grading, building etc., should not occur within Zone 1 and 2 and ideally no closer than 750 feet from the nest;
- selective timber harvesting may occur in Zone 2, but clearcutting should be avoided; and
- no construction or timber harvesting activities should occur within the ¼ mile protection zone during the eagle nesting season (December 15 through June 15).

Based on guidance provided by the FWS and the MDNR, **we recommend that:**

- **<u>Prior to construction</u>, Mid-Atlantic Express should:**
  - **a. conduct a nest occupancy survey at the bald eagle nest near milepost 44.8 to confirm the presence or absence of nests and file the results of that survey with the Secretary, MDNR, and the FWS;**
  - **b. incorporate the FWS's May 2007 "National Bald Eagle Management Guidelines" into Mid-Atlantic Express's construction activity;**
  - **c. contact the FWS to determine the appropriate size and shape of buffers, timing of project related activities, and distance of activities from the bald eagle's nest; and**
  - **d. file documentation of any mitigation plans developed in consultation with the FWS.**

The bald eagle would occur over the waterway for LNG marine traffic only as transient individuals during migration or moving within their range across Chesapeake Bay. Therefore, the chance of any adverse impacts to the bald eagle due to LNG releases from LNG vessels is negligible. If the above protection measures regarding the bald eagle nest near MP 44.8 are implemented during construction and operation activities, we believe that the Project would not significantly affect the bald eagle.

4.7.1.3 Shortnose Sturgeon (*Acipenser brevirostrum*)

The anadromous shortnose sturgeon is a federally listed endangered species and a state listed endangered species in both Maryland and Pennsylvania. Shortnose sturgeon occur along the Atlantic Ocean seaboard near river mouths, estuaries, and major rivers from the St. John's River in Florida to the St. John River in New Brunswick, Canada. The shortnose sturgeon is not known to undertake large-scale oceanic migrations, and typically spends its entire life cycle within its native estuary or river system.

Shortnose sturgeon typically spawn in freshwater areas with clean gravel or cobble bottom in swift water, although some evidence exists that the firmness of the substrate may be a more important indicator of habitat suitability than particle size. Shortnose sturgeon spawning in the Chesapeake Bay area typically occurs from the end of April to early May (CBP, 2004c). Male shortnose sturgeon typically stay on the spawning grounds longer than females. After spawning, the adults rapidly migrate downstream to summer foraging areas and then return during the winter.

Shortnose sturgeon are moderately tolerant of a range of salinities. Although shortnose sturgeon have occasionally been found in salinities as high as 30 parts per thousand, they prefer minimally saline conditions (0 to 5 parts per thousand) and are primarily residents of estuaries and large, brackish coastal rivers. With the exception of the spawning season, adult and juvenile shortnose sturgeon prefer areas with little or no current. They tend to occupy deepwater habitats during the day where sufficient oxygen is available, but move into shallow areas at night to feed. Adults show a general tendency to use deeper areas (approximately 30 to 100 feet deep) more often in winter than in summer, when they are usually found in water from approximately 4 to 30 feet deep. Although not strictly nocturnal, shortnose sturgeon tend to be most active at night. They are benthic feeders; adults feed primarily on mollusks, insects, crustaceans, and small fish, whereas juveniles feed mostly on crustaceans and insects.

A small and vulnerable population of shortnose sturgeon is known to be present in the Chesapeake Bay. The incidental capture of 74 shortnose sturgeon in the bay and its tributaries has been reported to the FWS from 1996 to 2006 via the Atlantic sturgeon reward program. This number includes four individual shortnose sturgeon that were captured in fishing gear at the mouth of the Patapsco River and several that were captured in the bay just outside of the mouth of the Patapsco River (NMFS, 2006a). Spawning has been reported in the James and York Rivers, and two mature egg-bearing females were captured in the Potomac River. Although this species has not been reported to spawn near the Patapsco River (MDNR, 2006b), researchers are currently tracking individuals in an attempt to document successful spawning in the Chesapeake system. No shortnose sturgeon were reported during the June 2006 and October 2006 marine surveys in the Patapsco River.

Shortnose sturgeon within the vicinity of the project area are vulnerable to the direct and indirect effects of dredging, noise from in-water construction, pile driving, intake systems for ballasts and pumps, and ship strikes from marine traffic.

Dredging activities have the potential to disrupt migratory movements, destroy habitat and prey resources, and entrain individuals. Spawning in the Chesapeake system has not been documented for this species, therefore, the Project would not disrupt shortnose sturgeon spawning. Dredging activities could increase sedimentation and turbidity in the immediate vicinity of the dredging operations, potentially resulting in a short-term impact to this species, not from the turbidity itself, but from the increased biological oxygen demand that typically results from the disturbance of anoxic sediments. Sturgeons, if present, may avoid the area until dissolved oxygen levels increase to desirable levels for this species. However, major dredging impacts would be temporary, and suspended sediments would likely return to background levels after a short time and within a short distance from the point of disturbance. Nevertheless, dredging would be kept to a minimum and would be conducted in accordance with permit requirements.

Dredging would also remove or reduce the availability of benthic food sources by direct removal from the sea floor and alteration of the particle size distribution of bottom sediments; however, recolonization of the substrate from surrounding areas is expected to restore the benthic community and food base. Valente (2003), in a report prepared for the NOAA Coastal Services Center, states that the loss of benthic habitats in areas subject to routine maintenance dredging is typically not an issue since these shipping channels were created and authorized decades ago, and are therefore viewed as part of the existing infrastructure in a given harbor or estuary. As such, these channels typically do not contain much critical benthic habitats (Valente, 2003).

Studies (e.g., Newell et al., 1998) report that dredging can result in a 30-70% reduction in species variety, a 40-95% reduction in the number of individuals, and a similar reduction in biomass. However, studies by McCauley et al. (1977), Kenny and Rees (1994, 1996), Kenny et al. (1998), and Guerra-Garcia et al. (2003) report initial recolonization rates and pre-disturbance community composition levels within a few months. In contrast, Boyd et al. (2004) report that benthic fauna remains in a perturbed state for years following high levels of dredging intensity, sometimes reflective of a change in the sediment composition of the dredged area. These varied results indicate the site-specific nature of recolonization and therefore, mitigative measures such as the proposed seasonal restrictions are viewed as an adequate protective measure.

Noise from construction activities may have a temporary impact on the shortnose sturgeon. However, the total ambient noise emanating from work boats, pile driving, and construction activities are likely to elicit an avoidance response from this species that would keep them away from work areas.

This species is vulnerable to entrainment in mechanical hopper and hydraulic dredges, typically resulting in injury and death. The NMFS (2007) indicated that the use of a mechanical dredge was recommended over hydraulic dredging because the lower water content of mechanical dredge spoils. NMFS (2007) has indicated that backwash typically produced by mechanical dredging is operator-dependent and therefore relatively controllable. The NMFS has also indicated that dredged material must all go to an upland containment site, and that no material should be placed overboard. In addition to these operator controls, the aforementioned seasonal restrictions would minimize the direct and indirect effects of project activities by avoiding sensitive times (e.g. spawning periods) in the sturgeon's life cycle. The NMFS (2007) has indicated that the incidental take of shortnose sturgeon cannot be authorized; however in accordance with the NMFS May 3, 2006 letter

AES has agreed to develop a NMFS approved training program to qualify persons to be endangered species observers during project activities. AES would train and certify endangered species observers in accordance with the NMFS-approved procedures. These certified observers would be stationed on the dredge while it is in operation to monitor for and record the presence of listed species. If sturgeon are noted along the path of the dredge, dredging activities would be halted or redirected to avoid impacts to the sturgeon. Therefore, we have included a recommendation in section 4.7.1.1 that would require AES to submit information to NMFS regarding dredging specifications and endangered and threatened species monitoring and training, and to file the NMFS-approved training and monitoring program with the Secretary.

Young sturgeons are particularly vulnerable to entrainment in intakes for ballasts and water pumps, such as for hydrostatic tank testing. Nevertheless, the potential adverse effects of ballast water and tank deluge system intakes are anticipated to be minimal since the most vulnerable life stages (i.e., eggs and larvae) are not expected in these waters (NMFS, 2007). Ballast intake is discussed in detail in section 4.6.2.2 (under LNG Terminal Operation, Ballast Water Impacts). The NMFS has indicated that any spawning that may occur would be in the upstream reaches of the Patapsco River (i.e., a portion of the river that would not be affected by the Project), and that specimens traveling downstream would reach a sufficient size to avoid uptake by water intake systems (NMFS, 2007). Additionally, NMFS (2007) has also indicated that since these types of impacts are already occurring in the Bay, any adverse impacts from water intakes associated with this project would be minimal. Nevertheless, if any sturgeon eggs (both shortnose and Atlantic) happen to be present near the terminal area, their typical adhesion to substrates and structures would minimize their potential for movement into any intake stream. Additionally, if any larval sturgeons happen to be within the terminal area, their typical demersal nature also minimizes their potential to be swept up in any intake stream.

As discussed above, potential adverse impacts from the intake of ballast water and the tank deluge system are anticipated to be minimal since the vulnerable life stages of this species are not expected to be within the waters of these systems.

NMFS (2006f) indicated that studies for the shortnose sturgeon species are not required, but if any shortnose sturgeons are recorded during other surveys, the NMFS should be notified as soon as possible.

Sturgeons are highly mobile; therefore, impacts from LNG vessels such as ship strikes are not anticipated to be significant. Impacts to sturgeon from spills are also expected to be insignificant as the footprint of any LNG spill along the waterway for LNG marine traffic would be negligible relative to the distribution of sturgeon in the Chesapeake Bay, and impacts to any sturgeon under a spill would be confined to the upper few feet of water subject to extreme temperature change from the LNG. Furthermore, all LNG vessels entering US waters carrying hazardous cargo file a spill contingency plan with the Coast Guard; implementation of such a plan would further mitigate any impacts should a release occur from an LNG vessel.

Because sturgeons are highly mobile and are expected to avoid construction activities and LNG vessels, and because AES would implement measures (described above) to minimize adverse effects on aquatic life, we have determined that implementation of the above-described measures would minimize impacts such that the Project is *not likely to adversely affect* the shortnose sturgeon.

4.7.1.4 Maryland Darter (*Etheostoma sellare*)

The Maryland darter is a federal endangered species and a state endangered species in Maryland. The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species listed the Maryland darter as extinct in 1996; however, it is still state listed as endangered in Maryland. This freshwater species is endemic to Maryland and its current range is confined to the mouth of Deer Creek along the Susquehanna River in Harford County, Maryland located approximately 5 miles downstream from where the Pipeline would cross Deer Creek at MP 35.54.

Maryland darters inhabit riffles, areas of choppy water caused by shoals or sandbars, in portions of streams where the water tumbles out of the hills onto the flat coastal plain. This area is known as the fall line; it is characterized by turbulent water and is the point where ships cannot go any farther upstream. The scarcity of

this species is attributed to its extremely specialized habitat requirements (MDNR, 2004b). The following waterbodies have been noted to contain Maryland Darter or its habitat: Deer Creek (from US Highway 1 downstream to the Susquehanna River), Buck Branch (entire length), Elbow Branch (entire length), and Gashey's Creek (entire length) (EPA, 2006). Biologists believe that the Deer Creek population is the only viable population; however it has not been sighted since 1987 and is believed to be extinct (EPA, 2006).

The Maryland darter can only survive in relatively healthy and clean waterbodies. Threats to the survival of the remaining Maryland darters include water quality degradation from contamination by pesticides, nutrient loading, and construction activities that cause siltation and increase turbidity. The range of the Maryland darter was significantly reduced in 1928 when the damming of the Susquehanna River caused excessive siltation of its habitat (EPA, 2006).

Mid-Atlantic Express has consulted with the NMFS, and the MDNR WHS with regard to the potential impacts of the project on the Maryland darter. The MDNR has not expressed concern about Project impacts to this species. The FWS has indicated that no additional research or assessments are needed for the Maryland darter (FWS, 2007e). The FWS (2007e) agrees that the methods Mid-Atlantic Express (i.e., the BMP's in Mid-Atlantic Express's ECP) plans to use for crossing Deer Creek and its tributaries are adequate; therefore we have determined that construction and operation of the proposed project would result in no effect on the Maryland Darter.

4.7.1.5 Bog Turtle (*Clemmys muhlenbergii*)

The bog turtle is a federally listed threatened species, a state listed threatened species in Maryland, and a state listed endangered species in Pennsylvania. The historic range of the bog turtle runs from southern New England to northern Georgia with the exception of a gap in Virginia, which divides the species into a northern population and southern population. In Pennsylvania, bog turtles are most commonly found in the Southeastern part of the state (PDCNR, 1997). Portions of the proposed pipeline and associated aboveground facilities in both Maryland and Pennsylvania would be located within the range of the bog turtle and the proposed pipeline route would cross drainage areas containing known bog turtle habitat (MDNR, 2006b).

Bog turtles are a semi-aquatic, omnivorous species that inhabit wetland areas, such as sphagnum bogs, shallow fens, and marshy meadows, with open canopies, slow flowing water and muddy bottoms. These wetland habitats typically have pockets of drier areas, saturated areas and areas that are periodically flooded (PDCNR, 1997). The diverse micro-habitats of these wetlands are used for nesting, hibernation, shelter, feeding, and basking (FWS, 2001). Bogs turtles are also known to use forested wetlands with small streams or springs as dispersal corridors to other more open marshes (PFBC, 2006).

Bog turtles have experienced at least a 50 percent reduction numbers over the past 20 years due to the destruction, degradation, and fragmentation of its habitat (FWS, 2001). This has resulted in their federal and state threatened and endangered status.

Project activities in and adjacent to bog turtle habitat have the potential to cause habitat destruction, degradation, and fragmentation. Even if the wetland is not directly impacted by activities (encroachment of the wetland), activities in upland areas may indirectly impact the bog turtle habitat by decreasing the quality of the habitat, fragmenting the travel corridors used by bog turtles between wetlands, and altering the hydrology of the wetland (FWS, 2001). Invasive plant encroachment is a major threat to bog turtle habitat. When disturbance occurs, invasive plant species take root and quickly spread to adjacent wetlands. The diverse plant species of the bog turtle habitat is displaced by a monoculture invasive species, making the wetland no longer suitable for the bog turtle (FWS, 2001). The MDNR (2006c) has indicated that sediment transport that occurs during storm events can change the hydrology and or vegetative character of wetlands. To avoid adverse impacts to wetlands that serve as bog turtle habitat, appropriate sediment and erosion control measures should be implemented. Upland buffers placed around bog turtle wetlands often do not provide the protection needed to avoid adverse indirect impacts to the bog turtle habitat (FWS, 2001).

Pursuant to FWS, PFBC, and MDNR WHS requirements, Mid-Atlantic Express evaluated wetlands in Lancaster and Chester Counties, Pennsylvania and Harford County, Maryland for potential bog turtle habitat during the 2006 field season. During these surveys, habitat assessments were performed on wetlands that would be directly or indirectly impacted by the project or project associated features and bog turtle habitat forms were filled out. Mid-Atlantic Express has indicated that the preliminary habitat field surveys identified several wetlands located within the project area that are considered suitable habitat for bog turtles. Mid-Atlantic Express conducted formal Phase I habitat suitability assessments for bog turtles in 21 wetlands in Chester and Lancaster Counties, Pennsylvania and Harford County Maryland in April 2007. During the formal Phase I survey, 10 wetlands (all located in Chester County, Pennsylvania) were determined to be suitable bog turtle habitat and would require a Phase II bog turtle survey. Phase II bog turtle surveys were performed in May and June of 2007 in the 10 suitable-habitat wetlands. Bog turtles were found at two locations during surveys on May 11 and May 21. The FWS and PFBC were notified within 48 hours of the bog turtle sightings, per FWS bog turtle survey guidelines. Mid-Atlantic Express had indicated it would submit the final report describing the findings of the Phase I and Phase II bog turtle surveys at the 21 surveyed wetlands to the FWS and PFBC during autumn 2007. In addition, the final report was to include an additional wetland for which Mid-Atlantic Express did not have access permission in April 2007. However, to date we have not received this report.

There are three additional wetlands with previously identified potential bog turtle habitat for which Mid-Atlantic Express did not anticipate acquiring access permission in time to survey during the April 15 - June 15 survey window in 2007. Mid-Atlantic Express plans to survey these three wetlands in 2008 if survey permission is acquired.

To avoid impacts to bog turtles and their habitats, the MDNR (2007a) recommends that actions be taken to avoid incidental "take" of this species, as described in the Federal Recovery Plan for bog turtles (FWS, 2001). This plan involves the establishment of 3 zones:

- Zone 1 - This zone includes all contiguous wetlands associated with an occupied bog turtle wetland. Within this zone the following activities should be avoided: development (roads, sewer lines, utility lines, storm water or sedimentation basins, residences, driveways, parking lots, and other structures); wetland alteration (draining, ditching, tiling, filling excavation, stream diversion, and construction of impoundments); heavy grazing; application of herbicides, pesticides, or fertilizer (except in an approved management plan [AMP]); mowing or cutting of vegetation (except in an AMP); farming (except light to moderate grazing); mining and delineation of lot lines;
- Zone 2 – This zone extends from the edge of the wetland out to 300 feet from that edge. Within this zone the following activities should be avoided: development (roads, sewer lines, utility lines, storm water or sedimentation basins, residences, driveways, parking lots, and other structures); mining; application of herbicides, pesticides, or fertilizer (except in an AMP); farming (except light to moderate grazing); rip-rapping stream banks; and delineation of lot lines; and
- Zone 3 – From the boundary of Zone 2 to the edge of the drainage basin or at least ¼ miles from the Zone 2 boundary. Within this zone any activities that may potentially alter the water quality or hydrology of the bog turtle wetland should be avoided.

The PFBC has requested that Mid-Atlantic Express submit detailed information for use in its review of potential impacts to the bog turtle. Therefore, with regard to the federally-listed bog turtle, **we recommend that Mid-Atlantic Express should:**

a. <u>prior to the end of the DEIS comment period</u>, develop a bog turtle management plan in consultation with the FWS and submit a copy of this plan to the Secretary;

b. <u>during the 2008 bog turtle survey season (April 15 - June 15)</u>, attempt to complete its bog turtle surveys at all previously unsurveyed sites with potential bog turtle habitat if survey permission is acquired;

c. **<u>prior to construction</u>, for sites where the bog turtle may occur, submit a site plan, description of proposed work, indirect and direct wetland acreage that would be impacted, habitat descriptions, on-site color photographs of the project area, and a wetland delineation report to the PFBC; and**

d. **<u>prior to construction</u>, file with the Secretary the results of its Phase I and Phase II bog turtle surveys, and further consultations with the FWS, the PFBC, and the MDNR, including any agency-recommended mitigation plans.**

With the adoption of a bog turtle management plan developed in consultation with FWS, we believe that the Project is *not likely to adversely affect* the bog turtle.

4.7.2 Federally Listed Species Along the Marine Transit Route

Potential impacts on federally listed species resulting from the proposed Sparrows-Point-related LNG vessel traffic in the Chesapeake Bay and the Patapsco River are discussed above (see sections 4.7.1.1 Marine Mammals and Sea Turtles, 4.7.1.2 Bald Eagle, and 4.7.1.3 Shortnose Sturgeon). The following discussion addresses potential impacts on federally listed species resulting from a hazardous LNG vessel incident. If an unignited LNG spill were to occur along the transit corridor within the Zones of Concern, any listed species within Zone 1 (as defined in section 4.12 of this EIS) could be impacted. Figure 4.12-1 (sheets 1 through 9 in Appendix K) shows potential habitat of threatened and endangered species along the LNG transit route. Because LNG is lighter than water, the LNG would float on the water until it would vaporize. If any listed species were to come into contact with the LNG, it would experience an extreme temperature change, and it could be injured or killed. The LNG from any release along the marine transit route would rapidly cool water under the LNG pool. Because the more dense cold water would settle, it could temporarily impact the benthos and species beneath the pool of LNG. However, the temperature change would be greatest at the surface, decreasing with depth. Whales and shortnose sturgeon within the LNG marine traffic corridor would be expected to avoid the impacted area if possible; additionally, whales within the project area are less sensitive to colder temperatures than many other species. Sea turtles would be expected to avoid, if possible, the colder water due to their cold-sensitivity. Thus, no significant impact on federally listed species would be anticipated from an unignited marine LNG spill within Zone 1. Formation of a cold, heavier-than-air vapor cloud could cause significant impacts to some terrestrial listed species within Zone 1 from asphyxiation; however, Zone 1 includes land only in the immediate vicinity of the proposed LNG terminal (and very little of the shoreline along the remainder marine transit route is within Zones 2 and 3).

If a pool fire were to occur in association with a release of LNG, species on or near the surface of the water within Zone 1 could experience injury or mortality either by the fire or radiant heat. Species within Zone 2 may be impacted by radiant heat, while others may be impacted by being displaced from their native territory/habitat. However, given the resilience of vegetation in wet warm climates, and that root systems would likely remain intact, these impacts would not be expected to be permanent, and habitat would be expected to recover relatively quickly. No impacts would be expected to species within Zone 3 from a pool fire. The maximum flammable range for a vapor cloud could extend to the outer limits of Zone 3. If the vapor cloud were to come in contact with an ignition source, the resulting flash fire could burn back to the spill and impact any listed species it contacted.

Section 7 of the ESA requires a federal agency to consult on a permitted "proposed action" and reasonably foreseeable events associated with that action. A spill event or other emergency type action is not a part of the defined proposed action. The marine transit safety and security measures make the probability of an LNG carrier spill from collisions, allisions, and terrorist attacks extremely unlikely. Due to the extremely unlikely possibility of a spill from an LNG carrier, we would not modify our effects determinations, as discussed above. If a release of LNG were to occur, and listed species were impacted, we would consult with the FWS and/or NMFS regarding impacts on those species under an emergency consultation (50 CFR §402.05).

4.7.3 State Listed Threatened and Endangered Species and other Species of Concern

4.7.3.1 Least tern (*Sterna antillarum*)

The least tern is as state listed threatened species in Maryland. The least tern has a nearly world-wide distribution; however hunting and habitat loss has reduced this species to relatively small local populations in the east (NYSDEC, 2008). The summer breeding grounds of the least tern span the Atlantic coast of the United States. From April through August these birds form breeding colonies of up to 200 individuals on broad level and open sandy or gravel beaches, dredge spoils or other open shoreline areas. Less frequently, breeding colonies have also been observed inland along large rivers or lakes and occasionally on buildings. In late August, least terns migrate to their winter grounds located along the coasts of the Gulf of Mexico, Central America, Brazil and Peru (NYSDEC, 2008).

The greatest threat to the survival of the least tern is the development of coastal areas causing the destruction of their breeding habitat. Human disturbance to a breeding colony can have a negative impact on the reproductive success of the nesting birds (Alsop, 2001; NYSDEC, 2008).

No least tern colonies are known near the proposed LNG terminal or pipeline route. The MDNR (2007a) does not recommend surveys and has no further comments on the least tern in regard to this project. Therefore, construction and operation of this project would have no effect on the least tern.

4.7.3.2 Atlantic Sturgeon (*Acipenser oxyrinchus*)

The Atlantic sturgeon is a state listed endangered species in Pennsylvania; it is not listed by the federal government or by the State of Maryland. In addition, the Atlantic sturgeon is designated as a Species of Concern by NMFS along the entire east coast of the United States. The Atlantic sturgeon is an anadromous species that inhabits large estuaries and Atlantic coastal waters. The preferred spawning habitat for this species consists of clay, rubble, gravel, or shell with fast-flowing water at depths less than 3 feet. This species occurs along the entire east coast of the U.S. Many populations have undergone drastic declines, including those in the Chesapeake Bay. Atlantic sturgeon are protected by several federal, state, and international programs. The Atlantic States Marine Fisheries Commission has prepared a Draft Fisheries Management Plan for this species that regulates their harvest and coordinates their management from Maine to Florida (ASMFC, 2006).

The best available scientific information indicates that a reproducing Atlantic sturgeon population persists in the James River (NMFS, 2006a). Additionally, this species has been documented to occur in the mainstem of the Chesapeake Bay (NMFS, 2006a), and at least the York, Rappahannock, Nanticoke, and Susquehanna Rivers. A small and vulnerable population exists in the Chesapeake Bay. They may be found in the bay in April and May on their way to tributaries, which they use as spawning and nursery grounds (Chesapeake Bay Program, 2006). They have also been found at the mouth of the Patapsco River (NMFS, 2006a). Females move downstream within four to six weeks of spawning, while males may remain in the river or lower estuary until autumn when the temperature drops. Most juveniles remain in their natal river for one to six years before migrating into coastal waters. Atlantic sturgeon are rare in the Chesapeake Bay today, but recent evidence suggests limited spawning in the James and York rivers. Potential habitat exists in the vicinity of the LNG Terminal and the marine traffic transit route. No Atlantic sturgeon were reported during the June 2006 and October 2006 marine surveys in the Patapsco River although as stated previously, they would normally be found in the Bay during April and May (CBP, 2006b).

The potential impacts to the Atlantic sturgeon from the proposed project are similar to that of the shortnose sturgeon. Atlantic sturgeon within the vicinity of the project area are vulnerable to the direct and indirect effects of dredging, noise from in-water construction, intake systems for ballasts and pumps, and ship strikes from marine traffic. These potential impacts and appropriate mitigation measures are described in detail in Section 4.7.1.3 “Shortnose Sturgeon.”

As noted in Section 4.7.1.3, potential adverse impacts from the intake of ballast water and the tank deluge system are anticipated to be minimal since the vulnerable life stages of this species are not expected to be within the waters of these systems. The NMFS (2006f) indicated that surveys for the Atlantic sturgeon are not required, but if any Atlantic sturgeons are recorded during other surveys, NMFS should be notified as soon as possible. Therefore, the Project is not likely to adversely affect the Atlantic sturgeon.

4.7.3.3 Logperch (*Percina caprodes*)

The logperch is a state listed threatened species in Maryland. This freshwater species is primarily lake dwelling, but is known to exist in large streams and rivers (Werner, 2004). The logperch is common in the Great Lakes, Hudson Bay and Mississippi River Basins. It is present, although rare, in the Atlantic slope drainages from the Hudson River, New York to the Potomac River, Maryland (Page and Burr, 1991). Within its range the logperch prefers waterbodies with bottoms of gravel and sand, however, it can be found almost anywhere from small, rocky bottom, fast moving streams to vegetated lakes (Page and Burr, 1991). In June, logperch move into shallow water, less than 6 feet deep, with a sandy bottom to spawn. The eggs are laid in a small pit which is covered with sand (Werner, 2004). The primary food source for adult logperch is insects. Larval logperch feed on small crustaceans.

Populations of logperch are known to inhabit a site at Glen Cove along the Susquehanna River in Harford County, Maryland and the mouth of Conowingo Creek on the Cecil County, Maryland side of the Susquehanna River (MDNR, 2006c). The proposed pipeline would be in the vicinity of these areas, and Logperch within the vicinity of the project area may be adversely impacted by sedimentation and erosion (MDNR, 2006c). The MDNR (2007a) recommends that all best management practices be adhered to during any site disturbance in the areas where logperch are known to be present. These BMPs are included in Mid-Atlantic Express's ECP and would minimize the long- and short-term impacts of the project on the logperch. Surveys are not required for this species (MDNR, 2007a).

Implementation of the above-described measures would minimize impacts such that the Project is not likely to adversely affect the logperch.

4.7.3.4 Regal Fritillary (*Speyeria idalia*)

The regal fritillary is a butterfly species with Endangered Extirpated status in the state of Maryland. Although it is considered to be extirpated, it is possible that it may still exist in appropriate habitats throughout the state. The regal fritillary prefers tall-grass prairies or other open areas such as mountain pastures, wet fields, damp meadows and marshes (Opler et al., 2006). The current range of the regal fritillary is tallgrass prairies in parts of Montana and North Dakota south to Colorado, Nebraska and Oklahoma; they are rare or absent east of the Appalachian Mountains, which was part of their former range (Opler et al., 2006). The decline of the regal fritillary is attributed to habitat fragmentation and loss of habitat to development or agriculture.

Potential impacts of the project on the regal fritillary include the loss or disturbance of vegetative habitat (WDNR, 2006). Mitigation measures such as habitat restoration or enhancement may be beneficial to the regal fritillary such as reseeding areas with native plants used as food sources for the regal butterfly. Regal fritillaries feed on the nectar from thistles and milkweed as adults and feed on violets during the larval stage (Opler et al., 2006)

MDNR (2007a) has indicated that there is no longer any known regal fritillary populations within the project vicinity since the proposed alternate Pipeline route near Churchville, Maryland (Harford County) has been dropped from consideration. The MDNR (2007a) does not require surveys or further consultation in regards to this species. Therefore, the project would have no impacts to the regal fritillary.

4.7.3.5 Additional Species of Concern

In a February 6, 2007 letter to AES, PDCNR also indicated that the following butterfly and moth species of concern may also be affected by the Project: dot-lined white moth (*Artace cribraria*) and tolype moth (*Tolype*

notailis), between approximately MPs 48.5 and 49.0; and black dash (*Euphyres conspicuus*) and mulberry wing (*Poanes messasoit*) at approximately MPs 84.39 and 84.85. The PDCNR recommends that surveys for these species be conducted at the appropriate time of year by a PDCNR-approved biologist (PDCNR, 2007). Mid-Atlantic Express has committed to performing these surveys. Therefore, **we recommend:**

- **<u>Prior to construction</u>, Mid-Atlantic Express complete its surveys for the dot-lined white moth and tolype moth between approximately MPs 48.5 and 49.0 and the black dash and mulberry wing butterflies at approximately MPs 84.39 and 84.85. Mid-Atlantic Express should continue to consult with the PDCNR regarding mitigation that may be appropriate to avoid or minimize impacts on these moths and butterflies and file the results of its surveys and consultation, including a description of final agreed upon mitigation measures, with the Secretary.**

Maryland-Listed Flora

The MDNR (2007a) has reported a total of 20 rare, threatened, or endangered plant species to be located on or near the proposed project location. Of these 20 species, seven are listed as rare, five are listed as threatened, and eight are listed as endangered. The MDNR recommends that surveys for these species be performed during the appropriate time of year (2007a).

Seneca snakeroot (*Polygala senega*), a Maryland-listed threatened species, is known to occur near the proposed pipeline route crossing of Wildcat Branch within Gunpowder Falls State Park in Harford County (approximate MP 23.39) (MDNR, 2007a). Seneca snakeroot is a perennial, native, dicotyledonous forb in the milkwort family. It is primarily found on dry rocky soils and hillsides, particularly in calcareous soils, but also in lowland forests, prairies, and savannahs. Bashful bulrush (*Scirpus verecundus*) and woolly sedge (*Carex pellita*), Maryland-listed rare species, are also known to occur at this location (MDNR, 2007a).

Three Maryland- listed endangered plant species — hoary frostweed (*Helianthemum bicknellii*), tufted hairgrass (*Deschampsia cespitosa*), and porcupine sedge (*Carex hystericina*) — are known to occur near the proposed pipeline route crossing of a NTWSSC in the Pilot area of Cecil County (approximate MPs 44.87 to 44.88, 45.27 to 45.29, 47.01 to 47.06, and 47.24 to 47.26) (MDNR, 2007a). Hoary frostweed is a perennial, native, dicotyledonous forb in the rock-rose family, typically occupying the sub-shrub layer. It is found in prairies, rocky open areas, dry sandy soils, woodlands, and glades. (Hoary frostweed is also a Pennsylvania-endangered plant species, although it is not affected by the project in that state). Tufted hairgrass is a perennial, native, monocotyledonous grass. It is found in dry, usually sandy or rocky soils in open woods, clearings, and plains. It is also sometimes found on rocky ledges on bluffs. Porcupine sedge is a perennial, native, monocotyledonous sedge. It is found in lowland forests, sedge meadows, wet depressions, along creek drainages, along hillside seeps, fens, seepage areas, and calcareous soils. Reticulated nutrush (*Scleria reticularis*) and dwarf prairie willow (*Salix tristis*), Maryland-listed rare species, are also known to occur at this location (MDNR, 2007a).

MDNR reports six state listed endangered or threatened plant species located within serpentine barrens habitat west of the proposed pipeline route crossing of Pilot Road in Cecil County (approximate MP 45.85) (MDNR, 2007a). The endangered species are serpentine aster (*Aster depauperatus*), northern dropseed (*Sporobolus heterolepis*), and broad-glumed brome (*Bromus latiglumis*); the threatened species are featherbells (*Stenanthium gramineum*), fameflower (*Talinum teretifolium*), and Leonard's skullcap (*Scutellaria leonardii*). In addition, the proposed pipeline route may cross through two populations of serpentine aster near the Rock Springs area (Cecil County). Serpentine aster is a perennial, native dicotyledonous forb in the aster family. It is currently designated as a serpentine barren endemic. Northern dropseed is a perennial, native, mocotyledonous grass in the grass family. It is found in pine barrens over olivine (a silicate mineral of iron and manganese), limestone, or serpentine, and in serpentine grasslands. Broad-glumed brome is a perennial, native, monocotyledonous grass in the grass family. It is found in wet woods and prairies, low or rich woods over basic rocks, and alluvial soil along streams. Featherbells is a perennial, native, monocotyledonous forb in the lily family. It is found in thin woodlands, cut-over woodland borders and meadows, usually in small

colonies, emergent wetlands, open sphagnous swales, seepage swamps, moist thickets, and floodplain forests (rarely upland). Fameflower is a perennial, native, dicotyledonous forb in the purslane family, and typically occupies the sub-shrub layer. It is found in dry serpentine barrens; rock outcrops; dry rocks and sands; and serpentine, sandstone and gneiss glades. Leonard's skullcap is a perennial, native, dicotyledonous forb in the mint family; it is found in dry rock soil, low woods and fields usually on basic soil, serpentine barrens, and shale barrens. Few-flowered panicgrass (*Panicum oligosanthes*), a Maryland-listed rare species, is also known to occur at this location (MDNR, 2007a).

Clammyweed (*Polanisia dodecandra*), a Maryland-listed endangered plant species, is reported by the MDNR (2007a; 2006c) within the railroad tracks in the Beachwood area near Back River in Baltimore County (MP 8.62 or MP 8.97) in close proximity to the proposed pipeline route. Clammyweed is an annual, native, dicotyledonous forb in the caper family. It is found on dry sandy or gravelly soils, especially along streams; dry, open sandy or gravelly ground of waterside banks; sand spits; and gravel along railroad tracks.

Two Maryland-listed rare plant species — Ostrich fern (*Matteucia struthiopteris*) and mossy-cup oak (*Quercus macrocarpa*) — are reported by the MDNR to be located within the vicinity of the proposed pipeline. Ostrich fern is known to exist within the proposed pipeline route in the area of Gunpowder Falls State Park (MDNR, 2007a). Mossy-cup oak is noted by the MDNR to occur near the project route intersection with Connelly Road in Harford County.

Several populations of the Maryland-threatened goldenseal (*Hydrastis canadensis*) are known to occur at Glen Cove along the Susquehanna River in Harford County, south of the proposed route (between MP 43.61 and MP43.90). Goldenseal and Hitchcock's sedge (*Carex hitchcockiana*) are also known to occur where the proposed pipeline route runs close to the mouth of Conowingo Creek on the Cecil County side of the Susquehanna River (Between MP 44.49 and 44.6). Goldenseal is a perennial herb that grows in rich woods and mature, moist, mixed deciduous forest. Hitchcock's sedge is a Maryland-endangered sedge that grows in calcareous or rich and moist woods.

Pennsylvania-Listed Flora

In February 6, 2007 correspondence to AES, PDCNR reported the following four Pennsylvania-listed endangered and seven Pennsylvania-listed threatened plant species to be potentially impacted by the proposed pipeline. (MPs are those where PDCNR requested surveys during the appropriate time of year.)

Elephant's foot (*Elephantopus carolinianus*) is a Pennsylvania endangered perennial herb that grows in open woods and serpentine barrens. (MPs 49-50).

Eastern blue-eyed grass (*Sisyrinchium atlanticum*) is a Pennsylvania endangered perennial herb that grows in moist to dry, sandy, open ground of fields and thin woods. (MPs 50-51).

Northern dropseed (*Sporobolus heterolepis*) is a Pennsylvania endangered plant species described above under "Maryland-Listed Flora" (MPs 48-49, 51-53).

Tawny ironweed (*Vernonia glauca*) is a Pennsylvania endangered perennial herb that grows in dry fields, upland wooded slopes, or clearings. (MPs 81-82).

Serpentine aster (*Aster depauperatus* = *Symphyotrichum depauperatum*) is a Pennsylvania threatened species described above under "Maryland-Listed Flora" (MPs 49-50).

Maryland golden-aster (*Chrysopsis mariana*) is a Pennsylvania threatened perennial herb that grows in dry sandy woods, clearings, roadside banks, and serpentine barrens. (MPs 49-50, 51-53).

Ellisia (*Ellisia nyctelea*) is a Pennsylvania-threatened annual herb that grows on damp, shady banks and in rich alluvial woods (MPs 72-74).

Annual fimbry (*Fimbristylis annua*) is a Pennsylvania threatened annual herb that grows in moist depressions on serpentine barrens. (MPs 48-49).

Umbrella magnolia (*Magnolia tripetala*) is a Pennsylvania-threatened (and proposed for delisting) deciduous tree that grows on rich wooded slopes and floodplains (MPs 59-60).

Few-flowered nutrush (*Scleria pauciflora*) is a Pennsylvania threatened perennial herb that grows in dry, open woods and serpentine barrens. (MPs 48-49).

Fameflower, also called round-leaved fameflower (*Talinum teretifolium* = *Phemeranthus teretifolius*) is a Pennsylvania threatened plant species described above under "Maryland-Listed Flora" (MPs 48-49).

PDNR also reports the following additional plant species of concern to be potentially affected by Project activities: Elliott's beardgrass (*Andropogon gyrans*, MPs 67-68, 81-82), Bushy aster (*Aster dumosus* = *Symphyotrichum dumosum*, MPs 61-63), White heath aster (*Aster ericoides* = *Symphyotrichum ericoides*, MPs 72-74), Screw-stem (*Bartonia paniculata*, MPs 64-68), Field dodder (*Cuscuta pentagona*, MPs 49-50), Nuttail's trefoil (*Desmodium nuttallii*, MPs 48-50), Soapwort gentian (*Gentiana saponaria*, MPs 61-63), St. Andrew's cross (*Hypericum stragulum*, MPs 49-50, 82-83), Stiff cowbane (*Oxypolis rigidior,* MPs 60-63, 64-68), Serpentine panic grass (*Panicum annulum*, MPs 49-50), Plain ragwort (*Senecio anonymous*, MPs MPs 48-49), Cranefly orchid (*Tipularia discolor*, MPs 69-70, 72-74), and Twisted yellow-eyed grass (*Xyris torta*, MPs 81-82).

Mid-Atlantic Express has committed to perform surveys for these endangered, threatened, and special concern species.

Flora Impacts and Mitigation

There are potential direct and indirect impacts to listed plant species from the implementation of the proposed project. The major direct impacts include encroachment into habitats and the subsequent potential removal or injury to individual plants. Potential indirect impacts include modifications to the surrounding habitat or landscape that may affect the environmental conditions necessary for the successful perpetuation of the plant species populations. These environmental conditions include, but are not limited to hydrology, soil chemistry, light penetration, humidity, and plant-insect-mycorrhizal associations.

The minimization of direct impacts to listed plant species could be accomplished by avoidance. The MDNR (2007a) and PDCNR (2007) recommend that surveys for Pennsylvania and Maryland listed plant species be conducted in areas of appropriate habitat located with the project's limit of disturbance. Mid-Atlantic Express has committed to conducting these surveys during the appropriate flowering/survey window for each species. Indirect impacts to plant species would be minimized via conservative avoidance of sensitive habitats by allowing for protective buffers around these habitats. Mid-Atlantic Express has routed the proposed pipeline along existing development corridors in order to minimize disturbances to natural resources including sensitive plant habitats.

Additionally, the MDNR has provided the following specific recommendations for each of the plant species reported in their April 3, 2007 letter (MDNR, 2007a):

- Seneca snakeroot in Gunpowder Falls State Park (Harford County) – further coordination with MDNR is recommended. The proposed new trenching along the existing right-of-way is anticipated to result in an unacceptable loss of this species in a Nontidal Wetland of Special State Concern, and re-routing of the pipeline is recommended;
- Hoary frostweed, tufted hairgrass, and porcupine sedge in the Pilot Area (Cecil County) – further coordination with MDNR is recommended. Additionally, surveys for these plant species should be conducted in areas of appropriate habitat that exist within the project's limit of disturbance from Red Hill Road northeast to Old Mill Road;
- Serpentine aster near the Rock Springs Area (Cecil County) - further coordination with MDNR is encouraged. Additionally, surveys for this plant species should be conducted in areas of appropriate habitat that exist within the project's limit of disturbance from Red Hill Road northeast to the Pennsylvania/Maryland border;

- Clammyweed in the Beachwood Area near Back River (Baltimore County) – Surveys for this species are recommended in areas of appropriate habitat that exist within the project's limit of disturbance from the Fischer Road/I-695 intersection south to the Morse Lane/I-695 intersection. The surveys should include the areas for the proposed pipeline, access roads, and pipeyards;
- Goldenseal at Glen Cove (Harford County) – Surveys for this species are recommended for areas of appropriate habitat that exist within the project's limit of disturbance from Castleton Road (Route 623) east to the Susquehanna River;
- Goldenseal and Hitchcock's sedge near Conowingo Creek (Cecil County) – surveys for these species are recommended in areas of appropriate habitat that exist within the project's limit of disturbance from the edge of the Susquehanna River east to the crossing of Conowingo Creek; and
- Featherbells, Fameflower, northern dropseed, Leonard's skullcap, serpentine aster, and broad-glumed brome in serpentine barren habitat by Pilot Road crossing (Cecil County) – surveys for these plant species are recommended in areas of appropriate habitat that exist within the project's limit of disturbance, from Conowingo Creek northeast to the Millers Park Drive area where it crosses or nears the project route.

Conclusions

Mid-Atlantic Express has committed to perform surveys for state listed endangered, threatened, and special concern species. Many surveys were scheduled for 2007 (see table 4.7-2). However, survey results and agency consultations have not yet been filed with the Commission. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express file with the Secretary the results of its state-endangered and threatened plant species surveys and consultations with the MDNR and Pennsylvania Natural Diversity Inventory (PNDI), and mitigation plans developed in consultation with the MDNR and the PNDI regarding these species. These survey results, consultation documentation, and mitigation plans should also address the eastern serpentine barrens crossed by the proposed pipeline route along the Maryland/Pennsylvania border. For any surveys not yet completed, Mid-Atlantic Express should provide a schedule for completing these surveys.**

4.8 LAND USE, RECREATION, AND VISUAL RESOURCES

4.8.1 Land Use

4.8.1.1 LNG Terminal and Waterway for LNG Marine Traffic

The proposed LNG terminal would be located on a privately owned site at the Sparrows Point Industrial Complex on the Sparrows Point peninsula east of the Port of Baltimore in Baltimore County, Maryland. The site consists of approximately 80 acres that is currently part of a larger parcel owned by SPS Limited Partnership L.L.L.P. (SPS). The larger parcel was formerly owned and operated by BSC and was historically used as a steel manufacturing and shipbuilding facility. The 80-acre terminal site is comprised of approximately 45 acres of upland area which would be permanently developed for the LNG terminal facilities, and 35 acres of a near-shore open water to be developed for placement of the offloading platform and two LNG ship berths. In addition, 15 acres located just south of the property boundary and 20 acres to the north of the site would be used for temporary construction use, including a DMRF and temporary staging and equipment storage areas. The DMRF would use 15 of the additional 35 acres for a processing area and a storage area for the processed dredge material (also see Section 2.2.1). Once construction is completed, the 35 acres would be cleaned up and restored to pre-construction conditions. The area of the LNG terminal site and surrounding larger parcel is identified as industrial in the Baltimore County Master Plan. The industrial land at the terminal site and in the surrounding area is composed of buildings (some of which are abandoned), roads, docks, and railroad beds.

Aquatic areas that would be affected by the construction of the LNG terminal include the 35 acres of open water and an additional 119 acres comprised of the marine approach channel, the turning basin, and near-shore areas around the berths. The shoreline adjacent to the open water would be impacted by the construction of the bulkhead and the 119-acre area would be dredged for LNG ship transit and maneuvering and the barge routes of transit between the dredge locations and the DMRF. (Also see section 4.3 for impacts to aquatic resources.)

The Coast Guard report "Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas Spill Over Water" identified "Zones of Concern" with regards to public safety in the area of a LNG vessel. Zone 1 represents the area of highest concern. These Zones of Concern were superimposed over the location of the LNG terminal and proposed vessel transit route to determine areas of concern regarding public safety along the waterway for LNG marine traffic and around the LNG terminal site. The zones move with the LNG carrier along the transit route and are depicted in figures 4.12-1 and figures 4.12-2 (see Appendix K). The waterway considered in this analysis is the area of the Chesapeake Bay within the vessel transit route impact area, which is approximately 4.4 miles wide. The shoreline is greater than two miles from the shipping channel for most of the LNG transit route, with the exception of the areas near Sparrows Point, Sandy Point, Cove Point, and Cape Henry. The banks along both the east and west sides of the channel are largely undeveloped and primarily comprised of wetlands. Along the western banks of the channel are state and national parks and Gibson Island. Gibson Island is predominantly undeveloped. Along the eastern banks of the channel are state parks, a wildlife management area, and two small undeveloped islands, Poplar Island and Barren Island.

The majority of the shoreline of Chesapeake Bay is undeveloped or developed as rural settlements and vacation homes. There are no areas where Zone of Concern 1 would overlap land or populated areas along the transit route. Zone 2 would overlap a portion of Sandy Beach, which is considered a medium population area in the daytime hours of summer and low population during the remainder of the year. Zone 2 would contact the land at both landward ends of the Key Bridge (both Hawkins Point and Soller Point to Coffin Point), along the causeway north of the Key Bridge and up to Turner Station, and for the western half of the Sparrows Point peninsula, which are all considered low population areas. These points of contact for Zone 2 and land are all within the final LNG vessel approach along Brewerton Channel and the Brewerton Angle, the approach up the Sparrows Point Shipyard Channel, and within the LNG turning basin. For Zone 3, there would be contact with land and populations for the final approach of the LNG vessels from Kent Island north – including the southwestern shore of Kent Island, along Sandy Point including Sandy Point State Park, from Gibson Island north to Bodkin Neck, and from Bodkin Neck west and northwest to Rock Point and Hawkins Point. The communities of Rivera Beach and Orchard Beach would fall within Zone 3 along this final segment.

Additional uses in the waterway include commercial and recreational crabbing, fishing and boating

4.8.1.2 Pipeline Facilities

The Sparrows Point Project would include construction of a 30-inch-diameter pipeline that would connect the LNG terminal at three meter stations adjacent to existing Columbia, Transco, and TETCO aboveground facilities in Chester County, Pennsylvania. The pipeline would consist of approximately 88 miles of 30-inch-diameter pipeline traversing Baltimore, Harford, and Cecil Counties in Maryland and Lancaster and Chester Counties in Pennsylvania. Table 4.8.1-1 summarizes the land uses crossed by the proposed pipeline route.

The pipeline would be installed within a permanent 50-foot-wide right-of-way. An additional 25 feet of temporary right-of-way would be required for construction, which would result in a construction right-of-way of 75 feet, except as noted below. Land use impacts associated with the pipeline would include the areas within the permanent and temporary rights-of-way. Typical configurations of the permanent and temporary rights-of-way are shown in section 2.2.2.1, figures 2.2.2.1-1 and 2.2.2.1-2, and 2.2.2.1-3. Areas, mileposts and uses of extra workspaces needed during construction are presented in Appendix C.

TABLE 4.8.1-1

Acres of Land Affected by Construction and Operation of the Mid-Atlantic Express Pipeline Facilities

	Agricultural Land		Forest Land		Open Land		Open Water		Residential Land		Industrial/ Commercial a/		Total	
	Const b/	Ops c/	Const b/	Ops c/	Const b/	Ops c/	Const b/	Ops c/	Const b/	Ops c/	Const b/	Ops c/	Const b/	Ops c/
TOTAL AFFECTED LAND USE BY TYPE:														
Pipeline Construction Workspace - including temporary workspace	676.19	274.93	306.41	146.85	34.79	12.32	9.52	5.43	129.33	60.73	86.86	41.76	1243.10	542.02
Pipe Yards/Contractor Yards/Staging Areas	172.40	0.00	0.00	0.00	70.44	0.00	0.00	0.00	0.00	0.00	72.14	0.00	314.98	0.00
Access Roads	14.02	1.01	4.75	0.00	4.11	0.25	0.00	0.00	4.78	0.14	15.21	0.00	42.87	1.40
Aboveground Facilities - valves & meter station sites	0.30	0.15	0.90	0.45	1.20	0.60	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.20
Total Affected Land Use	862.91	276.09	312.06	147.30	110.54	13.17	9.52	5.43	134.11	60.87	174.21	41.76	1603.35	544.62
TOTAL AFFECTED LAND USE BY COUNTY:														
Total Affected Land Use in Baltimore County, MD	85.66	25.85	88.65	46.17	27.48	3.24	0.73	0.47	72.87	34.60	141.89	27.84	417.28	138.17
Total Affected Land Use in Harford County, MD	229.26	85.78	73.78	36.64	7.20	0.05	2.97	2.20	29.74	12.43	0.00	0.00	342.95	137.10
Total Affected Land Use in Cecil County, MD	50.94	10.05	40.16	12.77	36.45	0.00	4.88	2.43	0.06	0.00	0.00	0.00	132.49	25.25
Total Affected Land Use in Lancaster County, PA	98.24	38.43	21.60	8.32	5.82	2.38	0.19	0.00	0.08	0.08	0.00	0.00	125.93	49.21
Total Affected Land Use in Chester County, PA	398.81	115.98	87.87	43.40	33.59	7.50	0.75	0.33	31.36	13.76	32.32	13.92	584.70	194.89

Constr = Construction, and refers to area affected by construction of the pipeline facilities; **Ops** = Operations, and refers to area affected by operation of the pipeline facilities.

a/ Includes state, county, and local roadways, and railways.

b/ Consists of entire construction workspace for pipeline facilities, including extra workspaces. Acreages were calculated using polygon analysis and therefore totals may not always equate to a straight length times width calculation. Due to rounding, totals may not equal totals for other tables.

c/ Consists of only the 25-foot-wide permanent maintained workspace for the proposed pipeline facilities (i.e., ROW beyond existing maintained ROW), and excludes the 25-foot-wide overlap with any existing maintained rights-of-way. Acreages were calculated using polygon analysis and therefore totals may not always equate to a straight length times width calculation. Due to rounding, totals may not equal totals for other tables.

Existing Rights-of-Way

The proposed pipeline would be constructed within or adjacent to various existing rights-of-way for approximately 74.3 miles or 84.8 percent of the route. Mid-Atlantic Express proposes to construct the pipeline parallel to I-695 for about 4 miles, BGE's overhead power lines for about 21.7 miles, and an existing Columbia pipeline for approximately 45.8 miles. The remaining 13.3 miles (15.2 percent) would be constructed on newly created rights-of-way.

Aboveground Facilities, Extra Workspaces, Staging Areas, and Access Roads

Construction of the pipeline would require installation of nine mainline valves and three meter station facilities, for a total of twelve new aboveground facilities. The meter stations would be located adjacent to the existing pipeline facilities of the receiving pipeline systems. Mid-Atlantic Express would acquire an additional 0.1 acre of land for construction and 0.05 acre for operation of each mainline valve facility and an additional 0.5 acre of land for construction and 0.25 acre for operation of each metering facility. Land requirements for the installation of the pig launcher and mainline valve at the LNG terminal are included in the LNG terminal site requirements (see Section 4.8.1.1).

Mid-Atlantic Express would use a maximum construction right-of-way of 100 feet in areas where extra workspace is necessary to facilitate construction, such as at stream or wetland crossings, road or rail crossings, or areas to stockpile topsoil (see section 2.3.2.2).

Pipeline construction would require about 27 pipe yards, contractor yards (including temporary parking for the pipeline construction crews) and staging areas located along the proposed right-of-way (see Appendix B for the locations of these proposed pipe yards/contractor yards, and Appendix C, table C-2, for a description of existing land use at each yard). These locations would total 315.0 acres of impact during construction (see table 4.8.1-1), but would not be used during operation of the pipeline. These areas would be in agricultural land, open land or industrial/commercial land. No forest or residential land would be impacted by these temporary construction yards. The impacts would be temporary and reversible with restoration.

Pipeline construction would also require the temporary use of 70 access roads affecting 40.0 acres of land (see Appendix B for the locations of these roads and table C-3 in Appendix C for a description of the roads). Fifty-five of these roads and portions of five others are existing paved, gravel, or dirt roads. In some instances, improvements would be necessary (e.g., widening, reinforcing, adding gravel). Approximately 1.4 acres of land would be impacted by the maintenance of 8 permanent roads to aboveground facilities such as mainline valves or meter stations. These permanent access roads would represent a permanent change in land use of this area. Permanent roads would total less than 0.5 mile in aggregate length. According to a review of NWI Maps, two of the proposed temporary access roads would cross waterbodies. An unnamed tributary of Deer Creek would be crossed at MP 36.5 and an unnamed tributary of Marsh Creek Lake would be crossed at MP 84.65. Both of these crossings are at existing road crossings and would be limited to a width of 25 feet.

Land use impacts

Construction of the pipeline facilities would disturb a total of approximately 1,603 acres of land, including the pipeline construction right-of-way, extra workspace, aboveground facilities, staging areas and access roads. Of this, approximately 545 acres would be retained as permanent right-of-way for the pipeline (542 acres), for the aboveground facilities (MLVs and meter stations) (1.2 acres), and for the permanent access roads (1.4 acres). Table 4.8.1-1 summarizes the acres of each land use that would be affected by the proposed pipeline facilities.

Agricultural land would be the primary land use affected by construction of the pipeline facilities totaling approximately 862.91 acres (53.8 percent). The remaining land uses that would be disturbed consist of forest land (312.1 acres or 19.4 percent), industrial/commercial land (174.2 acres or 10.9 percent), open land (110.5 acres or 6.9 percent), residential land (134.1 acres or 8.4 percent), and open water (9.5 acres or 0.6 percent).

4.8.2 Existing and Planned Residences and Developments

The two most significant potential impacts to residences associated with construction and operation of natural gas facilities are disturbance during construction and encumbrance of property for future uses (e.g., the limitation on future permanent structures within the permanent right-of-way). Residences within 50 feet of construction work areas would be most likely to experience the effects of construction and operation of the Project.

Temporary construction impacts on residences can include inconveniences caused by noise and dust generated by construction equipment, personnel, and trenching through roads or driveways; ground disturbance of lawns; removal of trees, landscaped shrubs, or other vegetative screening between residences and/or adjacent rights-of-way; potential damage to existing septic systems or wells; potential damage to other utilities; and removal of aboveground structures, such as sheds or trailers, from within the right-of-way.

4.8.2.1 LNG Terminal

The LNG terminal site is surrounded by remaining portions of the larger SPS parcel to the north, east and south and the Patapsco River to the west. There are no residences located within 1 mile of the closest point of the LNG facility. The closest residence to the LNG terminal site is located 1.1 miles to the north-northwest from the end of the pier, in the community of Turner Station. Due to the distance to residences, no direct impacts to residences are likely while the facility is being constructed. Indirect impacts to residences during construction of the LNG terminal would include increased construction-related traffic on local roads, primarily I-695 and the exit ramp to Sparrows Point, and potentially increased noise during dredging or marine pile driving activities. For a discussion of the impacts of construction traffic and noise on residents see sections 4.9.4 and 4.11.2.

Potential impacts on residences during operation of the LNG terminal include increased visibility of aboveground structures associated with the facility, increased traffic, changes in air quality, and safety concerns. These impacts and applicable mitigation measures are discussed in sections 4.8.6.1 for visual resources, 4.9.4 for transportation and traffic, 4.11.1 for air quality, and 4.12 for reliability and safety. In addition, several commenters are concerned with property values near the facility; this issue is discussed in section 4.9.5.

Planned Developments

There are no identified planned residential developments within 1 mile of the LNG terminal site based on information provided to date by local agencies and reviews of web sites and aerial photographs.

According to an article in *The Daily Record* (Baltimore) (Mosher, 2006), Ecron S.P. Corp. has proposed to build an ethanol plant on a portion of the Sparrows Point Shipyard site. The goal of the plant is to distill 110 million gallons of ethanol a year (Pelton, 2006). According to MDE (2006), Ecron S.P. filed for an air permit for the ethanol plant between August 16 and September 15, 2006. The Annapolis-based Ecron has reportedly signed an option to lease 54 acres from the shipyard owner Barletta Willis Inc. The land option agreement between Ecron and Barletta Willis Inc was extended until October 2007 to provide time for Ecron to secure financing for the project. At the writing of this document, there was no additional information available on the Ecron option. The Ecron option parcel does not overlap the parcel to be leased for the LNG terminal. However, the ethanol plant site does overlap an area proposed to be used by AES as a temporary equipment laydown and storage yard during construction of the LNG terminal. If Ecron does not proceed with plans to build the ethanol plant, or if Ecron's construction schedule would commence at a date that would not interfere with AES's construction schedule, AES would proceed with plans to utilize the identified 20-acre site for temporary equipment laydown and a storage yard. If the Ecron ethanol plant construction schedule commences such that AES could not use the 20-acre site, AES has received preliminary approval from SPS, (the owner of the 226-acre shipyard property) to utilize 20 to 30 acres of the shipyard property for temporary equipment laydown and a storage yard.

There are no other identified planned industrial developments within 0.25 mile of the LNG terminal site based on information provided to date by local agencies and reviews of web sites and aerial photographs.

4.8.2.2 Waterway for LNG Marine Traffic

As noted above, Zone 1 does not overlap land or populated areas along the transit route. Populated areas overlapped by Zone 2 or 3 would not be significantly impacted by routine LNG vessel traffic. No direct impacts to existing or planned residences or developments along the transit route would result from routine LNG vessel traffic.

In the event of a non-routine event associated with LNG shipping transport, the severity of impacts on developed areas within Zones 1-3 would depend on the location of the incident relative to the population, the scope of the incident, and whether the LNG released ignited or evaporated. This could be a significant impact, with injuries ranging from mild to fatal, being most severe in Zone 1 and decreasing outward through Zones 2 and 3. However, because of the implementation of safety and security measures during marine transit (see section 4.12.5), the probability of a marine LNG spill is extremely low and not considered a reasonably foreseeable event.

4.8.2.3 Pipeline Facilities

Existing Residences

The proposed pipeline would cross numerous subdivisions. The proposed work area for the pipeline facilities would be located within 50 feet of 179 residences and 56 other buildings, primarily industrial or commercial in nature. There are 11 residences within the proposed construction workspace. Appendix F lists residences and other structures within 50 feet by milepost and indicates the distance of each from the proposed construction work area. In many congested residential areas, we evaluated route variations to avoid or minimize impacts to residences (see section 3.3.3 Route Variations). In some cases we were able to identify an alignment that would avoid or minimize conflicts with housing, and we recommend those alternate alignments be incorporated into the pipeline route. In other cases, we rejected the route variations because the variations affected new residential developments, affected other existing residences, or were not constructible for various other reasons.

Residences close to the construction workspace are most likely to experience direct impacts during construction including increased noise, heavy vehicle traffic and dust. (Also see sections 4.9.4 for traffic related impacts, 4.11.1 for dust-related and 4.11.2 for noise-related impacts and mitigation measures proposed.) Mid-Atlantic Express would employ land agents during construction to notify and coordinate with landowners throughout the construction process. Mid-Atlantic would give notice to residence owners and/or tenants prior to construction. Impacts are expected to be short-term and would be limited to daylight hours, typically Monday through Saturday.

Although the proposed pipeline route is adjacent to the existing Columbia Gas corridor (for 45.8 miles), numerous homeowners have stated that the existing pipeline corridor is at the edge of their property or is not visible due to vegetation between the existing pipeline corridor and the home. Therefore, the new pipeline right-of-way would encroach on the homeowner's property and would have an increased visual presence.

Mid-Atlantic Express would implement general measures to avoid disruption and minimize impacts to residences during pipeline construction. These measures include restricted construction right-of-way, erecting barricades, and stovepipe construction (also see section 2.3.2.2). Typical construction techniques in restricted residential areas are presented in the BMPs in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012)).

We believe that for each residence located within 25 feet or less of the construction right-of-way, Mid-Atlantic Express should provide site-specific plans. Mid-Atlantic Express has not provided site-specific plans to

minimize impacts on the residences and other buildings within 50 feet of the construction workspace. **Therefore, we recommend that:**

- **<u>Prior to the end of the DEIS comment period,</u> for all residences located within 50 feet of the construction work area, Mid-Atlantic Express should commit to:**
  - **a. not remove mature trees and landscaping within the edge of the construction work area, unless necessary for safe operation of construction equipment;**
  - **b. immediately after backfilling the trench, restore all lawn areas and landscaping within the construction work area consistent with the requirements of the Plan;**
  - **c. fence the edge of the construction work area adjacent to the residence for a distance of 100 feet on either side of the residence to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;**
  - **d. try to maintain a minimum distance of 25 feet between the residence and the edge of the construction work area; and furthermore,**
  - **e. for any residence closer than 25 feet to the construction work area file a site-specific plan with the Secretary <u>prior to the end of the DEIS comment period</u> that includes:**
    1. **a description of construction techniques to be used (such as reduced pipeline separation, centerline adjustment, use of stove-pipe or drag-section techniques, working over existing pipelines, pipeline crossover, bore, etc.), and include a dimensioned site plan that shows:**
       - **i. the location of the residence in relation to the new pipeline and, where appropriate, the existing pipelines;**
       - **ii. the edge of the construction work area;**
       - **iii. the edge of the new permanent right-of-way; and**
       - **iv. other nearby residences, structures, roads, or waterbodies.**
    2. **a description of how Mid-Atlantic Express will ensure the trench is not excavated until the pipe is ready for installation and the trench is backfilled immediately after pipe installation; and**
    3. **evidence of landowner concurrence if the construction work area and fencing will be located within 10 feet of a residence.**

There could be permanent impacts to the residences located close or within the pipeline construction workspace and permanently maintained workspace. The areas impacted during construction would be restored to preconstruction conditions with the exception of the removal of deep rooted vegetation or trees that would be permanently removed. Residential uses would be continued along the permanently maintained right-of-way following construction. However, certain residential practices may be restricted or prohibited within the permanently maintained right-of-way (such as erection of permanent structures and planting of deep rooted vegetation/trees over the permanently maintained right-of-way). In no instance is it anticipated that construction or operation of the pipeline would result in demolition or removal of residential structures.

Septic Systems

Thirty-five specific properties with septic systems have been identified by the landowners as possibly being impacted by the Project. Mid-Atlantic Express has identified approximately 26 miles of the proposed pipeline route as areas where residences would likely have septic systems. However, only two areas have been identified where septic systems would be crossed, at MP 66.48 and at MP 81.2 to 81.7. Additional septic

systems may be present along the proposed pipeline route as Mid-Atlantic Express has not identified the location of septic fields crossed, nor provided site-specific plans if the septic field would be impacted.

For those residences that have septic systems or fields, Mid-Atlantic Express has stated that it would attempt to vary the route to avoid impacts. If a route variation is not feasible, Mid-Atlantic Express has indicated that it would evaluate the feasibility of boring or redesign of the system on a case-by-case basis during the final pipeline design. Mid-Atlantic Express has also indicated that any impacted septic system or field that cannot be avoided would be repaired, redesigned or replaced to preconstruction condition, at a minimum. Mid-Atlantic also indicated that if a septic system is damaged and immediate repairs are not possible or are not successful, it would ensure that waste waters would be managed at the residence either by installation of a temporary system, which could include lift pumps and a holding tank, or possibly temporary relocation of the residents while their septic system is repaired. If any additional septic systems or fields are identified, Mid-Atlantic Express would take those measures outlined above. However, Mid-Atlantic Express has not provided a detailed plan to minimize or mitigate impacts to septic system or fields impacted by the Project. **Therefore, we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express should file with the Secretary a Septic System Contingency Plan which would detail steps it would take to avoid disturbance to septic systems; mitigate for damage to septic systems; and restore/replace the septic system. Any temporary repair/mitigation should take into account <u>all</u> waste water that would normally be handled by the septic system.**

Other Existing Development

The proposed pipeline route would cross the Baltimore County Waste Water Treatment Plant property at approximately MP 7.6. The route crosses this property in an area parallel and adjacent to the property line abutting the I-695 corridor. This routing would minimize impacts to the property and is not anticipated to impact daily operations of the plant facilities during construction. During construction and operation, access to the pipeline right-of-way would be gained through plant property. Construction and operation of the proposed pipeline would not impact access to the waste water treatment plant. Mid-Atlantic Express has stated that they would work with plant management personnel to minimize interference with plant operations.

The proposed pipeline route would cross the Chester Water Authority's Water Treatment Plant property. Construction and operation of the proposed pipeline would not impact access to the water treatment plant. The route would, however, cross the Chester Water Authority's two water mains and the lagoon force main. Mid-Atlantic Express has been in communication with Chester Water Authority to determine appropriate methods of crossing the mains. Updates on plan development have not been provided to FERC staff. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express should work with the Chester Water Authority to develop and implement a site-specific plan for crossing the Chester Water Authority mains and file this plan with the Secretary.**

With respect to other existing facilities listed in Appendix F, FERC notes that Mid-Atlantic Express has not provided site-specific crossing plans to ensure adequate access and public safety for employees and customers during construction. During our review of the filed photo-alignment sheets, we note that while no direct impact to buildings would occur at these locations, exterior parking areas, driveways and other public and employee use areas may be impacted at some locations. **Therefore we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express identify the existing facilities listed in Appendix F where construction would impact public or employee use areas (parking, driveways, walkways, etc.). For each of these locations, Mid-Atlantic Express should provide a site-specific plan, developed in consultation with property owners, identifying the area that would be disturbed during construction and how public access and safety would be maintained.**

Planned Developments

The only new planned developments identified within 0.25 miles of the construction workspace for the proposed pipeline route are eleven developments approved or pending approval by Harford County, Maryland (Harford County Department of Planning and Zoning, 2006). All but one of these developments is residential. The locations of the planned developments and the distance and direction to the proposed pipeline route are presented in table 4.8.2-1.

TABLE 4.8.2-1

Planned Developments Within 0.25 Mile of the Proposed Pipeline Route Within Harford County, Maryland

Approx. Milepost	Plan Name	Planned Development	Direction from construction right-of-way	Distance from construction right-of-way (feet)	Status
25.8	Brookhill Farms	Residential	Crossed	Crossed	under construction
34.2	Clark, George R. State Lots 5-12	Residential	N	250	pending
30.2	Fallstaff Limited Partnership	Residential	Crossed	Crossed	pending
30.4	Forest View Farms	Residential	E	Adjacent	pending
32.85	Fox Trail	Residential	Crossed	Crossed	under construction
28.5	Grafton Ridge	Residential	Crossed	Crossed	under construction
30.8	Reeves Crossing	Residential	Crossed	n/a	under construction
36.3	Willow Brook	Residential	NW	1,084	pending
39.95	Lands of Pennington. Lots 12-16	Residential	SE	340	pending
32.05	Sharon Station	Residential	Crossed	Crossed	pending
39.05	Lands of Dinning. Lot 3	Non-Residential	Crossed	Crossed	pending

Mid-Atlantic Express has stated that mitigation measures would include the following FERC requirements, at a minimum:

- avoid removal of mature trees and landscaping within the edge of the construction workspace unless necessary for the safe operation of construction equipment;
- restore all lawn areas and landscaping within the construction workspace, consistent with the Commission's procedures, after backfilling the trench; and
- maintain safety fencing throughout open trench phases of pipe installation.

All of the above mitigation measures are included within Mid-Atlantic Express's ECP, which is included in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012). There would be minimal adverse impacts to planned developments from operation of the pipeline. As with the impacts to existing residences outlined above, certain practices may be restricted or prohibited within the permanently maintained right-of-way. Due to the ongoing construction status of a number of the planned developments that would be crossed by the proposed pipeline route, the developments could be completed prior to pipeline construction. Therefore, **we recommend that:**

- **In the event that new residences are built prior to Project construction, Mid-Atlantic Express should update Appendix F of this EIS for the residences located within 50 feet of the construction work areas (i.e., construction right-of-way and extra temporary work space) and file this information in its initial Implementation Plan with the Secretary <u>before</u>**

construction. For all residences that would be 25 feet or closer to the construction work area, Mid-Atlantic Express should file a site-specific plan with the Secretary for review and written approval of the Director of OEP prior to construction.

4.8.3 Coastal Zone Management

4.8.3.1 Federal Coastal Zone Management Act

In 1972, Congress passed the CZMA to "preserve, protect, develop, and where possible, to restore or enhance, the resources of the nation's coastal zone for this and succeeding generations" and to "encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone" (16 USC 1452, section 303 (1) and (2)).

Section 307 (c)(3)(A) of the CZMA states that "any applicant for a required federal license or permit to conduct an activity, in or outside the coastal zone, affecting any land or water use or natural resource of the coastal zone of that state shall provide a certification that the proposed activity complies with the enforceable policies of the state's approved program and that such activity will be conducted in a manner consistent with the program." In order to participate in the CZMP, a state is required to prepare a program management plan for approval by the NOAA, Office of Coast and Ocean Resource Management (OCRM). Once the OCRM has approved a plan and its enforceable program policies, a state program gains "federal consistency" jurisdiction. This means that any federal action (e.g., a project requiring federally issued licenses or permits) that takes place within a state's coastal zone must be found to be consistent with state coastal policies before federal action (e.g., issuance of a license or permit) can take place.

The Sparrows Point LNG terminal project is subject to federal CZMA regulations. The LNG terminal and the portion of the pipeline in Maryland are subject to Maryland's CZMP. The pipeline in Pennsylvania is not located in Pennsylvania's coastal zone. The LNG vessel transit would be within designated coastal zone management areas in the states of Maryland and Virginia. The Coast Guard is responsible for ensuring compliance with the CZMA as it relates to establishment of the safety and security zones for LNG marine traffic affecting Maryland and Virginia waters.

Maryland's CZMP requires completion of a Coastal Facilities Review Act (CFRA) application. The MDNR is the lead agency in Maryland for implementing the CZMP. The CFRA application is the primary application process for environmental permitting associated with the LNG terminal and associated pipeline areas within Maryland. The CFRA application includes applications to address air emissions, wetland and waterbody crossings, water use and discharge, wastewater discharge, and certain other applications required to be filled with the State of Maryland. AES and Mid-Atlantic Express filed the CFRA application with the MDE Wetlands and Waterways program on January 8, 2007, which initiated their request for a CZMA consistency determination. In June and then again in December of 2007, this consistency determination was denied by MDE. At the issue of this DEIS, AES is contesting the objection from MDE regarding the consistency determination with the Secretary of Commerce. The Secretary of Commerce has not issued a decision on this appeal process. The LNG Terminal Application Environmental Report for the project provided the basis for the environmental review associated with the various applications under CFRA. Review of the CFRA by the MDE is ongoing during the appeal process. Concurrence that the AES Sparrows Point LNG and Mid-Atlantic Express Pipeline projects are consistent with the CZMA must be received prior to any issuance of a Notice to Proceed with construction from the Secretary of the FERC. Therefore, **we recommend that:**

- **Prior to construction, AES and Mid-Atlantic Express file with the Secretary documentation that the Project is consistent with the Coastal Zone Management Act.**

4.8.3.2 Maryland Critical Areas Act

In addition to CZMP requirements, the LNG terminal and portions of the pipeline areas within Maryland are subject to the State of Maryland's Critical Areas Act. In response to concerns about the quality and

productivity of Chesapeake Bay, the Chesapeake Bay Critical Area Protection Program was established in 1984 with the passage of the Critical Area Act, a comprehensive resource protection program for the Bay and its tributaries. The Critical Area Act defines a "Critical Area" as all land within 1,000 feet of the mean high water line of tidal waters, or the landward edge of tidal wetlands and all waters of and lands under Chesapeake Bay and Atlantic Coastal Bays and tributaries. The Critical Area Act established the Critical Area Commission (see http://www.dnr.state.md.us/criticalarea/) to enable the state and local governments to jointly address the impacts to habitat and aquatic resources that may result from land development within the Critical Area.

Critical Area lands are located in the southern portion of the project area and all are located within Baltimore County, Maryland. The LNG terminal site is located within a Critical Area and there are a total of 12 Critical Area crossings along the pipeline route. These areas are summarized in table 4.8.3-1.

Land within the Critical Area is categorized by its predominant use and the intensity of its development. This system contains three categories of different land development areas: Intensely Developed Areas (IDAs), Limited Development Areas (LDAs), and Resource Conservation Areas (RCAs). IDAs are areas where little natural habitat occurs due to residential, commercial, institutional and/or industrial development. LDAs contain areas of natural plant and animal habitats with little impairment to the quality of runoff from these areas. These areas have a low to moderate intensity of development that may include areas similar in nature to IDAs, with these areas being less than 20 acres in size. Development in IDAs is encouraged to minimize forest destruction and impervious surface cover, but no required limitations exist; however new development or redevelopment in IDAs should reduce pollution from stormwater runoff by at least 10 percent below that of existing land use (Chesapeake Bay Foundation, 2004).

RCAs are natural environments or contain resource-utilization activities, which include agriculture, aquaculture, commercial forestry and fishery activities. No RCAs are crossed by the proposed pipeline route. Forest Interior Dwelling Species habitats occurring within Maryland Critical Areas are protected as a Habitat Protection Areas (HPAs) under Maryland's Critical Area Law and Criteria; these are addressed in detail in section 4.6.1 of this document.

There are eight crossings of IDA lands, including the LNG terminal site, totaling 11,932 feet. There are four crossings of LDA lands totaling 4,063 feet. Further information regarding these crossings was provided to MDE as part of AES's Coastal Facility Review Act application filed in January 2007. As part of the application, AES committed that the four crossings of LDA lands would be restored to their original use. The Critical Area Commission has designed a set of standards, or Critical Area Criteria, which are then adopted into local ordinances that govern land use and development. The LDA and IDA categories of land development areas allow for use such as the LNG terminal and the associated pipeline as they are consistent with the existing development intensity and meet the goals of the Critical Areas Act. Adverse impacts to Critical Areas are primarily managed by local governments which are responsible for implementing the measures needed to protect water quality, conserve plant and animal habitat, and direct growth and development. The means by which this is accomplished is through permitting or management plans that incorporate mitigation and restoration. As such, the MDE has recommended that mitigation for clearing within Critical Areas should be coordinated with local governments. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, AES and Mid-Atlantic Express consult with appropriate state/local agencies regarding Maryland-designated Critical Areas and any mitigation plans to be implemented during the construction and operation of the Project. AES and Mid-Atlantic Express should file copies of correspondence and any resulting mitigation plans with the Secretary**

TABLE 4.8.3-1

Summary of Areas of the Project Located in Baltimore County, Within Maryland's Designated Critical Areas

Facility	Starting Mile Post	Ending Mile Post	Critical Area Category	Length (miles) or Area (acres) within Critical Area a/
LNG Terminal Facility				
	NA	NA	IDA	45 (acres)
Mid-Atlantic Express Pipeline				
	0.00	0.27	IDA	0.27
	0.44	0.69	IDA	0.25
	0.69	1.03	IDA	0.34
	4.08	4.38	LDA	0.30
	5.93	5.98	LDA	0.05
	6.66	7.04	IDA	0.38
	8.22	8.66	IDA	0.44
	8.73	9.02	LDA	0.29
	10.24	10.37	LDA	0.13
	11.06	11.18	IDA	0.12
	11.26	11.28	IDA	0.02
	15.71	16.15	IDA	0.44
Access Roads				
	1.00	1.17	IDA	0.17
	4.78	4.99	LDA	0.21
	5.12	5.18	IDA	0.06
	8.24	8.32	IDA	0.08
	8.53	5.94	IDA	0.41
	16.00	16.01	IDA	0.01
Pipe Yards				
Pipe yard #1	NA	NA	IDA	NA
Pipe yard #2	NA	NA	LDA	NA
Pipe yard #3	NA	NA	LDA	NA

a/ quantity is miles crossed, unless noted as acres
NA not applicable for non-pipeline facilities

4.8.4 Hazardous Waste Sites

A search of several databases was conducted to identify hazardous waste sites within 0.25 miles of the LNG terminal site and within 0.25 miles of the proposed pipeline route. With the exception of the potential impacts of disturbed sediments to water quality and marine life discussed in sections 4.3.2.4 and 4.6.2, hazardous waste sites which may exist along the waterway for LNG marine traffic would not be impacted by, nor impact construction or operation of the proposed facilities and are therefore not addressed here. The databases searched include locations of environmental investigation and cleanup sites, operating facilities that generate or manage hazardous waste, or facilities listed for evaluation of air emissions, PCB generation or similar factors. The databases identified a total of 22 hazardous, potentially hazardous, and solid waste sites within 0.25 miles of the project. Table 4.8.4-1 lists those sites that would be crossed by the proposed pipeline or that could potentially impact the pipeline construction work areas with contaminated groundwater.

TABLE 4.8.4-1

Contaminated Sites and Landfills Crossed by, or Upgradient from the Project

Name of Site	County/State	Mile Post	Type of Site a/	Direction from Project	Distance from Project (mile)
LNG Terminal Facility					
None					
Mid-Atlantic Express Pipeline					
Baltimore Business Park / Avesta Sheffield	Baltimore/MD	8.32 & 8.52	RCRA/STATE	Crossed twice	crossed
68th St Dump	Rosedale/MD	8.80	NPL	W	0.25
Fitzpatrick Charles B Fitzpatrick Tiffany L	Baltimore/MD	37.93	dump site	crossed	crossed
Strasburg Landfill	Chester/PA	74.55	NPL, CERCLIS	crossed	crossed

a/ Abbreviations:

RCRA - EPA Resource Conservation And Recovery Information System Sites – Database of RCRA facilities with reported violations and subject to corrective actions.

NPL - EPA National Priority List- Database of confirmed, proposed or deleted Superfund sites.

CERCLIS - EPA Comprehensive Environmental Response Compensation And Liability Information System - a database of sites where response actions are planned or underway.

STATE - MDE Voluntary Cleanup Program & State Master List – MDE Voluntary Cleanup Program site listing and the Environmental Restoration & Redevelopment Program State Master List.

Data since January 2001 has been received from the National Response System database ;EPA no longer maintains this data.

LNG Terminal

No hazardous waste sites have been identified within the LNG terminal site. Public comments indicate concern with the neighboring Bethlehem Steel property, which is identified as being subject to RCRA Corrective Action. This listing is in reference to a 1994 Consent Decree issued to the former BSC related to correction of air emissions issues, landfill operation issues, investigation and corrective action of apparent waste disposal or spill locations, and waste minimization and recycling initiatives. The Consent Decree does not cover the proposed LNG terminal site or remaining areas of the former shipyard.

In discussions with MDE, Waste Management Administration, FERC has learned that the Sparrows Point Shipyard (Barletta) was carved out of a 1996 Consent Decree between EPA, DOJ, and Bethlehem Steel. The shipyard owner, SPS, agreed to participate in MDE's Voluntary Cleanup Program (VCP). SPS is in the process of completing its environmental assessment of the property and will develop a Response Action Plan. As per the VCP, remediation of the property would be accelerated relative to the priority that the area was assigned under the consent decree. Barletta-Willis, Inc., the owner of the SPS property, would lease a portion of that property to AES for the construction and operation of the LNG facility. The SPS property has been divided off from the former Bethlehem Steel Property and is no longer subject to the Consent Decree between EPA and Bethlehem Steel and their successor Mittal Steel. Methods for handling potentially-contaminated soils encountered at the proposed LNG terminal site as discussed in greater detail in sections 4.2.1.

Regarding the dredging activities, we have identified potentially harmful contaminants in the sediments to be dredged (see section 4.3.2.4 of this EIS). Dredging issues are further discussed in section 4.3.2.5 of the EIS.

Pipeline

There are 21 sites within 0.25 miles of the proposed pipeline route that were identified in the database search that may affect land use in the area of the listed site. Of these, only 3 are directly crossed by the pipeline, and one site is down gradient from the pipeline (see table 4.8.4-1). Where the pipeline is proposed to cross these properties, special attention has been given to centerline routing to avoid or minimize the potential to cross the property footprint and/or impacted areas.

The Baltimore Business Park-Avesta Sheffield Facility, formerly known as Eastern Stainless Steel Company, has been identified in the CERCLIS and RCRA/STATE database. The Project would cross the Baltimore Business Park property (the Avesta Sheffield Facility is within this business park) twice: at MP 8.32 for 652 feet; and at MP 8.52 for 486 feet. A Draft Site Closure Report prepared by SESTECH Environmental dated March, 2003 indicated that several areas of contamination existed on the property, however, the most critical areas of concern were the nickel and chromium groundwater contamination (SESTECH Environmental, 2003). The suspected source of the nickel and chromium contaminates is located beneath the Essex building, which is approximately 900 feet west of the proposed pipeline route, and has been eliminated. The report concluded the concentrations of chromium in the lower aquifer and nickel in the groundwater pose no risk to human health and the environment. A Site Specific Target Level (SSTL) of 0.15 mg/L of dissolved Nickel in groundwater was recorded near the proposed pipeline route and was stated to be protective of human health and the environment at the Back River.

The 68th Street Dump/Industrial Enterprises is located near the town of Rosedale in Baltimore County, Maryland. The final Hazard Ranking System Report, dated December 9, 1998, indicated that the 68th Street Dump site covers about 235 acres in Rosedale and another 18 acres in the City of Baltimore (Roy W. Weston, Inc. 1998). The site consists of several adjacent landfills, which received municipal, commercial, and industrial wastes, from the 1950s through the early 1970s. Hazardous substances detected at the 68th Street site include: VOCs, SVOCs, PCBs, and metals. 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 proposed pipeline route crosses railroad tracks on the north side of the Back River. The proposed pipeline crossing of the Back River at this location is anticipated to use a HDD, with the drill path paralleling the existing powerline and pipeline corridor that already exist and cross the river at this location. Contaminated ground water may be encountered during the HDD crossing of Back River. Mid-Atlantic Express would implement the Plan for the Unanticipated Discovery of Hazardous Wastes or Contaminated Sites, which is described below, to monitor for groundwater contamination associated with the 68th Street Dump/Industrial Enterprises site when constructing the pipeline in this area. Additionally, we have recommended that Mid-Atlantic Express provide a report and plans for the use of the open-cut method at this location in the event that HDD is determined to be not feasible (see section 4.2.2).

The Fitzpatrick, Charles B and Fitzpatrick Tiffany L dumpsite was identified by Mid-Atlantic Express during field surveys along the proposed pipeline route in the summer/fall survey season of 2006 (trash and debris accumulation observed). The dumpsite would be crossed by the proposed pipeline route. If contamination associated with the materials discarded at the dumpsite is encountered during construction of the pipeline, Mid-Atlantic Express would implement the Plan for the Unanticipated Discovery of Hazardous Wastes or Contaminated Sites, which is described below.

The Strasburg Landfill covers 22 acres near Coatesville in western Newlin Township, Chester County, Pennsylvania. In 1983, the PDEP found VOCs (benzene, vinyl chloride, 1, 2- dichloroethane) and metals (copper and lead) in on-site monitoring wells, and various chlorinated VOCs in an off-site private well down gradient of the landfill (Public Health Assessment 2005). The PDEP analyses identified the same contaminants in leachate from the landfill. The landfill was closed in 1983 by the PDEP. After it was closed, the landfill was capped with a layer of compacted soil, a polyvinyl chloride (PVC) liner, and another layer of soil and weathered rock. Leachate collection and treatment systems and 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 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 were performed by the EPA, and remediation that began in September, 1999 was completed in September, 2000. Construction of remedial actions or engineering controls is complete at the site and EPA has determined that under current conditions at this site, potential or actual human exposures are under control. The site has not yet been de-listed from the NPL.

Unanticipated Contaminated Soils

Contaminated soils associated with the above documented or other, undocumented hazardous waste sites could be encountered during construction of the proposed pipeline facilities. If hazardous wastes or other forms of contamination, as defined in applicable federal, state and local regulations and guidelines, are encountered during construction of the Project, Mid-Atlantic Express would implement the Plan for the Unanticipated Discovery of Hazardous Wastes or Contaminated Sites (Appendix N). General provisions of this plan are summarized below.

The first step in this plan would be to determine the extent, nature, and disposition of areas with previously known and/or suspected contamination that would be impacted during construction. The plan procedures include specifications for excavation or subsurface activities, classification and handling requirements for contaminated material, and dewatering and sedimentation control. Additional areas of potentially contaminated soil, material and/or groundwater may be encountered during excavation, dewatering or other project construction activities. During these activities, Mid-Atlantic Express would designate Environmental Inspectors to monitor the construction process. In the event that the discovery of hazardous wastes or contaminated sites occurs, Mid-Atlantic Express would restrict access to the suspected area, notify the Environmental Inspectors and construction manager, notify the landowner(s) of the subjected parcel(s), and consult with appropriate local, state or federal regulatory agencies with respect to the management and/or disposal of contaminated media.

Mid-Atlantic Express would perform additional tasks during excavation or HDD activities if known or suspected environmental contaminants are identified. These include the additional involvement of the Environmental Inspector(s) during the process, obtaining permits for the extraction or discharge of groundwater if necessary, stockpiling of excavated material, and the utilization of control measures to minimize airborne dust and prohibit rainfall from collecting in open excavations.

An Environmental Inspector would ensure that excavated materials, in particular contaminated material, is managed appropriately so as not to further spread environmental contaminants. Chemical laboratory testing would be used to classify potentially contaminated excavated materials. Materials would be managed in the interim period between detection or identification of suspect environmentally impaired media and receipt of analytical results (and ultimately disposal) in accordance with all applicable federal, state, county, and local government guidelines and regulations.

Construction contractors would be required to observe general site provisions to ensure that Environmental Inspectors have access to the site and that materials are managed in accordance with the plan provisions.

4.8.5 Recreation and Public Interest Areas

The Sparrows Point LNG terminal and Mid-Atlantic Express Pipeline projects would not affect any national parks or forests; Indian reservations; national wilderness areas; national wildlife refuges; waterfowl production areas; recreational, scenic or historic trails designated through the National Trails System Act of 1968, as amended; federally designated natural, recreational or scenic areas; registered natural landmarks; or national wild and scenic rivers. Construction of the LNG terminal site would include areas of the Patapsco River, a major tributary to Chesapeake Bay. No other designated recreation or public interest area would be occupied by the LNG terminal site. The pipeline route is near or crosses one state park, four trails, one state-designated scenic and wild river, and two historic districts. In addition, a number of schools, churches, local parks, camp grounds, recreation areas and a golf course are crossed by the proposed pipeline route. Further information is provided in section 4.8.5.1 below.

4.8.5.1 Designated Recreation and Public Interest Areas

Designated areas of recreation and public interest in Maryland and Pennsylvania are presented in this section. A summary of special land use parcels crossed or within 0.25 mile of the Sparrows Point LNG terminal and Mid-Atlantic Express Pipeline projects is presented in table 4.8.5-1

TABLE 4.8.5-1

Recreational And Public Interest Areas
Crossed or Within 0.25 Mile of the Proposed LNG Terminal Site or Pipeline Route a/

Name of Site	County/State	Milepost	Type of Site	Direction from Project	Distance from Project (ft)	Comment
LNG Terminal Facility						
Patapsco River	Baltimore/MD	0.0	Recreational	West	Adjacent	--
Mid-Atlantic Express Pipeline						
Batavia Park	Baltimore/MD	9.42	Park	-	Crossed – about 157 ft	Follows Existing Corridor
Race Road Park	Baltimore/MD	11.22	Park	-	Crossed – about 155 ft	--
Victory Villa School	Baltimore/MD	12.50	School	Southeast	775	--
Middle River Middle School	Baltimore/MD	12.80	School	Southeast	900	--
Glenmar School	Baltimore/MD	13.10	School	Southeast	1,200	--
Gunpowder Falls State Park	Baltimore/MD	18.16	Park	-	Crossed – 1,144 feet	Follows Existing Corridor
Gunpowder Falls Golf Course (formerly Mt. Vista Golf Course)	Baltimore/MD	19.05	Golf Course	-	Crossed – 2,124 feet	Follows Existing Corridor
Saint Stephens Church	Baltimore/MD	19.74	Church and School	-	Crossed by ATWS b/	Follows Existing Corridor
Franklinville Road Park	Baltimore/MD	20.41	Park	East	250	Follows Existing Corridor
Gunpowder Falls State Park	Baltimore and Harford/MD	21.93	Park	-	Crossed	Follows Existing Corridor
Humane Society Of Harford County Inc	Harford/MD	24.83	Animal Shelter	-	Crossed	Follows Existing Corridor
Fallston Middle & High Schools	Harford/MD	25.91	School Complex	-	Crossed	Pipeline is distant from occupied structures
Scarboro Conservation Area	Harford/MD	38.20	Conservation Area	-	Crossed	--
Evangelical Methodist Church/Hartford Christian School	Harford/MD	39.84	School Athletic Fields	South	Adjacent	Soccer fields are within 50 feet of construction work area
Dublin Elementary School	Harford/MD	40.10	School	South	1,250	--
Dublin Bell Park	Harford/MD	40.50	Park	North	575	--
Indian Lake Christ Service Camp	Harford/MD	43.67	Summer Camp	-	Crossed	HDD/ Existing Corridor
Mason-Dixon Trail	Harford/MD	43.88	Trail	-	Crossed	HDD
Camp Conowingo (Girl Scout Council of Central Maryland Inc.)	Cecil/MD	44.57	Scout Camp	-	Crossed – 3,468 feet	Two pipeyards proposed by Mid-Atlantic Express within open areas of this property

TABLE 4.8.5-1

Recreational And Public Interest Areas
Crossed or Within 0.25 Mile of the Proposed LNG Terminal Site or Pipeline Route a/

Name of Site	County/State	Milepost	Type of Site	Direction from Project	Distance from Project (ft)	Comment
Camp Conowingo (Girl Scout Council of Central Maryland Inc.)	Cecil/MD	45.56	Scout Camp		Crossed – 1,502 feet	--
Chester County Girl Scouts C/O Freedom Valley	Chester/PA	56.78	Scout Camp	-	Crossed	Follows Existing Corridor
Upper Oxford Township Park	Chester/PA	61.90	Park	Southeast	900	--
Doe Run Friends Cemetery	Chester/PA	67.70	Cemetery	East	70	Follows Existing Corridor
Brandywine Conservancy Inc	Chester/PA	69.32	Conservation Area	-	Crossed	Follows Existing Corridor
Beacon Hill Park	Chester/PA	77.00	Park	-	Crossed	--
West Bradford Elementary School	Chester/PA	77.00	School	West	250	--
Lloyd Park	Chester/PA	79.70	Park	East	Adjacent	--
West Bradford Township	Chester/PA	77.75	Town Hall/ Baseball Field	-	Crossed	--
Beaver Creek Elementary School	Chester/PA	79.60	School	Southeast	750	--
Copeland Run Learning Center	Chester/PA	79.76	Daycare Center	-	Crossed	--
Downingtown Area School District	Chester/PA	80.40	School Complex	East	800	--
Dowlin Struble Forge Park	Chester/PA	82.32	Park	-	Crossed	--
Shamona Creek Elementary School	Chester/PA	83.65	School	-	Crossed	--
Hickory Park	Chester/PA	84.80	Baseball Fields/Tennis Courts	-	Crossed	--
Windsor Baptist Church	Chester/PA	85.47	Church, School and Cemetery	-	Crossed	--
Pickering Valley Elementary School	Chester/PA	85.60	School	Southeast	925	--
Saint Elizabeth Church	Chester/PA	86.20	Church and School	-	Crossed	--
Beth Israel Congregation	Chester/PA	86.32	Church and School	West	120	--

a/ All schools within 0.25 mile of the pipeline are included; only churches with church property crossed or within 150 feet of the construction right-of-way are included.
b/ ATWS = Additional temporary workspace, also known as extra workspace.

Mid-Atlantic Express would develop and implement site-specific mitigation measures for recreation or public interest parcels crossed by the proposed pipeline route. These measures may include restricting activity to within the existing pipeline corridor, minimizing work space, or developing site-specific plans. Further information regarding these crossings is provided below.

LNG Terminal

The LNG terminal site is located on a peninsula of land that extends into the Patapsco River east of the Port of Baltimore. The Patapsco River empties into the upper reach of Chesapeake Bay. Construction of the LNG terminal would include widening and deepening the existing approach channel and turning basin offshore of the site. Specific issues of boating and fishing, with respect to the construction and operation of the LNG terminal, are treated in section 4.8.5.2.

Waterway for LNG Marine Traffic

The Coast Guard report "Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas Spill Over Water" identified "Zones of Concern" with regards to public safety in the area of a LNG vessel. These Zones of Concern were superimposed over the location of the LNG terminal and proposed vessel transit route to determine areas of concern regarding public safety.

Regarding LNG marine traffic, no national parks were identified within the transit route or overlay Zones. One state park, Sandy Point State Park, is overlapped by Zone 3 and approximately 50 m of Zone 2. The park comprises a 786 acre park on the Chesapeake Bay opened in 1952. The park supports day-use recreational activities, including swimming, fishing, crabbing, boating and windsurfing. Wildlife and bird watching are also promoted by the park. Potential risks to public safety at Sandy Point State Park from any potential LNG release or event is addressed by the WSA. The WSA developed recommendations for use by the Coast Guard in developing its Waterway Suitability Report, which was released on February 25, 2008. The WSR (Appendix J) summarizes methods to mitigate risks to safety and security.

The effect of LNG vessel traffic on marine recreation is discussed in Section 4.8.5.2 Boating and Fishing.

Pipeline

Parks and Camps

Gunpowder Falls State Park is located within Harford and Baltimore Counties and contains nearly 18,000 acres established to protect the stream valleys of the Big and Little Gunpowder Falls and the Gunpowder River. Two crossings of the park would be required for construction of the pipeline. The proposed pipeline route was selected using an existing overhead electric powerline utility corridor for the crossing locations. Impacts to Gunpowder Falls State Park during construction would include temporary closure of the hiking trail, visual impacts to park users, and vegetation clearance along the proposed pipeline route. Impacts to park visitors would also include exposure to construction noise and dust generated by construction equipment. Instream construction activities, particularly cutting pipe trenches and pipe lay activities, would negatively impact park use and visual aspects of trails near the stream.

The first crossing of Gunpowder Falls State Park would be from about MP 18.16 to MP 18.37. The pipeline would cross about 1,144 feet of the park property including the stream crossing of Gunpowder Falls. A preliminary site-specific cross-section diagram of the stream crossings for Gunpowder Falls at MP 18.28 has been reviewed by FERC staff. The diagram indicates the crossing method at this stream would be a coffer dam (which dams half the river at a time. Mid-Atlantic Express has also indicated that MDE would impose a seasonal restriction to prohibit instream work during March 1 – June 15 (also see Section 4.6.3). Mid-Atlantic Express has also indicated that they would develop and implement site-specific plans for the crossings at Gunpowder Falls State Park. These plans would include, at a minimum, a scaled plot plan showing the areas of disturbance, a discussion of construction methods, a plan to minimize the length of closure of the hiking trail (including constructing a temporary bridge, using steel plates, fencing and/or other acceptable methods to ensure safety of park visitors), re-vegetation plans and proposed mitigation efforts.

The second crossing of Gunpowder Falls State Park would begin at about MP 21.93. The pipeline would cross Little Gunpowder Falls (MP 22.22). Little Gunpowder Falls would be crossed either using open cut, or alternatively by HDD. Mid-Atlantic Express has indicated it is evaluating crossing Little Gunpowder Falls

and the NTWSSC just north of the Falls to address MDE concerns with crossing the NTWSSC. If open cut method is used, the park property (approximately 550 feet south of the river) would be crossed along an existing BGE powerline crossing of the Falls and park. The pipeline crossing would also cross a foot trail which follows the northern edge of the river. This BGE easement has already opened the canopy of the forested riparian zone on both side of the river and the powerline corridor is a noticeable intrusion on the viewshed from the trail. If open cut is used to cross the Little Gunpowder Falls, the clearing necessary for the pipeline workspace would exacerbate the degradation of the view from the trail. If Mid-Atlantic Express chooses to use HDD to cross the river and the NTWSSC, the visual impairment from the trail would be avoided or greatly reduced.

Because consultation with MDNR regarding these park crossings has not been completed and site-specific plans have not been finalized, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express file its final plans for crossing Gunpowder Falls State Park. This plan should be developed through continuing consultation with MDNR and include minimization of tree clearing, avoidance and/or minimization of conflict with park use, park user safety issues, and specific restoration and revegetation plans. The plan should provide for continuous use of park trails, including detours where necessary. The final plan for crossing the park, along with MDNR correspondence, should be filed with the Secretary.**

In addition to Gunpowder Falls State Park, the pipeline would cross 4 local parks (Batavia Park, Race Road Park, Beacon Hill Park and Dowlin Struble Forge Park) and would be adjacent to Lloyd Park. The impact on each local park is discussed in the following paragraphs.

The pipeline would follow the eastern boundary of Batavia Park, along the curve of I-695 at MP 9.42. The pipeline would cross about 157 feet of the park and would result in tree removal on this boundary of the park. The pipeline work space would not cross any infrastructure within the park. The pipeline construction would temporarily impact the noise level at the park, but the pipeline corridor is removed from any park infrastructure and may be distant from any site of park users. The permanent right-of way would permanently change the land cover type from forested to open herbaceous cover for the life of the project.

The pipeline would cross Race Road Park at MP 11.22. The pipeline would cross about 155 feet of the park, which appears in aerials to be undeveloped park land not affecting any developed infrastructure. Although the park does not appear to have any facilities, it may have pedestrian trails. The pipeline construction would temporarily impact the noise level at the park. The permanent right-of way would permanently change the land cover type from wooded to open herbaceous cover for the life of the project.

The pipeline would cross Beacon Hill Park at MP 77.00. It appears that the pipeline ATWS would cross 48 feet of the eastern corner of the park, about 400 to 600 feet from baseball fields in the park. This portion of the park does not have any infrastructure. The pipeline construction could temporarily impact the noise level at the park. The permanent right-of way would permanently change the land cover type from wooded to open herbaceous cover for a small portion of the eastern edge of the park for the life of the project.

The propose pipeline route would cross Dowlin Struble Forge Park at MP 83.32. Since Mid-Atlantic Express did not get permission to survey through some of this area, we estimate that the crossing would be several hundred to a thousand feet in length. The construction within this park would have a substantial impact on the park use, the parking lot access, and the trails of the park. The pipeline route is proposed to follow the existing Columbia Gas pipeline corridor through the park. The construction and operation of the pipeline would have noticeable, longterm visual impacts on the forested portion along the East Brandywine Creek. Mid-Atlantic Express has not provided a site-specific crossing plan for this park. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express file its draft plan for crossing Dowlin Struble Forge Park. This plan should be developed through continuing consultation with Uwchlan Township and the administrator of the park, and include minimization of tree clearing, avoidance and/or minimization of conflict with park use, park**

user safety issues, and specific restoration and revegetation plans. The plan should provide for continuous use of park trails, including detours where necessary. The final plan for crossing the park, along with Uwchlan Township and park administration correspondence, should be filed with the Secretary for review and written approval by the Director of OEP.

The pipeline route would be adjacent to Lloyd Park, northwest of Downingtown, Pennsylvania at about MP 79.7. The pipeline route would not cross the park property, but would parallel Lloyd Avenue at or near one entrance to the park. Pipeline construction would add to the noise background at the park for a period of days or weeks. During the short period when the pipeline construction crosses Lloyd Avenue just north of the park boundary, traffic congestion could temporarily impact easy access to the park.

Additionally, the proposed pipeline route would cross a summer camp, and two Girl Scout camps in Maryland and one Girl Scout camp in Pennsylvania. Mid-Atlantic Express has not yet developed site-specific crossing methods or mitigation measures for these locations.

The pipeline would cross two segments – from MP 44.57 to MP 45.23, and from MP 45.56 to MP 46.21 – of Camp Conowingo, a 600-acre Girl Scouts of Central Maryland facility. The camp has resident activities, including a summer camp from mid-June to early August. There also are opportunities for year-round activities as well (e.g., troop camping) (Girl Scouts of Central Maryland, no date).

Approximately 0.1 mile of the first segment would be crossed by HDD; the remaining 0.56 mile would be open-trenched. A proposed HDD work area for the Susquehanna River and the aforementioned trenching would be located in forest on this property, plus a small portion (0.16 acre) at the edge of an open area that may be used as a seasonal campground. The majority (6.1 acres) of the forest land that would be cleared on this property is in a 100-foot x 2650-foot ATWS that Mid-Atlantic Express has proposed for the pull string of the pipe for the 5120-foot long Susquehanna River HDD. The length of this ATWS would accommodate only approximately half the length of pipe needed for the HDD. Therefore, Mid-Atlantic Express would fabricate two pull strings, laying them side-by-side in the ATWS and welding them together when the first string has been pulled almost into the HDD bore hole. However, we believe that the configuration of the right-of-way from MP 44.7 (the end of the HDD) to MP 45.8 can accommodate bends in the pull string such that a single pull string can be used. We further believe that a maximum 50-foot-wide ATWS would be needed for a single HDD pull string, and that the pull string can be slowly brought over the proposed pipeline centerline by approximately MP 45.1, if not sooner. This would allow use of the nominal 75-foot-wide construction right-of-way for much of the pull string instead of necessitating an additional cleared width, and thus avoid clearing of over 3 acres of forest land. It would also necessitate supporting only one rather than two parallel pull-strings on the side-slope in the currently proposed configuration. Therefore, in order to reduce clearing of forest land associated with the camp, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express file with the Secretary an evaluation of the feasibility of fabricating the Susquehanna River HDD pull string as a single string. The evaluation should specifically address the use of a maximum 50-foot-wide ATWS for the pull string and maximizing the use of the nominal 75-foot-wide construction right-of-way to avoid additional forest clearing. Should use of a single pull string not be feasible, Mid-Atlantic Express should restrict the pull string ATWS width to 50 feet and use the 75-foot-wide construction right-of-way for the second pull string.**

Mid-Atlantic Express also proposes to use two open areas of this Girl Scout parcel as pipeyards: a 2.67-acre pipeyard approximately 150 feet north of the proposed pipeline centerline and adjacent to the construction work space at MP 44.6; and a 2.19-acre pipeyard approximately 600 feet north of the proposed pipeline centerline and approximately 450 feet north of the construction work space at MP 45.0. These fields contain camp facilities (Girl Scouts of Central Maryland, no date), and thus construction may interfere with camp activities. Furthermore, an access road to the pipeyard and right-of-way at MP 44.6 would pass next to Bell Manor, a historic Victorian home from the 1860's which the Girl Scouts are currently renovating (Girl Scouts of Central Maryland, no date). The structure is Site CE-684 on the Maryland Inventory of Historic Properties (Maryland Historic Trust, 2008). Mid-Atlantic Express has not yet performed its survey of historic structures

that may be affected by pipeyards; they will do so when the locations of the pipeyards/contracting areas are refined. See section 4.10.1 for additional information.

The MP 45.56 to MP 46.21 segment of Camp Conowingo that would be crossed by the proposed pipeline contains both forest and open land. The closest developed areas of the camp are approximately 0.5 mile northwest of MP 45.6 and thus would not incur any direct impacts from the project other than construction noise.

The proposed pipeline would cross Camp Tweedale, a Girl Scouts of Eastern Pennsylvania camp, from MP 56.78 to MP 56.92. This portion of the proposed pipeline route includes both open and forest land along the existing Columbia right-of-way. Camp Tweedale facilities include cabins, a pool, a nature center, and trails; and there are summer camp programs June - August (Girl Scouts Council of Eastern Pennsylvania, 1977). The main camp buildings are approximately 500 feet northwest of the proposed construction work space at MP 56.9 and thus would not suffer direct impacts other than construction noise.

At both of the aforementioned Girl Scout camps there is potential for construction to interfere with planned activities. Therefore, in order to minimize impacts on such activities, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express submit construction schedules and plans, developed with the input of the Girl Scouts of Central Maryland and the Girl Scouts Council of Eastern Pennsylvania, for crossing and minimizing impacts to activities and facilities at Camp Conowingo and Camp Tweedale. The plans should address, at a minimum, a discussion of any facilities, roads, utilities and/or waterbody areas that would be disturbed; a discussion of the construction methods, revegetation plans, and proposed mitigation efforts; and a discussion of how the areas would be safely kept open for camp users.**

Trails

The Star-Spangled Banner National Historic Trail is awaiting action by Congress to establish the trail as a National Scenic Trail. The proposed Star-Spangled Banner National Historic Trail would consist of recreation areas, road and water trails. The routes would be marked as continuous segments on the ground, consistent with current land use, and at water access points. Based on maps provided by NPS, the proposed trail route would be crossed at MP 2.0 in an area where the both the trail and the pipeline would parallel I-695. Based on information provided by NPS, it is anticipated that the trail would be a driving route in this area. Therefore, construction and operation of the pipeline would not impact the use of the existing roadway as the trail driving route.

The Maryland and Pennsylvania Railroad Preservation Society is working to preserve the Old Maryland and Pennsylvania (MAPA) Railroad as a recreation trail. The portion of the trail has already been developed in Harford County, Maryland. Although the pipeline route crosses the old MAPA railroad at MP 31.8 along an existing right-of-way, it would not cross the recreational trail or any planned extension of the trail. Therefore, no impacts to the MAPA railroad trail are anticipated.

The Mason-Dixon Trail connects the Appalachian Trail with the Brandywine Trail. The trail follows the banks of the Susquehanna River from York Haven, southeast of Harrisburg, Pennsylvania, to the shore of Chesapeake Bay in Maryland. This is a private trail, constructed and maintained by volunteers, and supported by members of the Mason-Dixon Trail System Inc. (Mason Dixon Trail System, Inc., 2006). The proposed pipeline route would cross the Mason-Dixon Trail at approximately MP 43.88. The trail would be crossed as part of the HDD segment at the Susquehanna River. The closest surface disturbance to the trail would be approximately 0.15 mile to the southwest of the trail, at the HDD entry hole location for the Susquehanna River crossing. See Section 4.3.2.7 for a discussion of the potential impacts and proposed mitigation associated with this crossing. The potential temporary impacts would consist of a cable crossing the path to provide direction for the HDD drill bit, and noise associated with the drilling operation. In order to protect users of the trail during construction**, we recommend that**:

- **<u>Prior to construction</u>, Mid-Atlantic Express develop and file with the Secretary a plan to allow safe passage for users along the Mason-Dixon Trail during the HDD operation.**

The proposed pipeline route would also cross Brandywine Trail, maintained by the Wilmington Trail Club, at MP 74.19 in Chester County, Pennsylvania. The Brandywine Trail is a 34-mile hiking trail that parallels Brandywine Creek from near Philadelphia to the outskirts of Wilmington, Delaware. This crossing occurs within an existing right-of-way the pipeline parallels. Mid-Atlantic Express would cross the Brandywine Trail by trenching methods, with a perpendicular crossing. This crossing method would require temporary closure of the trail. Public comments have included concerns regarding impacts to the annual Brandywine Trail End-to-end Hike and archaeological resources (also see section 4.10.1) identified in this area. Because of these concerns, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express should develop and file with the Secretary, a site-specific plan for the crossing of the Brandywine Trail. This plan should include: a scaled plot plan showing the areas of ground disturbance and locations of tree clearing; locations of temporary fencing; means for keeping the trail open during the construction period; trail restoration; and a revegetation plan that includes active replanting. This plan should be developed in consultation with the Wilmington Trail Club to minimize construction conflict with the Brandywine Trail End-to-End hike.**

Golf Courses

The Sparrows Point Country Club is located north of the terminal site. Construction of the proposed pipeline route would not cross or be adjacent to the country club.

The proposed pipeline route would cross Gunpowder Falls Golf Course (formerly Mt Vista Golf Course) in Kingsville, Maryland at MP 19.05. The pipeline would cross about 2,024 feet of the golf course property. The pipeline would cross the southeast corner of the 18-hole course. Construction would impact cart paths and the rough near Hole #5 and would cross the green and tee box for Hole #6. Mid-Atlantic Express has stated that they would develop and implement a site-specific plan for crossing at special land use locations. Mid-Atlantic Express has stated that these plans would include, at a minimum, a scaled plot plan showing the areas of disturbance, a discussion of any facilities, roads, utilities and/or waterbody areas that would be disturbed, a discussion of the construction methods, re-vegetation plans, proposed mitigation efforts, and a discussion of how the areas would be safely kept open for users. Due to the nature of the land uses at these crossings, **we recommend that:**

- **<u>Prior to construction</u>, Mid-Atlantic Express develop and file with the Secretary, a site-specific plan for crossing the Gunpowder Falls Golf Course.**

Schools and Other Public Use Properties

We received numerous comments from the public regarding the safety of pipeline installation and operations near, adjacent to, or across school or other public use properties. The properties of schools or churches that would be nearby or crossed by the pipeline are presented in table 4.8.5-1. Properties of two churches, two schools, and an animal shelter are crossed by the proposed pipeline route in Maryland (see table 4.8.5-1). Specifically, we received many comments regarding the safety issues of the pipeline in the vicinity of the Fallston Middle and High School campuses. The pipeline would cross about 590 feet of the Board of Education of Harford County property, which includes the middle and high school campuses, at the northeast boundary of the property near MP 25.91. We have determined that the pipeline alignment would be approximately 600 feet from the closest baseball field, about 800 feet from the track, and a range of 700 to 1000 feet from occupied buildings of the middle school and high school campuses. Since the pipeline would pass by populated neighborhoods near the school property, the pipeline would likely be classified as a DOT Class 3 for this segment of construction, regardless of the distance to the school outdoor recreational facilities or occupied buildings (see section 4.12.9 for discussions on pipeline safety).

Three schools, two churches, one with an associated cemetery, and a daycare center property are crossed by the proposed pipeline route in Pennsylvania. Mid-Atlantic Express has not yet conducted sufficient site-specific surveys of these crossing locations to determine the precise locations of the crossings or to develop site-specific crossing methods or mitigation measures.

Mid-Atlantic Express has stated that it would develop and implement site-specific plans for crossings at special land use locations. Mid-Atlantic Express has stated that these plans would include, at a minimum, a scaled plot plan showing the areas of disturbance, a discussion of any facilities, roads, utilities and/or waterbody areas that would be disturbed, a discussion of the construction methods, re-vegetation plans, proposed mitigation efforts, and a discussion of how the areas would be safely kept open for users. To address the public concern raised regarding safety and the potential for construction to disrupt school or daycare center operations, **we are recommending that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express prepare site-specific plans developed in consultation with the school or daycare administrator for each school or daycare center listed in table 4.8.5-1 as "crossed." The plans should include provisions to: address construction noise mitigation, prohibit leaving trenches open over night on any school or daycare property, and indicate that the timing of construction near the school or daycare center would be scheduled in consultation with the facility administrator to minimize disruption to school or daycare activities. The plans, along with any comments from each facility administrator, should be filed with the Secretary.**

Special Status Waterbodies

Deer Creek is listed by Maryland as a Scenic River, which is defined as a "free-flowing river whose shoreline and related land are predominately forested, agricultural, grassland, marshland, or swampland with a minimum of development for at least 2 miles of the river length." The stream valley surrounding Deer Creek is identified within the Deer Creek Advisory Board's Deer Creek Scenic River guide, 1979 revision, most importantly for its large percentage of open and agricultural land. The proposed pipeline route crosses the creek at MP 35.54 in Harford County, Maryland. The creek crossing occurs adjacent to an existing right-of-way along steep, wooded terrain. A perpendicular crossing would be used in this location to minimize potential impacts. In addition, BMPs would be used for stream and waterbody crossings to further reduce potential impacts associated with the crossing in the AES Application, Resource Report 2, Appendix 2A, (Docket Number CP07-62-000, Accession No. 20070109-4012). Mid-Atlantic Express has proposed flume and dam as a site specific crossing technique for this waterbody crossing. See also Section 4.6.2 for a further discussion of potential impacts and planned mitigation associated with this stream crossing. Members of the public have commented that Deer Creek is a scenic river and should be protected. The staff has determined that the Project crossing of Deer Creek does occur within a segment considered to be a "Scenic River" by state designation. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Mid-Atlantic Express develop, in consultation with the Deer Creek Advisory Board, the NMFS and the MDNR, a construction and mitigation plan for Deer Creek to address minimizing tree clearing, potential fisheries impacts and effects on the scenic river status. Mid-Atlantic Express should file the plan with the Secretary for review and written approval by the Director of OEP.**

In Pennsylvania, rivers included in the Scenic Rivers System are classified by the state as Wild, Scenic, Pastoral, Recreational and Modified Recreational Rivers (Sections 4; (a) (1) of the Pennsylvania Scenic Rivers Act). The proposed pipeline route would cross the Octoraro River in Lancaster and Chester Counties of Pennsylvania and the Lower Brandywine River in Chester County, Pennsylvania; both of these river systems are designated as Pastoral at the proposed pipeline crossing locations (PDCNR 2006a). The Pastoral river designation recognizes that the surrounding pastoral landscape enhances the aesthetic qualities of this river type. Pastoral rivers shall be free-flowing and capable of supporting water based recreation, fish and aquatic life. The view from the river or its banks shall be predominately pastoral or farming countryside. For the river

systems crossed by the proposed pipeline, managing organizations associated with the Pennsylvania Scenic Rivers Program include the Octoraro Creek Watershed Association and the Brandywine Conservancy.

The Octoraro River crossing (MP 56.3) parallels the existing route of the Columbia Gas pipeline. The properties on both sides of the river at the crossing location are owned and maintained by the Chester Water Authority which operates a municipal water supply from the Octoraro Reservoir located west of the pipeline alignment. Mid-Atlantic Express proposes to cross the Octoraro River by the dam and pump method, which would block river access by boat across the pipeline crossing section during construction. This would be a temporary impact to local boating or canoeing. The areas of the pipeline crossing would be in an area that has been previously developed with a water supply structure. The pipeline would cross the Octoraro River at a point where the Columbia Gas pipeline has already opened a visual pipeline corridor through the forested riparian zone on both banks of the river. As planned, the pipeline construction workspace, particularly the ATWS on the south bank of the river, would increase the width of the clearing through the forested riparian zone, and would thus increase the impact on the view from the river.

The Lower Brandywine is composed of multiple streams and associated corridors, including Buck Run, West Branch Brandywine Creek, Board Run, and East Branch Brandywine Creek. The proposed pipeline route would cross the Lower Brandywine at the following locations: MP 72.14 on Buck Run, MP 74.25 on West Branch Brandywine Creek, MP 76.54 on Broad Run, and MP 82.31 on East Branch Brandywine Creek. Since Mid-Atlantic Express proposes open-cut construction at these crossings, water quality and appearance would be temporarily impacted downstream of the pipeline trenching and installation. The construction activities would also impede recreational access by boat or canoe along these sections of the river for the period of construction. As planned, the pipeline construction workspace would increase the width of the clearing through the forested riparian zone at each of these four crossings and would thus increase the impact on the view from the creeks at each crossing.

Because of the potential impact on the viewshed at these Pastoral waterbodies and temporary disruption to recreational and boating access, **we recommend that:**

- **<u>Prior to construction</u>, Mid-Atlantic Express develop, in consultation with the PDCNR, the Octoraro Creek Watershed Association, and the Brandywine Conservancy, construction and mitigation plans for the Octoraro River (MP 56.3) and each of the four crossings of the Brandywine Creek system (i.e., MPs 72.14, 74.25, 76.54, and 82.31) and file the plan with the Secretary for review and written approval by the Director of OEP. These plans should address: minimizing tree clearing within the riparian zones of the waterbodies, potential measures to reduce impacts to recreational and boating access during construction, and effects on the viewshed along these Pastoral Rivers.**

Conservation Easements

No conservation easements are located on the land proposed for use by the proposed LNG terminal site for construction or operation. In Pennsylvania, the pipeline route would not cross any state-owned land, including state forests, state game lands or wildlife management areas, state-designated natural or wild areas, or state-designated recreation or scenic areas.

Maryland's Rural Legacy Program is designed to preserve large blocks of contiguous open space that are among the State's most valuable because of their agricultural, natural and cultural resources. The proposed pipeline route crosses several Rural Legacy Program and Maryland Agricultural Land Preservation easements (MDNR, 2006b). The proposed pipeline route would also cross several Agricultural Conservation Easements administered by local municipalities and Brandywine Land Trust Conservation Easements administered by the Brandywine Conservancy's Environmental Management Center in Pennsylvania.

Table 4.8.5-2 lists those sites in Maryland and Pennsylvania along the proposed pipeline route with conservation easements. In these locations, Mid-Atlantic Express would consult with the Rural Legacy Program director, the local municipality or the Brandywine Environmental Management Center to determine if

the proposed activities related to construction of the pipeline would need to be reviewed for consistency with the terms of the easements held. Crossings of conservation easement lands would require restoration to agricultural usage. Mid-Atlantic Express has stated that it would implement FERC's Plan for Crossing Agricultural Lands.

TABLE 4.8.5-2

Parcels Containing Conservation Easements Crossed by the Proposed Pipeline Route

Site Name	County/State	Beginning Mile Post	Approximate Crossing Length (feet)
LNG Terminal Facility			
none			
Mid-Atlantic Express Pipeline			
Agricultural Easement	Harford/MD	28.01	501
Agricultural Easement	Harford/MD	28.08	432
Agricultural Easement	Harford/MD	28.14	591
Agricultural Easement	Harford/MD	28.215	671
Agricultural Easement	Harford/MD	28.95	1718
Agricultural Easement	Harford/MD	29.27	124
Agricultural Easement	Harford/MD	29.29	68
Agricultural Easement	Harford/MD	29.3	400
Agricultural Easement	Harford/MD	29.33	2460
Agricultural Easement	Harford/MD	33.24	1461
Agricultural Easement	Harford/MD	33.38	86
Agricultural Easement	Harford/MD	33.4	90
Agricultural Easement	Harford/MD	42.43	922
Agricultural Easement	Chester/PA	56.86	311
Agricultural Easement	Chester/PA	56.93	1440
Agricultural Easement	Chester/PA	57.2	1646
Agricultural Easement	Chester/PA	58.88	2713
Agricultural Easement	Chester/PA	59.4	1837
Agricultural Easement	Chester/PA	59.8	2473
Agricultural Easement	Chester/PA	61.63	300
Agricultural Easement	Chester/PA	62.61	1300
Agricultural Easement	Chester/PA	62.87	1512
Agricultural Easement	Chester/PA	63.46	3053
Agricultural Easement	Chester/PA	64.52	879
Agricultural Easement	Chester/PA	64.69	428
Agricultural Easement	Chester/PA	65.66	400
Brandywine/Agricultural	Chester/PA	65.73	1458
Agricultural Easement	Chester/PA	66	2380
Brandywine Easement	Chester/PA	66.6	1531
Brandywine/Land Trust	Chester/PA	67.24	675
Brandywine/Land Trust	Chester/PA	67.37	390
Brandywine/Land Trust	Chester/PA	67.71	6117
Brandywine/Land Trust	Chester/PA	68.88	1699
Brandywine Easement	Chester/PA	69.21	241
Brandywine Easement	Chester/PA	69.27	331
Brandywine/Land Trust	Chester/PA	69.33	2763
Brandywine Easement	Chester/PA	69.85	52

TABLE 4.8.5-2 **Parcels Containing Conservation Easements Crossed by the Proposed Pipeline Route**			
Site Name	**County/State**	**Beginning Mile Post**	**Approximate Crossing Length (feet)**
Land Trust	Chester/PA	69.86	2440
Brandywine/Land Trust	Chester/PA	70.33	325
Brandywine/Land Trust	Chester/PA	70.34	1438
Brandywine/Land Trust	Chester/PA	70.6	1123
Brandywine/Land Trust	Chester/PA	70.81	2101
Brandywine/Land Trust	Chester/PA	71.22	3085
Brandywine/Land Trust	Chester/PA	71.76	975
Brandywine/Land Trust	Chester/PA	71.94	135
Brandywine/Land Trust	Chester/PA	71.97	952
Brandywine/Land Trust	Chester/PA	72.15	1660
Brandywine/Land Trust	Chester/PA	72.46	1467
Brandywine/Land Trust	Chester/PA	72.58	380
Brandywine Easement	Chester/PA	72.82	361
Brandywine/Land Trust	Chester/PA	72.9	600
Brandywine/Land Trust	Chester/PA	73.02	1702
Brandywine/Land Trust	Chester/PA	73.34	1468
Brandywine/Land Trust	Chester/PA	73.5	512
Brandywine/Land Trust	Chester/PA	73.71	704
Brandywine/Land Trust	Chester/PA	73.84	795
Brandywine Easement	Chester/PA	73.99	225
Brandywine Easement	Chester/PA	74.03	485
Possible Easement	Chester/PA	76.12	738
Possible Easement	Chester/PA	76.23	130

Conclusions

We have recommended that Mid-Atlantic Express prepare site-specific plans for several designated recreational and public interest areas discussed above, with several of these plans requested to be provided during the comment period of the DEIS. This will allow FERC staff to further address the issues in the final EIS and allow the public to review the plans and have the opportunity to comment on them. With the implementation of these conditions, we believe that the proposed project could be built in a manner that does not significantly impact recreation and public interest areas.

4.8.5.2 General Recreation

Boating and Fishing

The LNG terminal site is located on the Patapsco River east of the Port of Baltimore. The Chesapeake Bay and Patapsco River provide ample opportunities for recreational boating and fishing. These waters support various species of seafood including blue crab, oysters, striped bass, perch, eels, catfish, and soft clam shells, which are fished by both commercial and recreational fishers. Further information on commercial fishing and boating is discussed in Section 4.9.4.2, Vessel Traffic. There are numerous public boating access points to the bay and its tributaries, several of which are within the vicinity of the proposed terminal facility and the proposed pipeline route.

Construction

LNG Terminal and Waterway for LNG Marine Traffic

Construction of the proposed LNG terminal site would include widening and deepening the existing approach channel and turning basin offshore of the site to accommodate marine traffic expected at the proposed LNG terminal. See section 2.3.1.3 for more information on dredging activities. Dredging of the approach channel, the turning basin and the ship docking areas would require a period of 24 months for completion, with some breaks in the schedule for seasonal restrictions, if imposed by agencies. During this time frame there would be one dredge, with an approximate foot print of 6,800 square feet (sf), three to four scows, each with an approximate foot print of 13,000 sf, and two associated tugs to reposition the dredge and to move the scows back and forth into position, occupying a foot print of approximately 1,800 sf each. The total impact area of all of this equipment would be approximately 49,400 sf, at any one time.

AES proposes to apply a stand-off (buffer) distance of approximately 200 feet on the dredge and 50 feet on the other vessels, based on a common practice estimate, which equates to an overall impact area of approximately 0.015 square miles or approximately 1.3% of the overall area available in the area of the LNG terminal to enter and exit Bear Creek. There are numerous public boating access points to the bay from Bear Creek, including four public boat launches and six marinas, and FERC has received comments from the public concerned about restrictions to boating access. However, there is no navigational marine channel within Bear Creek and the impact area from the buffer zone would not restrict access to Bear Creek. Access around the work vessels would be restricted to the stand-off distances described above.

Therefore, while dredging is underway, boating in the immediate vicinity would have some restrictions. Boaters would need to go around the dredging area during the period of construction. However, boating restrictions would not prevent access to Bear Creek or the Patapsco River for small pleasure craft or small fishing boats. Access for deeper draft boats on Bear Creek may be limited during the construction period as the depth of Bear Creek in the vicinity of the construction may not accommodate rerouting of these boats. (Further information regarding impacts to commercial vessels is discussed in Section 4.9.4.2.) No long-term impacts to boating are anticipated as a result of construction activities.

Potential impacts to recreational fishing, charter fishing, and recreational boating within the Chesapeake Bay from the construction of the LNG terminal are anticipated to be minor and short-term in duration. Information regarding potential impacts from contaminated sediments is discussed in Section 4.2.1, and information regarding impacts to fish during construction and dredging is discussed in Section 4.6.3. Time of year constraints may be imposed on the construction and dredging activities, by the COE, if deemed necessary, to minimize impacts to recreational boating and fishing harvest. The MDE has issued several public advisories to avoid consumption of certain fish (primarily channel catfish, white catfish, and white perch) caught in the Patapsco/Baltimore Harbor area (MDE, 2007e). The Patapsco River, including Baltimore Harbor, has been closed indefinitely to shellfish harvesting for commercial or recreational consumption. Impacts from the dredging and construction activities are not expected to alter these existing public advisories or shellfish harvesting restrictions.

There would be no construction or dredging required for the waterway for LNG traffic from the entrance to Chesapeake Bay through the Brewerton Angle Channel.

Pipeline

There are nine public boat launches in Baltimore County that are owned and operated by the MD Department of Parks and Recreation. The Cox's Point boat launch is located within the vicinity of the proposed pipeline route. The Cox's Point Park boat launch is located off Riverside Drive and provides access to the Back River. This boat launch is located on the north shore of Back River, across the waterway from the proposed pipeline route which is located to the south of the Back River. Construction of the pipeline would not impact Back River or recreational boating associated with Cox's Point Park.

Fishing and boating occur on the Susquehanna River, the Octoraro River and the Lower Brandywine River, which would be crossed by the proposed pipeline route. Construction across the Susquehanna River would be by HDD, thus fishing and boating would not be impacted. However, fishing and boating at the Octoraro River and Lower Brandywine River crossings would be temporarily impacted by pipeline construction for the period of construction.

There are eight public boat launches in Harford County that are owned and operated by the MD Department of Parks and Recreation. These are Broad Creek, Susquehanna State Park, Jean Roberts Park, Harve de Grace, Otter Point, Willoughby Beach, Flying Point Park, and Mariner Point Park. Of these eight, only the Broad Creek boat launch is located within the regional vicinity of the proposed pipeline route. The Broad Creek Public Landing boat launch (Harford County) is located off Route 623 and provides access to Broad Creek, a tributary to the Susquehanna River near the Maryland and Pennsylvania border. It has one ramp, 30 parking spaces, and restroom facilities. This ramp can only accommodate small vessels (less than 16 feet in length). As stated above, construction across the Susquehanna River would be by HDD, thus boating from this local ramp would not be impacted.

There are six public boat launches in Cecil County that are owned and operated by the MD Department of Parks and Recreation. These are Port Deposit, Perryville, Charlestown, Elk Neck State Park, Stemmers Run, and Fredericktown. None of these boat launches are located within the vicinity of the proposed pipeline route and would not be impacted by construction.

Operations

LNG Terminal and Waterway for LNG Marine Traffic

Chapter 33 CFR 165.500 establishes waters of the Chesapeake Bay and its tributaries, from surface to bottom, within a 500 yard radius around cruise ships and vessels transporting certain dangerous cargo (CDC), LNG, or liquid hazardous gas (LHG) while transiting, anchored, or moored within the COTP Baltimore zone as safety/security zones. Therefore, the Coast Guard would need to establish moving safety/security zones for all boaters around the LNG carriers during transit and while berthed at the LNG terminal. These moving safety zones are defined under 33 CFR 165.503, no vessel may approach within 500 yards of a passenger vessel carrying a CDC within the COTP Hampton Roads Zone. Therefore, recreational vessels drifting or anchored in the path of an oncoming moving safety/security zone would be required to leave their location and remain outside the moving safety/security zone while the zone passes. These fishermen or boaters could relocate to the edge of the existing shipping channel or to nearby waters outside the main shipping channel. An exception to this rule is that vessels may approach to within 100 yards if the vessel is traveling at minimum speeds to navigate safely.

AES anticipates that the LNG terminal would receive approximately two to three ships per week. Based on a review of vessel traffic, the average number of ships transiting the route up the Patapsco River to Baltimore Harbor is 1,812 vessels per year. LNG ships transiting to and from the Sparrows Point Terminal would increase commercial marine traffic up the channel by about 5 to 7 percent. While this is a relatively minor numerical increase, the traffic from LNG ships has the potential to have a more substantial impact than typical commercial marine traffic on boating and fishing activities.

The moving safety/security zone around the LNG ships would affect recreational boats as follows:

- boats that have drafts between 5 feet and 8 feet (larger sailboats and larger cabin cruisers regularly moored at Bear Creek Marinas) would be able to pass incoming LNG vessels outside of the safety/security zone and if they get permission to slow their speed in order to get within 100 yards of the LNG vessel;
- boats less than 5 feet draft should be able to pass incoming LNG ships without restriction; and

- larger recreational boats with drafts greater than 8 feet and, as discussed further in Section 4.9.4.2, commercial fishing boats in the safety/security zone, would need to move when LNG transit vessels pass through.

For the larger boats that must leave the moving safety and security zone, leaving and then returning to the zone would entail weighing anchor, moving to the edge of the zone, waiting for the moving safety and security zone to pass, returning the boat to the original location, and resetting the anchor. Although this is a temporary impact — from an estimated 40 minutes to possibly two hours per occurrence, and between 4-6 times per week — it may cause an impact on typical fishing and boating routines in the channel or near-channel areas of the Bay. The Coast Guard would transmit routine Broadcast Notices to Mariners, informing the public of each forthcoming implementation of the moving safety and security zone. Additionally, escort tugs and any Coast Guard escort vessels would serve as an additional layer of on-scene notification with the LNG carrier. Such advanced warning should allow recreational boaters to time their required movements out of and back into the moving safety and security zone such that disruption is minimized. Therefore, the impact of the Project on recreational vessels would be minor and of short duration when it would occur, but it would occur periodically for the life of the Project.

AES has submitted a WSA to the Coast Guard that includes development of ships routing, establishment of safety/security zones, and evaluation of potential effect on recreational and commercial boating and fishing. Below are some concerns brought up by the commercial, recreational, and charter boat fishing groups. Although we have received a number of comments regarding the potential impacts associated with terminal operations and, more specifically, LNG carrier transits, **with this DEIS we are soliciting additional public comment on specific boating and fishing impacts**.

To better understand the potential impacts of the LNG terminal and transiting LNG vessels, AES and representatives from Halcrow HPA met with the MDNR Tidal Fisheries and Sport Fish Advisory Committee and three fishing associations. The three fishing associations include the Maryland Waterman's Association (represents commercial fishermen on Chesapeake Bay), the Maryland Saltwater Sport Fisherman's Association (MSSA, represents recreational fishermen on the Chesapeake Bay and mid-Atlantic region), and the Upper Bay Charter Captains Association (represents the charter boat industry).

The major issues and concerns brought up by these groups included the potential impact enforcement of a moving security zone around arriving LNG vessels would have on the fishing industry as well as charter boats whose business depends on their customers ability to catch fish. Several speakers indicated it is not always as easy as weighing anchor and moving out of the way. Another concern was the Coast Guard was too aggressive in their enforcement of the 500 yard moving security zone around LNG vessels arriving at Cove Point (another LNG terminal) which required fishing vessels to leave the area long before the LNG vessel was expected to pass through. Another issue brought up by the MSSA was the escort tugs operating out of Cove Point and their overly aggressive behavior during escort.

The groups identified that Craighill Channel would be impacted the most for fishing and Bloody Point North for recreational boating. Another area mentioned with concern to transit LNG vessels was Sandy Point State Park due to the large amount of recreational vessels and number of people on the shore.

The fishing and boating associations opposed the proposed Sparrows Point LNG terminal due to the reasons stated above. They also agreed that if the Sparrows Point LNG terminal were to be approved that the best time for the LNG vessels to transit through the Upper Bay was at night. Due to the nature of the concerns expressed in the WSA, we are recommending in section 4.9.4.2 that AES continue to discuss these concerns with local fishing interests and develop specific operational and communication guidelines for LNG vessels to address Project impacts to shipping and fishing interests along the transit route and within the Port of Baltimore, and to file these guidelines with the Secretary prior to construction.

Six marinas have been identified within Bear Creek that could be impacted by LNG vessels while approaching and docked at the LNG terminal including Anchor Bay Marina at 3,506 meters from the LNG terminal, Sheltered Harbor Marina at 3,840 meters from the LNG terminal, Lynch Cove Marina at 4,110 meters from

the LNG terminal, Sparrows Point Country Club at 4,305 meters from the LNG terminal, Sparrows Point Country Club at 4,305 meters from the LNG terminal, Starr Marine at 3,670 meters from the LNG terminal, and Stouttens Bear Creek Marina at 4,850 meters from the LNG terminal. None of these six marinas reported charter fishing boats or cruise ships operating out of their marinas. However, Anchor Bay stated that charter boats do visit and dock at their marina during the summer months.

There are nine public boat launches in Baltimore County that are owned and operated by the MD Department of Parks and Recreation. In order of proximity to the terminal site, these are Turner Station, Merritt Point Park, Inverness Park, Cox's Point, Rocky Point Park, Dundee Creek Marina, Gundpowder State Park, Loch Raven Reservoir, and Prettyboy Reservoir. Of these nine, the Turner Station, Merritt Point Park, and Inverness Park boat launches are located within the vicinity of the proposed terminal site and could be impacted by LNG vessels while approaching and docked at the LNG terminal. Each of these three launches is described below.

The Turner Station boat launch is located off Avondale Road and provides access to Peach Orchard Cove (i.e. Peach Orchard Creek). It has four ramps, 30 parking spaces, and restroom facilities. These ramps can accommodate large vessels, defined by the state as those greater than 16 feet in length. The immediately surrounding communities it serves are Turner Station, Watersedge, and West Inverness.

The Merritt Point Park launch is located off Dunmanway Road and provides access to Bull Neck Creek. It has three ramps, 12 parking spaces, and restroom facilities. This ramp can accommodate large vessels (greater than 16 feet in length). The immediately surrounding community it serves is Dundalk, and this boat launch provides the only ramps for the Dundalk-Eastfield area. Popular fishing areas in these communities include Merritt Point Park and Chesterwood Park where fishing is done from both the shoreline and piers (BCDRP, 2007).

The Inverness Park boat launch is located off Lynch Road and provides access to Lynch Cove (i.e., Bear Creek). It has two ramps, 14 parking spaces, but no restroom facilities. These ramps can accommodate large vessels (greater than 16 feet in length). The immediately surrounding communities it serves are West Inverness, Watersedge, and Turner Station.

Potential impacts of the LNG vessels with their associated moving safety/security zones were evaluated in the WSA for recreational boating events scheduled and unscheduled on the Chesapeake Bay. Recreational boating events could also be affected if their timing and location conflict with the approach of an LNG carrier. However, all recreational boating events are subject to prior review and approval by the Coast Guard. Although there is no simple list of scheduled and unscheduled marine events, the most recent list shows there is potential impact from LNG transit vessels to 12 scheduled marine events and 11 recurrent scheduled marine events. This does not include unscheduled marine events or new events that are not included on this list. We anticipate that all practical attempts would be made to coordinate the transit of LNG carriers so that they would not conflict with known recreational boating events. The effect of LNG carrier transit on recreational boating events would be minor and occasional but would occur for the life of the Project.

Pipeline

Operation of the pipeline would not impact recreational boating and fishing activities.

Waterfowl Hunting

Local hunting groups, including the Maryland Waterfowlers Association, have expressed concern that the construction and operation of the LNG terminal would interfere with waterfowl hunting recreation areas and waterfowl concentration and staging areas. Two waterbird colonies have been identified by MDNR in the vicinity of the proposed LNG terminal site. However, each colony is located approximately 1.5 miles from the site. Therefore, no impact to these colonies or hunting of these waterbirds is anticipated from construction and operation of the LNG terminal. AES would coordinate its construction activities with the MDNR's Wildlife & Heritage Service to protect historical waterfowl concentration areas and to implement control measures to

protect waterbirds. See section 4.6.1 for a further discussion of potential waterfowl impacts associated with construction and operation of the Project. A search of information on local hunting, including the MDNR Public Hunting Lands website, has not indicated any waterfowl hunting areas in the immediate vicinity of the LNG terminal site on Sparrows Point or the proposed berthing area.

Professional hunting guides that service recreational waterfowl hunters utilize watercraft to provide hunting access for their clientele. Potential restrictions to hunting waterfowl from watercraft associated with construction and operation of the LNG terminal, including LNG ship traffic and marine dredge area, would be the same as those for recreational boating and fishing, as discussed above.

4.8.6 Visual Resources

4.8.6.1 LNG Terminal and Waterway for LNG Marine Traffic

The degree of visual impact that may result from a proposed project is typically determined by considering the general character of the existing landscape and the visually prominent features of the proposed facility. The proposed LNG terminal site is located within an existing steel manufacturing and former shipbuilding facility. The industrial land at the terminal site and in the surrounding area is composed of abandoned buildings, roads, docks, and railroad beds. Therefore, the development of the LNG terminal is within the context of an existing industrial area. Four representative viewpoints of the LNG terminal site are from the water's edge at the Community Center at Turner Station (northwest of the proposed terminal site), Hawkins Point (southwest of the proposed terminal site), MTA Police Building/Coffin Point (west-northwest of the terminal site), and from the existing shipping channel, north of the Brewerton Channel (approximately due west of the terminal site) (see Appendix M).

The COE uses a Management Classification System (MCS) to provide general guidelines on the degree of and nature of visual change acceptable in a landscape. The five management classes include: preservation, retention, partial retention, modification, and rehabilitation, with preservation areas having the most distinct visual quality and rehabilitation areas having the least distinct visual quality. The characteristics and visual management objectives for these areas include:

- Preservation - areas considered to be unique and having the most distinct visual quality in the region. They are highly valued and are often protected by federal and state policies and laws. While limited project activity is not precluded, it should not be readily evident;
- Retention - areas regionally recognized as having distinct visual quality but may not be institutionally protected. Project activity may be evident but should not attract attention;
- Partial Retention - areas locally valued for above average visual quality but are rarely protected by institutional polices. Project activity may attract attention and dominate the existing visual resource;
- Modification - areas not noted for their distinct qualities and are often considered to be of average visual quality. Project activity may attract attention and dominate the existing visual resource; and
- Rehabilitation - areas noted for their minimal visual quality and are often considered blighted areas. Project activity should alter the existing undesirable visual resources.

Based on the characteristics of these management classes, the proposed LNG terminal site would be included in the "modification" class.

The dominant feature of the LNG terminal site would be the aboveground storage tanks and the LNG vessels while at the unloading dock. Three 160,000 m^3 net capacity, full containment LNG storage tanks would be constructed at the LNG terminal site. These tanks would be approximately 170 feet in height and 270 feet in diameter. The terminal would be lit at night for safety and security reasons. Outdoor area lighting would be provided for all process areas and certain roadways. The LNG storage tanks and other elevated structures would be equipped with warning lights as required by air safety regulations.

Access between land and the unloading platform would be provided by an existing pile supported finger pier. The existing pier would be rehabilitated to provide an adequate foundation for the new structure that would support the LNG pipeway and spill containment system, and also the unloading platform. The unloading platform would be elevated and located on the existing pier, approximately 620 feet from the shoreline and support the LNG unloading arms and vapor return arms for each berth. One LNG berth would be provided on the north side of the pier, and one berth would be provided on the south side. To support the Sparrows Point LNG terminal marine operations, navigational aids would be installed. Buoys equipped with lights would be placed approximately every 1200 feet marking the width of navigable channel. Navigation lights would be installed on land and on structures, such as the end of the pier. A range light may also be installed.

The LNG terminal site does not affect any nationally designated or recognized visual resources or visually sensitive areas, including scenic roads, trails or rivers. In addition, the LNG terminal site is not located on or adjacent to any state-designated scenic roads. Potential impacts to visual resources and visually sensitive areas were minimized with the development of a project design that is consistent with existing or planned industrial land uses in the area of the LNG terminal site.

As previously discussed, the project area is in the modification management class landscape where projects may display aesthetic characteristics of form, line, color, texture, scale, and composition that differ from those of the existing visual resources and where a project should exhibit good design and visual compatibility with its surroundings (COE, 1988b).

From most vantage points, views of the LNG terminal would be far ground or distant views. Near ground or close views would be limited to views from the Patapsco River from commercial ships and the few recreational boats that use the area around the LNG terminal site. Moderate to distant views would occur from the Community Center at Turner Station, Hawkins Point, and the MTA Police Building/Coffin Point.

While the LNG terminal would be visible and permanently impact visual resources in the area, the overall aesthetic effect would be minor. The visual character in the project area is defined by heavy industrial uses and the large commercial ships that transit through this segment of the Patapsco River. Many of these existing uses have already introduced large vertical and horizontal elements into the landscape along the Patapsco River. The facilities associated with the Sparrows Point LNG Project would be visually compatible with their surroundings and consistent with the management objectives of the modification class.

The addition of LNG vessel traffic along the waterway would be within the context of an existing ship channel that supports large commercial vessels. There would be an increase of 5 to 7 % to the existing commercial ship traffic to the Port of Baltimore along the channel. This increase would be due to approximately 120 to 150 LNG vessel trips per year, or approximately one vessel going to the terminal each day and one vessel returning along the ship channel the next day. The average distance from view points along the shore to the vessel transit route would be two miles near the Port of Baltimore and would increase to approximately four miles from the shore further to the south. Therefore, the addition of LNG vessel traffic to the waterway would have minor to no overall visual impact.

4.8.6.2 Pipeline Facilities

Of the 88 miles of the proposed pipeline, approximately 91 percent would be constructed within or adjacent to various existing rights-of-way. Mainline valves and metering facilities would be constructed within the permanent pipeline right-of-way in areas of agricultural or open land. Mainline valves and metering facilities would be relatively small and would not present a significant change in the visual quality of areas surrounding the pipeline right-of-way. Mid-Atlantic Express would install visual screening at these facilities to soften the impact of their appearance. This chosen routing aids in limiting visual impacts as visible features of the pipeline facilities would be similar to the existing visible corridor.

The proposed pipeline route does not occupy or cross any nationally designated or recognized visual resources or visually sensitive areas, including scenic roads, trails or rivers. The proposed pipeline route would cross two river systems designated by the PDCNR as Pastoral in the Scenic Rivers System in Pennsylvania – the

Octoraro and Lower Brandywine Rivers – and one river, Deer Creek, listed by Maryland as a Scenic River. The Pastoral River designation recognizes that the surrounding pastoral landscape enhances the aesthetic qualities of this river type.and the view from the river or its banks shall be predominately pastoral of farming countryside. Impacts on the visual aesthetics at these rivers are discussed in section 4.8.5.1. In addition, no facilities associated with the pipeline within the state of Pennsylvania occupy or cross state-designated scenic roads.

The pipeline route crosses the Gunpowder Crossing Scenic Byway in four locations, at Maryland SR 23, SR 24, SR 543 and US Route 1. This scenic byway leads visitors along the roads near the Gunpowder River and Gunpowder Falls State Park. Each of these crossings of the scenic byway would occur along an existing right-of-way the pipeline parallels. Visual impacts would be greatest where the pipeline route crosses the byways and the pipeline right-of-way would be seen by passing motorists. The duration of visual impacts would depend on the type of vegetation that is cleared or altered. The impact of vegetation clearing would be shortest in open lands consisting of scrub-shrub vegetation, where the re-establishment of vegetation following construction would be relatively fast. The impact would be greater in forest land, which would take many years to regenerate mature trees. The greatest visual impact would be from the removal of large specimen trees, which would be prevented from reestablishing on the permanent right-of-way. As the byway crossings parallel existing pipeline rights-of-way, no new crossing of scenic byways are expected. However, expansion of the existing rights-of-way would increase the visual impact of these crossings. Therefore, **we recommend:**

- **<u>Prior to construction</u>, Mid-Atlantic Express develop and file with the Secretary for review and written approval by the Director of OEP site-specific plans for each crossing of the Gunpowder Crossing Scenic Byway that include details regarding the types of vegetation to be removed and plans to minimize any necessary expansion of the width of the crossing area to be cleared and maintained.**

As discussed above in Section 4.8.5.1, the pipeline route would cross Gunpowder Falls State Park in two locations. The crossings would utilize existing overhead powerline rights-of-way to minimize impacts to the park. The existing visual character of the powerline rights-of-way consists of an alignment of lattice towers that follow a relatively clear corridor where tree clearing has already been performed. The pipeline alignment is anticipated to be located approximately 25 feet from the tower base foundations. During construction, tree cutting may be needed for safe worker operation and pipeline installation. As previously stated, Mid-Atlantic Express would continue to be in consultation with MDNR regarding the design plan for the crossing of the park, which would include the minimization of tree clearing and specific restoration re-vegetation. Once construction is complete, the permanent right-of-way would be maintained in a low-growth condition; trees would be allowed to grow back in Mid-Atlantic Express's temporary work space.

Visual impacts would be greatest to the 179 existing residences that are located within 50 feet of the construction workspace for the project. The pipeline route would be visible to these residents during construction with existing land use restored upon completion of construction. Mid-Atlantic Express would limit the trees to be cut, however where unavoidable there would be a long term impact associated with any tree removal. Mid-Atlantic Express would work with individual property owners to mitigate such impacts where necessary and feasible.

4.9 SOCIOECONOMICS

Several potential socioeconomic effects may result from construction and operation of the Project. Potential effects related to the local and non-local construction workers who would work on the proposed Project may include impacts on area population, employment, public services, nearby homes and businesses, and temporary housing during construction. Other potential impacts related to construction and operation may include disruption of normal vehicular traffic patterns in the vicinity of the terminal site, impacts to property values, and economic benefits associated with construction related expenditures and tax revenues.

The potential impacts of the project on land use and residences in the project area are discussed in Section 4.8. A discussion of the project's effects on population and employment, housing, public services, transportation and traffic, property values, tax revenue, and environmental justice is provided below.

Most project area data are presented by county. For the purposes of the discussions in this section, project area counties are those in which the LNG terminal, power plant, DMRF and pipelines would be constructed and operated. These are Baltimore, Harford and Cecil counties in Maryland, and Lancaster and Chester counties in Pennsylvania.

4.9.1 Population, Economy, and Employment

Population data for project area counties are shown in table 4.9.1-1. Baltimore County, the location of the LNG terminal, optional power plant and DMRF, is the most populous of the project area counties. It also has the highest population density of the project area counties, with a density of approximately 1,260 people per square mile. The other counties, which would be traversed by the pipeline, have population densities ranging from 247 (Cecil County) to 573 (Chester County) people per square mile.

Project area population, workforce (civilian) and unemployment rates are shown in table 4.9.1-1, while table 4.9.1-2 shows employment by industry sector. With the exception of Lancaster County, Pennsylvania, the dominant sector for employment is educational, health and social services. Most of Lancaster County's employment is in manufacturing. Baltimore County has an unemployment rate of 4.2%, the highest in the project area; the unemployment rate in Baltimore County also exceeds the state and U.S. unemployment rates of 3.2 and 3.7 percent, respectively. The other project area counties have unemployment rates below their respective state unemployment levels.

The economy of much of the land crossed by the pipeline is agricultural (see section 4.8.1.2). Mid-Atlantic Express would schedule construction in croplands to occur outside the crop growing season, to the extent practicable. If construction begins when crops are present, Mid-Atlantic Express would request the landowner to remove the crop and compensate them for crop loss by paying fair market value.

Population impacts resulting from the Sparrows Point Project would be associated with any temporary increase in residents, and would be a function of the total number of non-local construction or operational workers required for the Project.

The Project would generate employment during construction and operation. Construction employment would be temporary, over a duration of approximately three years. Table 4.9.1-3 shows estimated construction employment by project component. AES estimates peak construction employment would be approximately 700 positions, about 40 percent of which are expected to be filled by non-local labor. According to AES, some of the construction workforce would be from within the region, and others would temporarily re-locate to the area.

Most construction employment would be in Baltimore County, where the LNG terminal, power plant and DMRF would be located. Construction employment associated with pipeline construction would be distributed over the remaining project area counties, and would also draw from the local workforce for some positions.

Estimates of permanent employment associated with the operation of the LNG terminal, power plant and pipeline are presented in table 4.9.1-4. The total estimated employment would be 75 people, with annual salaries ranging from $28,000 to $150,000 and a total annual payroll of approximately $5.9 million.

The estimated construction workforce is small relative to the project area population, and construction employment would be spread over approximately three years. Although some construction labor would come from outside of the local area, construction employment is not expected to have a significant impact on local population. Beneficial economic effects of construction employment and payroll would be temporary and minor relative to the overall economy throughout the Project area.

TABLE 4.9.1-1

Existing Socioeconomic Conditions in the Project Area

Area	Population	Population Density (people per square mile)*	Per Capita Personal Income	Civilian Labor Force	Unemployment Rate (%)	Poverty Rate (%)	Major Industry
Baltimore County, MD	754,292	1260.1	$26,167	396,226	4.20	6.5	Educational, Health, and Social Services
Harford County, MD	218,590	496.4	$24,232	115,314	2.15	4.9	Educational, Health, and Social Services
Cecil County, MD	85,951	247.0	$21,384	44,787	2.83	7.2	Educational, Health, and Social Services
Lancaster County, PA	470,658	495.9	$20,398	243,015	2.00	7.6	Manufacturing
Chester County, PA	433,501	573.4	$31,627	229,631	2.50	5.2	Educational, Health, and Social Services
State of MD	5,296,486	541.9	$25,614	2,737,359	3.20	8.5	Educational, Health, and Social Services
State of PA	12,281,054	274.0	$20,880	5,992,886	3.50	11	Educational, Health, and Social Services
U.S.	296,410,404	79.6	$21,587	137,668,798	3.70	12.4	Educational, Health, and Social Services

All data compiled from the U.S. Census Bureau 2000 Census (http://factfinder.census.gov/home/saff/main.html?_lang=en), except data denoted by an *.
Data are limited to the household population and exclude the population living in institutions, college dormitories, and other group quarters.
Numbers represent the combined total of the employed and unemployed civilian population, 16 years and older.
Data are based on a sample and are subject to sampling variability.
* Data compiled from (http://www.fedstats.gov/).

TABLE 4.9.1-2

Local Workforce Composition by Industry Classification

Area	Total for all Industries	Construction	Manufacturing	Retail Trade	Finance, insurance, real estate, and rental and leasing	Professional, scientific, management, administrative, and waste management services	Education, health, and social services	Public Administration
Baltimore County, MD	379,705	22,494 / 5.9%	34,029 / 9.0%	42,862 / 11.3%	36,030 / 9.5%	40,049 / 10.5%	87,102 / 22.9%	29,039 7.6%
Harford County, MD	111,792	9,325 / 8.3%	12,278 / 11.0%	14,102 / 12.6%	8,027 / 7.2%	10,287 / 9.2%	22,112 / 19.8%	10,039 / 9.0%
Cecil County, MD	42,953	4,491 / 10.5%	6,793 / 15.8%	5,053 / 11.8%	3,099 / 7.2%	3,163 / 7.4%	7,578 / 17.6%	2,435 / 5.7%
Lancaster County, PA	235,686	18,242 / 7.7%	53,028 / 22.5%	30,563 / 13.0%	10,432 / 4.4%	15,674 / 6.7%	42,794 / 18.2%	4,751 / 2.0%
Chester County, PA	221,255	12,345 / 5.6%	32,810 / 14.8%	24,769 / 11.2%	22,064 / 10.0%	30,589 / 13.8%	43,715 / 19.8%	5,025 / 2.3%
State of MD	2,608,457	181,280 / 6.9%	189,327 / 7.3%	273,339 / 10.5%	186,159 / 7.1%	323,834 / 12.4%	538,350 / 20.3%	273,959 / 10.5%
State of PA	5,653,500	339,363 / 6.0%	906,398 / 16.0%	684,179 / 12.1%	372,148 / 6.6%	478,937 / 8.5%	1,237,090 / 21.9%	235,767 / 4.2%
U.S.	129,721,512	8,801,507 / 6.8%	18,286,005 / 14.1%	15,221,716 / 11.7%	8,934,972 / 6.9%	12,061,865 / 9.3%	25,843,029 / 19.9%	6,212,015 / 4.8%

All data compiled from the U.S. Census Bureau 2000 Census (http://factfinder.census.gov/home/saff/main.html?_lang=en).
Data are limited to the household population and exclude the population living in institutions, college dormitories, and other group quarters.
Numbers represent employed civilian population, 16 years and older in the respective industry classification.
Percent values depict percentage of employed civilian population employed in the respective industry classification for the county listed.

TABLE 4.9.1-3

Temporary Construction Employment Positions a/

Project	Number of Positions	Duration (years)	Low Salary Range	High Salary Range	Annual2 Payroll (million)	Direct Effect Multiplier b/ (million, annually)
LNG Terminal	325	3	$25,000	$150,000	$18.4	$36.8
LNG Pipeline	200	1	$25,000	$150,000	$11.3	$22.6
Power Plant	180	1.67	$25,000	$150,000	$18	$36
Dredged Material Recycling Facility	41	2	$28,000	$75,000	$2.01	$4.02
TOTALS	746	--	--	--	--	--

a/ Temporary construction employment positions are those jobs generated during the construction period. The data have been estimated based on similar projects. Annual payroll is estimated based on average number of employees per year, estimated staff profile, and range of salary values for the range of staff positions.

b/ Direct effect earnings multiplier of 2.0 used to estimate annual economic impact of construction of the Project to the local communities. This multiplier derived from the Economic Impact Analysis of the Dominion Resources' Cove Point LNG project (2004) in Calvert County, Maryland.

TABLE 4.9.1-4

Permanent Employment Positions

Project	Project Cost (million)	Number of New Positions	Low Salary Range	High Salary Range	Annual Payroll	Direct Effect Multiplier c/ (million, annually)
LNG Terminal	$400	41	$28,000	$150,000	$3,500,000	$35
LNG Pipeline	$250	9	$30,000	$100,000	$455,000	$4.55
Power Plant	$165	16	$30,000	$150,000	$1,500,000	$15
Dredged Material Recycling Facility a/ & b/	$120	9	$28,000	$75,000	$411,000	$4.11

a/ The staffing plan for the Dredged Material Recycling Facility is phased over 4 years; 41 full-time positions during the first two years, 23 during years 3 and 4. Approximately 9 full-time employees would be needed to manage regular operations of the facility for the remainder of the facility's operational lifecycle. Annual payroll is estimated based on average number of employees per year, estimated staff profile, and range of salary values for the range of staff positions.

b/ The DMRF Project cost of $120 million is included in the LNG Terminal Project cost of $400 million.

c/ Direct effect earnings multiplier of 10.0 used to estimate annual economic impact of operation of the Project to the local communities. This multiplier derived from the Economic Impact Analysis of the Dominion Resources' Cove Point LNG project (2004) in Calvert County, Maryland.

Similarly, permanent employment for the project would not have a significant impact on local population. Annual payroll would contribute to the local economy, but the employment of 75 people is still small relative to the local workforce.

4.9.2 Housing

As shown in table 4.9.2-1, rental vacancy rates in Baltimore and Harford counties are lower than the Maryland state vacancy rate, whereas Cecil County has a vacancy rate higher than the state average. Both Lancaster and Chester counties have lower vacancy rates than the average for Pennsylvania. Vacant housing units, and vacant seasonal units are shown in table 4.9.2-1.

AES estimates that approximately 40 percent of the LNG Terminal construction workers would temporarily relocate near the project site. AES has indicated workers would choose their housing independently, so the

workforce is likely to be dispersed within a reasonable commute distance from the project location, and choosing a variety of temporary housing options, including motels and other short-term accommodations.

TABLE 4.9.2-1

Housing and Vacancy Rates

Area	Vacant Housing Units a/	Vacant Housing Units for Seasonal, Recreational, or Occasional Use b/	Renter-Occupied Housing Units a/	Rental Vacancy Rate (%)
Baltimore County, MD	13,857	1,212	97,298	5.7
Harford County, MD	3,479	299	17,519	5.5
Cecil County, MD	3,238	1,410	7,819	6.8
Lancaster County, PA	7,430	808	50,352	4.9
Chester County, PA	5,868	571	37,477	4.8
State of MD	164,424	38,880	639,108	6.1
State of PA	472,747	148,230	1,370,666	7.2
U.S.	10,424,540	3,578,718	35,664,348	6.8

Data compiled from the U.S. Census Bureau, Census 2000 (http://factfinder.census.gov/home/saff/main.html?_lang=en).

a/ *Vacant Housing Unit:* According to the U.S. Census Bureau, a housing unit is vacant if no one is living in it at the time of enumeration, unless its occupants are only temporarily absent. Units temporarily occupied at the time of enumeration entirely by people who have a usual residence elsewhere are also classified as vacant. A housing unit may be a house, apartment, mobile home, group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Separate living quarters are those in which the occupants live separately from any other individuals in the building and which have direct access from outside the building or through a common hall.

b/ *Seasonal, Recreational, or Occasional Use Housing Unit:* According to the U.S. Census Bureau, seasonal, recreational, or occasional use housing units include vacant units used or intended for use only in certain seasons, for weekends, or other occasional use throughout the year. Interval ownership units, sometimes called shared ownership or time-sharing condominiums, are included in this category.

The numbers of vacant units and vacancy rates provided for the project area counties suggest the project area could absorb the estimated temporary workforce, some of which would be drawn from the local workforce, over the construction period. Temporary housing availability would vary, but because the estimated workforce is small relative to the overall population and housing availability in the project area, the construction phase of the project would not have a significant effect on the local housing markets.

The permanent workforce is projected to consist of 75 people, some of whom would be local residents already. This is a negligible change relative to the local population and housing market, and is therefore not expected to have a significant effect on local housing.

4.9.3 Public Services

Public services include police, fire, medical services, public schools, water and sewer services, and social services. Table 4.9.3-1 summarizes police, fire and medical facilities in the project area counties. Baltimore County, where most of the construction and operation activities would be concentrated, has a police workforce of approximately 2,338 officers. Baltimore County Emergency Medical Services (EMS) operates within the Baltimore County Fire Department, which consists of career and voluntary personnel. Police, fire, EMS and 911 services are dispatched from a central location in Towson, Maryland. The center is operated 24 hours per day and is staffed by approximately 30 emergency communications technicians (Baltimore County Chamber of Commerce, 2007).

As indicated in table 4.9.3-1, fire and EMS support in the other project counties are staffed all or in part by volunteers. Police services are provided by state and county police and sheriff departments, and municipal law enforcement agencies. Some of the project areas are rural and emergency services may be more dispersed than in areas such as Baltimore County. Limited construction related demands on these services could include local

police assistance to facilitate construction traffic flow and EMSs to treat injuries associated with construction accidents, however these requirements are expected to be well within the capabilities of the existing services.

TABLE 4.9.3-1

Public Services

Area	Hospitals and Medical Centers	Police Officers	Fire/EMS	
			Stations	Personnel
Baltimore County, MD	14	2338	25 a/	3,300 b/
Harford County, MD	2	528	45 b/	2,400 b/
Cecil County, MD	4	105	16 b/	1,056 b/
Lancaster County, PA	16	475	80 b/	4,030 b/
Chester County, PA	3	538	68 b/	1,590 b/

a/ Excludes approximately 33 volunteer fire stations.
b/ Fire and EMS combined.

AES has been working with the National Association of State Fire Marshals to meet with state and local emergency response services in the areas of the LNG terminal site and the proposed pipeline route. AES has indicated that training and resource needs for response to hazards associated with the project have been and would continue to be discussed with these agencies. AES would also require its construction contractors to contact and coordinate with fire departments and emergency response agencies prior to construction, and to establish relationships and response options with these agencies.

Project design includes protective equipment and systems addressing emergency prevention and response, as described in Section 4.12. AES has indicated it would establish relationships with local emergency response organizations to consider response options and would solicit input during the development of the Facility Emergency Response Plan (ERP) for the project. The ERP is discussed in section 4.12.7. As part of this process, AES and the appropriate response organizations would determine resources required to implement the ERP, if any, and allocate payment responsibilities for needed resources. AES expects to fully fund additional resources, including both equipment and services, and training necessitated solely as a result of the construction and operation of the Project. In those cases where AES' plans would be integrated with the existing local emergency response organization plans, AES would fund the associated incremental costs.

Any substantial release of LNG would require the response of local and state emergency responders – police, fire, and medical personnel, which would put a financial burden on those agencies. To address any potential financial impacts to those agencies from emergency response, the FERC, under Section 3A(e) of the NGA, requires an applicant to include a Cost-Sharing Plan in the ERP that contains a description of any direct cost reimbursements to these agencies. (See section 4.12.6, Emergency Response and Evacuation Planning.)

As discussed in Section 4.9.1, neither the construction nor operational phase of the project would significantly affect the number of people living in the area. Therefore, the potential impact on local schools and social services from the addition of temporary or permanent workers would be negligible. Further, no impacts on local water supply and wastewater infrastructure would be expected due to increases in population associated with construction or operation of the proposed Project. See section 4.3.1 for a discussion of aquifers and water supply wells and impacts related to construction and operation of the proposed Sparrows Point Project.

4.9.4 Transportation and Vessel Traffic

4.9.4.1 Vehicle Traffic

LNG Terminal

The LNG Terminal site is located within the larger SPS parcel and would be served by the existing internal road network within the former shipyard. Access from the regional interstate highway system would be from

I-695 Exit 43 to Route 158 to Wharf Road to Sparrows Point Road. Local workers may use North Point Boulevard or Peninsula Expressway to reach the site area.

Construction at the LNG terminal site would include construction of the terminal, DMRF and power plant, as well as associated site clearing and preparation. Activity would be conducted between 6:00 a.m. and 6:00 p.m., Monday through Saturday. Table 4.9.4-1 summarizes the duration and estimated vehicle trips during construction at the LNG terminal site.

TABLE 4.9.4-1

Traffic During Construction

Project Component	Duration (months)	Daily Trips - Construction	
		Employees	Trucks
LNG Terminal	36	204 a/	31
DMRF	24 b/	275	220 c/
Power Plant	32	204	16
Pipeline	12-14	182	95

a/ Annualized average of employee vehicle (200) and bus (4) trips during the three years of construction.

b/ 24 month operation of the DMRF; up to an additional 24 months to remove the PDM from storage onsite; therefore, the truck operations could last up to 48 months.

c/ Truck transportation of PDM may be reduced if some or all material is transported by rail.

Vehicle trips would be generated by employee commutes to and from the site, deliveries of equipment, and transportation of bulk materials. The DMRF would transport PDM offsite by truck, or possibly a combination of truck and rail transportation. Construction of the power plant would require hauling of materials removed during site demolition and clearance.

Additional detail regarding employee trips to the LNG terminal site area is discussed in the level of service (LOS) analysis below.

Current steel mill operations at Mittal Steel employs approximately 2500 people. During peak construction of the LNG Terminal, the traffic load entering and leaving the worksite, including the 220 daily truck loads to transport the PDM off the property, combined with existing Mittal Steel traffic may present considerable opportunity for traffic problems in entering and exiting Sparrows Point industrial area. Therefore, **we recommend that:**

- **Prior to the end of the DEIS comment period, AES, in consultation with Mittal Steel and other major employers at Sparrows Point, should prepare and file with the Secretary a Construction Traffic Management Plan that addresses and minimizes potential problems with worker access to other employment centers of the Sparrows Point industrial complex. The Plan should address total vehicular traffic at the construction site, volume of traffic from other employers and schedule of shift changes, and describe potential restrictions of construction traffic during shift changes, as necessary.**

After construction, permanent employment at the LNG terminal, including the terminal, DMRF and power plant, would be approximately 66 people. Table 4.9.4-2 summarizes traffic that would be generated during operation of the Project. In addition to new traffic from employees at the LNG terminal, there would be some truck and other vehicle traffic for deliveries and related activities. The additional trips are small relative to existing traffic in the general vicinity of the Project, and therefore traffic impacts during operation from new vehicle trips are considered to be negligible.

TABLE 4.9.4-2 **Traffic During Operation**		
Project Component	**Daily Trips - Operation**	
	Employees	**Trucks**
LNG Terminal	41	34
DMRF	9 a/	275
Power Plant	16	6
Pipeline	9	NA

a/ Phased in over four years, from peak of 41 employees during construction, reducing to 9.

Level of Service Analysis

An analysis of the LOS for the I-695 off-ramps at Exit 43 near the LNG terminal site was completed to determine the potential impacts of construction and operation traffic at the LNG Terminal site. LOS is a measure by which transportation planners determine the quality of service on transportation devices, or transportation infrastructure. LOS is regarded as a measure of traffic density (or a measure of congestion), rather than overall speed, of the journey, and may be used as a tool to measure changes in conditions or availability.

The transportation LOS system uses the letters A through F, with A being best and F being worst. LOS A represents the best, described as conditions where traffic flows at or above the posted speed limit and all motorists have complete mobility between lanes. LOS B is slightly more congested, with some impingement of maneuverability; two motorists might be forced to drive side by side, limiting lane changes. LOS C has more congestion than B, where ability to pass or change lanes is not always assured. LOS C is the target for urban highways in many places. At LOS C most experienced drivers are comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained. LOS D is high density traffic where speeds are somewhat reduced and motorists are hemmed in by other cars and trucks. LOS E is a marginal service state where flow becomes irregular and speed varies rapidly, but rarely reaches the posted limit. LOS F is the lowest measurement of efficiency for a road's performance. Flow is forced; every vehicle moves in lockstep with the vehicle in front of it, with frequent drops in speed to nearly zero mph. Roadways and intersections with LOS E or F are those with traffic conditions at or above capacity and would be considered unacceptable to motorists.

Existing traffic volumes and turning movements were provided to AES by the Maryland Transportation Authority and were used to determine the LOS for 2005. A summary of the LOS analysis is provided in table 4.9.4-3. Construction worker vehicles were added to the existing traffic during AM and PM peak traffic periods for the on-ramps and off-ramps for I-695 at Exit 43. For this analysis, it was assumed that the construction phase of the LNG Terminal would employ an approximate combined peak of 755 employees for the LNG terminal, DMRF and power plant, with employees using single occupancy vehicles and 50% of the vehicle trips would occur during peak traffic periods. For operational traffic, an annual growth factor of 2% was added to the 2005 LOS volumes. The LOS analysis assumed that 75 employees would be onsite for operations at the LNG terminal, including the terminal, DMRF and power plant. These operational employees were assumed to use single occupancy vehicles and that 70% of the vehicle trips would occur during peak traffic periods.

The LOS analysis determined that in three directions, the LOS would decrease from either A to B or B to C during the construction phase. No changes in LOS would occur due to operational traffic. The study results indicate that the lowest LOS for the I-695 intersection at Exit 43 would be LOS C. At LOS C, the roads are considered below design capacity; that is, the traffic load is acceptable.

TABLE 4.9.4-3 **Level of Service Analysis**				
Intersection	**Existing LOS**	**LOS with Construction Traffic**	**Existing LOS with 2% Growth through 2010**	**LOS with Annual Growth and Operational Traffic in 2010**
AM Peak Period				
Westbound/Southbound – Off-ramp	A	B	A	A
Westbound/Southbound – On-ramp	B	B	B	B
Eastbound/Northbound – Off-ramp	A	A	A	A
Eastbound/Northbound – On-ramp	A	A	A	A
Eastbound/Northbound – Stop controlled intersection at bottom of off-ramp	B	B	B	B
PM Peak Period				
Westbound/Southbound – Off-ramp	A	A	A	A
Westbound/Southbound – On-ramp	A	B	B	B
Eastbound/Northbound – Off-ramp	B	B	B	B
Eastbound/Northbound – On-ramp	B	C	B	B
Eastbound/Northbound – Stop controlled intersection at bottom of off-ramp	C	C	C	C

Pipeline Facilities

Pipeline construction would generate short-term traffic from construction workers, deliveries and staged equipment along and within the pipeline right-of-way. Mid-Atlantic Express indicates public access roads would be used to the extent possible, but that some access roads would be constructed and/or improvements would be made on existing roads to permit construction.

Pipeline construction would require approximately 200 employees, and they would drive to and park at pipeyards, staging and construction yard areas. Work hours would be 6:00 a.m. to 6:00 p.m., Monday through Saturday. Construction workers would park in staging areas and be transported to the sites, which would reduce traffic. Because the traffic at any one location associated with construction of the pipeline would be short-term, and workers would be transported to the sites, impacts to traffic during pipeline construction are considered to be non-significant.

Only occasional maintenance and inspection trips would occur along the pipeline right-of-way during operation. These trips would not be sufficient in number to impact local traffic conditions.

Roadway and Highway Construction Impacts

The MDOT SHA maintains a Highway Needs Inventory (HNI). The HNI is a technical reference and planning document which identifies highway improvements to serve existing and projected population and economic activity in the state as well as address safety and structural problems that warrant major construction or reconstruction. The projects identified in this document represent only an acknowledgment of need based on technical analysis and adopted local and regional transportation plans. The HNI is not a construction program, and inclusion of a project does not represent a commitment to implementation. The HNI may be considered as a compilation of projected major highway deficiencies. It is important to note that only a portion of the projects in this document would be addressed in the future through selective capital improvements. (http://www.sha.state.md.us/keepingcurrent/maintainroadsbridges/hni/hni.asp)

Mid-Atlantic Express has consulted with MDOT regarding locations of planned roadway expansions relative to the proposed pipeline route. Of these, US 1, MD 152, MD 24 and MD 23 are listed on the HNI. US 1, MD 152 and MD 24 are listed as potential multi-lane reconstruction projects while MD 23 is listed as a potential two-lane reconstruction project. These projects are proposed within the HNI but are not yet planned projects.

No planned expansions are located in areas that would be crossed by the proposed pipeline route. In areas where the proposed pipeline route would cross roadways, the piping would be placed deep enough and would be of a sufficient class upgrade that would allow for future potential roadway expansion, should it be required in the future.

The proposed pipeline route would cross many major and minor roadways. Road crossing permits would be required for all road crossings. These permit applications would be reviewed by the appropriate governing authorities, who would have opportunity to comment or place conditions on the roadway crossing design. Construction methods for crossing major roadways would include trenchless methods, such as boring or HDD, that would minimize traffic disruption. Minor roadways and drives may be crossed using open trenching. In these cases, Mid-Atlantic Express would work with the appropriate local authorities to identify the appropriate traffic management procedures for each crossing. Appropriate signage, traffic flaggers and/or minor detours would be used to minimize traffic disruption. Once construction is completed, roadways would be restored in accordance with engineering specifications, to pre-construction conditions or better. Due to the number of minor roadways and drives crossed by the pipeline and the potential for disruption during construction across these roadways, **we recommend that:**

- **<u>Prior to construction</u>, Mid-Atlantic Express work with the appropriate authorities to develop site-specific traffic and safety plans wherever road closures or restrictions may be required. These plans and documentation of consultation with appropriate authorities should be filed with the Secretary.**

Mid-Atlantic Express has consulted with state and local authorities, including the Deputy SHA Administrator and the Maryland Transportation Authority (MTA) concerning access to roadways to be used during construction and operation of the project. Mid-Atlantic Express has indicated that it would, prior to construction, determine final locations and methods of construction to eliminate or minimize interference to roadway layout and operational characteristics. In addition, Mid-Atlantic Express has indicated it would establish detours where needed, and would provide sufficient notice and signs on roadways that would be affected. Mid-Atlantic Express would use state highway information systems such as Maryland's CHART system to help disseminate information to motorists on Maryland roadways, if needed. Mid-Atlantic Express has also committed to repair (or bond for repair of), damage to roadways occurring as a result of this project, to restore the condition of the roadways to their pre-construction condition.

The proposed pipeline route would parallel I-695 and I-95. Mid-Atlantic Express consulted with the MDOT SHA and the MTA and gained authority to conduct and complete surveys along these roadways. During construction of the pipeline along I-695 and I-95, work would be required within the right-of-way of the highway, adjacent to the roadway. Work within this right-of-way would require coordination with MDOT and the use of approved MDOT safety vehicles and appropriate signage for worker protection. Anticipated impacts to traffic from this work include potential reduced speed and congestion associated with the construction zone, although activities would take place outside of the active roadway. Mid-Atlantic Express has stated it would develop and submit a work plan for approval by MDOT prior to construction, and would implement additional requirements specified by MDOT as appropriate.

In November 2007, Mid-Atlantic Express met with the SHA regarding their filing applications for exceptions to the SHA Utility Policy for three segments of the pipeline route which are in the SHA highway right-of-way. SHA is currently reviewing these requests for exceptions. At the same time, Mid-Atlantic Express proposed and filed route variations for these segments in the event that they do not receive approval for the exceptions. One additional route variation regarding the route around the highway I-695 ramp at Cove Road was proposed and is discussed in section 3.3.3 (see Route Variation 2A). Based on these interactions with the SHA, **we recommend that:**

- **<u>Prior to initiating construction along I-695</u>, Mid-Atlantic Express should continue to consult with MDOT SHA and file with the Secretary an MDOT-approved construction work plan for pipeline construction adjacent to I-695. Mid-Atlantic Express should file with the**

Secretary any additional correspondence with SHA and the results of SHA's review of the Mid-Atlantic Express application for exceptions.

Railroads

The proposed pipeline route would cross railroads within both Maryland and Pennsylvania. Mid-Atlantic Express has stated that all railroad crossings would be submitted to the appropriate governing ownership and would include a plan and profile view and pertinent design load analysis and calculations along with the relevant permit application. Each railroad crossing would be engineered in accordance with API- 1102 "Steel Pipeline Crossing Railroad and Highways." The class of railroad, i.e., class 1, 2, or 3, would be identified during the permitting process and in discussion with the governing ownership, and would be reviewed for any additional crossing design criteria. The carrier pipe under railroads would be installed with a minimum of cover, as proposed by the appropriate and relevant railroad owner. Each crossing would be oriented at 90 degrees with respect to the railroad and would be an embankment-type crossing. The crossing would be a bored crossing at sufficient depth to avoid potential impact to the railroads and performed in accordance with industry "best practices." As pipeline construction is not an uncommon activity along railroads, we do not anticipate that construction or operation of the proposed pipeline would interfere with operation of the railroad.

4.9.4.2 Vessel Traffic

Expected Ship Volumes

During dredging activities, one dredge vessel, one tugboat, one work/survey boat, one crew boat and one inspection/contractor diving vessel would be onsite. Two daily vessel trips are anticipated for the crew boat and four daily vessel trips are anticipated for the tugboat during the six days per week that dredging activities would occur. In addition to the dredging activities, approximately ten daily vessel trips of barged steel and equipment during construction are anticipated. Of these ten trips, five would originate from the Port of Baltimore area and five would originate from the Gulf States region.

During operation of the project, two to three LNG ships per week would arrive at the LNG terminal site, for a total of approximately 120 to 150 ships per year. Three tugboats and two security/escort boats would participate in the arrival, berthing and departure of each LNG ship.

Existing Ship Traffic in the Port of Baltimore

Current overall vessel traffic volume in the transit route into Baltimore Harbor is approximately 30% less than historical volumes. According to information from the Baltimore Marine Exchange, the number of ships arriving into the Port of Baltimore has declined from 4,033 in 1975 to 2,119 in 2005. However, the size of the ships and the associated increase in value of the cargo delivered to the Port of Baltimore has increased during this time.

A new passenger cruise terminal was established at South Locust Point in spring 2006 to serve approximately 28 cruise ship visits to Baltimore between May and November. A 500-yard security zone has been established for cruise ships, as well as LNG ships. According to the WSA, cruise ships typically come in early in the morning and leave early in the evening on Friday and Sundays.

Impacts on Commercial Shipping and Fishing

Traffic to the LNG terminal would travel along the major vessel transit route into Baltimore Harbor. Therefore, impacts from the LNG transport vessels from this project on commercial shipping interests are expected to be consistent with existing marine shipping traffic and associated impacts.

Impacts from LNG vessel traffic are not anticipated to result in significant impacts to existing marine shipping traffic along the transit route. However, AES has not completed its consultations with the Port of Baltimore or other maritime shipping interests along the transit route.

Information provided in the WSA included concerns from commercial fishing operations regarding the impacts of the moving security zone around LNG ships. (Impacts of proposed LNG terminal operations on recreational fishing are discussed in section 4.8.5.2) Fishing operations would be affected when the vessels are required to move out of the security zone. MDNR regulates the hours that commercial fisherman are permitted to fish. Therefore, it may not be feasible for fishing interests to make up the amount of time lost due to passing LNG ships. As noted previously in section 4.8.5.2, the Coast Guard would transmit routine Broadcast Notices to Mariners, giving advance notification of each forthcoming implementation of the moving safety and security zone. Additionally, escort tugs and any Coast Guard escort vessels would serve as an additional layer of on-scene notification with the LNG carrier. Such advance warning should allow commercial vessels to time their required movements out of the moving safety and security zone such that disruption is minimized.

Existing LNG ship traffic to the Cove Point terminal has already impacted commercial fishing operations in the area. Specifically, the area of Craighill Channel was identified as an active fishing area that would be impacted by LNG ship traffic. As discussed in the WSA, the Maryland Tidal Fisheries and Sport Fish Advisory Commission, along with three fishing associations, proposed measures to minimize the impact of the LNG ship moving security zone. Due to the nature of the concerns expressed in the WSA and WSR, **we recommend that:**

- **<u>Prior to construction</u>, AES continue its discussions with the Port of Baltimore and other major shipping and commercial and recreational fishing interests along the marine transit route and develop specific operational and communication guidelines for LNG vessels. These guidelines should address any concerns raised regarding impacts to shipping and fishing interests including the effects on marine traffic and congestion along the transit route and within the Port of Baltimore. These guidelines should take into account the recommendations provided in the Waterway Suitability Assessment and Report and be filed with the Secretary.**

4.9.5 Property Values

LNG Terminal

The FERC has received numerous comments regarding the potential effect of the Project on property values. The proposed LNG terminal site would be located within the expansive Sparrows Point Industrial complex, adjacent to Mittal Steel, and on an industrial waterfront near the Francis Scott Key Bridge. The nearest residence would be approximately 1.1 miles from the site.

A number of studies have been conducted to estimate the effect, if any, of LNG and other industrial facilities on property values. These studies, as summarized in recent analyses of LNG facilities, have generally concluded that LNG facilities would not have a significant effect, positive or negative, on property values. Studies addressing property value effects, including one study not related specifically to LNG facilities include:

- Argonne National Laboratory – economic impacts of "noxious" facilities on local wages and property values. Concluded some facilities have a significant impact on property values, but that LNG facilities did not have a significant positive or negative effect on property values. (Clark and Nieves, 1993);
- Real Estate Consulting Group of Connecticut – survey of tax assessors in communities where LNG facilities exist or were being developed. The authors concluded that the LNG facilities did not affect assessments, and property owners in the vicinity of LNG facilities did not request lower valuations. (RECG 1995);
- Market Analysis, KTR Newmark LLC – market analysis commissioned by KeySpan LNG reviewed 1985-2004 single-family home sales within a 2-mile radius of the Distrigas LNG

terminal in Everett, MA. As reported in the Weaver's Cove EIS, the average annual price increases in the study area from 1995-2004 exceeded those for Massachusetts, Boston area, and Middlesex County; and

- McCluskey and Rausser – effects of perceived risk on property values. The study suggested perceived risk, including perceptions derived from media coverage, could affect property values. Although the article substantiates this potential for effects on property values, the analysis is based on perceived risk associated with a Texas hazardous waste site, which has material differences in the character of the risk associated with the proposed LNG terminal project. (McCluskey and Rausser, 2001).

AES commissioned a review of real estate values near the Cove Point LNG terminal located in Calvert County, MD. The review, summarized in a December 2006 memorandum, included comparative property sales values within 1 mile of the Cove Point facility for the years 2000 to 2006, and included similar property value information for areas 5 to 12 miles from the Cove Point facility. The review concluded the presence of the facility had "no depressing effect" on property values (Carson, 2006). The information contained in the review supports the observation that property values were not affected by the presence of the Cove Point facility. However, the Cove Point facility was an existing LNG receiving terminal, and so its expansion project is not fully comparable to the AES project. Therefore behavior of property markets in the vicinity of Cove Point are not directly applicable to the Sparrows Point Project.

The proposed project site is in an existing industrial area and would not change the proximity of nearby residential properties to industrial facilities. With the exception of the study by McCluskey and Rausser, studies noted above suggest that the presence of an LNG facility would have little or no effect on property values. Media coverage could influence perceived risk near the project site. However, the empirical data supporting the link between media coverage and depressed property values contained in McCluskey and Rausser (2001) was derived from a hazardous waste site which, in contrast to the proposed project, was an existing operation with documented contamination and cleanup activity. The perceived risk in the McCluskey analysis was related to a known site condition and probable chronic risk, whereas the risk of greatest concern to the proposed project is more "episodic" – concern for a catastrophic release. Although there may be some relevance for the proposed project in the data presented in McCluskey, the differences in the fundamental conditions and risks are substantial enough to avoid drawing parallel conclusions for the proposed Project.

Waterway for LNG Marine Traffic

Due to the distance from the waterway to shore in most segments of Chesapeake Bay, and due to the fact that these ship channels already carry commercial and industrial cargoes, the additional traffic of LNG ships 2 to 3 times per week should not affect property values along the Bay shoreline.

Pipeline Facilities

The FERC has received numerous comments regarding the potential effect of the installation of additional pipeline and/or expansion of the existing pipeline rights-of-way on property values. Landowners typically have the following concerns regarding potential impacts on property values: devaluation of property if encumbered by a pipeline easement; being the responsible party for property taxes within a pipeline easement; paying potential landowner insurance premiums for Project-related effects; and negative economic effects resulting from changes in land uses.

Prior to initiating construction, Mid-Atlantic Express would acquire easements on private lands for both the temporary (construction) and permanent (operation) rights-of-way. The easement would provide Mid-Atlantic Express the right to construct, operate, and maintain the pipeline, and establish a permanent right-of-way. In return, Mid-Atlantic Express would compensate the landowners for use of the land and the temporary loss of crops or other land use. Mid-Atlantic Express has indicated that it would seek to negotiate a fair market value compensation with affected landowners, and would use third-party appraisers to estimate comparable property value to use as the basis for determining appropriate compensation. Where the pipeline route crosses public

land, Mid-Atlantic Express would coordinate with the managing agencies to obtain any required easements or permits.

If an easement cannot be negotiated with the landowner and a project has been certificated by the Commission, Mid-Atlantic Express may use the right of eminent domain granted to it under Section 7(h) of the NGA to obtain the right-of-way and additional workspaces identified in the Certificate. Section 7(h) implies that eminent domain is a remedy of last resort, to be used "when any holder of a Certificate cannot acquire by contract, or is unable to agree with the owner of property to the compensation to be paid for, the necessary right-of-way." Under eminent domain, Mid-Atlantic Express would still be required to compensate the landowner for the right-of-way and for any damages incurred during construction. However, the level of compensation would be determined by a court according to state law.

The impact that a natural gas project may have on the value of any land parcel depends on many factors, including the size of the parcel, the parcel's current value, land use, and the value of other nearby properties. However, subjective valuation is generally not considered in appraisals. This is not to say that the Project would not affect resale values. Potential purchasers may make a decision based on intended future use and, if the presence of the Project would make that use infeasible, it is possible that that potential purchaser may not acquire the parcel. However, each potential purchaser has differing criteria and means.

A 2006 study analyzed property sales near two pipelines in Washington, using methodologies that considered proximity and persistence over time (Hansen et al. 2006). One of the two pipelines had an incident. A comparison of property values near the pipeline before and after the incident noted a decline in property values following the incident, but the decline was most pronounced for properties within 50 feet of the affected pipeline. The properties regained their expected value over time. (Hansen et al. 2006)

The placement of a pipeline easement through or adjacent to a property may affect the landowner's use of the property. Compensation for damage resulting from the easements, as applicable, would reduce or eliminate the potential effects of pipeline easements on property owners along the pipeline right-of-way.

Landowners are responsible for all property taxes levied against parcels, and this responsibility would be independent of the existence of any Project-related pipeline easement. However, if a landowner felt that the Project, should it be constructed, reduced the value of their property, the landowner could appeal the assessment and subsequent property taxation to the local property taxation agency. If the parcel were reappraised, the landowner would then be responsible for property taxes based upon an appraisal that directly incorporated the easement.

Regarding the potential for insurance premium adjustments associated with pipeline proximity, insurance advisors consulted on other natural gas projects reviewed by the FERC have indicated that LNG terminals and associated pipeline infrastructure do not have an impact on homeowner insurance rates (FERC, 2004). As such, the FERC believes that homeowners' insurance rates are unlikely to change as a result of construction and operation of the Project facilities.

4.9.6 Tax Revenues

Estimated tax revenues generated during construction and operation of the project are shown in table 4.9.6-1.

Maryland tax receipts from the construction of the Project are estimated to be a total of $3.5 million. Tax revenues generated by Project operation in Maryland would be approximately $9.6 million per year.

During the operation of the Project, annual tax revenues in Pennsylvania would be approximately $1.0 million, derived from sales and income taxes. According to Pennsylvania tax code, the pipeline and associated activities are not subject to sales tax during construction or operation.

The project would also provide local economic benefit from the purchase of materials and services during construction and operation, and those indirectly generated through increased employment. AES expects to obtain many of its products and services from manufacturers and or distributors in the Mid-Atlantic Region, and to use local suppliers, which would provide a benefit to local businesses.

TABLE 4.9.6-1

Project Construction and Operation Estimated Tax Revenue

Project	Construction				Operations c/			
	Sales Tax (millions)	Income Tax a/ (millions)	Property Tax a/ (millions)	Construction Total Revenues (millions)	Sales Tax (millions)	Income Tax (millions)	Property Tax d/ (millions)	Operations Total Revenues (millions)
Terminal & Pipeline								
Maryland	$2.0	$0	$0	$2.0	$0.1	$6.0	$7.0	$13.1
Pennsylvania b/	$0	$0	$0	$0	$0.02	$1.0	$0	$1.02
Total	$2.0	$0	$0	$2.0	$0.12	$7.0	$7.0	$14.12
Power Plant								
Maryland	$1.5	$0	$0	$1.5	$0.1	$0.5	$2.6	$3.2
Pennsylvania b/	$0	$0	$0	$0	$0	$0	$0	$0
Total	$1.5	$0	$0	$1.5	$0.1	$0.5	$2.6	$3.2
Combined Totals								
Maryland	$3.5	$0	$0	$3.5	$0.2	$6.5	$9.6	$16.3
Pennsylvania b/	$0	$0	$0	$0	$0.02	$1.0	$0	$1.02
Total	$3.5	$0	$0	$3.5	$0.22	$7.5	$9.6	$17.32

a/ No income tax revenue or property tax revenue associated with facility construction activities in Maryland and Pennsylvania.
b/ No Pennsylvania state sales tax revenue associated with construction activities.
c/ Projected average value per year for expected lifecycle of the facilities (at least 30 years).
d/ Projected net property tax revenue associated with Project operations in Maryland includes tax credits for operational years 1 through 10.

4.9.7 Environmental Justice

The FERC's NEPA review includes an analysis to identify disproportionately high and adverse health or environmental effects on minority and low-income populations. The FERC's NEPA review process provides opportunities for public participation and consultation with potentially affected communities and the identification of any significant adverse effects to minority or low-income populations or Native American tribes.

AES and Mid-Atlantic Express have conducted outreach throughout the project development process. The outreach efforts included publicly announced meetings, delivery of Project updates, invitations to tours and learning opportunities about LNG terminal and shipping issues, and more than 2,200 letters to landowners and stakeholders. Letters were sent to landowners within one-half mile of the proposed terminal site (note there are no residences within one mile of the terminal site) and landowners on and abutting the proposed primary and alternative pipeline route segments. The open-houses hosted by AES and Mid-Atlantic Express included two meetings in Dundalk, and single meetings in White Marsh, Pasadena, and Bel Air, Maryland and meetings in Oxford and Downingtown, Pennsylvania. In addition, the FERC sponsored three scoping meetings in North Point/Edgemere and Bel Air Maryland, and Downington, Pennsylvania.

Environmental Justice Areas and Potential Impacts

Comments from the public related to environmental justice identified the following concerns:

- the Project discriminates against the African American community at Turner Station;
- areas affected would be burdened by the pipeline and would not receive benefits;
- handling of potentially contaminated sediments would further spread contamination; and
- the terminal facility would violate the U.S. Department of Housing and Urban Development (HUD) guidelines for acceptable separation distance from a hazardous facility.

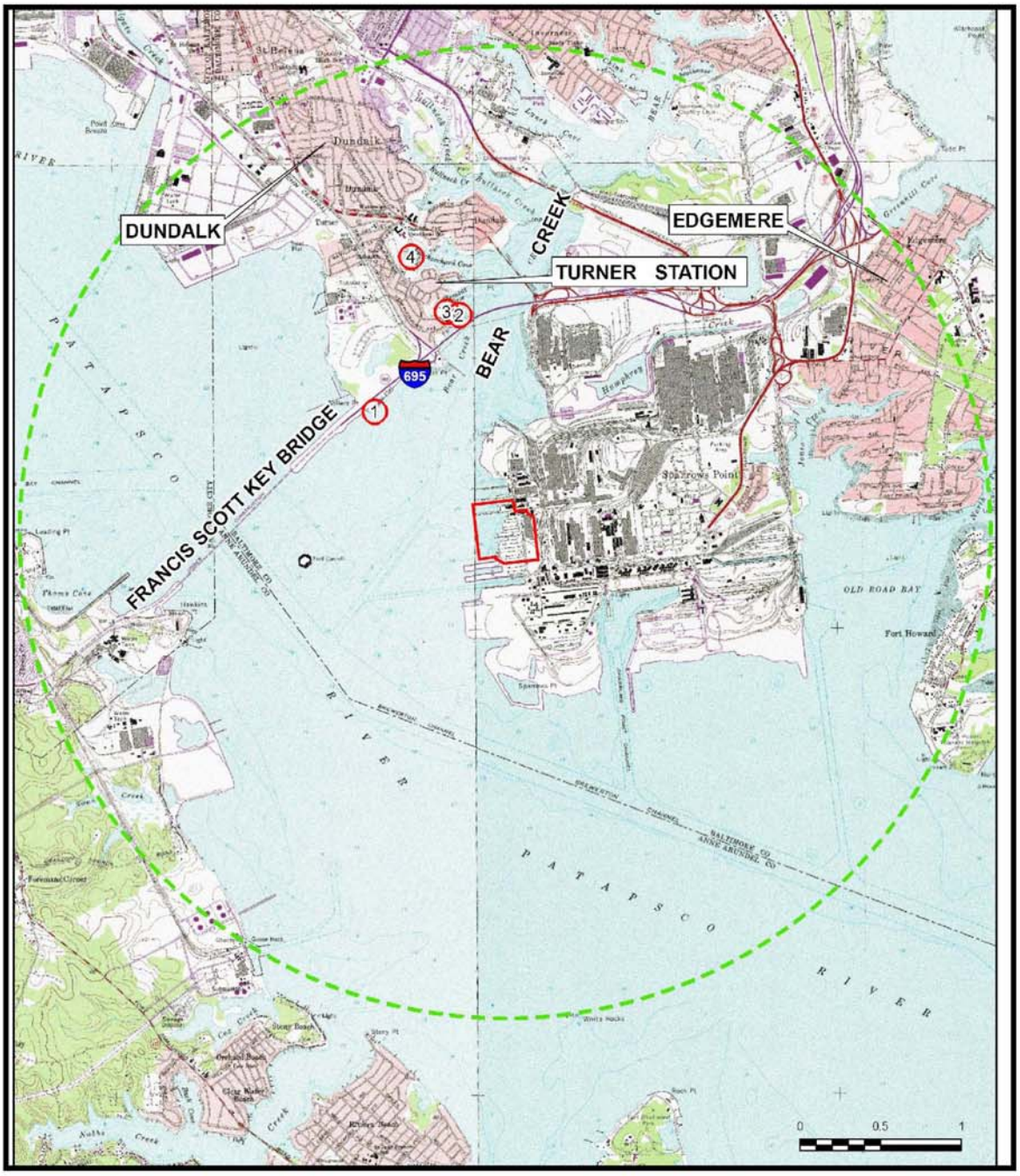
AES addressed these concerns through the identification of environmental justice areas in the vicinity of the proposed Project and an analysis of impacts that could disproportionately affect these areas. An *environmental justice area* is defined as:

- a community in which the minority population represents a higher percentage than the county average; and/or
- a community in which the percentage of persons living below the poverty level is higher than the county average.

Environmental justice areas were identified through the review of available state, county, and municipal statistics regarding median income, poverty levels, and ethnicity.

Figure 4.9.7-1 shows the project location relative to local communities and community projects identified in the Turner Station Community Conservation Plan 2000. Table 4.9.7-1 presents census data on the racial and ethnic composition of the population in the project area, by county.

Percentages of total minority populations for all counties within the project area fall below the respective state averages for total minority population. Minority groups which exceed state averages include the *Asian* population in Chester County, Pennsylvania; *Native Hawaiian and other Pacific Islander* population in Harford County, Maryland; and *Hispanic and Latino* populations of Lancaster and Chester Counties, Pennsylvania. Populations of *Individuals Reporting Some Other Race* and *Individuals Reporting Two or More Races* in Lancaster County, Pennsylvania also exceed the state average (U.S. Census Bureau 2000).



LEGEND

PROPOSED SPARROWS POINT LNG TERMINAL FACILITY

THREE MILE RADIUS

Locations of Shoreline Project by Turner Station Community Conservation Plan 2000

1. Proposed Dredging at Soller Point
2. Improvements at Fleming Park
3. Removal of Shoreline Debris at Fleming Park
4. Improvements at Turner Station Park

Figure 4.9-7-1
Sparrows Point LNG Project
Proposed Terminal
Location and Surrounding Communities

TABLE 4.9.7-1

Racial/Ethnic Statistics for the Terminal Site and Mid-Atlantic Express Pipeline Construction Corridor

County/State	Racial/Ethnic Group (percent)								Total Minority Population (percent)	Median Household Income 1999	Families Below Poverty Level (%)
	White a/	Black or African-American a/	Native American and Alaska Native a/	Asian a/	Native Hawaiian and Other Pacific Islander a/	Individuals Reporting Some Other Race	Individuals Reporting Two or More Races	Individuals of Hispanic or Latino Origin b/			
MARYLAND											
Baltimore Co.	74.4	20.1	0.3	3.2	0.0 c/	0.6	1.4	1.8	25.6	50,667	4.5
Harford Co.	75.1	9.3	0.2	1.5	0.1	0.7	1.5	1.9	24.9	57,234	3.6
Cecil Co.	93.4	3.9	0.3	0.7	0.0 c/	0.5	1.2	1.5	6.6	50,510	5.4
Average	*81.0*	*11.1*	*0.3*	*1.8*	*0*	*0.6*	*1.4*	*1.7*	*19.0*	*52,804*	*4.5*
State Average	*64.0*	*27.9*	*0.3*	*4.0*	*0.0 c/*	*1.8*	*2.0*	*4.3*	*36.0*	*52,868*	*6.1*
PENNSYLVANIA											
Lancaster Co.	91.5	2.8	0.1	1.4	0.0 c/	2.9	1.3	5.7	8.5	45,507	5.3
Chester Co.	89.2	6.2	0.1	2	0.0 c/	1.3	1.1	3.7	10.8	65,295	3.1
Average	*90.4*	*4.5*	*0.1*	*1.7*	*0.0 c/*	*2.1*	*1.2*	*4.7*	*12.0*	*55,401*	*4.2*
State Average	*85.4*	*10.0*	*0.1*	*1.8*	*0.0 c/*	*1.5*	*1.2*	*3.2*	*14.6*	*40,106*	*7.8*

a/ Includes persons reporting only one race.

b/ Persons who identify themselves as Hispanic or Latino may be of any race; the percent Hispanic or Latino should not be added to the percentage for racial categories.

c/ Value greater than zero but less than half unit of measure shown.

Source: U.S. Census Bureau, Census 2000 (http://factfinder.census.gov/homes/saff/main.html?_lang-en).

Table 4.9.7-2 presents census data on income and poverty status of the population in the project area, by county.

The per capita personal income level for Baltimore County, Maryland and Chester County, Pennsylvania exceeds the state per capita personal income level for the respective state. The average per capita personal income levels for the remaining counties within the project area are less than the respective state values. However, the poverty rate for each county is below that of the respective state.

Turner Station, the residential community closest to the terminal site, is located approximately 1.1 miles away. *Census 2000* information indicates the population of Turner Station is 80 percent *African American*, 16 percent *White*, and 4 percent *Other*. The median household income for Turner Station is $28,324, which is greater than the median income values reported for Baltimore County and the State of Maryland. Turner Station is considered an environmental justice area based on its minority population (US Census Bureau 2000).

Turner Station is part of the larger Dundalk community. Dundalk is a community that has developed around the past industrial activities, such as steelmaking, shipbuilding, distilling, and manufacturing, which are now in decline.

TABLE 4.9.7-2

Income and Poverty Statistics

County/State	Per Capita Personal Income	Poverty Rate (Percent)
MARYLAND	$25,614	8.5
Baltimore Co.	$26,167	6.5
Harford Co.	$24,232	4.9
Cecil Co.	$21,384	7.2
PENNSYLVANIA	$20,880	11
Lancaster Co.	$20,398	7.6
Chester Co.	$31,627	5.2

Source: U.S. Census Bureau, Census 2000 (http://factfinder.census.gov/home/saff/main.html?_lang=en)

LNG Terminal

Construction of facilities at the terminal site would occur on land that is located within a larger industrial complex. The area has been used for industrial purposes since 1889. Outside of this industrial complex and within a 3-mile radius of the proposed terminal site lie portions of Baltimore County, the community of Dundalk, and several component neighborhoods, including Turner Station (an environmental justice area) as well as communities not considered environmental justice areas. The proposed terminal was selected based on requirements for port access. Planning reports for development in the area of the terminal site include:

- Dundalk, A Second Century Vision;
- Turner Station Community Conservation Plan; and
- Baltimore County Master Plan 1989-2000.

The proposed development at the terminal site is compatible and consistent with existing use and long-range plans identified for the area. Plans for the terminal site would have no negative impact on the proposed projects or revitalization efforts included in *Dundalk, A Second Century Vision*. Similarly, construction and operation of the terminal facility would have no negative impacts on the community redevelopment and revitalization concepts included in the *Turner Station Community Conservation Plan*. The *Baltimore County Master Plan* identifies the terminal site as industrial for purposes of land use, an area of industrial employment for development policy purposes, and as high ground with pollution potential for purposes of environmental

policy. The *Baltimore County Master Plan* also encourages reuse of Sparrows Point for redevelopment of new industrial purposes; terminal construction and operation is consistent with this plan (AES 2006).

The communities nearest the terminal facility may not directly receive natural gas from the terminal; however, increased employment associated with the construction and operation of the terminal would benefit the communities economically.

AES would have to comply with the conditions of a COE dredging permit, and would have to use dredging methodology suitable for the level of chemical constituents contained in the sediments; therefore, dredging activities in the approach channel and turning basin would not result in increased risk to environmental and human health within adjacent areas.

The proposed terminal location lies within an existing industrial area in which heavy industry manufacturing facilities currently exist and function. Development of the terminal is consistent with existing development and does not represent a new or inconsistent development with respect to existing environmental conditions; therefore, the project is not expected to affect HUD funding to surrounding communities.

Neither the construction nor the operation of the terminal facility would disproportionately result in adverse human health or environmental effect on minority or low income communities or Native American populations.

Waterway for LNG Marine Traffic

The socioeconomic impacts of normal operations of the LNG tanker are detailed above in Section 4.9.4.2, Vessel Traffic. While the likelihood of an emergency leading to a marine LNG spill is low, potential hazards are considered in this EIS. A discussion of the principal properties and hazards associated with LNG is presented in section 4.12.1. Without proper safety measures and mitigation, there is a potential for significant socioeconomic impacts from an ignited or unignited LNG spill depending on the location, severity, and the time of year the incident occurred. Marine transit safety and security mitigation measures have been committed to throughout Section 4.12.

In the case of an event, ship traffic would be halted until the affected LNG vessel could be safely removed from the river channel. The time and cost associated with removing an LNG vessel would be relative to that required to remove any other similarly incapacitated large vessel from the channel. The complexity and costs of removal would vary greatly depending on the location of the vessel when damaged and the extent to which it is damaged. Because of its physical properties, released LNG would quickly disperse in the atmosphere or, if ignited, burn in a pool fire. A significant unignited LNG release and dispersion would be a short-lived event and may result in a temporary closure of the affected section of the transit route.

The Coast Guard report "Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas Spill Over Water" identified "Zones of Concern" with regards to public safety in the area of a LNG vessel. These Zones of Concern were superimposed over the location of the LNG terminal and proposed vessel transit route to determine areas of concern regarding public safety. No populated areas were within Zone 1. Zone 2 would overlap a portion of Sandy Beach, which is considered a medium population area in the daytime hours of summer and low population during the remainder of the year. Zone 2 would also overlap parts of Sparrows Point, Hawkins Point, Sollers Point, and Coffin Point, which are all considered low population areas. Zone 3 would overlap some medium population areas, which include a small part of the Riviera Beach community at the mouth of Stony Creek and a portion of the Greater Dundalk area, which includes the community of Turner Station, to the north of the Terminal Site. Zone 3 would also overlap some low population areas and two uninhabited islands.

Socioeconomic impacts of a substantial marine LNG release would not differentiate effects based on demographic characteristics of the population. Therefore, there would not be any disproportionately high or adverse environmental and human health impacts to low-income and minority populations. The severity of impacts on populations within Zones 1-3 would depend on the location of the incident relative to the population, the scope of the incident, and whether the LNG released ignited or evaporated. This could be a

significant impact, with injuries ranging from mild to fatal, being most severe in Zone 1 and decreasing outward through Zones 2 and 3. However, because of the implementation of safety and security measures during marine transit as discussed in Section 4.12.8, the probability of a marine LNG spill is extremely low and not considered a reasonably foreseeable event.

Pipeline

The pipeline route was selected to minimize potential adverse impacts to landowners and stakeholders. The selected route maximizes the use of existing utility and highway rights-of-way, which results in minimal impacts to individual landowners and undisturbed land. Environmental impacts associated with proposed pipeline construction would be temporary and would affect all sensitive receptors equally; no single environmental justice area or community would be disproportionately affected. No long-term detrimental impacts would occur. Therefore, the proposed pipeline would not result in disproportionately adverse human health or environmental effects on minority or low-income communities or Native American programs.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA (16 USC 470) requires the FERC to take into account the effects of its undertakings (including issuances of a Certificate) on properties listed, or eligible for listing, on the NRHP and to provide the ACHP an opportunity to comment on its undertakings. AES Sparrows Point LNG, and Mid-Atlantic Express, as non-federal parties, are assisting the FERC in meeting its obligations under Section 106 and the implementing regulations at 36 CFR 800.

4.10.1 Results of the Cultural Resource Surveys

LNG Terminal

Aboveground Cultural Resources

Background research and an architectural survey of the LNG terminal site were conducted by the Ottery Group, Inc. (Howell 2006). The Ottery Group initiated consultation with the Maryland State Historic Preservation Officer (MD-SHPO). The cultural resources area of potential effect (APE) for the LNG terminal site is defined as the entire Sparrows Point Shipyard. The Sparrows Point Shipyard is a 226 acre facility of which 150 acres are on dry land and 76 acres are in water. It was constructed in 1889 by the Maryland Steel Company (later BSC) and was the site of ship construction from 1891 to the early 1990s. Current operations consist solely of ship dismantling and scrapping. No prior historic above ground investigations had been conducted at the Sparrows Point Shipyard.

As a result of the architectural survey, background research, and consultation with the MD-SHPO, the Sparrows Point Shipyard (Maryland Historic Trust [MHT] Inventory No. BA-3208) was identified as an NRHP eligible historic district. The Sparrows Point Shipyard was critical in the development of America's steel industry in the early twentieth century and was a critical industrial hub during the Second World War contributing to American victory against the Axis Powers. Despite modifications to a number of buildings the historic character and skyline of the installation remains largely intact.

Five historic structures were identified within the LNG terminal lease area. These include the Fabricating Shop (MHT Inventory No. BA-3208-1), the Panel Shop (MHT Inventory No. BA-3208-2), the Pipe Shop (MHT Inventory BA-3208-3), the Shipways (MHT Inventory No. BA-3208-4), and the Service Building (MHT Inventory No. BA-3208-5). The Fabricating Shop, the Pipe Shop, and remaining intact Shipways, are considered contributing elements of the Sparrows Point Shipyard District and are considered potentially eligible for the NRHP. The Panel Shop and the Service building are both less than 59 years old and do not contribute to the historic character of the Sparrows Point Shipyard District. Neither is eligible for inclusion on the NRHP.

The Ottery Group, Inc. prepared an MHT Maryland Inventory of Historic Properties (MIHP) form for the Sparrows Point Shipyard along with MHT Determination of Eligibility forms for the district and the five structures within the LNG terminal lease area. The forms were submitted to the MHT on November 15, 2006. The MHT concurs with the National Register determination of eligibility (Howell 2007). We agree. Consultation between AES and MHT to develop an appropriate mitigation plan for potential adverse impacts is ongoing.

Terrestrial Archaeological Resources

Background research and consultation with MD-SHPO indicate that no prior surveys for terrestrial archaeological resources within the Sparrows Point Shipyard LNG terminal lease area have been conducted. No subsurface archaeological investigations were conducted within the LNG terminal due to a lack of land access. However, we do not consider the area to be archaeologically sensitive due to previous extensive ground disturbances from industrial land use and no terrestrial archaeological investigations are recommended (Locking et al. 2006a). Concurrence by the MD-SHPO is pending.

Maritime Archaeological Resources

AES consulted with the MD-SHPO to determine the potential for maritime archaeological resources that might be affected by dredging and other activities at the LNG terminal at Sparrows Point Shipyard. AES provided bathymetry of the submarine area off Sparrows Point. The MD-SHPO requested that AES conduct a marine archaeology instrument survey of a 300 by 600 feet area (4.1 acres) within the proposed turning basin area for the LNG terminal where bathymetric contours indicated potential submerged artificial structures. A phase I marine archaeological remote sensing survey of the 4.1 acre area was undertaken in July 2006 (Pelletier et al. 2006).

A total of 15 individual magnetic anomalies and three acoustic anomalies were identified. No sub-bottom profiler anomalies were identified. The magnetic anomalies were indicative of discarded or lost debris, manmade bottom disturbances, or natural bottom features and were not indicative of submerged cultural deposits. Therefore, development of the LNG terminal would have no impact on submerged maritime archaeological sites. The MD-SHPO concurs with the conclusions of the study (MD-SHPO 2006, 2007). We agree.

Waterway for LNG Terminal

An evaluation was performed to summarize known submerged and terrestrial cultural resources located within the waterway for LNG marine traffic and identify any that are listed or may be eligible for listing on the NRHP. The records search included the Zones of Concern out to 2.2 miles on either side of the marine transit route. The marine transit route is defined by the ship channels that would be transited within Chesapeake Bay.

Submerged Cultural Resources

A records search identified 33 submerged cultural resources within the transit route Zones of Concern. Thirty are shipwrecks, two are 17th century submerged barrel wells, and one is an inundated Middle-Late Woodland archaeological site. Eight of these shipwrecks are listed in site files maintained by the State Historic Preservation Office of Maryland. The remaining reported shipwrecks have not been investigated, but are listed on the National Oceanic and Atmospheric Administration (NOAA) Automated Wreck and Obstruction Information System ("AWOIS").

Submerged cultural resources in shallow waters are experiencing active and ongoing erosion and degradation as a result of current patterns of weather, wind, waves, and the wakes of passing boats and ships. No significant additional impacts to cultural resources are expected as a result of normal LNGC traffic along the transit route. There is a slight chance of collision between a moving LNG vessel and a stationary submerged cultural resource, but the risk is no greater than from existing deep draft marine traffic in the ship channels. Of the 30 reported shipwrecks, 9 are located in Zone 1, 12 in Zone 2, and 9 in Zone 3. The risk to the reported

submerged cultural features is further minimized by the fact that the LNG marine traffic cannot traverse areas outside the normal ship channel boundaries as the vessels would run aground in waters less than 36 feet deep. Thus, much of the area of the Zones of Concern, and virtually all of Zones 2 and 3 (i.e. outside of 500 m from the ship channels) are outside the transit area that can be physically reached by the LNG vessels.

Submerged resources in Zone 3 would have a low potential to be adversely impacted by an LNG release or event, but resources in Zones 1 or 2 would have a higher potential to be adversely affected given their proximity to the transit route centerline. However, the effects of an LNG release, including fire and radiant heat, would be greatly reduced for all cultural resources below the water surface. MD-SHPO concurrence on these conclusions is pending.

Terrestrial Archaeological Resources

Sixty-five terrestrial archaeological sites are recorded within the transit route Zones. All are located in Maryland. None of the 65 sites are listed on the NRHP. Sixty-four are located in a Low Impact Zone on or near the shoreline in Zone 3. One, 18AN649, is reported in the Medium Impact Zone or Zone 2, but contains no standing structures and as such would experience minimal to no effect.

Terrestrial archaeological resources close to the shoreline experience active and ongoing erosion and degradation as a result of current patterns of weather, wind, waves, and the wakes of passing boats and ships. No significant additional impacts to cultural resources are expected as a result of normal LNG marine traffic along the transit route. No terrestrial archaeological resources would be affected by normal LNG shipping operations. MD-SHPO concurrence on these findings is pending.

There is a small potential that an LNG release or event would affect NRHP listed or eligible terrestrial archaeological sites. Terrestrial archaeological sites are below ground resources and would not be expected to be adversely affected by a fire associated with a release or event.

Aboveground Cultural Resources

Nine aboveground historic resources listed on the NRHP and another four that are eligible for listing on the NRHP are located within the transit route Zones (table 4.10.1-1).

Aboveground cultural resources such as historic buildings and other structures could be adversely affected by an LNG release or event. These effects include physical destruction or damage from radiant heat or fire. Measures to protect aboveground NRHP listed or eligible properties would be the same as population and infrastructure risk mitigation measures incorporated by the Coast Guard in its Waterway Suitability Report. MD-SHPO concurrence on these recommendations is pending.

National Historic Landmarks

No National Historic Landmarks are located within the transit route Zones of Concern.

Tribal Land/Tribal Fishing Areas

No federally recognized Native American tribes have tribal lands and/or exclusive fishing rights on the Chesapeake Bay, including the area within the vessel transit route or Zones.

TABLE 4.10.1-1

Properties Listed or Eligible for Listing on the National Register of Historic Places Within the AES Sparrows Point LNG Marine Traffic Zones of Concern.

County, State	ID no. or Status	Site No.	MD no.	Name	Category	Date	Zone
Anne Arundel, MD	NR-75	18AN534	AA-330	Sandy Point Farmhouse	Building	ca. 1815	3: (low)
Anne Arundel, MD	NR-1299	Not available	AA-166	Sandy Point Shoal Light Station	Structure	1883	2: (medium)
Anne Arundel, MD	NR-1300	Not available	AA-945	Baltimore Light Station	Structure	Not available	2: (medium)
Baltimore, MD	NR-1316	Not available	BA-1551	Craighill Channel Lower Range Front Light Station	Structure	Not available	3: (low)
Baltimore, MD	NR-1317	Not available	BA-1552	Cut-Off Channel Range Front Light Station	Structure	Not available	2: (medium)
Baltimore, MD	NR-1318	Not available	BA-1553	Cut-Off Channel Range Rear Light Station	Structure	Not available	3: (low)
Dorchester, MD	NR-1323	Not available	D-644	Hooper Island Light Station	Structure	Not available	2: (medium)
Baltimore, MD	NR-202	Not available	BA-146	Todd Farmhouse	Building	1830	3: (low)
Anne Arundel, MD	NR-334	18AN169	AA-129	Hancock's Resolution	Structure	17th – 18th century	3: (low)
Anne Arundel, MD	Eligible	Not available	AA-325	Whitehall	Building	18th century	Not available
Anne Arundel, MD	Eligible	Not available	AA-80	Fort Nonsense	Building	1800-1825	Not available
Anne Arundel, MD	Eligible	Not available	AA-721	Douglass Summer House (Twin Oaks)	Building	1894	Not available
Anne Arundel, MD	Eligible	Not available	AA-358	Thomas Point Shoal Light	Building	1875	Not available

Pipeline Facilities

Aboveground Cultural Resources

AES consulted with the MD-SHPO and Pennsylvania SHPO (PA-SHPO) regarding the potential affects construction of the Mid-Atlantic Express Pipeline would have on significant historic architecture and other potential aboveground resources. Both the MD-SHPO and the PA-SHPO stated that the proposed undertaking may have the potential to have direct and/or visual effects on nearby historic buildings or structures, including those that have not yet been identified. Surveys are required to identify NRHP listed or eligible aboveground resources that could be affected.

No survey of above ground resources has been conducted along the proposed pipeline route, pending determination of the locations of major aboveground facilities. A survey would be conducted when the location of these facilities is determined.

Though the survey of above ground resources is incomplete, four potential historic properties are known to be located in or near the project area. These include the Old Maryland and Pennsylvania (MAPA) Railroad crossed by the pipeline corridor in Maryland, the Doe's Run Village historic district in Chester County, Pennsylvania, the Kirks Mills Historic District in Pennsylvania, and the Bell Manor historic Victorian home in Maryland. The affect the Mid-Atlantic Express pipeline would have on these properties would be addressed as part of the survey of above ground cultural resources.

The eligibility for the MAPA Railroad to be included on the National Register has not yet been assessed. However, the Maryland and Pennsylvania Railroad Preservation Society is working to preserve the MAPA

Railroad as a recreation trail. A portion of the trail has already been developed in Harford County, Maryland. The pipeline route crosses the old MAPA railroad at MP 31.8 along an existing right-of-way; however, the pipeline route does not cross the recreational trail project or any planned extension of the trail. Since the proposed pipeline route does not cross the existing trail project or planned extension, no impacts to the MAPA railroad trail are anticipated.

There are two historic districts of special note along the pipeline route in Pennsylvania:

- Doe's Run Village in Chester County, Pennsylvania is listed as a historic district in the National Register of Historic Places (NRHP). The proposed pipeline route would cross the district for approximately 3,000 feet beginning at MP 70.7. The pipeline would cross the historic district parallel to existing pipelines at a distance of about 2000 feet north of most historical structures at Does Run, thus minimizing visual impacts to the core of the district. However, additional consultation with the PA SHPO and any other concerned parties would be required to ascertain if the pipeline would be compatible with the remainder of the district uses; and
- Kirks Mills Historic District in Lancaster County, Pennsylvania is listed as a historic district in the NRHP and is recognized by the Pennsylvania Bureau of Historic Preservation as potentially culturally significant. Kirks Mills is a restored mill town containing ten houses built by Quakers in the latter half of the 18th century. The proposed pipeline would cross the district for approximately 5,500 feet beginning at MP 51.2. According to comments from Kirks Mills area landowners, the proposed pipeline route and alternative pipeline routes would cross the district. Additional consultation with the PA-SHPO and any other concerned parties would be required to ascertain if the pipeline would be compatible with district uses.

Terrestrial Archaeological Resources

AES conducted background research and Phase I archaeological investigations along portions of the proposed pipeline route in Maryland and Pennsylvania. The archaeological survey followed the MD-SHPO and PA-SHPO guidelines for archaeological investigations and combined Phase IA visual reconnaissance and archaeological site potential assessment with Phase IB archaeological subsurface investigation in areas of moderate to high archaeological site potential. The results of the investigation are documented in four reports – two covering Maryland that are to be submitted to the MD-SHPO (Locking et al. 2006a, Locking and Eldridge 2007a) and two covering Pennsylvania that are to be submitted to the PA-SHPO (Locking et al. 2006b, Locking and Eldridge 2007b). As of preparation of the DEIS a total of 39.49 miles (64.21 km) of the 47.21 miles (75.98 km) pipeline route in Maryland where property access was granted was surveyed (Locking et al. 2006a, Locking and Eldridge 2007a). A total of 30.76 miles (49.50 km) of the proposed 39.77 mile (64 km) pipeline route where property access was granted in Pennsylvania was surveyed (Locking et al. 2006b, Locking and Eldridge 2007b). The remaining 7.72 miles (12.42 km) in Maryland and 9.01 miles (14.50 km) in Pennsylvania have not been subjected to archaeological survey due to a lack of land access. The archaeological survey of the remaining areas would be conducted when property access has been secured.

Tables 4.10.1-2 and 4.10.1-3 list terrestrial archaeological sites located within the pipeline right-of-way and summarize management recommendations. Sixteen previously recorded archaeological sites are located within the pipeline right-of-way. Site 18CE153 was investigated during the Phase I archaeological survey and may be eligible for the NRHP. The remaining 15 previously recorded archaeological sites have not been evaluated for NRHP eligibility and would require Phase I archaeological investigation. Thirty-one new sites within the pipeline right-of-way have been identified and investigated (table 4.10.1-3). Of these, 14 would require additional archaeological investigation. Phase I investigations at four sites (36CH866, 36CH867, NEA 06-CH-12, and NEA 06-CH-13) were incomplete and additional investigations would be required. Ten sites (18BA550, 18CE153, 18CE361, 18HA291, 18HA292, 36CH862, 36CH863, 36CH864, 36LA1457, and 36LA1460) may be eligible for the NRHP and would be avoided or subjected to Phase II investigations to determine NRHP eligibility. No additional archaeological investigations are recommended at Site 36CH542,

but the site contains a historic structure that would require evaluation as an above ground historic cultural resource. The remaining 16 sites are recommended as not NRHP eligible.

The status of MD-SHPO and PA-SHPO concurrence are listed in table 4.10.1-2 and table 4.10.1-3. The MD-SHPO concurs that five sites in Maryland may be NRHP eligible (MD-SHPO 2006, 2007). We agree. The PA-SHPO concurs that five sites in Pennsylvania may be NRHP eligible (PA-SHPO 2006, 2007). We agree. Sites that may be eligible for inclusion on the NRHP would be avoided or effect to them mitigated by data recovery.

Pipeyard/Contractor Staging Areas

AES has indicated pipeyard/contractor staging areas at 25 locations along the Mid-Atlantic Express Pipeline route. These areas, combined with associated access roads, would encompass 350 acres.

TABLE 4.10.1-2

Previously Recorded Terrestrial Archaeological Sites Within Pipeline Right-of-Way

State	County	SHPO Site Number	Other Name/ Site No.	Site Type	NRHP Status/Management Recommendation	SHPO Concurrence
Maryland	Cecil	18CE153	10001-1	Prehistoric resource procurement site	May be NRHP eligible; avoidance or Phase II recommended	Pending
Maryland	Harford	18HA140	10001-3	Prehistoric Scatter	Undetermined	Pending
Maryland	Harford	18HA141	10001-4	Prehistoric Scatter	Undetermined	Pending
Maryland	Harford	18HA142	10001-5	Prehistoric Scatter	Undetermined	Pending
Maryland	Harford	18HA143	1000-7	Prehistoric Scatter	Undetermined	Pending
Pennsylvania	Chester	36CH521	88-2-11	Historic Domestic Site	Undetermined	Pending
Pennsylvania	Chester	36CH522	88-2-12	Historic and Prehistoric	Undetermined	Pending
Pennsylvania	Chester	36CH523	88-2-13	Prehistoric and Historic Scatter	Undetermined	Pending
Pennsylvania	Chester	36CH525	Brandywine; 06-CH-01	Prehistoric Scatter	Undetermined	Pending
Pennsylvania	Chester	36CH542	88-2-9	Historic Domestic Site	Undetermined	Pending
Pennsylvania	Chester	36CH768	MAF 123	Prehistoric Scatter	Undetermined	Pending
Pennsylvania	Chester	36LA516	88-2-6	Prehistoric Scatter	Undetermined	Pending
Pennsylvania	Chester	36LA517	88-2-6	Prehistoric and Historic Scatter	Undetermined	Pending
Pennsylvania	Chester	36LA519	88-2-8	Prehistoric Scatter	Undetermined	Pending
Pennsylvania	Chester	36LA973	88-2-4	Prehistoric and Historic Scatter	Undetermined	Pending
Pennsylvania	Chester	36LA975	Sleepy Hollow	Prehistoric Scatter	Undetermined	Pending

TABLE 4.10.1-3

Newly Investigated Terrestrial Archaeological Sites in Pipeline Right-of-Way

State	County	SHPO Site Number	Other Name/ Site No.	Site Type	NRHP Status/Management Recommendation	SHPO Concurrence
Maryland	Baltimore	18BA550	NEA 06-BA-01	Prehistoric Scatter	May be NRHP eligible; avoidance or Phase II recommended	Concur
Maryland	Baltimore	18BAX316:1	NEA 06-BA-03	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Maryland	Baltimore	18BAX316:2	NEA 06-BA-02	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Maryland	Cecil	18CE316:1	NEA 06-CE-02	Historic Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Maryland	Cecil	18CE316:2	NEA 06-CE-03	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Maryland	Cecil	18CE361	NEA 06-CE-01	Prehistoric Scatter	May be NRHP eligible; avoidance or Phase II recommended	Concur
Maryland	Cecil	18CE153	NEA 06-CE-04	Prehistoric resource procurement site	May be NRHP eligible; avoidance or Phase II recommended	Concur
Maryland	Harford	18HA291	NEA 06-HA-01	Prehistoric Scatter	May be NRHP eligible; avoidance or Phase II recommended	Concur
Maryland	Harford	18HA292	NEA 06-HA-04	Prehistoric Scatter	May be NRHP eligible; avoidance or Phase II recommended	Concur
Maryland	Harford	18HAX60:1	NEA 06-HA-06	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Maryland	Harford	18HAX60:2	NEA 06-HA-05	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Maryland	Harford	18HAX60:3	NEA 06-HA-03	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Maryland	Harford	18HAX60:4	NEA 06-HA-02	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Pennsylvania	Chester	Non-site, number not assigned	NEA 06-CH-01	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended	Concur
Pennsylvania	Chester	Non-site, number not assigned	NEA 06-CH-02	Historic Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Pennsylvania	Chester	36CH867	NEA 06-CH-03	Historic Scatter	Phase I incomplete; recommend close interval shovel testing to determine site boundaries and potential NRHP eligibility	Concur
Pennsylvania	Chester	36CH542	NEA 06-CH-04	Historic Structure	Architectural assessment recommended. Lies outside pipeline corridor and was not subjected to archaeological survey.	Concur

TABLE 4.10.1-3 **Newly Investigated Terrestrial Archaeological Sites in Pipeline Right-of-Way**						
State	**County**	**SHPO Site Number**	**Other Name/ Site No.**	**Site Type**	**NRHP Status/Management Recommendation**	**SHPO Concurrence**
Pennsylvania	Chester	Non-site, number not assigned	NEA 06-CH-05	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Pennsylvania	Chester	36CH861	NEA 06-CH-06	Prehistoric Scatter	Not NRHP eligible; no additional archaeology recommended.	Concur
Pennsylvania	Chester	36CH862	NEA 06-CH-07	Prehistoric Scatter	May be NRHP eligible; avoidance or Phase II recommended	Concur
Pennsylvania	Chester	36CH863	NEA 06-CH-08	Prehistoric Scatter	May be NRHP eligible; avoidance or Phase II recommended	Concur
Pennsylvania	Chester	36CH864	NEA 06-CH-09	Prehistoric Scatter	May be NRHP eligible; avoidance or Phase II recommended	Concur
Pennsylvania	Chester	36CH865	NEA 06-CH-10	Prehistoric Scatter	Not NRHP eligible; no additional archaeology recommended.	Concur
Pennsylvania	Chester	36CH866	NEA 06-CH-11	Prehistoric Scatter	Phase I incomplete; recommend close interval shovel testing to determine site boundaries and NRHP eligibility.	Concur
Pennsylvania	Chester	Non-site, number not assigned	NEA 06-CH-12	Prehistoric Scatter	Phase I incomplete; recommend close interval shovel testing to determine site boundaries and NRHP eligibility.	Concur
Pennsylvania	Chester	Non-site, number not assigned	NEA 06-CH-13	Prehistoric Isolate	Phase I incomplete; recommend close interval shovel testing to determine site boundaries and NRHP eligibility.	Concur
Pennsylvania	Chester	Non-site, number not assigned	NEA 06-CH-14	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Pennsylvania	Chester	Pending	NEA 06-CH-15	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Pennsylvania	Lancaster	36LA1457	NEA 06-LA-01	Historic Scatter, Prehistoric Isolate	May be NRHP eligible; avoidance or Phase II recommended	Concur
Pennsylvania	Lancaster	Non-site, number not assigned	NEA 06-LA-02	Prehistoric Isolate	Not NRHP eligible; no additional archaeology recommended.	Concur
Pennsylvania	Lancaster	36LA1460	NEA 06-LA-03	Prehistoric Isolate	May be NRHP eligible; avoidance or Phase II recommended	Concur

Aboveground Cultural Resources

Background research and a survey of historic buildings are needed to determine if significant resources would be affected by the pipeyard/contractor staging areas. In response to Cultural Resource Data Request 1g AES has indicated that field surveys for cultural resources within the staging areas and access roads would be completed when the locations of the pipeyard/contracting areas are refined.

Terrestrial Archaeological Resources

Background research identified two archaeological sites within the boundaries of the pipeyard/contractor staging areas (18CE153 and 18CE310) (table 4.10.1-4). Portions of 18CE310 within the pipeline right-of-way have been subjected to Phase I archaeological investigations and the site would be avoided or subjected to further investigations to evaluate NRHP eligibility. Site 18CE310 is located within the pipeyard/contractor staging area that has not been surveyed. In response to Cultural Resource Data Request 1g AES has indicated that field surveys for cultural resources within the staging areas and access roads would be completed when the locations of the pipeyard/contracting areas are refined.

4.10.2 Native American and Agency Consultation

Letters were submitted to federally recognized Native American Tribes with historic ties to the Project area to inform the tribes of the Project, and request comment on the effect of the proposed Project on any traditional cultural properties.

TABLE 4.10.1-4

Previously Recorded Terrestrial Archaeological Sites Within Pipeyard/Staging Area

State	County	SHPO Site Number	Other Name/ Site No.	Site Type	NRHP Status/Management Recommendation	SHPO Concurrence
Maryland	Cecil	18CE153	10001-1	Prehistoric resource procurement site	May be NRHP eligible; avoidance or Phase II recommended	Concur
Maryland	Cecil	18CE310	10001-3	Prehistoric resource procurement site	Undetermined	Pending

There has been no response from six groups including the Absentee Shawnee Tribe of Oklahoma, the Cayuga Nation, the Onondaga Indian Nation, the St. Regis Mohawk Tribe, the Shawnee Tribe, and the Tuscarora Nation. Four tribes responded and stated they do not wish to consult on the project including the Oneida Indian Nation, the Oneida Tribe of Indians of Wisconsin, the Seneca Nation of Indians, and the Tonawanda Band of Seneca. The Eastern Shawnee Tribe of Oklahoma and the Seneca-Cayuga Tribe of Oklahoma had no comments on the project but requested to be informed of significant cultural resources or unanticipated discoveries if encountered during the project. The Stockbridge-Munsee Community of Wisconsin and the Delaware Nation of Oklahoma requested a fee to review the project.

4.10.3 Unanticipated Discoveries

In order to comply with state and federal regulations regarding unanticipated discoveries Mid-Atlantic Express has developed an unanticipated discovery plan. The plan outlines what actions Mid-Atlantic Express would take in the event that unanticipated cultural materials are encountered during construction of the proposed Project.

4.10.4 Compliance with the NHPA

Mid-Atlantic Express has not yet completed its cultural resources surveys. In addition, the MD-SHPO and PA-SHPO have not yet fully commented on Mid-Atlantic Express's survey reports for the pipeline facilities or potential need for terrestrial archaeological surveys at the Sparrows Point Shipyard, and discussions are ongoing between AES and the MHT regarding mitigation of potential adverse impacts to historic structures at the Sparrows Point Shipyard. Consequently, we have not completed the process of complying with section 106 of the NHPA. To ensure that the FERC's responsibilities under the NHPA and its implementing regulations are met, **we recommend that:**

- **Mid-Atlantic Express defer construction of the pipeline facilities <u>until:</u>**

a. **Mid-Atlantic Express files with the Secretary the results of the historic architecture field investigations along the proposed pipeline route and the comments of the appropriate SHPO for review and written approval by the Director of OEP, <u>prior to construction</u>;**

b. **Mid-Atlantic Express completes the outstanding cultural resources surveys of the pipeline corridor and ancillary use areas;**

c. **Mid-Atlantic Express files with the Secretary all additional required cultural resources survey reports and any treatment plans, and the Maryland SHPO's and Pennsylvania SHPO's comments on all reports and plans including comments regarding the pipeline crossing of the Doe's Run and Kirks Mills Historic Districts to identify any appropriate mitigative measures that would protect the Districts from pipeline installation and operation; and**

d. **the Director of OEP reviews and approves all cultural resources reports and plans, and notifies Mid-Atlantic Express in writing that it may proceed with treatment measures or construction.**

All material filed with the Secretary containing location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "CONTAINS PRIVILEGED INFORMATION - DO NOT RELEASE."

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

4.11.1.1 Regional Climate

The climate of the project area is affected by its proximity to the Chesapeake Bay, Delaware Bay, and Atlantic Ocean. Climate data obtained from NOAA (National Climatic Data Center, 2002) show that daily average high temperatures range from 40°F during January to 87°F during July. Daily average low temperatures range from 23°F during January to 67°F during July. The record minimum and maximum temperatures are -7°F and 105°F, respectively. The annual average precipitation amounts to 41 inches and is uniformly distributed throughout the year. The annual average snowfall amounts to 20 inches. At least a trace of precipitation occurs on approximately one-third of the days during the year. Prevailing winds are from the west-northwest. Southwesterly winds are more frequent during the summer months and northwesterly winds are more frequent during the winter months. The region is frequently under the influence of the Bermuda High Pressure System during the summer months. Air quality problems in the region are typically associated with this summer phenomenon.

4.11.1.2 Existing Air Quality

Ambient Air Quality Standards

The EPA has established National Ambient Air Quality Standards (NAAQS) for six pollutants: sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM) including PM less than 10 microns in diameter (PM_{10}) and PM less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). Total suspended particulate (TSP) standards were replaced in 1987 by the PM_{10} standards. The NAAQS were set at levels the EPA believed were necessary to protect human health (primary standards) and human welfare (secondary standards). The federal NAAQS for criteria pollutants are the same as the state standards established by the MDE, PDEP, and Virginia Department of Environmental Quality (VDEQ). Both MDE and PDEP also list standards for gaseous fluorides. The federal and state ambient air quality standards are summarized in table 4.11.1-1.

TABLE 4.11.1-1

Ambient Air Quality Standards

Air Pollutant	Averaging Period	Primary NAAQS ($\mu g/m^3$)a/	Secondary NAAQS ($\mu g/m^3$)a/	Maryland NAAQS ($\mu g/m^3$)a/	Pennsylvania NAAQS ($\mu g/m^3$)a/	Virginia NAAQS ($\mu g/m^3$)a/
Ozone (O_3)	8-Hour b/	157	157	157	157	157
Carbon Monoxide (CO)	1-Hour c/	40,000	-	40,000	40,000	40,000
	8-Hour d/	10,000	-	10,000	10,000	10,000
Nitrogen Dioxide (NO_2)	Annual e/	100	100	100	100	100
$PM_{2.5}$ e/	24-Hour f/	35	35	65	35	35
	Annual g/	15	15	15	15	15
PM_{10} e/	24-Hour h/	150	150	150	150	150
	Annual i/	-	-	50	-	50
TSP j/	24-Hour	-	-	-	-	-
	Annual	-	-	-	-	-
Lead (Pb)	3-Month d/	1.5	1.5	1.5	1.5	1.5
Sulfur Dioxide (SO_2)	3-Hour c/	-	1,300	1,300	1,300	1,300
	24-Hour c/	365	-	365	365	365
	Annual d/	80	-	80	80	80
Gaseous Fluorides k/	24-Hour d/	-	-	1.2	5	-
	72-Hour d/	-	-	0.4	-	-

a/ $\mu g/m^3$ = micrograms per cubic meter.

b/ The 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations at each location within an area over each year must not exceed standard.

c/ Not to be exceeded more than once per year.

d/ Arithmetic mean not to be exceeded.

e/ EPA established a policy to use the implementation of the Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR) permitting programs for PM_{10} as a surrogate for a $PM_{2.5}$ permitting program (71 FR 6718). These policies remain in effect until promulgation of EPA's implementation of a $PM_{2.5}$ NNSR program and approval of State Implementation Plans (SIPs) containing $PM_{2.5}$ PSD programs.

f/ The 3-year average of the 98th percentile of 24-hour concentrations must not exceed standard. The NAAQS was revised effective December 18, 2006 (71 FR 61144). Note that both the 1997 (65 µg/m3) and 2006 (35 µg/m3) standards are listed in 40 CFR 50 for the purposes of implementing $PM_{2.5}$ control strategies. Maryland Ambient Air Quality Standard (MAAQS) have not yet been revised.

g/ The 3-year average of the annual concentrations from a single or multiple local sites must not exceed standard.

h/ The expected number of days with maximum hourly average concentrations greater than the standard must be equal to or less than one.

i/ The 3-year average of the annual concentrations must not exceed standard. The annual PM_{10} standards of the NAAQS was revoked effective December 18, 2006 (71 FR 61144). MAAQS have not yet been revised. Note that because the PSD and NNSR permitting programs for PM_{10} currently serve as a surrogate for implementation of PSD and NNSR permitting programs for $PM_{2.5}$, compliance with the former annual standard of 50 $\mu g/m^3$ will continue to be evaluated.

j/ NAAQS revoked in 1987 (52 FR 24854) and is listed for completeness because TSP nonattainment areas remain designated (40 CFR 81).

k/ MDE also has a standard for total fluorides in and on field crops, forage for consumption by grazing ruminants and trees, grasses, herbs, etc.

Air Quality Control Regions and Attainment Status

Air Quality Control Regions (AQCRs) are areas established for air quality planning purposes in which implementation plans describe how ambient air quality standards will be achieved and maintained. AQCRs were established by the EPA and local agencies, in accordance with section 107 of the CAA and its amendments, as a means to implement the CAA and comply with the NAAQS through state implementation

plans (SIPs). The AQCRs are intra- and interstate regions such as large metropolitan areas where the improvement of the air quality in one portion of the AQCR requires emission reductions throughout the AQCR. The project area is located in four AQCRs. In addition, ship transit would impact one Virginia and one Maryland AQCR. Following is a list of AQCRs evaluated for the project:

- Metropolitan Baltimore Intrastate (AQCR 115) – Baltimore and Harford Counties, Maryland;
- Eastern Shore Intrastate (AQCR 114) – Cecil County, Maryland;
- South Central Pennsylvania Intrastate (AQCR 196) – Lancaster County, Pennsylvania;
- Metropolitan Philadelphia Interstate (AQCR 045) – Chester County, Pennsylvania;
- Hampton Roads Intrastate (AQCR 223) – Norfolk, Virginia Beach, and Newport News, Virginia; and
- Southern Maryland Intrastate (AQCR 116) – Calvert County, MD.

The proposed LNG terminal would be located in Baltimore County, Maryland. The proposed pipeline would be located in Baltimore, Harford, and Cecil Counties in Maryland, and Lancaster and Chester Counties in Pennsylvania. The optional power plant would be located in Baltimore County, Maryland.

Each AQCR, or portion thereof, is designated based on compliance with the NAAQS. AQCR designations fall under three categories as follows: attainment (areas in compliance with the NAAQS); nonattainment (areas not in compliance with the NAAQS); or unclassifiable. AQCRs that were previously designated nonattainment, but have since met the requirements to be classified attainment are also classified as maintenance areas. Air quality in all of the project counties is designated as attainment or unclassifiable with respect to the NAAQS for CO, NO_2, PM_{10}, SO_2, and Pb.

With respect to O_3, the project counties are all designated as nonattainment, with the exception of Lancaster County. All of the nonattainment counties are classified as Subpart 2/Moderate for the 8-hour NAAQS. Lancaster County was previously classified as Subpart 1/Marginal nonattainment for the 8-hour NAAQS. On July 6, 2007, Lancaster County was redesignated to attainment for the 8-hour NAAQS under an EPA approved maintenance plan. The EPA has issued anti-backsliding measures to facilitate the transition from the 1-hour NAAQS to the 8-hour NAAQS. Attainment with the 8-hour NAAQS for the Subpart 1/Marginal nonattainment areas was required by June 2007 and for the Subpart 2/Moderate nonattainment areas is required by June 2010. There are no Subpart 1/Marginal nonattainment areas impacted by the project.

With respect to $PM_{2.5}$, Cecil County is designated as attainment and the remaining project counties are designated as nonattainment. Because $PM_{2.5}$ standards for NAAQS were promulgated in 1997 and revised in 2006, states needed to reevaluate attainment designations by December 2007 and are required to submit SIP control strategies to EPA in two phases. The first submittal is due to the EPA in April 2008 and the second submittal is due to the EPA in April 2013. The EPA must issue final designations for the 2006 NAAQS by December 2009. Attainment with the 1997 NAAQS is required by April 2010 while attainment with the 2006 NAAQS is required by April 2015, unless additional time is granted to meet the standards.

Portions of Baltimore County in Maryland and Chester and Lancaster Counties in Pennsylvania remain designated as nonattainment for TSP. The pipeline route potentially crosses some of the designated areas in Baltimore County, but does not cross through the designated areas in Pennsylvania. Although TSP designations continue to be listed in 40 CFR 81, the TSP NAAQS were revoked when the PM_{10} standards were promulgated in 1987. SIP control strategies now use PM_{10} as the indicator for PM.

Air Quality Monitoring and Existing Air Quality

Air quality monitors are located throughout each state serving a variety of purposes, but mainly to determine the air quality conditions in representative areas. Monitoring data obtained from the EPA AirData network (EPA, 2006) for 2004 through 2007 were reviewed to characterize ambient air quality related to regulated

criteria pollutants in the vicinity of the project area. The pollutants include O_3, CO, NO_2, $PM_{2.5}$, PM_{10}, SO_2, and Pb. TSP is no longer measured in the project counties. Data from several monitors were reviewed for each AQCR, and the monitor resulting in the highest background concentrations for each pollutant and averaging period were used. A summary of these data for each AQCR is presented in table 4.11.1-2.

TABLE 4.11.1-2

Existing Ambient Air Concentrations for the Project Area

Air Pollutant	Averaging Period	Air Quality Control Region (ACQR)	Existing Air Quality ($\mu g/m^3$)	Monitoring Station Number and Location h/
Ozone (O_3)				
	8-Hour a/	AQCR 115	185	240251001 Edgewood, MD
		AQCR 114	182	24015003 Elkton, MD
		AQCR 196	165	420710007 Lancaster, PA
		AQCR 045	167	420290100 Toughkenamon, PA
Carbon Monoxide (CO)	1-Hour b/	AQCR 115	4,466	240053001 Essex, MD
		AQCR 114	2,863	420710007 Lancaster, PA
		AQCR 196	2,863	420710007 Lancaster, PA
		AQCR 045	4,924	100032004 Wilmington, DE
	8-Hour b/	AQCR 115	2,977	240053001 Essex, MD
		AQCR 114	1,718	420710007 Lancaster, PA
		AQCR 196	1,718	420710007 Lancaster, PA
		AQCR 045	2,519	100032004 Wilmington, DE
Nitrogen Dioxide (NO_2)	Annual c/	AQCR 115	28	240053001 Essex, MD
		AQCR 114	26	420710007 Lancaster, PA
		AQCR 196	26	420710007 Lancaster, PA
		AQCR 045	34	100032004 Wilmington, DE
$PM_{2.5}$	24-Hour d/	AQCR 115	35	240053001 Essex, MD
		AQCR 114	40	420710007 Lancaster, PA
		AQCR 196	40	420710007 Lancaster, PA
		AQCR 045	40	420710007 Lancaster, PA
	Annual	AQCR 115	15	240053001 Essex, MD
		AQCR 114	16	420710007 Lancaster, PA
		AQCR 196	16	420710007 Lancaster, PA
		AQCR 045	16	420710007 Lancaster, PA
PM_{10}	24-Hour f/	AQCR 115	58 e/	240053001 Essex, MD
		AQCR 114	59	420710007 Lancaster, PA
		AQCR 196	59	420710007 Lancaster, PA
		AQCR 045	68	100032004 Wilmington, DE
	Annual	AQCR 115	24	240053001 Essex, MD
		AQCR 114	19	420710007 Lancaster, PA
		AQCR 196	19	420710007 Lancaster, PA
		AQCR 045	23	100032004 Wilmington, DE
Sulfur Dioxide (SO_2)	3-Hour b/	AQCR 115	220	240053001 Essex, MD
		AQCR 114	134	420710007 Lancaster, PA
		AQCR 196	134	420710007 Lancaster, PA
		AQCR 045	395	100031008 Delaware City, DE
	24-Hour b/	AQCR 115	50	240053001 Essex, MD
		AQCR 114	58	420710007 Lancaster, PA
		AQCR 196	58	420710007 Lancaster, PA
		AQCR 045	141 i/	100031008 Delaware City, DE
	Annual c/	AQCR 115	11	240053001 Essex, MD
		AQCR 114	14	420710007 Lancaster, PA
		AQCR 196	14	420710007 Lancaster, PA
		AQCR 045	18	420450002 Delaware CO., PA

TABLE 4.11.1-2

Existing Ambient Air Concentrations for the Project Area

Air Pollutant	Averaging Period	Air Quality Control Region (ACQR)	Existing Air Quality ($\mu g/m^3$)	Monitoring Station Number and Location h/
Lead (Pb)	Quarter g/	(AQCR 115)	ND	-
		(AQCR 114)	ND	-
		(AQCR 196)	ND	-
		(AQCR 045)	ND	-

a/ Average of the annual 4th highest 8-hour average observations recorded during the years 2005, 2006, and 2007.
b/ Maximum of the 2nd highest observations recorded during the years 2005, 2006, and 2007.
c/ Maximum annual average observation recorded during the years 2005, 2006, and 2007.
d/ Data for years 2003, 2004 and 2005 used for monitor 240053001.
e/ Average of the annual average observations recorded during the years 2005, 2006, and 2007.
f/ 4th highest 24-hour average observation recorded during the years 2005, 2006, and 2007.
g/ Maximum quarterly average observation recorded during the years 2005, 2006, and 2007.
h/ Area monitor resulting in the highest background concentration for that AQCR.
i/ Data for years 2004, 2005, and 2006 used for monitor 100031008 due to suspect data in 2007.
ND = Not defined.

4.11.1.3 Regulatory Requirements for Air Quality

The proposed project would be potentially subject to a variety of federal, state, and local regulations pertaining to the construction or operation of air emission sources. The MDE, PDEP, and VDEQ have the primary jurisdiction over air emissions produced by the proposed project in Maryland, Pennsylvania, and Virginia, respectively. Each agency enforces its own regulations as well as EPA's federal requirements. The following sections summarize the applicability of various state and federal regulations.

Federal Air Quality Requirements

The CAA, 42 USC 7401 et seq., as amended in 1977 and 1990, and 40 CFR parts 50 through 99 are the basic federal statues and regulations governing air pollution in the United States. The following federal requirements have been reviewed for applicability to the proposed Project.

- New Source Review (NSR)/Prevention of Significant Deterioration (PSD)/Nonattainment New Source Review (NNSR) Construction Permits (40 CFR 52 and 40 CFR 51);
- Acid Rain Operating Permits (40 CFR 72);
- New Source Performance Standards (NSPS) (40 CFR 60);
- National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR 61 and 40 CFR 63);
- Title V Operating Permits (40 CFR 70);
- Chemical Accident Prevention Provisions;
- Federal Class I Area Protection (40 CFR 81); and
- General Conformity (40 CFR 93).

The MDE and PDEP are delegated by the EPA to implement the Federal programs. Each state has additional programs that further regulate emission sources.

NSR/PSD/NNSR

Separate preconstruction review procedures have been established for projects that are proposed to be built in attainment areas versus nonattainment areas. The preconstruction review process for new or modified major

sources located in attainment areas is called NSR and may include a PSD review. This review process is intended to keep new air emission sources from causing existing air quality to deteriorate beyond acceptable levels codified in the federal regulations. Construction of major new stationary sources in nonattainment areas must be reviewed in accordance with the nonattainment NSR regulations which contain stricter thresholds and requirements.

Construction of major new stationary sources in attainment areas must be reviewed in accordance with the PSD regulations. The PSD rule defines a major source as any source with a potential to emit (PTE) 100 tons per year (tpy) or more of any criteria pollutant for source categories listed in 40 CFR 52.21(b)(1)(i) or 250 tpy or more of any criteria pollutant for source categories that are not listed. If a new source is determined to be a major source for any criteria pollutants, then other remaining criteria pollutants would be subject to PSD review if those pollutants are emitted at rates that exceed significant emission thresholds (100 tpy for CO; 40 tpy for NO_x, VOC, and SO_2 each; and 15 tpy for PM_{10}). Sources which exceed the 100 or 250 tpy thresholds are then subject to a PSD review and PSD increments which are used to define the maximum allowable pollutant concentration increases over baseline concentrations that are allowed in attainment areas. The Class I and class II PSD increments are listed in table 4.11.1-3.

TABLE 4.11.1-3

PSD Class I and Class II Increments

Pollutant	Class I Increment ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)
SO_2		
3-Hour	25	512
24-Hour	5	91
Annual	2	20
PM_{10}		
24-Hour	8	30
Annual	4	17
NO_x		
Annual	2.5	25

Major source and significant emission thresholds have not yet been established for $PM_{2.5}$. On November 1, 2005, EPA published proposed major source thresholds and proposed significant emission thresholds for $PM_{2.5}$ and its precursors in the same notice but has not adopted final thresholds. Until the EPA adopts a PSD program for $PM_{2.5}$, the EPA has established policies whereby PM_{10} programs serve as a surrogate (71 FR 6718). Ammonia thresholds would be established in individual SIP attainment demonstrations.

Major new stationary sources applying for a PSD construction permit must include a Best Available Control Technology (BACT) analysis and a detailed dispersion modeling analysis in its permit application.

Table 4.11.1-4 represents the annual maximum potential emissions from the proposed LNG terminal and the optional power plant and relevant PSD threshold criteria. If built alone, the proposed LNG terminal would not be subject to a PSD review because emissions of each NSR regulated pollutant are less than 100 tpy. If the optional power plant is built, MDE has indicated that emissions from the LNG terminal and power plant would be combined and subject to one threshold level and receive a combined permit. The optional power plant would be classified as one of the 28 source categories. Therefore, the power plant and LNG terminal combined would be subject to the 100 tpy threshold. Emissions of CO would be greater then 100 tpy and would be subject to PSD review. The remaining criteria pollutants would be subject to the significant emissions thresholds. PM_{10} emissions would exceed the significant emission thresholds and would also require PSD review. $PM_{2.5}$ and ammonia emissions may also be significant. NO_x and VOC emissions would be subject to NNSR thresholds as discussed below.

One additional factor considered in the PSD permit review process is the potential impacts on protected Class I areas. If a project is located within 100 kilometers of a federal Class I area, additional modeling analysis may

be required to determine the potential impacts on the area. Areas of the country are categorized as Class I, Class II, or Class III. Class I areas were designated specifically as pristine natural areas or areas of natural significance and have the lowest increment of permissible deterioration, which precludes development near these areas. Many areas in the United States are classified as Class II. Class II areas are designed to allow moderate, controlled growth. Class III designations, intended for heavily industrialized zones, can be made only on request and must meet all requirements outlined in 40 CFR 51.166. Class I areas are given special protection under the PSD program. If the new source is required to comply with PSD program requirements and is near a Class I area, the source is required to determine its impacts at the nearby Class I area(s). The source is also required to notify the appropriate federal land manager(s) for the nearby Class I area(s).

The nearest Class I area is the Shenandoah National Park in Virginia and is located approximately 145 kilometers from the site. The Brigantine Wilderness Area in New Jersey is the next closest and is located approximately 193 kilometers east of Logan Township. Both Class I areas are located at distances of greater than 100 kilometers, such that a Class I area impact analysis would not be automatically required.

TABLE 4.11.1-4

Estimated Emissions From LNG Terminal and Pipeline Interconnect Construction

Pollutant/Year	NO_X	VOC	$PM_{2.5}$	SO_2
2008	391.1	39.3	20.1	7.2
2009	1,377.8	150.32	68.0	34.7
2010	269.9	28.2	13.7	8.8

Nonattainment New Source Review Construction Permits

Baltimore County is designated as an O_3 nonattainment area. Stationary sources of VOC and NO_x are subject to O_3 nonattainment area requirements because these pollutants are precursors to ground-level O_3 formation. The NNSR major source thresholds for stationary sources located in Baltimore County are 25 tpy for NO_x and 25 tpy for VOC. Major new stationary sources applying for a nonattainment NSR construction permit must include a Lowest Achievable Emission Rate (LAER) analysis and identify emission offsets in its permit application.

Baltimore County is also designated as a $PM_{2.5}$ nonattainment area. The EPA has not yet established NNSR requirements for $PM_{2.5}$. Until the EPA adopts a nonattainment NSR program for $PM_{2.5}$, the EPA has established policies whereby PM_{10} programs serve as a surrogate (71 FR 6718). Therefore, the NNSR major source threshold for $PM_{2.5}$ is 100 tpy.

The proposed LNG terminal would be subject to O_3 NNSR review because potential emissions of NO_X are greater than 25 tpy. The optional power plant would also be subject to NNSR review because potential emissions of each NO_X and VOC are greater than 25 tpy. In either case, AES would be required to receive a NNSR permit from the MDE after it has reviewed the potential emissions and controls. Neither the proposed LNG terminal nor the optional power plant would be subject to $PM_{2.5}$ nonattainment NSR review because potential emissions of the surrogate PM_{10} are less than 100 tpy.

Title V Operating Permits

Title V of the CAA requires states to establish an air operating permit program. The requirements of Title V are outlined in the federal regulations in 40 CFR 70 and in the MDE's regulations at COMAR 26.11.03. The permits required by these regulations are often referred to as Title V or Part 70 permits.

Major sources (i.e., sources with a PTE greater than a major source threshold level) are required to obtain a Title V operating permit. Title V major source threshold levels in Baltimore County are: 100 tpy for CO, SO_2, PM_{10}, or $PM_{2.5}$, 25 tpy for NO_X or VOC, 10 tpy for an individual hazardous air pollutant (HAP), or 25 tpy for any combination of HAPs.

As shown in table 4.11.1-4, the proposed LNG terminal would be subject to the program because the PTE for NO_X is greater than the major source threshold. Therefore, the proposed LNG terminal would need to apply for and obtain a Title V operating permit from the MDE. All other emissions, including HAP emissions (8.6 tpy total), would be less than major source thresholds.

Likewise, the proposed LNG terminal combined with the optional power plant would be subject to the program because the PTE for NOx, CO, and VOC would be greater than the major source thresholds and therefore would be required to obtain a Title V operating permit from the MDE. All other emissions, including HAP emissions (13.3 tpy total, 7.3 tpy for greatest single HAP), would be less than major source thresholds.

Acid Rain Operating Permits

The requirements of the Acid Rain permit program are outlined in 40 CFR 72. The program applies to new utility units that supply more than one-third of the potential electrical output capacity and more than 25 MW output to any power distribution system for sale. Acid rain permit applications must be submitted at least 24 months prior to the new utility unit commencing operation.

The Acid Rain Permit program would not apply to the proposed LNG terminal. None of the equipment to be installed at the LNG terminal could be defined as a utility unit. However, the Acid Rain Permit program would apply to the non-jurisdictional, optional power plant, which would generate 300 MW output for sale to the grid.

New Source Performance Standards

NSPS regulations (40 CFR 60) establish pollutant emission limits and monitoring, reporting, and recordkeeping requirements for various emission sources based on source type and size. These regulations apply to new, modified, or reconstructed sources. The following NSPS requirements were identified as potentially applicable to the specified sources at the facility.

Subpart Db of 40 CFR 60, *Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units,* applies to fuel-fired industrial, commercial, or institutional steam-generating units with maximum heat input rates greater than 100 MMBtu/hr. The definition of an applicable unit includes sources that produce steam or heat water or any other heat transfer medium. The hot water heaters, which would be used to vaporize the LNG, would have a capacity of 345 MMBtu/hr each and would burn natural gas to heat an intermediate fluid (a glycol water-water solution). The heaters are therefore subject to Subpart Db. Subpart Db establishes specific emission limits for NO_X (0.1 lb/MMBtu). The proposed hot water heaters would comply with the emission standard with a NO_X emission rate of 0.004 lb/MMBtu. Subpart Db recordkeeping and reporting requirements would also apply.

Subpart KKKK of 40 CFR 60, *Standards of Performance for Stationary Combustion Turbines,* applies to stationary combustion turbines that are modified, constructed, or reconstructed after February 18, 2005 and have maximum heat input rates greater than 10 MMBtu/hr. Turbines subject to Subpart KKKK are exempt from 40 CFR 60 Subpart GG emission standards for turbines. Likewise, duct burners and heat recovery steam generators (HRSGs) subject to Subpart KKKK are exempt from 40 CFR Subparts Da, Db, and Dc emission standards for steam generating units. Subpart KKKK would apply only to the proposed optional power plant. The proposed NO_X emissions of 2 parts per million dry volume (ppmdv) at 15% O_2 would comply with the 15 ppmdv at 15% O_2 emission standard. The power plant would be fueled exclusively with natural gas and would comply with the fuel sulfur content requirements. The power plant would include a continuous emissions monitoring system (CEMS) that would meet the monitoring requirements.

Subpart Kb of 40 CFR 60, *Standards of Performance for Volatile Organic Liquid Storage Vessels,* lists affected emission sources as storage vessels containing volatile organic liquids (VOLs). Regulatory applicability is dependent on the construction date, size, vapor pressure, and contents of the storage vessel. Subpart Kb applies to new tanks, unless otherwise exempted, that have a storage capacity between 75 m^3 (19,813 gal) and 151 m^3 (39,890 gal) and contain VOCs with a maximum true vapor pressure greater than or

equal to 15.0 kilopascals (kPa). Subpart Kb also applies to tanks that have a storage capacity greater than or equal to 151 m^3 and contain VOCs with a maximum true vapor pressure greater than or equal to 3.5 kPa. Each of the LNG storage tanks would have a capacity of 160,000 m^3, which would meet the volume criteria for Subpart Kb. The LNG is considered a VOL because a small potion of the LNG would consist of VOCs. The proposed LNG storage tanks would operate at approximately -260°F and the vapor true pressure of the VOC (assumed to be propane) at this temperature is 0.0007 kPa. This would be well below the applicability threshold of 3.5 kPa; therefore, Subpart Kb would not apply.

Subpart IIII of 40 CFR 60, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines,* applies to diesel-fueled stationary compression ignition internal combustion engines of any size that are constructed, modified, or reconstructed after July 11, 2005. The rule requires manufacturers of these engines to meet emission standards based on engine size, model year, and end use. The rule requires owners and operators to configure, operate, and maintain the engines according to specifications and instructions provided by the engine manufacturer. The requirements would apply to the proposed fire engines and standby emergency generator. The recordkeeping and reporting requirements would also apply.

National Emission Standards for Hazardous Air Pollutants

The NESHAPs, codified in 40 CFR Parts 61 and 63, regulate HAP emissions. Part 61 was promulgated prior to the 1990 Clean Air Act Amendments (CAAA) and regulates specific HAPs: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride.

The 1990 CAAA established a list of 189 HAPs, resulting in the promulgation of Part 63. Part 63, also known as the Maximum Achievable Control Technology (MACT) standards, regulates HAP emissions from major sources of HAP emissions and specific source categories that emit HAPs. Part 63 defines a major source of HAPs as any source that has the PTE 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

LNG storage and process facilities are not one of the source categories regulated by Part 61; therefore, the requirements of Part 61 would not apply. Relevant emission standards to the proposed LNG terminal are listed in Part 63, including marine vessel loading operations (Subpart Y); oil and gas production facilities (Subpart HH); natural gas transmission and storage facilities (Subpart HHH); industrial, commercial, and institutional boilers and process heaters (Subpart DDDDD); and reciprocating internal combustion engines (Subpart ZZZZ). With the exception of Subpart ZZZZ, these subparts establish requirements for major sources of HAPs only. Revisions to Subpart ZZZZ were promulgated January 18, 2008 to include reciprocating internal combustion engines located at the HAP "area sources". The potential HAP emissions from the LNG terminal would be 8.6 tpy in aggregate and 8.2 tpy of hexane (the individual HAP with the greatest potential emissions). Therefore, the LNG terminal would not be a major source of HAPs and therefore would only be subject to the NESHAPs Subpart ZZZZ for the reciprocating internal combustion engines. Compliance with NSPS Subpart IIII would also satisfy the requirements of Subpart ZZZZ.

In addition to those emission standards identified above, emission standards for stationary combustion turbines (Subpart YYYY) and industrial process cooling towers (Subpart Q) are relevant to the optional power plant. As with the other subparts, these emission standards apply only to major sources of HAPs. The potential HAP emissions from the LNG terminal plus optional power plant would be 13.3 tpy in aggregate and 7.3 tpy of formaldehyde (the individual HAP with the greatest potential emissions). Therefore, the LNG terminal plus optional power plant configuration would not be a major source of HAPs and would not be subject to the NESHAPs.

Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and minimize potential impacts if a release does occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than specified in the regulation, the facility must prepare and

submit a risk management plan (RMP). If a facility does not have a listed substance on-site, or the quantity of a listed substance is below the applicability threshold, the facility does not have to prepare an RMP. In the latter case, the facility still must comply with the requirements of the general duty provisions in Section 112(r)(1) of the 1990 CAAA if there is any regulated substance or other extremely hazardous substance on-site. The general duty provision is as follows:

"The owners and operators of stationary sources producing, processing, handling and storing such substances have a general duty to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility, taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur."

Stationary sources are defined in 40 CFR 68 as any buildings, structures, equipment, installations, or substance-emitting stationary activities which belong to the same industrial group, that are located on one or more contiguous properties, are under control of the same person (or persons under common control), and are from which an accidental release may occur. However, the definition also states that the term stationary source does not apply to transportation, including storage incidental to transportation, of any regulated substance or any other extremely hazardous substance. The term transportation includes transportation subject to oversight or regulation under 49 CFR Parts 192, 193, or 195. It can also mean a state natural gas or hazardous liquid program for which the state has in effect a certification to DOT under 49 USC Section 60105. Based on these definitions, the only substance that would potentially be applicable to the RMP regulation is the LNG that is stored incidental to transportation. Therefore, RMP would not be required for this facility. However, the facility would have to comply with the general duty provisions of the 1990 CAAA as discussed above.

The OSHA standard 29 CFR 1910.119, Process Safety Management (PSM) of Highly Hazardous Chemicals, is also not applicable to the Project. Based on standard interpretations published by OSHA in response to questions on PSM applicability to LNG facilities, OSHA has concluded that current USDOT regulations in 49 CFR Parts 192 and 193 and enforced by the Pipeline and Hazardous Materials Safety Administration (PHMSA) cover LNG and gas transmission and distribution processes, and that OSHA is precluded from enforcing the PSM standard with respect to working conditions associated with fire and explosion hazards of these processes. Therefore, the Pipeline and LNG Terminal, which are subject to 49 CFR Parts 192 and 193, respectively, would not be subject to the PSM regulations.

General Conformity

A conformity analysis must be conducted by the lead federal agency if a federal action would result in the generation of emissions that would exceed the conformity threshold levels (de minimus) of the pollutants(s) for which an air basin is in nonattainment. According to section 176(c)(1) of the CAA (Title 40 CFR Part 51.853), a federal agency cannot approve or support any activity that does not conform to an approved SIP. Conforming activities or actions should not, through additional air pollutant emissions:

- cause or contribute to new violations of the NAAQS in any area;
- increase the frequency or severity of an existing violation of any NAAQS; or
- delay timely attainment of any NAAQS or interim emission reductions.

General conformity assessments must be completed when the total direct and indirect emissions of a planned project would equal or exceed the specified pollutant conformity emission thresholds per year in each nonattainment area. With regard to the proposed project, the relevant general conformity pollutant thresholds are:

- O_3 nonattainment precursors: 100 tpy of NOx and 50 tpy of VOCs for portions of the project located in O_3 nonattainment areas that are within an O_3 transport region and are not classified as serious, severe, or extreme;

- O_3 maintenance precursors: 100 tpy of NO_X, SO_2, or NO_2 and 50 tpy of VOCs for portions of the project located in O_3 maintenance areas that are within an O_3 transport region;
- $PM_{2.5}$: 100 tpy of $PM_{2.5}$, SO_2, NO_X, and VOC or ammonia for portions of the project located in $PM_{2.5}$ nonattainment areas; or
- if emissions of a nonattainment pollutant are regionally significant (i.e., emissions of a nonattainment pollutant equal or exceed 10 percent of the nonattainment area emissions of the nonattainment pollutant).

A conformity determination must show that the emissions would conform to the applicable SIP and would not reduce air quality in the nonattainment area. This can be demonstrated through acquisition of emission offsets, SIP revisions, or dispersion modeling. On-site mitigation of emissions, (i.e., controls above and beyond what is required by regulation), can also be used to demonstrate conformity. According to 40 CFR 51.853, emissions from sources subject to NNSR or PSD requirements are exempt and are deemed to have conformed.

As described above, the project counties are designated as O_3 moderate or marginal nonattainment and maintenance areas. Both direct and indirect emissions resulting from the project must be calculated and combined for comparison against the thresholds. The combined potential direct and indirect emissions of NO_X from the proposed construction activities would be greater than 100 tpy in both Maryland and Pennsylvania. Also, VOC emissions from the proposed construction activities in Maryland during 2009 would be greater than 50 tpy. Last, marine traffic emissions of NO_X would be greater than 100 tpy in Maryland and Virginia waters. The Virginia waters are also located in O_3 maintenance areas.

Four of the project counties are also designated as nonattainment areas for $PM_{2.5}$ (the relevant Virginia counties are all designated attainment). In the case of NO_X, precursor emissions must be evaluated unless the local SIP specifically identifies that NO_X is determined to not be a significant precursor. In the case of VOC and ammonia, precursor emissions must be evaluated only if the local SIP identifies VOC and ammonia as significant precursors. These determinations have not yet been made by the MDE or the PDEP. Direct $PM_{2.5}$ emissions resulting from the project activities would be less than 100 tpy in both Maryland and Pennsylvania. In contrast, SO_2 emissions from marine traffic activities during project operations would be greater than 100 tpy in Maryland. Based on these emissions, the project would be subject to general conformity determinations in Maryland, Pennsylvania, and Virginia. Section 4.11.1.5 provides additional information about the General Conformity Determination.

Applicable State Air Quality Requirements

COMAR 26.11.02.09 Construction Permits

The MDE requires a construction permit for all new facilities meeting specific criteria set forth in COMAR 26.11.02.09. The purpose of the construction permit is to ensure that any new, modified, replaced, or relocated emission sources comply with all applicable state and federal air quality requirements. The MDE is delegated to implement the federal PSD and nonattainment NSR programs through this regulation. Based on the criteria in the rule, the LNG terminal would need to obtain air permits for the hot water heaters, six of the emergency fire water pumps, the standby emergency generator, and the vent stack heater prior to construction. The optional power plant would be required to apply with the MPSC, which is delegated to implement the federal PSD and nonattainment NSR programs for facilities that generate more than 70 MW of electricity.

COMAR 26.11.03 Operating Permits

The MDE's Title V operating permit program is regulated under COMAR 26.11.03. As discussed in detail above, the LNG terminal would require a Title V operating permit as would the LNG terminal plus optional power plant configuration.

COMAR 26.11.09 Emission Standards for Combustion Sources

COMAR 26.11.09 specifies emission standards for fuel burning equipment. Standards are specified for visible emissions, PM, SO_2, and major NO_X sources. The LNG terminal's hot water heaters, fire pumps, standby emergency generator, and vent stack heater would be subject to these emission standards. The optional power plant's turbine and duct burner would also be subject to these emission standards.

COMAR 26.11.17 Control of VOC and NO_X

COMAR 26.11.17 constitutes MDE's Reasonably Available Control Technology (RACT) rules which apply to major sources of nonattainment pollutants. The RACT rules would apply to NO_X emissions from the LNG terminal, and would apply to both VOC and NO_X emissions from the LNG terminal plus optional power plant configuration. The LAER determinations required under nonattainment NSR permitting would comply with the RACT requirements.

4.11.1.4 Air Quality Impacts and Mitigation

Construction Air Pollutant Emissions

Construction of the proposed LNG terminal, pipeline, and optional power plant facilities would have impacts on air quality due to fugitive dust emissions and combustion products from construction equipment. The construction activities that would generate air emissions include:

- site preparation (earth moving);
- operation of vehicles and trucks during construction;
- operation of marine vessels during construction;
- installation of terminal components;
- marine pier rehabilitation;
- pipeline and pipeline interconnection installation; and
- employee commuting trips.

The amount of fugitive dust would depend on numerous factors including: degree of vehicular traffic; amount of exposed soil, soil moisture content; and wind speed. Construction of the LNG terminal and pipeline would also result in combustion emissions from a variety of sources, including bulldozers, cranes, trucks, backhoes, side boom tractors, pile drivers, and dredges.

Site preparation would include demolition of existing structures, stripping the top layer of earth, constructing the LNG storage tank dike, and similar site preparation for other facilities. Site preparation activities would generate fugitive dust (PM_{10}) from earthmoving and movement of construction equipment over unpaved surfaces and tailpipe emissions from construction equipment and vehicle engines. The construction equipment and vehicles would be powered by internal combustion engines that would generate PM_{10}, SO_2, NO_X, VOC, and CO emissions. Site preparation equipment would include cranes, trucks, bulldozers, front-end loaders, backhoes, compactors, graders, dump trucks, and other mobile construction equipment.

The installation of terminal components would include installation of LNG unloading and vapor return arms, major mechanical equipment, and piping and instrumentation, pier rehabilitation, as well as construction of LNG storage tanks, foundations, pipe racks, and buildings. The terminal site construction equipment would include cranes, backhoes, pile drivers, welders, and generators, which would generate tailpipe and fugitive dust emissions similar to the site preparation activities.

The proposed Project would include excavating and dredging to widen and deepen the existing approach channel and turning basin to accommodate LNG ships. The emissions generated by these activities would be predominantly combustion emissions from the construction equipment and vehicle engines. The construction

equipment would include a clam shell dredge, tugboats, workboats, crewboats, inspection/diving vessels and trucks. A DMRF would be constructed and operated at the site. The DMRF would use hoppers, conveyors, pug mills for mixing additive, and stacking equipment. The pug mills and additive delivery system would each be equipped with individual baghouses for control of $PM_{10}/PM_{2.5}$.

Site truck traffic and worker commuter vehicles would generate fugitive dust from travel on paved and unpaved surfaces as well as tailpipe emissions. The proposed LNG terminal site construction would require a workforce between 400 and 600 over a period of 36 months. The internal combustion engines for most of the construction equipment would burn diesel fuel. Some of the pickup trucks and most of the commuter vehicles would likely burn gasoline.

Air emissions would also be generated during construction of the proposed natural gas sendout pipeline. The pipeline construction activities would take place over a period of about 12 months. Similar to the terminal construction emissions, the pipeline construction activities would generate fugitive dust from clearing, trenching, backfilling, grading, and traffic on paved and unpaved areas, as well as combustion emissions from construction equipment, commuter trips, and supply vehicles. The internal combustion engines powering most of the pipeline construction equipment and vehicles would burn diesel fuel and the remaining vehicles would burn gasoline. Equipment that would be used for the pipeline construction activities would include earthmoving equipment, pickup trucks, compressors, pumps, trenchers, stringing trucks, welding rigs, and equipment for restoring disturbed areas.

The emissions from construction activities are not part of the permitting requirements for the LNG terminal and pipeline. Nevertheless, emissions from the construction activities are discussed above to assist in assessing the environmental issues associated with the Project. Estimates were based on EPA emission factors for stationary engines (for construction equipment and commuter vehicle tailpipe emissions), EPA estimation methods for vehicle travel on paved roads (for dust generated by on-site truck and vehicle traffic and worker commuting trips), and EPA estimation methods for concrete batch plants. SO_2 emission factors were based on appropriate chapters of EPA's AP-42. AP-42 assumes that diesel fuel contains approximately 0.3 to 0.5 percent sulfur by weight. AES indicated that it would use the diesel fuels that are commercially available in the Project area at the time of construction. These diesel fuels are expected to contain less than 0.05 percent sulfur by weight based on current EPA fuel standards. Therefore, SO_2 emissions provided by AES are conservative. The emissions from construction activities would include $PM_{2.5}$, PM_{10}, NO_X, CO, SO_2, VOCs, and HAPs. The total criteria pollutant emissions from construction are summarized in table 4.11.1-4. It is conservatively assumed that all PM_{10} is less than 2.5 microns in diameter; therefore, the PM_{10} emissions are equal to the $PM_{2.5}$ emissions.

Note: Emissions summaries are summed from all counties covering the LNG terminal, pipeline and ship traffic related to construction. Construction emissions and impacts are addressed in the General Conformity analysis in Section 4.11.1.5.

These emissions would be spread over a period of about 36 months and would increase pollutant concentrations in the vicinity of the project; however, their effect on ambient air quality would vary with time due to the construction schedule, the mobility of the sources, and the variety of emission sources. The emissions would cease at completion of the proposed project. The projected emissions in table 11.1-4 do not reflect the current project schedule or fugitive dust emissions from mobile construction equipment. Therefore, to present accurate emission estimates by construction year for the project, and accurately mitigate emissions under General Conformity, **we recommend that**:

- **<u>Prior to the end of the DEIS comment period</u>, AES and Mid-Atlantic Express provide updated construction emissions for each year and each non-attainment or maintenance area based on the currently proposed project schedule. Updated emissions should include fugitive dust from mobile construction equipment.**

Fugitive dust could have an impact in the immediate vicinity of the construction activity and would cease once construction in a particular area is complete. To ensure that measures are implemented to reduce emissions during construction, **we recommend that:**

- **<u>Prior to construction</u>, AES and Mid-Atlantic Express should prepare and file a Fugitive Dust Control Plan with the Secretary for review and written approval of the Director of OEP that specifies when/how the following measures would be applied:**
  - **a. require contractors to meet all air quality requirements and employ equipment that meets relevant emission standards;**
  - **b. apply water or dust suppressants to disturbed areas;**
  - **c. cover open hauling trucks as needed;**
  - **d. use paved roads when practical;**
  - **e. limit vehicle speeds; and**
  - **f. stabilize disturbed areas upon completion of construction.**

Air Pollutant Emissions from Operations

Operation of the LNG terminal would result in air emissions from mobile sources (LNG ships, tugs, and commuter and delivery vehicles) and stationary equipment (heaters and emergency equipment) associated with the LNG facility.

New air emission sources associated with operation of the proposed Project include:

- four natural gas-fired hot water heaters (345 MMBtu/hr each);
- one diesel fuel-fired fresh water fire pump (2.6 MMBtu/hr);
- six diesel fuel-fired salt water fire pumps (4.9 MMBtu/hr each);
- one diesel fuel-fired emergency generator (20.6 MMBtu/hr);
- one natural gas-fired vent stack heater; and
- LNG ships at berth.

Operating emissions for stationary sources associated with the Project are presented in table 4.11.1-5. In addition to the LNG terminal, emissions for a nonjurisdictional optional power plant are also presented in table 4.11.1-5. During operation of the project, air emissions from LNG marine traffic and other project related vessels would occur. Table 4.11.1-6 presents the mobile source emissions associated with the project.

AES would not own or operate the LNG ships delivering to the LNG terminal. AES proposes to attempt negotiating contracts under which tankers would operate at berth preferentially with natural gas and alternatively with low sulfur marine diesel to reduce emissions. Emissions from mobile sources, not including LNG ships, are regulated primarily through fuel mandates and engine emission standards that must be met by the engine manufacturers. These fuel mandates and engine standards would likely reduce the mobile source emissions identified above. One of the most significant reductions would be the SO2 emissions from fuel oil and diesel fuel combustion as fuel mandates significantly reduce the allowable sulfur content in these fuels.

As stated previously, general conformity would apply to the mobile source operational activities. A draft determination of conformity is presented in Section 4.11.1.5.

No air emissions would be directly generated by the pipeline during normal operation. Rare situations may require blowing down a segment of the pipeline; however, the only regulated emission that would be generated in such event is a small quantity of VOC.

TABLE 4.11.1-5

Operating Emissions Summary for the Proposed Stationary Source Configurations a/

Emission Unit (Quantity)	NO_2 lb/hr	NO_2 tpy	CO lb/hr	CO tpy	VOC lb/hr	VOC tpy	SO_2 lb/hr	SO_2 tpy	$PM_{10}/PM_{2.5}$ lb/hr	$PM_{10}/PM_{2.5}$ tpy	HAPs lb/hr	HAPs tpy
Scenario 1, LNG Terminal Only Configuration												
Hot Water Heaters (4)	3.7	18.1	7.6	34.9	4.3	18.9	0.1	0.5	7.8	34.2	2.0	8.6
Fresh Water Fire Pump (1)	4.2	0.1	0.3	0.01	0.1	0.002	0.004	0.0001	0.1	0.002	0.01	0.00031
Salt Water Fire Pumps (6)	53.4	1.6	3.6	0.10	1.1	0.03	0.05	0.002	0.3	0.01	0.04	0.0013
Emergency Generator (1)	41.9	1.3	3.4	0.10	0.9	0.03	0.04	0.001	0.2	0.007	0.03	0.00092
Vent Stack Heater (1)	0.0	0.001	0.1	0.003	0.1	0.003	0.04	0.001	0.1	0.001	0.02	0.0007
LNG Ships (at berth)		11.8		1.8		0.3		3.0		0.4	-	0.029
Total		32.9		37.0		19.3		3.6		34.6	-	8.6
Scenario 2, LNG Terminal Plus Optional Power Plant												
CTG + HRSG (1)	21.6	105.7	32.8	154.6	11.3	50.1	0.3	1.4	16.2	71.1	2.2	9.7
Hot Water Heaters (1)	0.3	1.5	0.6	3.1	0.4	1.6	0.01	0.04	0.7	2.8	0.16	0.71
Fresh Water Fire Pump (1)	4.2	0.1	0.3	0.01	0.1	0.002	0.004	0.0001	0.1	0.002	0.01	0.00031
Salt Water Fire Pumps (6)	53.4	1.6	3.6	0.10	1.1	0.03	0.05	0.002	0.3	0.01	0.04	0.0013
Emergency Generator (1)	41.9	1.3	3.4	0.10	0.9	0.03	0.04	0.001	0.2	0.007	0.03	0.00092
Vent Stack Heater (1)	0.0	0.001	0.1	0.003	0.1	0.003	0.04	0.001	0.1	0.001	0.02	0.0007
LNG Ships (at berth)		11.8		1.8		0.3		3.0		0.4		0.029
Cooling Tower (1)									0.57	2.5		-
Total		122		159.7		52.1		4.5		76.8	-	10.45
Scenario 3, LNG Terminal Plus Optional Power Plant, No HRSG Firing												
CTG (1)	19.3	94.7	29.4	138.7	3.4	15.5	0.3	1.2	13.2	58.0	2.2	9.7
Hot Water Heaters (2)	1.6	8.0	3.2	15.0	1.8	7.9	0.1	0.2	3.3	14.2	0.82	3.6
Fresh Water Fire Pump (1)	4.2	0.1	0.3	0.01	0.1	0.002	0.004	0.0001	0.1	0.00	0.01	0.00031
Salt Water Fire Pumps (6)	53.4	1.6	3.6	0.10	1.1	0.03	0.05	0.002	0.3	0.01	0.04	0.0013
Emergency Generator (1)	41.9	1.3	3.4	0.10	0.9	0.03	0.04	0.002	0.2	0.007	0.03	0.00092
Vent Stack Heater (1)	0.0	0.001	0.1	0.003	0.1	0.003	0.04	0.001	0.1	0.001	0.02	0.0007
LNG Ships (at berth)		11.8		1.8		0.3		3.0		0.4		0.029
Cooling Tower (1)									0.57	2.5		-
Total		117.5		155.7		23.8		4.4		75.1	-	13.3

TABLE 4.11.1-5

Operating Emissions Summary for the Proposed Stationary Source Configurations a/

Emission Unit (Quantity)	NO_2 lb/hr	NO_2 tpy	CO lb/hr	CO tpy	VOC lb/hr	VOC tpy	SO_2 lb/hr	SO_2 tpy	$PM_{10}/PM_{2.5}$ lb/hr	$PM_{10}/PM_{2.5}$ tpy	HAPs lb/hr	HAPs tpy
Regulatory Thresholds												
PSD Major Source b/	NA	100/ 250	NA	100/ 250	NA	100/ 250	NA	100/ 250	NA	100/ 250	-	-
PSD Significant Emissions	NA	40	NA	100	NA	40	NA	40	NA	15	-	-
NNSR Major Source c/	NA	25	NA	NA	NA	25	NA	NA	NA	100	-	-
Title V Major Source	NA	25	NA	100	NA	25	NA	100	NA	100	-	10/25

a/ Emissions of lead, beryllium, mercury, sulfuric acid mist, asbestos, vinyl chloride, fluorides, hydrogen sulfide, total reduced sulfur, reduced sulfur compounds, CFCs, halons, and O_3 depleting substances are negligible.

b/ Applicant would seek a determination from MDE regarding the applicable PSD major source threshold.

c/ Major source threshold for PM_{10} listed as surrogate for $PM_{2.5}$ nonattainment areas.

NA Not applicable.

lb/hr is used to represent pound per hour; tpy is used to represent tons per year.

TABLE 4.11.1-6

Operating Emissions Summary for the Proposed Mobile Sources a/

Emission Unit (Quantity)	NO_2 tons/ delivery	NO_2 tpy	CO tons/ delivery	CO tpy	VOC tons/ delivery	VOC tpy	SO_2 tons/ delivery	SO_2 tpy	PM_{10}/PM_{25} tons/ delivery	PM_{10}/PM_{25} tpy
LNG Ship Transit	4.39	790.7	0.59	105.9	0.11	20.5	2.99	538.5	0.26	47.5
LNG Ship Hoteling	0.06	10.4	0.01	2.1	0.00	0.3	0.01	1.8	0.00	0.3
Tugs	0.42	76.1	0.04	6.3	0.02	2.9	0.01	1.2	0.02	4.2
Security and Escort Boats	0.06	11.0	1.27	227.9	0.04	6.7	0.00	0.0	0.00	0.1
Dredges		28.8		7.9		1.5		0.5		1.1
Commuting		0.8		7.3		0.6		0.0		0.0
Total		917.9		357.4		32.4		542.0		53.0

a/ The emissions assume 180 ship arrivals per year of various capacity ships, with each ship remaining at berth for a maximum of 24 hours. Emissions include the entire one-way transit distance of 164 nautical miles through Virginia and Maryland waters.

Air emissions from the LNG terminal and the optional power plant would be subject to BACT and LAER requirements. These requirements are more stringent than the NSPS, RACT, and state emission standards that would also apply to the proposed project. The emission controls proposed by AES would include:

- Hot Water Heaters - low-NO_X burners and/or flue gas recirculation combined with SCR for NO_X control and an oxidation catalyst for CO control; and
- Turbine/Duct Burner - dry low-NO_X combustors in the turbine and SCR for NO_X control and an oxidation catalyst for CO control.

During operating of the project, air emissions from LNG marine traffic and other project-related vessels would occur along the entire waterway from the territorial seas to the ship berth. The impacts of the LNG marine traffic and other marine vessels within state waters are discussed above under the emissions inventories and below under the operational impact assessment. During transit in federal and International waters, the LNG ships would usually burn boil-off gas from vaporized LNG. The boil-off gas (or natural gas) burned during ship transit would be a "cleaner burning" fuel with lower emissions than the heavy weight fuel typically burned during maneuvering, hotelling, and unloading operations while coming into and out of port. The operation of the LNG ships in transit outside of state waters would be moving at faster speeds, in a localized area for a shorter time period, and operating using a "cleaner burning" fuel than the transit within state waters. During times when operating firing boil-off gas is not feasible, the ships would use heavy fuels. The emission to any one localized area during ship transit outside of state waters would be temporary, transient, and occurring at distances allowing for considerable dispersion before reaching any sensitive receptors. Therefore, air emissions from ship transit are not expected to result in a significant impact on air quality.

Operational Impact Assessment

In order to provide a more thorough evaluation of the potential impacts on air quality in the vicinity of the proposed project, the FERC asked AES to conduct a quantitative assessment of project air emissions. The assessment included air dispersion modeling to predict off-site (i.e., ambient) concentrations in the vicinity of the project from PM_{10}, SO_2, NO_2, and CO resulting from the proposed emissions associated with operation of the project for comparison to appropriate federal air quality standards. A summary of the methodology and results is provided below.

Impacts were predicted for the Class II area surrounding the LNG terminal. The modeling was conducted using the EPA's approved AERMOD with a five-year data set (1990 through 1994) previously approved by the MDE for modeling sources in this region. AERMOD is the preferred guideline model for predicting impacts from new and modified stationary sources. AES evaluated impacts for three scenarios:

- (Scenario A) Terminal emissions plus unloading emissions from the LNG carriers;
- (Scenario B) Terminal emissions, unloading emissions from the LNG carriers, and the optional nonjurisdictional power plant; and
- (Scenario C) Terminal emissions, unloading emissions from the LNG carriers, the optional nonjurisdictional power plant, plus hoteling, tugs and Coast Guard security boats in moored safety zone.

Predicted impacts on Class II areas were compared to Class II significant impact levels (SILs) and the results were added to the background value and compared to the NAAQS that have been defined by the EPA for SO_2, PM_{10}, NO_2, and CO. Note that $PM_{2.5}$ emissions were not modeled in this analysis based on the EPA's October 1997 and April 2005 guidance on implementation of NSR requirements for $PM_{2.5}$, which specifies that in the absence of a final implementation rule, PM_{10} should be used as a surrogate. Table 4.11.1-7 presents modeled pollutant impacts resulting from the project.

Pollutants presented in table 4.11.7 resulting from Scenario A were predicted to exceed the SILs for NOx, PM_{10} (24-hour and annual), and SO_2 (3-hour and 24-hour). For Scenario B, impacts were predicted to exceed the SILs for all pollutants and averaging periods with the exception of CO (1-hour and 8-hour). For Scenario C, impacts were predicted to exceed the SILs for all pollutants and averaging periods. Since several pollutant impacts exceeded their applicable SILs, this would normally trigger further evaluation including other sources in the area. In the absence of the nonjurisdictional optional power plant (e.g., modeled Scenario A), the Project would not be subject to PSD. Therefore, a full cumulative impact analysis was not required for the Project. However, a review was conducted of other sources in the area that could potentially interact with impacts from the LNG terminal. One source, Ecron Ethanol was identified and cumulative impacts from the LNG terminal and proposed ethanol plant were evaluated. The results of this analysis, presented in Section

4.13, would demonstrate that combined impacts of the LNG terminal and ethanol facility, when added to monitored background concentrations comply with the NAAQS.

TABLE 4.11.1-7

Predicted Ambient Air Quality Concentrations for Worst-Case Facility Configurations

Scenario (see text)	Pollutant	Averaging Period	Significant Impact Level ($\mu g/m^3$)	Maximum Predicted Concentration ($\mu g/m^3$)	Year of Maximum Predicted Impact	Background Value ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
A	CO	1-hour	2,000	121.0	1994	4,466	4,587	40,000
		8-hour	500	83.4	1994	2,977	3,060.4	10,000
	NO_2	Annual	1	3.7	1994	28	31.7	100
	PM_{10}	24-hour	5	12.7	1992	58	70.7	150
		Annual	1	3.3	1994	24	27.3	50
	SO_2	3-hour	25	44.7	1993	220	264.7	1,300
		24-hour	5	15.6	1993	50	65.6	365
		Annual	1	0.9	1994	11	11.9	80
B	CO	1-hour	2,000	159.0	1993	4,466	4,625	40,000
		8-hour	500	115.0	1994	2,977	3,092	10,000
	NO_2	Annual	1	13.4	1994	28	41.4	100
	PM_{10}	24-hour	5	32.2	1990	58	90.2	150
		Annual	1	7.5	1994	24	31.5	50
	SO_2	3-hour	25	44.7	1993	220	264.7	1,300
		24-hour	5	15.6	1993	50	65.6	365
		Annual	1	1.1	1994	11	12.1	80
C	CO	1-hour	2,000	30, 368	1992	4,466	34.834	40,000
		8-hour	500	2,116.0	1992	2,977	5,093	10,000
	NO_2	Annual	1	16.1	1994	28	44.1	100
	PM_{10}	24-hour	5	32.8	1990	58	90.8	150
		Annual	1	7.7	1994	24	31.7	50
	SO_2	3-hour	25	82.5	1990	220	302.5	1,300
		24-hour	5	17.1	1993	50	67.1	365
		Annual	1	1.6	1994	11	12.6	80

4.11.1.5 General Conformity Determination

As previously discussed, a conformity analysis must be conducted by the lead federal agency if a federal action would result in the generation of emissions that would exceed the conformity threshold levels (de minimus) of the pollutants(s) for which an air basin is nonattainment, or if the emissions are deemed to be regionally significant. A conformity analysis must show that the emissions would conform to the SIP and would not reduce air quality in the air basin, which can be demonstrated through offsets, SIP provisions, or modeling. The EPA is the agency responsible for reviewing and approving the SIP prepared by designated state agencies.

The General Conformity Rule applies to projects that are located in nonattainment or maintenance areas. The proposed LNG terminal, portions of pipeline, and the ship transit routes are located in areas designated as O_3 attainment, Subpart 2 moderate O_3 nonattainment under the 8-hour O_3 standard, and O_3 maintenance areas. Under the 1-hour O_3 SIP, several areas are designated as severe O_3 nonattainment. Four counties are also classified as nonattainment with respect to the $PM_{2.5}$ standard.

With respect to O_3, several of the project counties are designated as nonattainment. All of the nonattainment counties are classified as "Subpart 2/Moderate" for the 8-hour NAAQS. The O_3 nonattainment counties

include: Baltimore, Harford, Cecil, Ann Arundel, Calvert, in Maryland and Chester County in Pennsylvania. Lancaster County was previously classified as "Subpart 1/Marginal" nonattainment for the 8-hour NAAQS. On July 6, 2007, Lancaster County was redesignated to attainment for the 8-hour NAAQS under the EPA approved maintenance plan. In addition, Queen Anne's and Kent Counties in Maryland are also O_3 maintenance areas (redesignated as attainment under the 8-hour standard on December 22, 2006). The Virginia waters are also located in an O_3 maintenance area (the Hampton Roads AQCR 223 was redesignated as attainment June 1, 2007).

With respect to $PM_{2.5}$, Baltimore, Harford, and Anne Arundel Counties, Maryland as well as Chester and Lancaster Counties, Pennsylvania are all designated as nonattainment.

Project activities that are potentially subject to a general conformity review include construction of the LNG terminal the optional power plant, and pipeline, operation of the pipeline, and marine traffic during the construction and operation phases. Because these activities are all subject to Commission approval (the federal action) and they all occur in O_3 and $PM_{2.5}$ nonattainment or maintenance areas, these activities would be subject to general conformity review.

According to 40 CFR 51.853, emission sources that are subject to NNSR and PSD permitting are exempt from the General Conformity determination. AES operations meeting this exemption include the LNG terminal and the optional power plant. Pollutant emissions that are less than major source thresholds are included in this exemption because the permitting requirements also include those pollutant emissions that are greater than significant emissions thresholds.

The FERC staff evaluated the construction emissions to determine if general conformity rules would apply based on regional significance. A project would be subject to general conformity rules based upon regional significance if the total of the direct and indirect emissions of a pollutant, while not exceeding general conformity pollutant thresholds, represents 10 percent or more of a nonattainment or maintenance areas total emissions of a particular pollutant. The most recent available air emission inventory data from the EPA's AirData website (2001) were evaluated for the affected nonattainment counties. The numerical results of this assessment would be provided in the upcoming General Conformity Determination to be issued separately from this DEIS. Both construction and operation emissions are significantly less than 10 percent of the 2001 emissions inventory for both nonattainment and maintenance pollutants and would, therefore, not be subject to general conformity requirements based on regional significance.

The FERC staff also evaluated the estimated construction emissions to determine if general conformity rules would apply based on the exceedance of conformity thresholds. Based on current information, the 100 ton per year conformity thresholds for NO_X would be exceeded during the construction phase in Baltimore, Harford, and Anne Arundel, Maryland counties in 2008, 2009, and 2010 and the 50 ton per year VOC conformity threshold in 2009. In Cecil County, MD and Chester County, PA, NO_X emissions during the construction phase are expected to exceed the conformity threshold in 2009. Also, in Chester County, PA, which is nonattainment for $PM_{2.5,}$ NO_X precursor emissions are expected to exceed the applicability threshold in 2009. We have recommended updated emissions information based on the requested updated project schedule to be included in Section 2.4.

The FERC staff also evaluated emissions subject to conformity review during the operational phase of the project. NO_X emissions during the operation of the LNG terminal in Maryland (Baltimore and Anne Arundel counties) and Virginia (Hampton Roads AQCR) are expected to exceed the 100 ton per year applicability thresholds during operations beginning in 2011. Beginning in 2012, Calvert County, MD would exceed the applicability threshold for NO_X. VOC and $PM_{2.5}$ emissions are not expected to exceed their respective applicability thresholds, in any of the nonattainment counties or AQCRs. SO_2 precursor emissions are estimated to exceed the 100 ton per year applicability threshold for $PM_{2.5}$ in 2012.

Because the 8-hour O_3 nonattainment designation went into effect on June 15, 2004, a SIP addressing attainment with the standard for this pollutant has not yet been submitted to the EPA. The MDE is responsible for addressing the draft SIP applicable to the Maryland nonattainment counties. The SIP for the Maryland

nonattainment counties was submitted to the EPA on June 15, 2007. The PDEP has also prepared and submitted the SIP for Pennsylvania's 8-hour nonattainment counties on August 29, 2007.

The FERC will issue to the public a draft General Conformity Determination for the project for review with a 30-day comment period on a separate track from the draft EIS. The draft General Conformity Determination would be mailed for review by the EPA, the MDE, the VDEQ, and the PDEP during the 30-day comment period. The FERC would then issue a final General Conformity Determination based on the updated emissions and comments received. Within 30 days of the final determination, the FERC would publish notice of its final determination.

The FERC can complete the analysis and issue a Final General Conformity Determination for the AES LNG terminal Project before the draft SIP is approved by the EPA if the MDE and PDEP, as the agencies responsible for the SIPs, issue a more detailed commitment letter to the EPA that addresses the requirements contained in Title 40 CFR Part 51.858(a)(5)(i)(B) and Title 40 CFR Part 93.158(a)(5)(i)(B). Alternatively, once the draft SIP is approved by the EPA, the FERC can complete the analysis and issue a Final General Conformity Determination if, in accordance with Title 40 CFR Part 51.858(a)(5)(i)(A) and Title 40 CFR Part 93.158(a)(5)(i)(A), the MDE, and PDEP provide documentation demonstrating that the total of the direct and indirect emissions from the portion of the proposed action to which the general conformity review applies, together with all other emissions in the nonattainment area, would not exceed the emissions budgets specified in the approved SIP. The Virginia maintenance counties are operating under an approved maintenance plan.

During consultations with the MDE on the project impacts, the agency has stated that while offsets are available to mitigate project emissions, the agency would prefer that the project use "real mitigation" either with the project, or through other certifiable projects to reduce emissions first, to minimize the amount of offsets needed. We agree with the MDE and are recommending additional information about "real mitigation" be provided below.

The Commission is required to make a Conformity Determination before the action is taken. To allow the Commission staff to complete the analysis and issue a final General Conformity Determination, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, AES and Mid-Atlantic Express provide information related to the preparation of the draft General Conformity Determination including:**
    - **a. an updated full air quality analysis identifying all mitigation requirements needed to demonstrate conformance with the applicable SIP including actual mitigation, above what is required under regulations, for either the project or through other certifiable projects (i.e. retrofitting tug boats with new clean-burning engines);**
    - **b. submit detailed information documenting how the project would demonstrate conformity in accordance with 40 CFR 51.858. The documentation should address each regulatory criteria listed in 40 CFR 51.858; provide a detailed explanation as to whether or not the project would meet each requirement; and for each criteria being satisfied, provide all supporting information on how the project would comply. Should any element of the project change substantially, AES and Mid-Atlantic Express should revise and refile the aforementioned information;**
    - **c. file a commitment letter from the MDE, the PDEP and the VDEQ to the EPA addressing the requirements contained in 40 CFR 51.858(a)(5)(i)(B) and 40 CFR 93.158(a)(5)(i)(B); and/or**
    - **d. provided documentation from the MDE, the VDEQ, and the PDEP demonstrating that the total of the direct and indirect emissions from the portion of the proposed action to which the general conformity review applies, together with all other emissions in the**

nonattainment area, would not exceed the emissions budgets specified in the approved SIP.

4.11.2 Noise

Construction and operation of the proposed LNG terminal, pipeline and optional power plant would generate noise in the vicinity of these activities. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day, over weeks, and over the course of a year. These variations are due, in part, to changing weather conditions and seasonal vegetative cover. Sound levels are expressed in units of decibels on an A-weighted scale (dBA). Two common measures used by federal agencies to address the time varying-quality of environmental noise are the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). The L_{eq} represents the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour. The L_{dn} is a weighted 24-hour average of the daytime and nighttime sound levels, with 10 dBA added to the nighttime sound levels to account for people's greater sensitivity to noise during nighttime hours of 10 pm to 7 am.

4.11.2.1 Noise Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974). This publication evaluates the effects of environmental noise with respect to health and safety. The document provides information for state and local agencies to use in developing their noise standards and regulations. The EPA has determined that in order to protect the public from activity interference and annoyance outdoors in residential areas, noise levels should not exceed an L_{dn} of 55 dBA. An Ldn of 55 dBA is equivalent to a continuous noise level of 48.6 dBA for facilities that operate at a constant level of noise. The FERC has adopted this criterion and it is used here to assess the potential noise impact from operation of the LNG terminal.

The State of Maryland also regulates noise. Maryland's Environmental Noise Act of 1974 limits noise to levels protective of the health, general welfare, and property of the people of the state. This regulation limits both the overall noise environment and the maximum allowable noise levels based on zoning districts for residential, commercial, and industrial areas (COMAR, 26:2:3). In addition, Maryland also regulates noise levels for receiving land use categories.

In residential areas, overall zoning district noise levels (L_{dn}) and maximum allowable nighttime (defined as 10 pm and 7 am) receiving land use category noise levels are limited to 55 dBA, the same as the FERC requirements. During daytime hours (7 am to 10 pm), the maximum allowable receiving land use category noise level in residential areas is 65 dBA. In commercial areas, the overall zoning district L_{dn} is limited to 64 dBA, with the maximum allowable nighttime receiving land use category level limited to 62 dBA and the maximum allowable daytime level limited to 67 dBA. In industrial areas, the zoning district noise level ($L_{eq(24)}$) is limited to 70 dBA and both the day and nighttime maximum allowable receiving land use category levels are 75 dBA.

Construction and demolition activities are exempt from zoning district and receiving land use noise level limits during the daytime hours. These activities may not exceed 90 dBA during the day and may not exceed the nighttime receiving land use levels between 10 pm and 7 am. Pile driving activities are specifically excepted form the State of Maryland noise regulations between 8 am and 5 pm.

Baltimore County, Maryland also maintains a planning noise ordinance (Baltimore County 2006). The local code does not provide specific levels or standards which must be met. Both the state and federal levels are more specific and restrictive. Therefore, the project would be required to meet the state and federal requirements for ambient noise.

4.11.2.2 Existing Noise Levels

Noise sensitive areas (NSAs) are defined by the FERC as residences, schools, hospitals, churches, and other similar types of areas. There are no NSAs within one mile of the proposed LNG terminal. Figure 4.11.2-1 identifies the nearest NSAs and land use near the proposed LNG terminal. The nearest NSA is located approximately 5,450 feet to the north of the proposed project in the Dundalk area. Table 4.11.2-1 lists the distance and direction of each NSA from the proposed LNG terminal.

TABLE 4.11.2-1

Noise Sensitive Areas Near the LNG Site

NSA	Distance and Direction	Description
NSA#1 – Dundalk Residence	5,450 feet north	Residence
NSA#2 – Edgemere Residence	9,400 feet east	Residence
NSA#3 – Residential Area, next to Veterans Affair medical center	14,100 feet southeast	Residences, Hospital
NSA#4 – Fort Armistead Park (south of Francis Scott Key Bridge)	9,650 feet west	Park

AES conducted an ambient noise survey at the four NSAs and at three additional locations on the proposed LNG terminal property boundary to document the existing sound environment prior to the operation of the LNG terminal. Figure 4.11.2-1 illustrates the locations of the monitoring sites. The monitoring was conducted over a 24-hour period from October 22 to 23, 2006. The data obtained from the survey were used to estimate existing sound levels at the NSAs and at each fenceline to adjacent properties. The measured noise levels at each of the four NSAs are provided in table 4.11.2-2. In addition to the noise level measurements, AES also documented contributing noise sources and prevailing meteorological conditions. Background noise sources that dominated the existing noise environment included Interstate Highway 695 located to the north between the LNG terminal site and NSA#1 and an industrial steel mill to the northeast between the proposed terminal and NSA#2. The existing Ldn noise levels at the NSAs ranged from 58.0 to 67.7 dBA. The estimated ambient noise levels at the fenceline locations are provided in table 4.11.2-3

TABLE 4.11.2-2

Measured Daytime and Nighttime Noise Levels at NSAs Nearest to the LNG Site

NSA	L_{eq} Daytime	L_{eq} Nighttime	Calculated Overall L_{dn}
NSA#1 – Dundalk Residence	67.4	58.1	67.7
NSA#2 – Edgemere Residence	65.3	53.1	64.6
NSA#3 – Residential Area, next to Veterans Affair medical center	53.5	51.37	58.0
NSA#4 – Fort Armistead Park (south of Francis Scott Key Bridge)	53.4	NA*	59.8

* NA=Not available. Nighttime access to the site is restricted.

4.11.2.3 Noise Impacts and Mitigation

Potential impacts were from the proposed project would be caused by temporary increases in noise during construction and permanent noise increases during operation of the Project. These potential noise increases were compared with the FERC standard for permissible noise at NSAs.

Legend

- SPARROWS POINT LNG TERMINAL FACILITY
- CONCEPTUAL CHANNEL AND TURNING BASIN
- SHIPPING CHANNEL
- RESIDENTIAL ZONE
- (1) NOISE SENSITIVE AREAS AND BACKGROUND NOISE MEASUREMENT LOCATION
- [5] ADDITIONAL BACKGROUND NOISE MEASUREMENT LOCATION

NOTE:

BACKGROUND NOISE DATA COLLECTION CONSISTED OF SEVERAL 30-60 MINUTE SAMPLES TAKEN DURING BOTH DAYTIME AND NIGHTTIME HOURS.

Figure 4.11.2-1
Location Map for Noise Sensitive Areas Near the Proposed Sparrows Point LNG Terminal

TABLE 4.11.2-3 **Measured Noise Levels at the Property Boundary**			
Location Number a/	**Description**	**Adjacent Land Use**	**L_{eq}(24)**
5	southern property boundary	Industrial	57.9
6	eastern property boundary	Industrial	58.4
7	northern property boundary	Industrial	62.4

a/ Refer to figure 4.11.2-1 for locations.

Construction Noise

Construction of the LNG terminal and pipeline would occur over approximately 34 months. Noise generating equipment and activities during construction would include heavy machinery, pile driving, HDD operations, trench laying and pipelaying activities, and dredging operations. The construction activities would cause temporary increases in ambient noise levels, the majority of which would occur during the daytime hours. The overall intensity of the noise at nearby receptors would depend on the number and type of equipment operating at a given time and the location of the receptor. Individual pieces of construction equipment typically generate noise levels in the 80 to 90 dBA range at a distance of 50 feet (EPA, 1971). Since more than one piece of equipment would likely operate at any given time, construction noise levels would be expected to exceed the State of Maryland's noise standards where construction activities would occur within 50 feet of a residence. While construction noise impacts would be temporary, AES would be required to employ appropriate mitigation measures.

The use of this equipment is expected to be transient and to occur for a relatively short period of time near any given residential structure. The pipeline construction period near residential areas would be compressed as much as possible to reduce these impacts. AES would incorporate residential mitigation measures for properties where construction would occur within 50 feet of a residence. These would include one or more of the following: use of noise absorbent curtains or barriers, enclose stationary equipment (such as generator sets), limiting construction primarily to weekday or business daylight hours, ensuring construction equipment mufflers are maintained in good working order, coordinating with residents prior to construction in residential areas, and if warranted, provisions for temporary lodging. In addition, AES would also prepare and file site specific residential noise mitigation plans for properties where construction would occur within 25 feet of a residence. These mitigation plans would be completed during final pipeline design.

Construction of the LNG terminal and optional power plant would also generate temporary increases in ambient noise, the majority of which would occur during daytime hours. The most intense noise levels would be generated by pile driving for the LNG tank foundations. Therefore, as a worst case scenario, AES modeled noise impacts from pile driving activities. Although pile driving noise levels are exempted from the State of Maryland regulations, predicted noise levels from pile driving at the nearest NSAs and property boundaries, presented in table 4.11.2-4 would be below the State of Maryland 90dBA threshold for daytime construction activities. Pile driving activities would not be conducted during nighttime hours. All other construction activities associated with the LNG terminal and optional power plant are expected to generate noise at less intense levels and would therefore not adversely affect nearby NSAs or land uses.

AES also is proposing to use HDD techniques at two river crossings: the Susquehanna River (location MP 44) and the Back River (MP 9). In addition, AES may use HDD as the crossing method for a third area, Little Gunpowder Falls (MP 22.23). AES modeled the anticipated noise impacts from HDD operations at the nearest NSAs using the best available information on HDD equipment. This analysis considered impacts both with and without sound barriers. The results are presented in table 4.11.2-5.

TABLE 4.11.2-4

Predicted Noise Levels at NSAs and Fenceline Locations From Pile Driving Activities

NSA	Predicted Pile Driving Sound Level L_{eq} (dBA) a/	Maryland Maximum Allowable Noise Limits (dBA) b/	Complies with Maryland Noise Limits [Yes/No]
NSA#1 – Dundalk Residence, 5450 ft north	63	90(55)	Yes
NSA#2 – Edgemere Residence, 9,400 ft east	58	90(55)	Yes
NSA#3 – Residential Area, next to Veterans Affair medical center, 14,100 ft southeast	55	90(55)	Yes
NSA#4 – Fort Armistead Park (south of Francis Scott Key Bridge), 9,650 ft west	58	90(55)	Yes
Southern Property Boundary (Receptor 5)	81	90(75)	Yes
Eastern Property Boundary (Receptor 6)	86	90(75)	Yes
Northern Property Boundary (Receptor 7)	84	90(75)	Yes

a/ L_{eq} values are conservatively assumed to be equal to the maximum steady state noise levels with all equipment for each activity. Therefore, L_{eq} is equal to L_{max}.

b/ Daytime limit (nighttime limit).

TABLE 4.11.2-5

Predicted Noise Levels From HDD Activities

Location	Distance to Nearest NSA	No Barrier		With Barriers	
		L_{eq} (dBA) a/	L_{dn} (dBA) a/	L_{eq} (dBA)	L_{dn} (dBA)
1: Susquehanna entrance	300	71	77	53	58
2: Susquehanna exit	600	55	62	37	44
3: Back River entrance	800	61	68	43	49
4: Back River exit	300	62	68	44	50
5. Little Gunpowder Falls Entrance	1,480	55	62	37	43
6. Little Gunpowder Falls Exit	165	65	72	47	53

a/ L_{eq} values are conservatively assumed to be equal to the maximum steady state noise levels with all equipment for each activity. Therefore, L_{eq} is equal to L_{max}.

HDD activities would proceed on a 24-hour schedule, introducing noise during nighttime hours. By installing noise barriers, noise associated with HDD activities would remain below the State of Maryland L_{dn} guideline value of 55 dBA, with the exception of the Susquehanna entrance location. While the noise associated with HDD activities would be temporary and would cease with the completion of HDD activities, AES would employ additional noise mitigation measures. Such measures may include the use of mufflers, sound barriers, and equipment and work enclosure areas. AES would also conduct noise monitoring at the Susquehanna entrance and Little Gunpowder Falls exit locations at the beginning of construction in this area to determine if the guidance value is being exceeded. AES would also designate that all contractors be required contractually to meet noise standards. Based on the projected noise levels with barriers from table 4.11.2-5, we believe noise impacts associated with HDD activities would be sufficiently mitigated. However since AES has not committed to any specific mitigation measures prior to performing HDD activities, and to ensure NSAs are not exposed to excessive noise during nighttime HDD operations, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, Mid-Atlantic Express should:**

a. **provide a commitment to use sound dampening barriers at all HDD locations providing equal to or better noise mitigation than those assumed in the noise analysis shown in table 4.11.2-5 of this DEIS; or**

b. **provide an updated noise analysis for HDD activities with NSAs within one half mile of the entry or exit site, including the projected noise levels of HDD activities with the specified mitigation measures Mid-Atlantic Express would implement prior to the start of HDD activity.**

Dredging would be required to accommodate the larger ships expected at the LNG terminal. Dredging activities would include use of a mechanical clamshell dredge, an environmental bucket technology, and some limited near shore backhoe dredging. Dredging would occur 24 hours per day and would be closest to NSA#1 and #2. Dredging activities would occur during initial construction and for maintenance during operation of the terminal. AES conducted an analysis of noise impacts from dredging activities for both initial construction and maintenance activities. The results of this analysis, presented in tables 4.11.2-6 and 4.11.2-7, shows that dredging activities would not exceed FERC or Maryland standards. Additionally, noise related to dredging activities would not increase the Ldn at any of the NSAs.

TABLE 4.11.2-6

Predicted Noise Levels (L_{dn}) from LNG Terminal and Power Plant

NSA	Existing Ambient L_{dn} (dBA)	Predicted Facility Contribution L_{dn} (dBA)	Ambient + Facility L_{dn} (dBA)
NSA#1 – Dundalk Residence, 5450 ft north	68	49	68
NSA#2 – Edgemere Residence, 9,400 ft east	65	38	65
NSA#3 – Residential Area, next to Veterans Affair medical center, 14,100 ft southeast	58	32	58
NSA#4 – Fort Armistead Park (south of Francis Scott Key Bridge), 9,650 ft west	60	36	60

TABLE 4.11.2-7

Predicted Sound Levels (L_{eq}) From Construction and Maintenance Dredging

NSA	Predicted Facility Sound Level L_{eq} (dBA) a/	Maryland Maximum Allowable Noise Limits (dBA) b/	Complies with Maryland Noise Limits [Yes/No]
NSA#1 – Dundalk Residence, 5450 ft north	42	90(55)	Yes
NSA#2 – Edgemere Residence, 9,400 ft east	31	90(55)	Yes
NSA#3 – Residential Area, next to Veterans Affair medical center, 14,100 ft southeast	26	90(55)	Yes
NSA#4 – Fort Armistead Park (south of Francis Scott Key Bridge), 9,650 ft west	30	90(55)	Yes

a/ L_{eq} values are conservatively assumed to be equal to the maximum steady state noise levels with all equipment for each activity. Therefore, L_{eq} is equal to L_{max}.

b/ Daytime limit (nighttime limit).

Operational Noise

Proposed aboveground pipeline facilities include nine mainline valve facilities and three interconnection tie-in locations. These facilities are not expected to generate significant noise. The project would not involve any compressor facilities. Operation of the proposed LNG terminal and optional power plant would generate noise. Major noise generating equipment would include the combustion turbines, transformers, heaters, pumps, compressors, and emergency generators. Most of this equipment would be enclosed in shelters

fabricated with noise reducing material. Since the terminal and optional power plant are still in the early design stages, a complete equipment list with manufacturers' specifications is not yet available. Other noise sources are unsheltered equipment such as natural gas send-out equipment, a booster air compressor, and a nitrogen compressor. The noise generating sources were modeled using vendor data, noise generation based on empirical formulas, or based on data from similar projects.

The results of the modeling are presented in tables 4.11.2-8 and 4.11.2-9, along with the existing ambient levels and the projected noise levels with the operation of the LNG terminal and optional power plant. The results of the modeling demonstrate that predicted impacts would be below the FERC and State of Maryland L_{dn} of 55 dBA as well as the maximum allowable levels (L_{eq}). A comparison of the existing and predicted L_{dn} for each NSA indicates that operation of the LNG terminal would not increase the L_{dn} at any of the NSAs. Since results of actual noise measurements may differ from those predicted by modeling, **we recommend that:**

- **AES make all reasonable efforts to ensure its predicted noise levels from the LNG terminal and optional power plant are not exceeded at the nearest NSAs and file noise surveys with the Secretary <u>no later than 60 days after placing the LNG terminal in service</u>. However, if the noise attributable to the operation of the LNG terminal and optional power plant exceeds 55 dBA Ldn at any NSA, AES should file a report on what changes are needed and should install additional noise controls to meet the level <u>within 1 year</u> of the in-service date. AES should confirm compliance with these requirements by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

TABLE 4.11.2-8

Predicted Noise Levels (L_{dn}) From LNG Terminal and Optional Power Plant

NSA	Existing Ambient L_{dn} (dBA)	Predicted Facility Contribution L_{dn} (dBA)	Ambient + Facility L_{dn} (dBA)
NSA#1 – Dundalk Residence, 5450 ft north	68	45	68
NSA#2 – Edgemere Residence, 9,400 ft east	65	37	65
NSA#3 – Residential Area, next to Veterans Affair medical center, 14,100 ft southeast	58	31	58
NSA#4 – Fort Armistead Park (south of Francis Scott Key Bridge), 9,650 ft west	60	37	60

LNG ships are not expected to appreciably affect noise levels from shipping lanes. An estimated 2 to 3 additional vessels per week would transit the shipping channels of Chesapeake Bay to deliver LNG to the LNG terminal. The transit route is at least two or more miles from land for the vast majority of the route such that noise impacts from the LNG ships are expected to be consistent with existing marine shipping traffic and their associated transient impacts. Localized noise quality would remain consistent in areas proximate to the shipping channels, and overall ambient background noise quality would not be appreciably affected.

Vessel traffic associated with operation of the project would generate underwater sounds. Cargo vessels, which are in the same category as LNG ships, are known to emit high levels of low frequency sound (6.8 to 7.7 hertz a5 181 to 190 decibels (re: 1 uPa)) capable of traveling long distances (Richardson et al., 1995). Noise generated by LNG marine traffic is generally omni-directional, emitting from all sides of the vessel (Whale and Dolphin Conservation Society 2004). However, noise levels are greatest on the sides of the ship and weakest on the front and rear of the ship. As discussed in section 4.6.2.1, fish may exhibit a transient avoidance behavior in response to LNG ship noise along the waterway from the territorial seas to the proposed LNG terminal. Above-water noise associated with the LNG marine traffic would occur in areas with no sensitive noise receptors or in areas where similar other large vessel traffic occurs and would not result in significant impacts on environmental resources.

TABLE 4.11.2-9

Predicted Sound Levels (L_{eq}) From LNG Terminal and Optional Power Plant at NSAs and Fenceline

NSA	Predicted Facility Sound Level L_{eq} (dBA) a/	Maryland Maximum Allowable Noise Limits (dBA) b/	Complies with Maryland Noise Limits [Yes/No]
NSA#1 – Dundalk Residence, 5,450 ft north	39	65(55)	Yes
NSA#2 – Edgemere Residence, 9,400 ft east	31	65(55)	Yes
NSA#3 – Residential Area, next to Veterans Affair medical center, 14,100 ft southeast	25	65(55)	Yes
NSA#4 – Fort Armistead Park (south of Francis Scott Key Bridge), 9,650 ft west	30	65(55)	Yes
Southern Property Boundary (Receptor 5)	62	75(75)	Yes
Eastern Property Boundary (Receptor 6)	74	75(75)	Yes
Northern Property Boundary (Receptor 7)	67	75(75)	Yes

a/ L_{eq} values are conservatively assumed to be equal to the maximum steady state noise levels with all equipment for each activity. Therefore, L_{eq} is equal to L_{max}.

b/ Daytime limit (nighttime limit).

4.12 RELIABILITY AND SAFETY

Three federal agencies share regulatory authority over the siting, design, construction and operation of liquefied natural gas (LNG) import terminals: the FERC, the U.S. Coast Guard and the DOT. The FERC authorizes the siting and construction of LNG import facilities and is the lead federal agency responsible for the preparation of analyses required under the NEPA for impacts associated with terminal construction and operation. The Coast Guard has authority over the safety of the LNG facility marine transfer area and over the safety of LNG marine traffic. The Coast Guard also has authority over security plans for LNG marine traffic, as well as for the entire LNG facility. The DOT has exclusive authority to promulgate and enforce safety regulations for on-shore LNG facilities beginning at the last valve immediately before the LNG storage tank(s). In 1980, the DOT established a set of safety standards, "Liquefied Natural Gas Facilities: Federal Safety Standards," under Title 49, CFR, Part 193 which apply to the construction, operation, and maintenance of on-shore LNG facilities.

In February 2004, the three participating agencies entered into an Interagency Agreement to assure that they work in a coordinated manner to address the full range of issues regarding safety and security at LNG import terminals, including the terminal facilities and tanker operations, and to maximize the exchange of information related to the safety and security aspects of the LNG facilities and related marine operations. The FERC closely coordinates its pre-authorization review of the proposal with the Coast Guard and the DOT to ensure a seamless safety and security review.

The operation of the proposed AES Sparrows Point LNG terminal poses a potential hazard that could affect the public safety without strict design and operational measures to control potential accidents. The primary concerns are those events that could lead to an LNG spill of sufficient magnitude to create an offsite hazard, including events associated with LNG marine traffic. However, it is also important to recognize the stringent requirements for the design, construction, operation, and maintenance of the facility as well as the extensive safety systems to detect and control potential hazards.

With the exception of the October 20, 1944 fire at the LNG facility in Cleveland, Ohio, the operating history of U.S. LNG facilities has been free of LNG safety-related incidents resulting in adverse effects to the public or the environment. The 1944 Cleveland incident was attributed to the use of materials inadequately suited for cryogenic temperatures and the lack of spill impoundments at the site[7]. Another operational accident occurred in 1979 at the Cove Point LNG facility in Lusby, Maryland. A pump seal failed, resulting in gas vapors entering an electrical conduit and settling in a confined space. When a worker switched off a circuit breaker, the gas ignited, causing heavy damage to the building and a worker fatality. Lessons learned from this accident resulted in changing the national fire codes, with the participation of the FERC, to ensure that the situation would not occur again. The proposed facilities would be designed, constructed, and operated in compliance with these codes.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria LNG liquefaction facility that killed 27 and injured 56 workers. No members of the public were injured. Preliminary findings of the accident investigation suggest that a cold hydrocarbon leak occurred at Liquefaction Train 40 and was introduced to the high-pressure steam boiler by the combustion air fan. An explosion developed inside the boiler fire box which subsequently triggered a larger explosion of the hydrocarbon vapors in the immediate vicinity. The resulting fire damaged the adjacent liquefaction process and liquid propane gas separation equipment of Train 40, and spread to Trains 20 and 30. Although Trains 10, 20, and 30 had been modernized in 1998-1999, Train 40 had been operating with its original equipment since start-up in 1981.

Although there are major differences between the equipment involved in the accident at Skikda and that proposed by AES (i.e., high-pressure steam boilers that power refrigerant compressors would not be used here nor are they used at any LNG facility under FERC jurisdiction), the sequence of cascading events identifies potential failure modes that warrant further evaluation. As a result, we have provided a recommendation in section 4.12.2, Front-End Engineering Design (FEED) Review, to address this issue.

A discussion of the principal properties and hazards associated with LNG is presented in section 4.12.1. A summary of our preliminary design and technical review of the cryogenic aspects of the LNG terminal is presented in section 4.12.2. Storage and retention systems are discussed in section 4.12.3. An analysis of the thermal radiation and flammable vapor cloud hazards resulting from a credible land-based LNG spill is presented in section 4.12.4, while the safety aspects of LNG transportation by ship is discussed and summarized in section 4.12.5. Emergency response and evacuation planning is discussed in section 4.12.6, and conclusions on marine traffic safety are provided in section 4.12.7. A discussion on security awareness related to terrorism is discussed in section 4.12.8. The reliability and safety issues related to the natural gas pipeline are discussed in section 4.12.9.

4.12.1 LNG Hazards

LNG's principal hazards result from its cryogenic temperature (-260º F), flammability, and vapor dispersion characteristics. As a liquid, LNG will neither burn nor explode. Although it can cause freeze burns and, depending on the length of exposure, more serious injury, its extremely cold state does not present a significant hazard to the public, which rarely, if ever, comes in contact with it as a liquid. As a cryogenic liquid, LNG will quickly cool materials it contacts, causing extreme thermal stress in materials not specifically

[7] For a description of the incident and the findings of the investigation, see "U.S. Bureau of Mines, Report on the Investigation of the Fire at the Liquefaction, Storage, and Regasification Plant of the East Ohio Gas Co., Cleveland, Ohio, October 20, 1944," dated February 1946.

designed for such conditions. These thermal stresses could subsequently subject the material to brittleness, fracture, or other loss of tensile strength. These hazards, however, are not substantially different from the hazards associated with the storage and transportation of liquid oxygen (-296º F) or several other cryogenic gases that have been routinely produced and transported in the United States.

LNG vaporizes rapidly when exposed to ambient heat sources such as water or soil. When released from its containment vessel and/or transfer system, LNG will generally produce 620 to 630 standard cubic feet of natural gas for each cubic foot of liquid. A large quantity of LNG spilled without ignition would form a vapor cloud that would travel with the prevailing wind until it either dispersed below the flammable limits or encountered an ignition source. If a large quantity of LNG is spilled in the presence of an ignition source, the resulting pool fire would produce high levels of radiant heat in the area surrounding the LNG pool.

A rapid phase transition (RPT) can occur when a portion of LNG spilled onto water changes from liquid to gas, virtually instantaneously. Unlike an explosion that releases energy and combustion products from a chemical reaction, an RPT is the result of heat transferred to the liquid inducing a change to the vapor state. The rapid expansion from the liquid to vapor state can cause locally large overpressures. RPTs have been observed during LNG test spills onto water. In some test cases, the overpressures generated were strong enough to damage test equipment in the immediate vicinity of the LNG release point. The sizes of the overpressure events have been generally small and are estimated to be equivalent to several pounds of trinitrotoluene (TNT). Although such a small overpressure is not expected to cause significant damage to LNG marine traffic, the RPT may increase the rate of LNG pool spreading and the LNG vaporization rate for a spill on water.

Methane vapors, the primary component of natural gas, are colorless, odorless and tasteless, and are classified as a simple asphyxiant. Methane vapors may cause extreme health hazards, including death, if inhaled in significant quantities within a limited time. Although very cold methane vapors may cause freeze burns, any cloud resulting from an LNG spill would be continuously mixing with the warmer air surrounding the spill site. Dispersion modeling indicates the majority of the cloud would generally be within 25° F of the surrounding atmospheric temperature, with colder temperatures closest to the spill source. In addition, this modeling estimates that most of the cloud would be below concentrations resulting in oxygen deprivation effects, including asphyxiation, with the highest methane concentrations closest to the spill source. Therefore, asphyxiation and freezing normally represent a negligible risk to the public from LNG facilities.

Although LNG will not burn, methane vapors in a 5 to 15 percent mixture by volume with air are flammable. Once a flammable vapor-air mixture from an LNG spill has been ignited, the flame front will propagate back to the spill site if the vapor concentration along this path is sufficiently high to support the combustion process. Combustible materials within the flammable portion of the cloud may be within the flame and could be ignited. However, any events leading to a containment failure would most likely be accompanied by a number of ignition sources. The result would be an LNG pool fire, and subsequent radiant heat hazards, rather than the formation of a large unconfined vapor cloud.

Although, LNG is not explosive as it is normally transported and stored, natural gas vapors (primarily methane) can explode if contained within a confined space, such as a building or structure, and ignited. Occasionally, various parties have expressed the energy content of an LNG storage tank or LNG ship in equivalent tons of TNT, as an implied measure of explosive potential. However, such a simplistic analogy fails to consider that explosive forces are not just a function of the total energy content but also of the rate of energy release. For a detonation to occur, the rate of energy release must be nearly instantaneous, such as with a TNT charge initiated by a blasting cap. Unlike TNT or other explosives which inherently contain an oxidizer, an unconfined vapor cloud must be mixed with oxygen within the flammability range of the fuel for combustion to occur. For a large unconfined vapor cloud, the flammability range tends to exist at the mixing zone at the edges of the cloud. When ignited, flame speeds about 20 to 25 meters per second (66 to 82 feet per second) and local over pressures up to 0.2 psig have been estimated for unconfined methane-rich vapor clouds. These are well below the flame speeds and over pressures associated with detonation.

The potential for unconfined LNG vapor cloud detonations was investigated by the Coast Guard in the late 1970s at the Naval Weapons Center at China Lake, California. These experiments, as well as other subsequent tests, are mentioned in Appendix C of the Sandia National Laboratories report entitled, *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water, December 2004* (Sandia Report). Using methane, the primary component of natural gas, several experiments were conducted to determine if unconfined vapor clouds would detonate. The tests indicated unconfined methane-air mixtures could be ignited, but no test produced unconfined detonation. There is no evidence suggesting that methane-air mixtures will detonate in unconfined open areas.

Further tests were conducted in the late 1970s to examine the level of sensitivity of an unconfined cloud to the presence of heavier hydrocarbons such as ethane and propane. As stated in Section 5 of Appendix C of the Sandia Report, detonation sensitivity is affected by the level of refinement of natural gas stored as LNG. The series of tests on ambient-temperature fuel mixtures of methane-ethane and methane-propane indicated that the addition of heavier hydrocarbons influenced the tendency of an unconfined vapor cloud to detonate. Less processed product with greater amounts of heavier hydrocarbons is more sensitive to detonation. During these experiments, all successful detonations were initiated with an explosive charge in well-mixed vapor clouds at correct stoichiometric proportions. These are not representative of conditions which would be expected during a large scale LNG spill. The precise timing, necessary mixing, and required amount of initiating explosives render the possibility for detonation of a large unconfined vapor cloud as unrealistic. Detonation of the unconfined natural gas cloud is extremely difficult to achieve and is generally considered by scientists and researchers to be very unlikely to occur during an LNG spill.

Consequently, the primary hazards to the public from an LNG spill either on land or water would be from dispersion of the flammable vapors or from radiant heat generated by a pool fire.

4.12.2 Front-End Engineering Design Review

As part of its application and in response to FERC staff's data requests, AES provided a FEED for the proposed project. The FEED and technical review emphasizes the engineering design and safety concepts as well as the projected operational reliability of the proposed facilities. The principle areas of coverage include: materials in cryogenic environments; insulation systems; cryogenic safety; thermodynamics; heat transfer; instrumentation; cryogenic processes; and other relevant safety systems.

In the course of the application review, FERC staff has evaluated information for the proposed design and installation of the Sparrows Point LNG import terminal. As a result of the technical review of the information provided by AES in the submittal documents, a number of concerns were identified by FERC staff relating to the reliability, operability, and safety of the proposed design. In response to staff's questions, AES provided written responses prior to the technical conference held on May 8, 2007. However, 31 of AES's responses indicated that corrections or modifications would be made to the design in order to address issues raised in the information request. As a result, **we recommend that:**

- **AES should provide information/revisions related to the 31 responses to the April 23, 2007 Engineering Information Request which stated that corrections or modifications would be made to the design. The <u>final design</u> should specifically address response numbers 3, 12, 13, 25, 26, 36, 38, 42, 50, 51, 52, 58, 60, 67, 70, 72, 73, 79, 80, 81, 83, 88, 91, 92, 94, 96, 97, 102, 103, 104, and 108 using management of change procedures.**

The FEED and specifications submitted for the proposed facilities to date are considered to be preliminary but would be the basis for any detailed design to follow. A significant amount of the design involving final selection of equipment manufacturers, process conditions, and resolution of some safety related issues would be completed in the next phase of the project development if authorization is granted by the Commission. This information would need to be filed with the Secretary for review and written approval by the Director of OEP.

In addition, several areas of concern related to the LNG terminal design and construction details have been noted and require additional consideration and/or action on behalf of the company. Follow up on those items requiring additional action should be documented in reports to be filed with the FERC. As a result, **we recommend that**:

The following measures should apply to the AES Sparrows Point LNG terminal. Information pertaining to these specific recommendations should be filed with the Secretary for review and written approval by the Director of OEP either: prior to initial site preparation; prior to construction of final design; prior to commissioning; or prior to commencement of service, as indicated by each specific condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 683 (Docket No. RM06-24-000), including security information, should be submitted as critical energy infrastructure information (CEII) pursuant to 18 CFR 388.112. See *Critical Energy Infrastructure Information*, Order No. 683, 71 Fed. Reg. 58,273 (October 3, 2006), FERC Stats. & Regs. ¶ 31,228 (2006). Information pertaining to items such as: offsite emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements would be subject to public disclosure. All information should be filed a minimum of 30 days before approval to proceed is requested.

- **Complete plan drawings and a list of the hazard detection equipment should be filed <u>prior to initial site preparation</u>. The list should include the instrument tag number, type and location, alarm locations, and shutdown functions of the proposed hazard detection equipment. Plan drawings should clearly show the location of all detection equipment.**
- **AES should provide a technical review of its proposed facility that:**
    - **a. identifies all combustion/ventilation air intake equipment and the distances to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids and flammable gases); and**
    - **b. demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices would isolate or shutdown any combustion equipment whose continued operation could add to or sustain an emergency.**

  AES should file this review <u>prior to initial site preparation</u>.
- **Complete plan drawings and a list of the fixed and wheeled dry-chemical, fire extinguishing, and other hazard control equipment should be filed <u>prior to initial site preparation</u>. The list should include the equipment tag number, type, size, equipment covered, and automatic and manual remote signals initiating discharge of the units. Plan drawings should clearly show the planned location of all fixed and wheeled extinguishers.**
- **Facility plans showing the proposed location of, and area covered by, each monitor, hydrant, deluge system, hose, and sprinkler, as well as piping and instrumentation diagrams, of the fire water system should be filed <u>prior to initial site preparation</u>.**
- **A copy of the hazard design review and list of recommendations that are to be incorporated in the final facility design should be filed <u>prior to initial site preparation</u>.**
- **A complete specification of the proposed LNG tank design and installation should be provided <u>prior to initial site preparation</u>.**
- **Drawings of the storage tank piping support structure and support of horizontal piping at grade should be filed <u>prior to initial site preparation.</u>**
- **The <u>final design</u> of the fixed and wheeled dry-chemical, fire extinguishing hazard control equipment should identify manufacturer and model.**

- **The final design should include an updated fire protection evaluation carried out in accordance with the requirements of NFPA 59A 2001, chapter 9.1.2.**
- **The final design should specify that the design pressure of sendout equipment containing LNG in low pressure service should not be less than the design pressure of the piping system.**
- **The final design should specify that LNG relief valves and LNG drains should not discharge into the vapor system.**
- **The final design should specify that LNG from relief valves and drains is to be returned to storage.**
- **The final design of the vapor return system should include provisions for the addition of LNG transfer pumps to the Platform Drum D-104. The vapor inlet piping to the drum should be designed to insure that all LNG, from the desuperheater and LNG piping discharging to the drum, cannot back flow to the vapor return piping.**
- **The final design should specify that the vapor inlet piping to the BOG drum should be designed to insure that all LNG, from the desuperheater and LNG piping discharging to the drum, cannot back flow to the vapor return piping.**
- **The final design should include provisions for the future installation of LNG pumps for the BOG drum.**
- **The final design should specify that the Low Point Drain Drum is to be equipped to remove residual liquids without personnel accessing the spill containment sump.**
- **The final design of the Low Point Drain Drum should include a pressure relief system to protect the vessel in the event of isolation.**
- **The final design of the boiloff condenser system should include a relief valve between the vapor inlet check valve and the fail closed LNG outlet control valve.**
- **The final design should include provisions to recycle the boiloff compressor discharge upstream of the BOG drum desuperheater.**
- **The final design should include bypass valves around the intank pump ESD2 discharge valves for cooldown of the discharge headers and piping.**
- **The final design should include a shutoff valve at the suction and discharge of each HP pump.**
- **The final design should specify that the minimum flow recycle line from the HP LNG pumps to downstream of the isolation valve to the LNG storage tanks should be the same pressure and temperature rating as the piping at the discharge of the HP LNG pumps.**
- **The final design should include a pilot relief valve or operated vent valve sized for thermal relief and located upstream of the isolation valves at the discharge of each vaporizer.**
- **The final design should include provisions to prevent freezing conditions occurring in idle vaporizers during normal shutdown, emergency shutdown, and extended power failure.**
- **The final design should include provisions to remove LNG from the inlet channel of the vaporizer.**
- **The final design should include a shutoff valve at the suction and discharge of each LNG vaporizer.**
- **The final design should specify that the vent stack be equipped with a discharge piece designed for ignited discharge conditions.**

- **The final design should include P&IDs and drawings of the meter station.**
- **The final design should include a discretionary vent valve for each LNG tank, operable through the DCS.**
- **The final design should include boiloff gas flow and temperature measurement for each tank.**
- **The final design should include LNG tank fill flow measurement with high flow alarm.**
- **The final design should specify that all ESD valves are to be equipped with open and closed position switches connected to the DCS/SIS.**
- **The final design should specify that the hazardous area classification of the LNG pump area and vaporizer LNG inlet and outlet piping areas would be Class 1 Group D, Division1.**
- **The final design should include provisions to protect piperacks and cabling from the effects of fire in the spill impoundment, S-606.**
- **The final design of the firewater system should include two firewater jockey pumps.**
- **The final design should specify that cameras would be provided to provide complete coverage of the unloading, LNG storage and process areas, in addition to cameras required for intrusion detection and security monitoring.**
- **The final design should specify that all drains from high pressure LNG systems would be equipped with double isolation and bleed valves.**
- **The final design should specify that for LNG and natural gas service, branch piping and piping nipples less than 50mm (2 inches), would be no less than schedule 160.**
- **The final design should specify that all piping designed for LNG service should be not less than schedule 40.**
- **The final design should specify that piping and equipment that may be cooled with liquid nitrogen would be designed for liquid nitrogen temperatures, with regard to allowable movement and stresses.**
- **The final design should include details of the shut down logic, including cause and effect matrices for alarms and shutdowns.**
- **The final design should include emergency shutdown of equipment and systems activated by hazard detection devices for flammable gas, fire, and cryogenic spills, when applicable.**
- **The final design should include details of the air gaps to be installed downstream of all seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap should vent to a safe location and be equipped with a leak detection device that: should continuously monitor for the presence of a flammable fluid; should alarm the hazardous condition; and should shutdown the appropriate systems.**
- **The final design should include a hazard and operability review of the completed design. A copy of the review and a list of the recommendations should be filed with the Secretary.**
- **The final design should include provisions for the installation of temporary high-pressure boiloff compression in the event that sendout operation is curtailed or interrupted for extended periods. Details should include plans and drawings of the boiloff gas recovery system and specification of the equipment and compressor to be installed.**
- **All valves including drain, vent, main, and car sealed, or locked valves should be tagged in the field during construction and prior to commissioning.**

- **The design details and procedures to record and to prevent the tank fill rate from exceeding the maximum fill rate specified by the tank designer should be filed prior to commissioning.**
- **A tabulated list of the proposed hand-held fire extinguishers should be filed prior to commissioning. The list should include the equipment number, type, size, number, and location. Plan drawings should include the type, size, and number of all hand-held fire extinguishers.**
- **Operation and Maintenance procedures and manuals, as well as safety procedure manuals, should be filed prior to commissioning.**
- **The FERC staff should be notified of any proposed revisions to the security plan and physical security of the facility prior to commencement of service.**
- **Progress on construction of the Project should be reported in filed monthly reports. Details should include a summary of activities, projected schedule for completion, problems encountered and remedial actions taken. Problems of significant magnitude should be reported to the FERC within 24 hours.**

In addition, **we recommend that the following measures should apply throughout the life of the facility:**

- **The facility should be subject to regular FERC staff technical reviews and site inspections on at least an annual basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, AES should respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, should be submitted.**
- **Semi-annual operational reports should be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported LNG, vaporization quantities, boil-off/flash gas, etc.), plant modifications including future plans and progress thereof. Abnormalities should include, but not be limited to: unloading/shipping problems, potential hazardous conditions from offsite vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, vapor or liquid releases, fires involving natural gas and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boiloff rates. Adverse weather conditions and the effect on the facility also should be reported. Reports should be submitted within 45 days after each period ending June 30 and December 31. In addition to the above items, a section entitled "Significant plant modifications proposed for the next 12 months (dates)" also should be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility.**
- **In the event the temperature of any region of any secondary containment becomes less than the minimum specified operating temperature for the material, the Commission should be notified within 24 hours and procedures for corrective action should be specified.**
- **Significant non-scheduled events, including safety-related incidents (i.e., LNG or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major**

injuries) and security related incidents (i.e., attempts to enter site, suspicious activities) should be reported to FERC staff. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification should be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification should be made to Commission staff within 24 hours. This notification practice should be incorporated into the LNG facility's emergency plan. Examples of reportable LNG-related incidents include:

a. fire;

b. explosion;

c. estimated property damage of $50,000 or more;

d. death or personal injury necessitating in-patient hospitalization;

e. free flow of LNG that results in pooling;

f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes gas or LNG;

g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes gas or LNG;

h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes gas or LNG to rise above its maximum allowable operating pressure (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;

i. a leak in an LNG facility that contains or processes gas or LNG that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any condition that could lead to a hazard and cause a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility;

l. safety-related incidents to LNG marine traffic at or en route to and from the LNG facility; or

m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, Commission staff would determine the need for an on-site inspection by Commission staff, and the timing of an initial incident report (normally within 10 days) and follow-up reports.

AES is proposing the use of a single finger pier approximately 56 feet in width to berth two LNG carriers simultaneously. Ships would be positioned on the north and south sides of the pier and cargo transfer operations would take place on an overhead unloading platform between the two ships. The overhead

unloading platform and the pier would be located in a semi-confined space created by the presence of two LNG carriers.

In the event of a spill on the platform, LNG and cold vapor may become a hazard to personnel below on the pier. AES has stated that when LNG cargo transfer operations are under way, no personnel should be needed to be present on the pier. However, we note that transfer of an entire cargo typically takes more than 12 hours to complete. During this time, there would most likely be a need for personnel to travel along the pier to either access the ship or the shore facilities.

AES has stated that procedures to minimize personnel exposure to any LNG spills in this area would be developed. For example, AES states that cargo transfer would be temporarily suspended during the period mooring hookups are being made on a second vessel. In addition, no personnel would be allowed to enter the area between the two vessels without self-contained breathing apparatus if instrumentation indicated a leak or a leak was suspected.

The unloading platform includes a stairwell, as well as a two safety cages and ladders, as a means of evacuation in the event of an LNG spill. The primary evacuation route for personnel from the unloading area would be from the pier back to shore. For personnel evacuation from the seaward side of the pier, AES has also proposed to install a permanent ladder down to the water on the outer dolphin. However, all evacuation routes from the unloading platform would be through the semi-confined area. In addition, there would be no water-craft permanently stationed at the base of the outer dolphin ladder.

This design is unique as other LNG facilities proposed or operating in the U.S. have used multiple pier configurations for simultaneous berthing arrangements. We believe that the pier configuration and possible simultaneous berthing have the potential to create hazardous conditions for personnel operations and evacuation. Therefore, **we recommend that:**

- **<u>Prior to the end of the DEIS comment period</u>, AES should provide design modifications or procedures which ensure that hazardous conditions would not be created by the simultaneous mooring of two LNG vessels at the unloading berth.**

The AES LNG terminal would be designed to withstand the effects of hurricane force winds, storm surges, and flooding. Based on an AES review of the NOAA National Climatic Data Center for the period of 1974 to 2006, three hurricanes and five tropical storms have occurred in Maryland. The maximum sustained wind speed recorded was 50 mph with gusts ranging from 35 to 72 mph. For the LNG storage tanks, the design wind velocity would be 150 mph per the requirements of 49 CFR 193.2067. For other process equipment containing LNG, the design wind velocity would be obtained from ASCE-7 and would be 90 mph for the terminal site. Similarly, the design wind velocity for site buildings would be 90 mph. AES would also incorporate several flood control techniques such as shore protection features, a flood wall that surrounds the LNG storage tanks and process area, and a storm water collection/drain system to collect and remove rain and flood water from the terminal site.

The terminal site elevations were established based on flood elevation data available for Sparrows Point in Baltimore County, Maryland. Flood elevations associated with storm events of varying return periods were obtained from the Flood Insurance Study (2004) by the FEMA. The anticipated flood level elevation would be nearly equivalent to the 100-year flood elevation of 7.7 feet North American Vertical Datum (NAVD88). The existing site elevation varies from 7 to 13 feet relative to NAVD88. The proposed elevation for the LNG storage tanks would be at least 10 feet NAVD88, and critical process area equipment, such as pumps, vaporizers, and boiloff gas compressors would be elevated at least 10 feet NAVD88. AES believes that with the flood control techniques described above and the various site elevations, the terminal site would be adequately designed to withstand the effects of hurricanes and storm events experienced in this area.

4.12.3 Storage and Retention Systems

LNG storage tanks come in a variety of categories. The following are descriptions of the tank designs most commonly used worldwide:

- single containment cylindrical metal tanks (predominantly used in the United States);
- spherical storage tanks (predominantly used in LNG vessels);
- double containment cylindrical metal inner tank and metal or concrete outer tank (commonly thought of as an LNG tank with a high wall dike);
- full containment cylindrical metal inner tank and metal or concrete outer tank (several authorized by the Commission; several applications currently proposed to the Commission, including this project);
- pre-stressed cylindrical concrete tank with an internal metal membrane (membrane tank) (none in the United States); and
- cryogenic cylindrical concrete tank, internal cryogenic tank, and prestressed concrete outer tank (one operational in the United States; the remainder worldwide).

Single-, double-, and full-containment LNG storage tanks have been authorized by the FERC for use at new LNG import facilities or expansions of existing terminals. To date, only single- and double-containment tanks have been in operation at the FERC regulated facilities. Several full-containment tanks have started construction in the United States, while approximately 50 have been constructed worldwide. During the review of earlier proposals, a number of issues surfaced concerning the applicability of existing codes and regulations to full-containment tanks. Specifically, the term "full containment" does not appear in the federal safety standards in 49 CFR 193. As a result, some project proponents have made the assumption that to design and construct a full-containment tank in accordance with European Standard 1473 - *Installation and Equipment for Liquefied Natural Gas - Design of Onshore Installations* (EN 1473) would satisfy the U.S. codes and standards.

For example, it has been suggested that thermal exclusion zones are not required for a full-containment tank because EN 1473 does not consider a tank fire scenario for full-containment tanks with a pre-stressed concrete wall and concrete roof. The staffs of the FERC and the DOT do not agree because Part 193 does not exclude full-containment tanks from thermal exclusion zone requirements. As a result, a thermal exclusion zone analysis is required for an LNG storage tank fire at the top of the secondary container (see section 4.12.4 Siting Requirements-Thermal and Dispersion Exclusion Zones).

Further, EN 1473 does not specify a minimum distance to the property line for full-containment tanks because no tank fire scenario is considered. However, NFPA 59A, 2001 edition, requires a separation of 0.7 times the tank diameter from the property line. AES Sparrows Point LNG's proposed tank separation distance to the property line meets this separation requirement.

Another issue regarding the full-containment design is that the tank outer wall (secondary containment) serves as the impoundment, a concept allowed under Parts 193.2161 and 193.2167, and under the "exception" in figure 2.2.2.6 of NFPA 59A, 2001 edition. A specific concern is the dual function of the concrete secondary container - it serves both the operational function of holding the insulation and gas pressure, and a safety function of containing liquid in the event of an inner tank failure. Conversely, in single- and double-containment tanks, independent systems provide operational and safety functions. While recognition must be given to the benefits of a concrete secondary container with respect to external events, such as projectiles or small aircraft, its ability to provide the dual functions while retaining its integrity has not been convincingly supported for all scenarios. This becomes increasingly important as proposed site acreage is reduced and buffer zones between adjacent properties are minimized. As such, the FERC staff considers it prudent design practice to provide some form of barrier to prevent liquid from flowing to an unintended area (i.e., outside the plant property) in the event that the storage tank primary and secondary containers fail.

AES proposes to install a floodwall around the LNG tanks and associated process area. The structure would be constructed to an elevation of 8 feet above the finished grade level and would enclose an area of approximately 24 acres. The structure's volumetric capacity would contain a single LNG tank's maximum

liquid capacity. This floodwall would confine LNG on the project site in the event of any hypothetical catastrophic event.

Concerns have also been expressed that the barrier could be considered a containment and prohibit certain equipment being located within the barrier and/or may conflict with other parts of the various codes with respect to hazardous and electrical code classifications. Other concerns are that the barrier could be considered an impounding area that would require new thermal and vapor cloud calculations. The purpose of the barrier is to prevent liquid from flowing off the plant property, and it is not the intent to define a containment or impounding area for thermal radiation or flammable vapor exclusion zone calculations or other code requirements.

4.12.4 Siting Requirements

Regulatory Requirements

The LNG facilities proposed in this project must comply with the siting requirements of 49 CFR 193, Subpart B. On March 30, 2000, the DOT revised 49 CFR 193 to incorporate the 1996 edition of NFPA 59A into the LNG regulations. On April 9, 2004, the DOT further revised 49 CFR 193 to incorporate the 2001 edition of NFPA 59A. The following sections specifically address siting requirements:

- **Part 193.2001, Scope of part**, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the marine vessel and the last manifold or valve immediately before a storage tank.
- **Part 193.2051, Scope**, states that each LNG facility designed, replaced, relocated or significantly altered after March 31, 2000, must be provided with siting requirements in accordance with subpart B and NFPA 59A, 2001 edition. In the event of a conflict with NFPA 59A, then Part 193 prevails.
- **Part 193.2057, Thermal radiation protection**, requires that each LNG container and LNG transfer system have thermal exclusion zones based on three radiation flux levels in accordance with Section 2.2.3.2 of NFPA 59A, 2001 edition.
- **Part 193.2059, Flammable vapor-gas dispersion protection**, requires that each LNG container and LNG transfer system have a dispersion exclusion zone in accordance with sections 2.2.3.3 and 2.2.3.4 of NFPA 59A, 2001 edition.

For the following LNG facilities that are proposed for this project, we have identified the applicable siting requirements from Part 193 and NFPA 59A, 2001 edition:

- Three 42,267,530 gallon (160,000 m^3) LNG storage tanks - Parts 193.2057 and 2059 require the establishment of thermal and flammable vapor exclusion zones for LNG tanks. Section 2.2.3.2 specifies four thermal exclusion zones based on the design spill and the impounding area. Sections 2.2.3.3 and 2.2.3.4 specify a flammable vapor exclusion zone for the design spill which is determined in Section 2.2.3.5.
- Two marine LNG unloading berths and a cargo transfer system; each berth would have three 16-inch-diameter unloading arms; the berths would share one 32-inch-diameter transfer line to the storage tanks - Parts 193.2001, 2057, and 2059 require thermal and flammable vapor exclusion zones for the transfer system. NFPA 59A, 2001 edition, does not address LNG transfer systems.
- Nine 7,000 gallons per minute (gpm) low-pressure (LP) in-tank pumps (three in each tank; two operating and one spare) and ten 1,700 gpm high-pressure (HP) sendout pumps (two spares) - Parts 193.2057 and 2059 require thermal radiation and flammable vapor exclusion zones. NFPA 59A, 2001 edition, Section 2.2.3.2 specifies the thermal exclusion zone and Sections 2.2.3.3 and 2.2.3.4 specify the flammable vapor exclusion zone based on the design spill in a process area.

- Seven high pressure (HP) vaporizers (one spare) and two intermediate-pressure (IP) vaporizers (one spare) - Same requirements as for LNG pumps.

The incorporation of the NFPA 59A requirements into Part 193 has resulted in some confusion and possible misinterpretation in applying the siting requirements. Parts 193.2057 and 2059 require exclusion zones for LNG transfer systems, which are defined to include transfer piping. However, NFPA 59A only requires exclusion zones for "transfer areas" which are defined as the part of the plant where liquids are introduced or removed from the facility such as truck loading or ship unloading areas. The definition of transfer area in NFPA 59A specifically excludes permanent plant piping such as cargo transfer lines. Additionally, NFPA 59A Section 2.2.3.1 specifically excludes transfer area at the water edge of marine terminals. When the DOT originally incorporated NFPA 59A into its regulations, it removed the requirement for impounding systems around transfer piping (old Part 193.2149). In the preamble to the final rule, the DOT determined that the most likely sources of leaks within an LNG plant are LNG storage tanks, cargo transfer areas, and vaporizers and process equipment, which are all addressed in NFPA 59A Section 2.2.1.2. The result is that while Part 193 retains exclusion zones for LNG transfer systems, neither Part 193 nor NFPA 59A requires the impoundment from which to base the calculations. We do not believe that this was the intent, nor do we believe that omitting containment for transfer piping is a sound engineering practice. The FERC staff will continue to require containment for all LNG transfer piping within a plant site.

The incorporation of NFPA 59A also changed the way in which design spills and impoundment capacities may be determined. Under Section 2.2.2.2, the capacity of impounding areas for vaporization, process, or LNG transfer areas must equal the greatest volume during a 10-minute period from any single accidental leakage source or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the authority having jurisdiction. Similar criteria appear in Section 2.2.3.5 for determining the design spill used in thermal and flammable vapor exclusion zone calculations. Prior to the incorporation of NFPA 59A the design spill in Part 193 assumed the rupture of a single transfer pipe with the greatest overall flow capacity, for not less than 10 minutes (old Part 193.2059(d)). As a result, the spill rate for vaporization, process, or LNG transfer areas may be assumed to be a "leakage source" rather than a full pipe rupture; however, the spill duration must be 10 minutes unless the authority having jurisdiction (*i.e.,* DOT's OPS), determines that a shorter time is acceptable. Again, given the confusion in applying the two requirements, the FERC staff will continue to utilize the 10-minute spill criteria at the maximum flow possible for containment sizing. This will ensure that impoundments are sized for a catastrophic failure, while recognizing that less conservative spill scenarios may be appropriate to calculate exclusion zones. In giving recognition to the integrity of all-welded transfer piping, the determination of the single accidental leakage source should be based on an evaluation of all small diameter attachments to the transfer piping for instrumentation, pressure relief, recirculation, etc., and any flanges that may be used at valves or other equipment, in order to determine the largest spill rate. This approach is the result of discussion with DOT's staff concerning the basis for design spills and application to exclusion zone determinations for proposals before the Commission.

Impoundment Systems and Design Spills

Part 193.2181 specifies that each impounding system serving an LNG storage tank must have a minimum volumetric liquid capacity of 110 percent of the LNG tank's maximum design liquid capacity for an impoundment serving a single tank. AES Sparrows Point LNG proposes three full-containment LNG storage tanks in which the outer tank wall serves as the impoundment system. The total impounding capacity would have a volumetric capacity of 50,009,090 gallons, which exceeds the 110 percent required capacity.

AES proposes to install only one insulated concrete impoundment basin, LNG Spill Containment Sump (S-606), at the LNG terminal site. The dimensions of the sump would be 70-feet-long by 70-feet-wide, with a depth of 18-feet. The volume capacity of this sump would be 660,000 gallons. The LNG Spill Containment Sump (S-606) would be located within the floodwall. Spills from the tank, vaporizers, sendout pumps, and unloading line would be routed to the sump by a series of collection troughs. The sump would be sized for a full rupture of the 32-inch unloading line during an unloading operation. A spill from this line over a 10-minute period would result in a spill volume of 550,400 gallons at a maximum unloading rate of 55,040 gpm.

The LNG Spill Containment Sump (S-606) would also contain a spill from the in-tank pumps withdrawal header and the processing area. Each LNG storage tank would be equipped with three in-tank pumps (two operating, one spare) individually rated for 7,000 gpm. With two pumps operating, the volume for a 10-minute spill from the in-tank pump withdrawal header would be 140,000 gallons. The maximum flow from the processing area would be from the high pressure pump suction header which includes 10 pumps (eight operating, 2 spare) individually rated for 1,700 gpm. A 10-minute spill from the high pressure pump suction header would release 136,000 gallons of LNG. Each of these individual spills would be contained in the LNG Spill Containment Sump (S-606).

Design Spills

The calculation of thermal and flammable vapor exclusion zones for the proposed LNG facility are based on the dimensions of the proposed spill containment systems and the design spills according to 49 CFR 193 and NFPA 59A, 2001 edition. In accordance with section 2.2.3.5 of NFPA 59A, 2001 edition, the design spill for an LNG storage tank with no penetrations below the liquid level is defined as the largest flow from any single line that could be pumped into the impounding area with the tank withdrawal pumps considered to be operating at full rated capacity over a 10-minute period. The guillotine rupture of the tank discharge header of the in-tank LNG pumps would produce a spill volume of 140,000 gallons.

NFPA 59A, 2001 edition, section 2.2.3.5 also defines design spills for impounding areas serving only vaporization, process, or LNG transfer areas as the flow from any single accidental leakage source for a 10-minute duration. In its analysis, AES modeled a design spill of the full flow from a guillotine rupture of the 32-inch diameter unloading line at a rate of 55,040 gpm. This would result in a 10-minute spill volume of 550,400 gallons. This spill would be completely contained by the LNG Spill Containment Sump (S-606). After a review of the piping and instrumentation diagrams for small diameter attachments, FERC staff determined that a credible LNG spill could result from a break of a 6-inch-diameter circulation line from the unloading header which would generate a spill volume of 128,200 gallons for a 10-minute spill. A spill from the high pressure pump suction header which would generate a spill volume of 136,000 gallons for a 10-minute spill was also considered.

Table 4.12.4-1 presents the impounding areas and spill size volumes used to determine adequate impounding capacity, as well as the design spills considered in the thermal radiation and flammable gas dispersion modeling.

Thermal Exclusion Zone

If a large quantity of LNG is spilled in the presence of an ignition source, the resulting LNG pool fire could cause high levels of radiant heat in the area surrounding the impoundment. Exclusion distances for various flux levels were calculated according to 49 CFR 193.2057 and section 2.2.3.2 of NFPA 59A, 2001 edition, using the "LNGFIRE III" computer program model (LNGFIRE III) developed by the Gas Research Institute. NFPA 59A, 2001 edition, establishes certain atmospheric conditions (0 mph wind speed, 70°F, and 50 percent relative humidity) which are to be used in calculating the distances. However, Part 193.2057 supersedes these requirements and stipulates that the wind speed, ambient temperature, and relative humidity which produce the maximum exclusion distances must be used, except for conditions that occur less than 5 percent of the time based on recorded data for the area. For its analysis, AES selected the following ambient conditions to produce the maximum distances: wind speeds of 15 and 18 mph; ambient temperature of 26°F; and 33 percent relative humidity. These conditions yield longer distances than the 0 mph wind speed, 70°F ambient temperature, and 50 percent relative humidity specified in NFPA 59A, 2001 edition. FERC staff agrees with AES's selection of atmospheric conditions.

TABLE 4.12.4-1

Impoundment Areas for LNG Spills

Source	Spill Size (gallons)	Impoundment System	Impoundment Size (gallons)
Impoundment Sizing Spills:			
LNG Storage Tank	44,945,696	Outer Tank Concrete Wall	50,009,090
Marine Transfer Line (32-inch dia.)	550,400	LNG Spill Containment Sump (S-606)	660,000
In-Tank Pump Withdrawal Header (30-inch dia.)	140,000	LNG Spill Containment Sump (S-606)	660,000
High Pressure Pumps Suction Header (6-inch dia.)	136,000	LNG Spill Containment Sump (S-606)	660,000
Design Spills:			
In-Tank Pump Withdrawal Header (30-inch dia.)	140,000	LNG Spill Containment Sump (S-606)	660,000
Marine Transfer Line (6-inch dia.)	128,200	LNG Spill Containment Sump (S-606)	660,000
High Pressure Pump Suction Header (6-inch dia.)	136,000	LNG Spill Containment Sump (S-606)	660,000

Under 49 CFR 193.2057, the LNG storage tank impoundment must have a thermal exclusion zone in accordance with NFPA 59A, 2001 edition. The referenced section 2.2.3.2 of NFPA 59A, 2001 edition, requires thermal radiation distances ranging from 1,600 to 10,000 British thermal units per square foot per hour (Btu/ft2-hr) to be calculated for a volume of LNG determined in accordance with section 2.2.2.1.

Thermal radiation distances calculated for the 1,600 to 10,000 Btu/ft^2-hr incident flux levels for an LNG storage tank impoundment fire were based on the outer tank's concrete wall diameter (254 feet) as the pool diameter and the flame height equal to the top of the concrete wall (137.5 feet). The target height was set at ground level (0 feet). The 1,600 Btu/ft^2-hr incident flux level for the LNG storage tank impoundment fire produced a longer distance at a wind speed of 15 mph compared to that of 18 mph. The resulting distances would be 394 feet for the 10,000 Btu/ft^2-hr; 775 feet for the 3,000 Btu/ft^2-hr zone; and 949 feet for the 1,600 Btu/ft^2-hr zone. Portions of the exclusion zones for the 1,600 and 3,000 Btu/ft^2-hr incident flux levels from the storage tanks extend over water to the south beyond the property line of the terminal. Since these portions of the 1,600 and 3,000 Btu/ft^2-hr thermal exclusion zones extend beyond the property line over water, we believe that these portions of the thermal exclusion zones are in compliance with 49 CFR 193.2057. The exclusion zones for the 1,600 and 3,000 Btu/ft^2-hr incident flux levels from the storage tanks would also extend beyond the property line of the terminal site to the north and east but would remain on land owned by SPS Limited Partnership LLP (the owner of the terminal site). On November 27, 2006, entered into an option to lease agreement with SPS Limited Partnership LLP restricting SPS Limited Partnership LLP from permitting the use or occupancy of land within 3,000 feet of the terminal site boundary in any manner that would conflict with the prohibited uses under the provisions of NFPA 59A, 2001 edition. Therefore, **we recommend that:**

- **<u>Prior to initial site preparation</u>, AES should file finalized documentation of the lease agreement which demonstrates that the exclusion zones extending offsite comply with 49 CFR 193.2057 and 193.2007.**

In addition, the thermal radiation distances were determined for the 1,600 Btu/ft^2-hr incident flux level centered on the LNG Spill Containment Sump (S-606). The 1,600 Btu/ft^2-hr would extend 366 feet from the center of the LNG Spill Containment Sump. This zone would not extend beyond the property line of the terminal site. Therefore, the thermal exclusion zone would remain on the LNG terminal site and would be in compliance with 49 CFR 193.2057.

Table 4.12.4-2 presents the calculated maximum distances for incident flux levels ranging from 1,600 Btu/ft^2-hr to 10,000 Btu/ft^2-hr, as verified by the FERC staff. Figure 4.12.4-1 illustrates the calculated thermal radiation exclusion zones.

TABLE 4.12.4-2 **Thermal Exclusion Zones**			
Source	Exclusion Area NFPA 59A Section 2-2.3.2(a)	Incident Flux (Btu/ft^2-hr) a/	Exclusion Zone (feet)
LNG Storage Tank Impoundment	Outdoor assembly area occupied by 50 or more people.	1,600	949
LNG Storage Tank Impoundment	Offsite structures used for occupancies or residences.	3,000	737
LNG Storage Tank Impoundment	Property line that can be built upon.	10,000	394
LNG Spill Containment Sump	Property line that can be built upon.	1,600	366

a/ The 1,600 Btu/ft^2-hr flux level is associated with an exposed person experiencing burns within about 30 seconds. At 3,000 Btu/ft^2-hr, an exposed person would experience burns within 10 seconds, however a wooden structure would not be expected to burn and affords protection to sheltered persons. At 10,000 Btu/ft^2-hr, clothing and wood can ignite spontaneously.

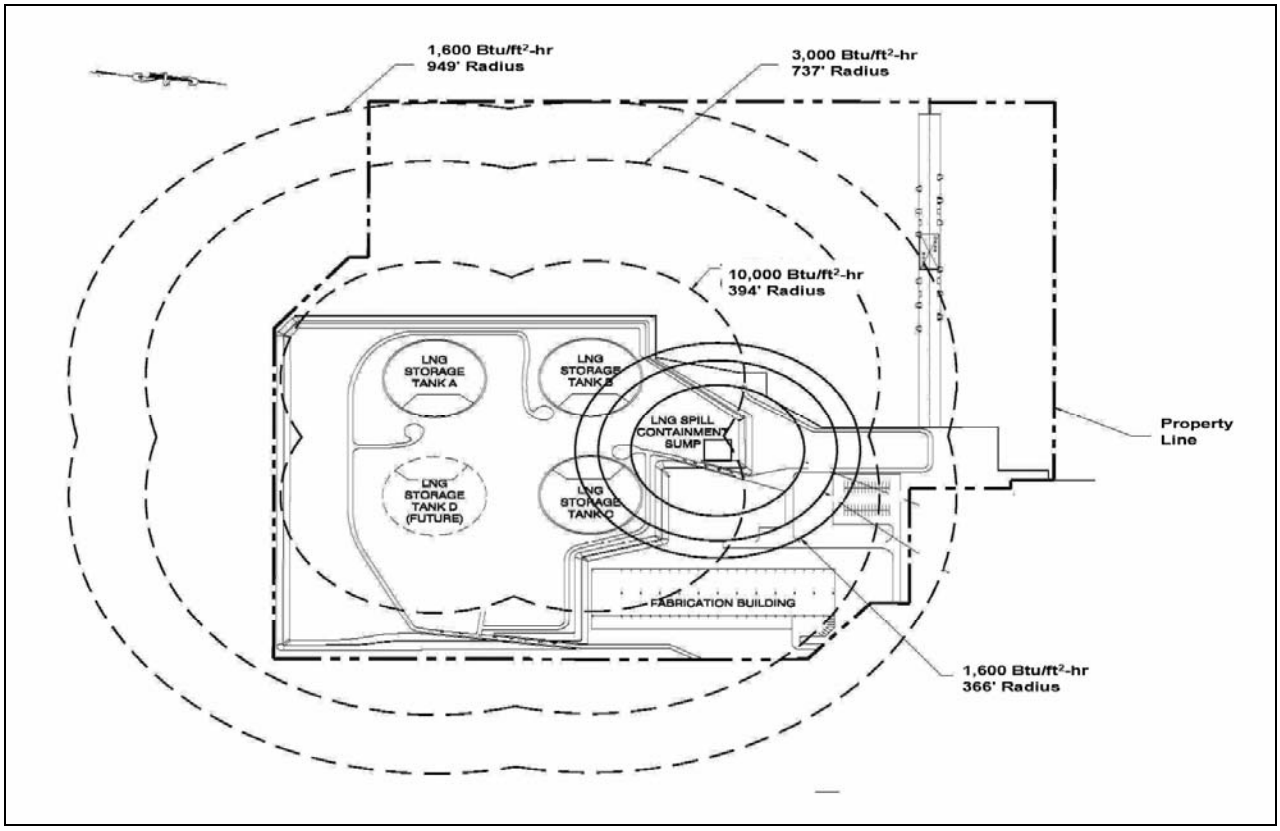


Figure 4.12.4-1 Thermal Exclusion Zones

Comments were received that the location of the proposed LNG terminal would affect funding for U.S. Department of Housing and Urban Development (HUD) projects. HUD regulations (Subpart C 51.200(a)) states that an acceptable separation distance shall be calculated "for HUD-assisted projects from specific, stationary, hazardous operations which store, handle, or process hazardous substances." Per HUD regulations, a hazard is defined as a "stationary container which stores, handles, or processes hazardous substances of an

explosive or fire prone nature." The thermal radiation flux levels from an LNG storage tank fire established by HUD for the siting of buildings and people in unprotected outdoor areas of congregation or recreation are 10,000 Btu/ft^2-hr and 450 Btu/ft^2-hr, respectively. Based on the nomographs developed by HUD, the Acceptable Separation Distances for buildings and exposure to people from a potential LNG tank fire were 180 feet and 870 feet, respectively. These distances were based on a fire width equal to the diameter of the storage tank's secondary container.

The FERC staff also used LNGFIRE III according to 49 CFR 193.2057 to verify the exclusion zone distances for the 10,000 Btu/ft^2-hr and 450 Btu/ft^2-hr thermal radiation flux levels established by HUD. The exclusion zone distances for the 10,000 Btu/ft^2-hr and 450 Btu/ft^2-hr flux levels were 394 feet and 1,364 feet, respectively. The closest residential communities, specifically Turner Station, are located approximately 1.2 miles from the proposed terminal site. Therefore, we believe that any funding for HUD projects would not be impacted by the Project.

Vapor Dispersion Zone

A large quantity of LNG spilled without ignition would form a flammable vapor cloud that would travel with the prevailing wind until it either dispersed below the flammable limits or encountered an ignition source. Part 193.2059 and sections 2.2.3.3 and 2.2.3.4 of NFPA 59A, 2001 edition, require that provisions be made to minimize the possibility of flammable vapors from reaching a property line that can be built upon and that would result in a distinct hazard. Part 193.2059 requires that dispersion distances be calculated for a 2.5 percent average gas concentration (½ the lower flammability limit [LFL] of LNG vapor) under meteorological conditions which result in the longest downwind distances at least 90 percent of the time. Alternatively, maximum downwind distances may be estimated for stability Class F, a wind speed of 4.5 mph, 50 percent relative humidity, and the average regional temperature. The section allows the use of the DEGADIS Dense Gas Dispersion Model, or the FEM3A model, to compute dispersion distances. Design spills into impounding areas serving LNG containers, transfer systems and piping are to be determined in accordance with section 2.2.3.5 of NFPA 59A, 2001 edition. In accordance with section 2.2.3.3 of NFPA 59A, 2001 edition, an average concentration of methane in air of 50 percent of the LFL cannot cross the property line from a design spill into each tank impoundment. In this case, compliance with section 2.2.3.3 would also meet the requirements of section 2.2.3.4 of NFPA 59A, 2001 edition.

In performing the vapor dispersion analysis for the LNG Spill Containment Sump (S-606) as required by 49 CFR 193.2059, AES selected a wind speed of 4.5 mph, an atmospheric temperature of 55.4° F, a relative humidity of 50 percent, and atmospheric stability Class F. FERC staff agrees with the selection of these conditions. AES used DEGATEC, a Microsoft Windows version of DEGADIS that includes the SOURCE model, in their vapor dispersion modeling of the full flow from a guillotine rupture of the 32-inch diameter unloading line at a rate of 55,040 gpm. This 10-minute spill volume of 550,400 gallons would result in a distance of 262 feet to the ½ LFL which would remain on the terminal site.

FERC staff did not agree with this calculation performed by AES. Therefore, we modeled a spill from the LNG tank header for 2 low pressure operating pumps each rated at 7,000 gpm (14,000 gpm). A 10-minute spill produces a distance of 361 feet to the ½ LFL which would remain on the terminal site. Figure 4.12.4-1 illustrates the calculated vapor dispersion exclusion zone.

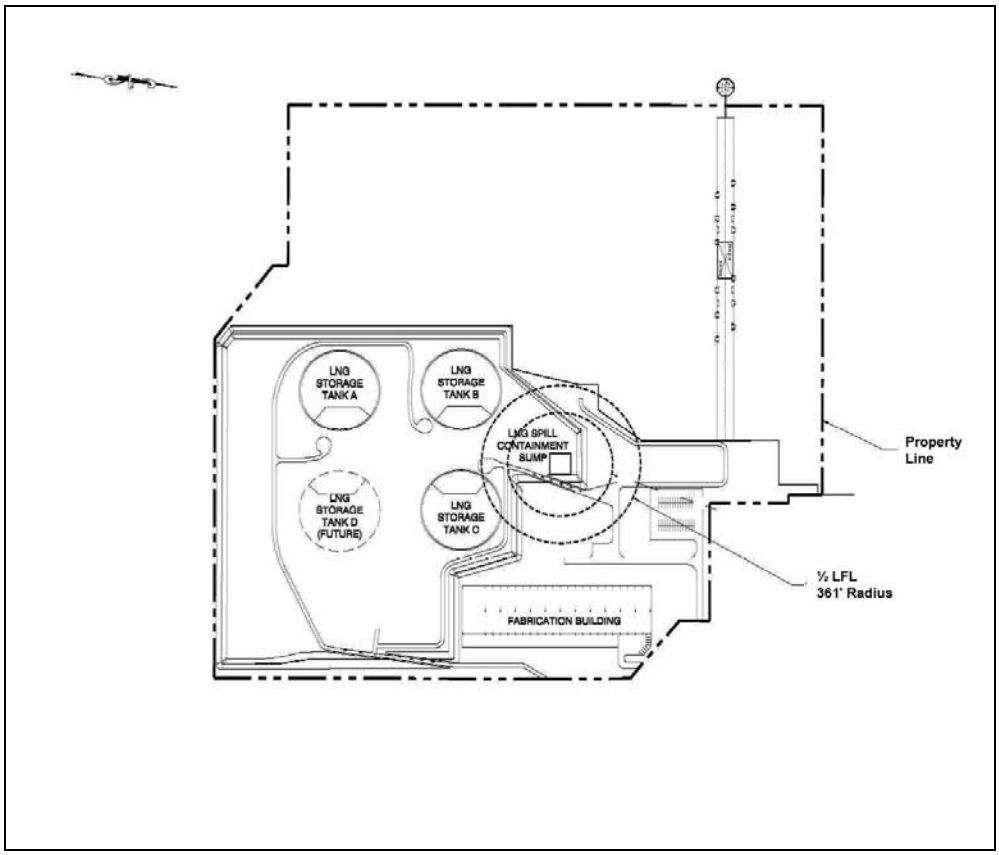


Figure 4.12.4-2 Vapor Dispersion Exclusion Zone

Although the impoundment system technically complies with 49 CFR 193.2059, the issue of the lengthy distance from potential spill locations to the sumps needs to be addressed. Potential LNG spills would be directed to the LNG Spill Containment Sump through both the unloading line trough and the sendout line trough. Long trenches increase the surface area available for heat transfer and, correspondingly, increase vapor generation. As a result, the control of vapors produced in these channels or trenches leading to these sumps must be considered.

In order to examine this issue, AES Sparrows Point LNG performed vapor dispersion calculations using a computational fluid dynamics code. The modeling took into consideration the effect of wind and site geometry. In the case of the unloading line trough, a spill rate of 55,040 gpm was assumed as the result of a guillotine rupture of the 32-inch diameter unloading line. The trough design structure around this piping includes a four foot tall concrete wall along both edges. These walls are designed for personnel protection, but would also retard the flow of vapor in the event of an LNG spill. AES proposes to install a 7-foot-tall impermeable vapor fence along the northeast corner of the unloading line. The simulations indicated that a portion of the LNG vapors could flow over the concrete wall and the 7-foot-tall vapor fence. As a result, AES Sparrows Point LNG proposes to install an additional 8-foot-tall impermeable fence between the pipe rack and the eastern property line. The modeling indicates that this vapor fence, which would be 45 feet inside of the eastern property line, would prevent the ½ LFL concentration isopleth from reaching the property line.

In the case of the sendout line trough, a spill rate equal to a guillotine rupture of the 30-inch diameter high pressure pump suction header was used. The trough design structure around this piping includes a three foot tall handrail with vapor fencing. AES proposes to install a 10-foot-tall impermeable vapor fence, 50 feet in length, located 210 feet inside of the nearest property line. A secondary fence, also 10 feet in height and 200 feet in length would be placed between the first fence and the property line. Based on this configuration, the modeling indicates that the ½ LFL concentration vapor cloud would remain approximately 15 feet inside the property line.

4.12.5 LNG Vessel Safety

Since 1959, LNG has been transported by ship without a major release of cargo or a major accident involving an LNG vessel. Over the last 45 years, LNG vessels have made over 44,000 voyages worldwide. Starting in 1971, LNG began arriving at the Distrigas facility in Everett, Massachusetts. To date, more than 680 cargoes, with volumes ranging from 60,000 to 138,000 m^3, have been delivered into the Port of Boston without incident. Recently, LNG imports to other US terminals, such as Elba Island, have steadily increased. During 2005, a total of 241 cargoes of LNG were imported into the United States. During 2006, 226 cargoes of LNG were imported into the United States. For 36 years, LNG shipping operations have been safely conducted in the United States.

4.12.5.1 History

During the 44,000 voyages that have been completed since the inception of LNG maritime transportation, there has not been a serious accident at sea or in a port which resulted in a spill due to rupturing of the cargo tanks. However, insurance records, industry sources, and public websites identify a number of incidents involving LNG vessels, including minor collisions with other vessels of all sizes, groundings, minor LNG releases during cargo unloading operations, and mechanical/equipment failures typical of large vessels. Some of the more significant LNG vessel incidents are described below:

- **Pollenger** had an LNG spill onto the steel cover of cargo tank number one during unloading at Everett, Massachusetts in April 1979. The spill caused cracking of the steel plate.
- **El Paso Paul Kayser** grounded on a rock in June 1979 in the Straits of Gibraltar during a loaded voyage from Algeria to the United States. Extensive bottom damage to the ballast tanks resulted; however, the cargo tanks were not damaged, and no cargo was released. The complete cargo of LNG was subsequently transferred to another LNG vessel and delivered to its United States destination.
- **LNG Taurus** grounded in December 1980 near the entrance to Taboata Harbor, Japan. The grounding resulted in extensive bottom damage, but the cargo tanks were not affected. The ship was refloated and the cargo unloaded.
- **Isabella** had LNG spill onto its deck due to a cargo tank overflow in June 1985, causing severe cracking of the steelwork. The spill had been attributed to a cargo valve failure during discharging of cargo.
- **Tellier** was blown by severe winds from its docking berth at Skikda, Algeria in February 1989 causing damage to the loading arms and the ship and shore piping. The cargo loading had been secured just before the wind struck, but the loading arms had not been drained. Consequently, the LNG remaining in the loading arms spilled onto the deck causing fracture of some plating.
- **Mostefa Ben Boulaid** had LNG spill onto its deck during loading operations in Algeria in 2002. The spill, which is believed to have been caused by overflow rather than a mechanical failure, caused significant brittle fracturing of the steelwork. The ship was required to discharge its cargo, after which it proceeded to dock for repair.
- **Khannur** had a cargo tank overfill into the ship's vapor handling system on September 10, 2001, during unloading at Everett, Massachusetts. Approximately 100 gallons of LNG were vented and sprayed onto the protective decking over the cargo tank dome, resulting in several cracks. After re-inspection by the Coast Guard, the Khannur was allowed to discharge its LNG cargo.
- **Norman Lady** was struck by the USS Oklahoma City nuclear submarine while the submarine was rising to periscope depth near the Strait of Gibraltar in November 2002. The 87,000-m^3 LNG vessel, which had just unloaded its cargo at Barcelona, Spain, sustained only minor damage to the outer layer of its double hull but no damage to its cargo tanks.

- **Tenaga Lima** grounded on rocks while proceeding to open sea east of Mopko, South Korea due to strong current in November 2004. The shell plating was torn open and fractured over an approximate area of 20 feet by 80 feet, and internal breaches allowed water to enter the insulation space between the primary and secondary membranes. The ship was refloated, repaired, and returned to service.
- **Golar Freeze** moved away from its docking berth during unloading on March 14, 2006, in Savannah, Georgia. The powered emergency release couplings on the unloading arms activated as designed, and transfer operations were shut down.
- **Catalunya Spirit** lost propulsion and became adrift 35 miles east of Chatham, Massachusetts on February 11, 2008. Four tugs towed the vessel to a safe anchorage for repairs. The Catalunya Spirit was repaired and taken to port to discharge its cargo.

4.12.5.2 LNG Vessel Construction

In 1980, at the initial peak of LNG import activity in the United States, the Coast Guard published the report *Liquefied Natural Gas and Liquefied Petroleum Gas – Views and Practices – Policy and Safety*. The report summarized the Coast Guard's extensive research into the safety hazards of LNG and its view that "...the nature of both LNG and LPG presents an acceptable risk for transportation in maritime commerce." This is due to the fact that LNG vessels are well constructed, robust vessels designed to withstand low-energy-type incidents that are prevalent in harbors and during docking operations. Moreover, safety measures, both equipment and training, are planned and designed into these LNG vessels to prevent or control all types of potential incidents. The Sandia National laboratory reached a similar conclusion in 2005 in its report.

The world's LNG vessel fleet currently exceeds 250 vessels (LNG Express, 2008). Currently, all of the ships in the LNG fleet operate under a foreign flag with foreign crews. The LNG vessels used to import LNG to the United States would be constructed and operated in accordance with the International Maritime Organization's (IMO) *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk*, the International Convention for the Safety of Life at Sea (SOLAS), and 46 CFR Part 154, which contain the United States safety standards for vessels carrying bulk liquefied natural gas. Foreign flag LNG vessels are required to possess a valid IMO Certificate of Fitness and a Coast Guard Certificate of Compliance.

As required by the IMO conventions and design standards, hold spaces and insulation areas on an LNG vessel are equipped with gas detection and low temperature alarms. These devices monitor for leaks of LNG into the insulation between primary and secondary LNG cargo tank barriers. In addition, hazard detection systems are also provided to monitor the hull structure adjacent to the cargo tank, compressor rooms, motor rooms, cargo control rooms, enclosed spaces in the cargo area, specific ventilation hoods and gas ducts, and air locks.

LNG vessels are equipped with a firewater system with the ability to supply at least two jets of water to any part of the deck in the cargo area and parts of the cargo containment and tank covers above-deck. A water spray system is also available for cooling, fire prevention, and crew protection in specific areas. In addition, certain areas of LNG vessels are fitted with dry chemical powder-type extinguishing systems and carbon dioxide (CO_2) smothering systems for fighting fires.

In 1993, amendments to the IMO's *Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk* required all tankers to have monitoring equipment with an alarm facility which is activated by detection of over-pressure or under-pressure conditions within a cargo tank. In addition, the cargo tanks are to be heavily instrumented, with gas detection equipment in the hold and inter-barrier spaces, temperature sensors, and pressure gauges. Fire protection must include the following systems:

- a water spray (deluge) system that covers the accommodation house control room and all main cargo valves;
- a traditional firewater system that provides water to fire monitors on deck and to fire stations found throughout the ship;

- a dry chemical fire extinguishing system for hydrocarbon fires; and
- a CO_2 system for protecting machinery including the ballast pump room, emergency generators, and compressors.

As a result of the terrorist attacks that occurred on September 11, 2001, the IMO agreed to new amendments to the 1974 SOLAS addressing port facility and ship security. The *International Ship and Port Facility Security (ISPS) Code* was adopted in 2003 by the IMO. This code requires both ships and ports to conduct vulnerability assessments and to develop security plans. The purpose of the code is to prevent and suppress terrorism against ships; improve security aboard ships and ashore; and reduce the risk to passengers, crew, and port personnel on board ships and in port areas. All LNG vessels as well as other cargo vessels 300 gross tons and larger, and ports servicing those regulated vessels, must adhere to these IMO and SOLAS standards. Some of the IMO requirements are as follows:

For Ships:

- Ships must develop security plans and have a Vessel Security Officer (VSO);
- Ships must be provided with a ship security alert system. These alarms transmit ship-to-shore security alerts to a competent authority designated by the Administration, which may include the company, identifying the ship, its location, and indication that the security of the ship is under threat or has been compromised;
- Ships must have a comprehensive security plan for international port facilities, focusing on areas having direct contact with ships; and
- Ships may have certain equipment onboard to help maintain or enhance the physical security of the ship.

For port facilities:

- Ports must develop a port facility security plan and have a Facility Security Officer (FSO); and
- Certain security equipment may be required to maintain or enhance the physical security of the facility.

For both ships and ports:

- Access must be monitored and controlled;
- Activities of people and cargo must be monitored;
- Secure communications must be readily available; and
- A Declaration of Security must be completed and signed by the FSO and VSO.

4.12.5.3 Hazards

The history of LNG shipping has been free of major incidents, and none have resulted in significant quantities of cargo being released (see section 4.12.4.1). No incidents have occurred at existing LNG terminals during the 50 years of operation that resulted in any significant quantities of cargoes being released. However, the possibility of an LNG spill from a ship over the duration of the proposed project must be considered. If an LNG spill were to occur, the primary hazard to the public would be the impact of radiant heat from a pool fire. If an LNG release were to occur without ignition, an ignitable gas cloud could form and present a hazard. This section presents the results of analyses specific to LNG vessels to determine distances for these hazards, and describes how the hazard distances would be managed if the Project is approved.

Historically, the events most likely to cause a significant release of LNG were a ship casualty such as:

- a grounding sufficiently severe to puncture an LNG cargo tank;

- a vessel colliding with an LNG vessel in transit;
- an LNG vessel alliding[8] with the terminal or a structure in the waterway; or
- a vessel alliding with an LNG vessel while moored at the terminal.

However, the attacks on September 11, 2001, have made the public keenly aware of an additional risk that must be considered in the evaluation of marine safety and security:

- A deliberate attack on an LNG vessel by a terrorist group.

To result in a spill of LNG, any of the above events would need to occur with sufficient impact to breach an LNG vessel's double hull and cargo tanks. All LNG vessels used to deliver LNG to the proposed Project would have double-hull construction, with the inner and outer hulls separated by about 10 feet. Furthermore, the cargo tanks are normally separated from the inner hull by a layer of insulation approximately 1-foot thick.

As a result, many grounding incidents severe enough to cause a cargo spill on a single-bottom oil tanker would be unable to penetrate both inner and outer hulls of an LNG vessel. An earlier Federal Power Commission (predecessor to the FERC) study estimated that the double-bottom of an LNG vessel would be sufficient to prevent cargo tank penetration in about 85 percent of the cases that penetrated a single-bottom oil tanker. Previous incidents with LNG vessels have primarily involved grounding, and none of these have resulted in the breach of the double hull and subsequent release of LNG cargo.

The likelihood of an LNG vessel sustaining cargo tank damage in a collision would depend on several factors – the displacement and construction of both the struck and striking vessels, the velocity of the striking vessel and its angle of impact with the struck vessel, and the location of the point of impact. The previous Federal Power Commission study estimated that the additional protection afforded by the double hull would be effective in low-energy collisions; overall, it would prevent cargo tank penetration in about 25 percent of the cases that penetrated a single-hull oil tanker.

In 1995, to assist the Coast Guard in San Juan, Puerto Rico, EcoEléctrica L.P. prepared an analysis of the damage that could result from an oil tanker striking an LNG vessel at berth (FERC, 1996). The analysis assumed a 125,000 m^3 LNG vessel and an 82,000-dead-weight-ton tanker carrying number 6 fuel oil without tug assistance. The analysis determined the minimum striking speed to penetrate the cargo tanks of an LNG vessel for a range of potential collision angles. The resulting minimum striking speeds are presented in table 4.12.5.3-1for the two principal cargo systems.

TABLE 4.12.5.3-1

Minimum Striking Speed to Penetrate LNG Cargo Tanks

Angle of Impact	Minimum Striking Speed (knots)	
	Spherical Tanks	Membrane Tanks
Greater than 60 degrees	4.5	3.0
45 degrees	6.3	4.0
30 degrees	9.0	6.0
15 degrees	18.0	12.0

[8] "Alliding" is the action of dashing against or striking upon a stationary object (for example, the running of one ship upon another ship that is docked) – distinguished from "colliding," which is used to refer to two moving ships striking one another.

For membrane tanks, the critical beam-on striking speed is 3.0 knots; for spherical tanks, the critical beam-on speed is 4.5 knots. For both containment types, lower angles of impact result in much greater minimum striking speeds to penetrate LNG cargo tanks. In the July/August 2002 issue of the "LNG Journal," the SIGTTO General Manager provides a table that indicates the critical speed necessary for a 20,000-ton vessel to puncture the outer hull of an LNG vessel is 7.3 knots. For a 93,000-ton ship, the impact speed is 3.2 knots. In neither case does such an impact result in damage to the LNG cargo containment system, nor does it result in release of LNG.

The DOE has released a study by Sandia National Laboratories entitled, *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water* (Sandia Report) December 2004. The Sandia Report included an LNG cargo tank breach analysis using modern finite element modeling and explosive shock physics modeling to estimate a range of breach sizes for both credible accidental and intentional LNG spill events. The analysis of accidental events found that groundings, collisions with small vessels and low-speed (less than 7 knots) collisions with large vessels striking at 90 degrees could cause minor ship damage but would not result in a cargo spill. This is due to the protection provided by the double-hull structure, the insulation layer, and the primary cargo tank of an LNG vessel. High-speed (12 knots) collisions with large vessels striking at 90 degrees were found to potentially cause cargo tank breach areas of 0.5 to 1.5 m^2.

In the event of a collision or allision of sufficient magnitude to rupture an LNG cargo tank, it is likely that sparks or flames would ignite the flammable vapors at the spill site. In a grounding of sufficient magnitude to rupture an LNG cargo tank, the damage would occur underwater, and the potential for ignition would be less than for collisions or allisions. In this case, an LNG spill would rapidly vaporize on water and form a potentially flammable cloud. If not ignited, the flammable vapor cloud would drift downwind until diluted below the LFL for methane. The maximum range of potentially flammable vapors, or the distance to the LFL, is a function of the volume of LNG spilled, the rate of the spill, and the prevailing meteorological conditions. If the flammable vapor cloud encountered an ignition source, the cloud would burn back to the spill site.

The final EIS for the Calcasieu LNG Project (FERC, 1976) analyzed the maximum range of a flammable vapor cloud and hazardous radiation levels from an instantaneous one-tank spill. As was consistent with risk analyses at that time and for nearly 25 years thereafter, the instantaneous spillage of one cargo tank was considered to be the "worst-case" scenario. Physical constraints on maximum vessel speeds and maximum depths of penetration required to rupture one LNG cargo tank render the possibility of an instantaneous release of more than one cargo tank to be implausible. This is not to imply that the loss of multiple cargo tanks could never occur, but that the extent of the hazard would not exceed that of the instantaneous spillage of one tank.

For an instantaneous one-tank spill with ignition, the final EIS for the Calcasieu LNG Project estimated that a hazardous thermal radiation level of 5,300 Btu/ft^2-hr would extend 3,595 feet from the center of the spill. For an instantaneous one-tank spill without ignition, the final EIS for the Yukon Pacific LNG Project (FERC, 1995) estimated that potentially flammable vapors could travel up to 3.3 miles, with a 10-mph wind and typical atmospheric stability.

In October 2001, the use of a one-tank instantaneous release as the worst-case scenario was reexamined by Quest Consultants, Inc (Quest) as part of an effort by the DOE to determine the hazards associated with reopening the Distrigas LNG import terminal following the terrorist attacks of September 11, 2001. It was determined that time-release spills through 1-meter and 5-meter diameter holes would more accurately simulate credible worst-case damage scenarios. The maximum flammable vapor cloud and radiation hazards were calculated for the two spill scenarios. For a spill on water with ignition, the maximum distance to a radiant flux level of 1,500 Btu/ft^2-hr was estimated to be 1,770 feet. For a spill on water without ignition, a flammable vapor cloud of 2.5 miles was estimated. In November 2003, in response to comments concerning its October 2001 study, Quest clarified that its study applied only to LNG spills resulting from a collision with a large ship in Boston's Outer Harbor, where waves would restrict the spreading of LNG on water.

Since the Quest study, there has been an emergence of studies by various parties to define the worst-case scenario that would result from a deliberate terrorist attack on an LNG vessel and the subsequent release of cargo. Distances have been estimated to range from 1,770 to 4,200 feet for a thermal radiation level of 1,500 Btu/ft^2-hr. Part of the reason for the apparent discrepancies is the lack of large-scale historical incidents, and the need to extrapolate small-scale field test data to a worst-case event. This inevitably leads to differing assumptions used by the various parties performing the modeling. For example, some models calculate a time-release cargo discharge through 1-meter or 5-meter diameter holes, while others assume that the cargo tank empties instantaneously.

As a result, the FERC commissioned a study by ABSG Consulting Inc. (ABSG) to search and review the literature on experimental LNG spills and on consequence methodologies that are applicable to modeling incidents of LNG spills on water. The goal of the study was to identify appropriate methods for estimating flammable vapor and thermal radiation hazard distances for potential LNG vessel cargo releases during transit and while at berth. The resulting study, *Consequence Assessment Methods for Incidents Involving Releases from Liquefied Natural Gas Vessels*, was released for public comment on May 14, 2004. On June 18, 2004, staff's responses to comments on the consequence assessment methods were issued. As discussed in greater detail in staff's responses, various components of the consequence assessment methodologies were revised based on comments received. In addition, the model was updated to include a lower limit on the characteristic wind speed. The revised methodology provides procedures for calculating: (1) the rate of release of LNG from a cargo tank penetration for various-sized holes; (2) the spreading of an unconfined LNG pool on water for both continuous spills and rapid (nearly instantaneous) releases; (3) the rate of vapor generation from an unconfined spill on water; (4) thermal radiation distances for LNG pool fires on water; and (5) flammable vapor dispersion distances.

A detailed evaluation of the consequences of a terrorist attack on a modern membrane LNG vessel was prepared by Lloyds Register North America for the Weaver's Cove LNG Project. The study evaluated the consequences of attacks on an LNG vessel by missiles and explosives. Finite element analysis was used to evaluate the effect of various-sized charges on both the outer and inner hulls. A 1-meter diameter hole in the inner hull at the waterline was found to be the worst-case scenario for hazard consequence assessments. This finding is consistent with the attack on the double-hull oil tanker *Limberg* which caused greater than a 5-meter diameter hole on the outer hull, but only minor damage to the inner hull. A failure modes and effects analysis was used to understand internal LNG release characteristics, and a residual strength analysis was used to investigate damage scenarios for a loaded LNG vessel.

As discussed above, the Sandia Report included an LNG cargo tank breach analysis, using modern finite element modeling and explosive shock physics modeling to estimate a range of breach sizes for credible accidental and intentional LNG spill events. For intentional scenarios, the size of the cargo tank hole depends on the location of the ship and source of threat. Intentional breach areas were estimated to range from 2 to 12 m^2. In most cases, an intentional breaching scenario would not result in a nominal hole area of more than 5 to 7 m^2, which is a more appropriate range to use in calculating potential hazards from spills. These hole sizes are equivalent to circular hole diameters of 2.5 and 3 meters.

The Sandia Report also included guidance on risk management for intentional spills, based on the findings that the most significant impacts to public safety and property exist within approximately 500 meters (1,640 feet) of a spill due to thermal hazards from a fire, with lower public health and safety impacts beyond 1,600 meters (approximately 1 mile). Large unignited LNG vapor releases were found to be unlikely, but could extend from nominally 2,500 meters (8,200 feet) to a conservative maximum distance of 3,500 meters (2.2 miles) for an intentional spill.

Cascading damage due to brittle fracture from exposure to cryogenic liquid or fire-induced damage to foam insulation was evaluated and, while possible under certain conditions, is not likely to involve more than two or three cargo tanks. Cascading events are not expected to increase the overall fire hazard by more than 20 to 30 percent (1,920 to 2,080 meters [6,300 to 6,825 feet]) but would increase the expected fire duration. RPTs are

possible for large spills, but the effects would be localized near the spill source and should not cause extensive structural damage.

In February 2007, the U.S. Government Accountability Office (GAO) published a report (GAO, 2007) that assessed recent studies, including the Sandia Report, that have been conducted on the consequences of an LNG spill resulting from a terrorist attack on an LNG ship. The GAO's panel of experts agreed that the most likely public safety impact of an LNG spill would be the radiant heat from a pool fire. Although the GAO report characterizes disagreements among the panel of experts, the majority felt the Sandia calculations were either accurate or overly conservative. The Sandia Report concluded that damage due to brittle fracture from exposure to cryogenic liquid or fire-induced damage was possible under certain conditions and would increase the duration of the event. The majority of the GAO expert panel agreed with Sandia that cascading events are not expected to significantly increase the overall fire hazards. The disagreement citied in the GAO report concerned the need for future research and clarifying uncertainties, rather than on Sandia's conclusions on cascading failures.

As part of the waterway suitability review process, the Coast Guard used the criteria developed by Sandia to define the outer limits of the hazard zones for assessing potential risks associated with the proposal. These hazard zones were based on the capacity of LNG vessels in operation in 2004 which had a cargo carrying capacity up to 148,000 m^3. The Zones of Concern used in the waterway review were:

- Zone 1 – impacts on structures and organisms are expected to be significant within 500 meters (1,640 feet). The outer perimeter of Zone 1 is the distance to thermal hazards of 37.5 kW/m^2 (12,000 Btu/ft^2-hr) from a pool.
- Zone 2 – impacts would be significant but reduced, and damage from radiant heat levels are expected to transition from severe to minimal between 500 and 1,600 meters (1,640 and 5,250 feet). The outer perimeter of Zone 2 is the distance to thermal hazards of 5 kW/m^2 (1,600 Btu/ft^2-hr) from a pool fire.
- Zone 3 – impacts on people and property from a pool fire or an unignited LNG spill that does not ignite are expected to be minimal between 1,600 meters (5,250 feet) and a conservative maximum distance of 3,500 meters (2.2 miles). The outer perimeter of Zone 3 should be considered the vapor cloud dispersion distance to the LFL from a worst case unignited release. Impacts to people and property could be significant if the vapor cloud reaches an ignition source and burns back to the source.

The severity of impacts within Zones 1 through 3 would depend on the location of the incident relative to a specific area, the scope of the incident, and whether the released LNG ignited or dispersed. This could be a significant impact, being most severe in Zone 1 and decreasing outward through Zones 2 and 3. However, because of the implementation of safety and security measures which would be required during marine transit, the likelihood of a marine LNG spill would be remote.

The methodology described in the ABSG study and revised in staff's responses to comments was also used by FERC staff to calculate the thermal radiation and flammable vapor dispersion distances for several holes ranging in diameter from 1 meter to 3.9 meters. Based on the penetration of the largest cargo tank of a 140,000-m^3 LNG vessel, a potential spill of 23,000 m^3 is estimated for the volume of LNG above the waterline. The estimated pool spread results and thermal radiation hazard distances are identified in table 4.12.5.3-2. Thermal radiation calculations are based on an ambient temperature of 32°F, a relative humidity of 31 percent, and a 22-mph wind speed obtained from National Oceanic and Atmospheric Administration's National Data Buoy Center.

TABLE 4.12.5.3-2 LNG Spills on Water from a 140,000 m3 LNG Vessel (using the ABSG model)					
LNG Release and Spread					
Hole area	0.8 m^2	1.5 m^2	5.0 m^2	7.0 m^2	12.0 m^2
Hole Diameter	1.0 m	1.4 m	2.5 m	3.0 m	3.9 m
Spill Time	94.0 min	48.0 min	15.0 min	10.4 min	6.2 min
Pool Fire Calculations					
Maximum Pool Radius	340 ft	477 ft	816 ft	939 ft	1,102 ft
Fire Duration	94.1 min	48.1 min	15.2 min	10.7 min	6.5 min
Distance to:					
1,600 Btu/ft^2-hr	2,227 ft	2,875 ft	4,318 ft	4,805 ft	5,426 ft
3,000 Btu/ft^2-hr	1,744 ft	2,241 ft	3,345ft	3,718 ft	4,192 ft
10,000 Btu/ft^2-hr	1,081 ft	1,376ft	2,029 ft	2,248 ft	2,528 ft
12,000 Btu/ft^2-hr	998 ft	1,269 ft	1,868 ft	2,070 ft	2,327 ft

Flammable vapor dispersion calculations were based on an ambient temperature of 32 ºF, 50 percent relative humidity, a 4.5-mph wind speed and atmospheric stability Class F. Based on a 1-meter diameter cargo tank breach in a 140,000 m^3 LNG vessel, an unignited release would result in an estimated pool radius of 425 feet. The unignited vapor cloud would extend to 7,286 feet to the LFL and 10,372 feet to one-half the LFL. It is important to identify certain key assumptions of conditions that must exist in order to achieve these vapor cloud distances. First it would be necessary for an event to create a 1-meter diameter hole by penetrating the outer hull, the inner hull, and cargo containment without ignition. Far more credible is that the event creating a 1-meter diameter hole would also result in a number of ignition sources which would lead to an LNG pool fire and subsequent thermal radiation hazards. It is also unlikely that a flammable vapor cloud could achieve these distances over land surfaces without encountering an ignition source, and subsequently burning back to the source.

The results of these calculations are in agreement with the Zones of Concern used by the Coast Guard in assessing the waterway suitability and are in agreement with the Sandia Report. For the project, AES Sparrows Point LNG proposes to receive LNG vessels with a capacity of 217,000 m^3. However, in the absence of validation that the Zones of Concern are appropriate for LNG vessels with a cargo capacity up to 217,000 m^3, the Coast Guard has stated that LNG vessel arrivals would be limited to those with a cargo capacity no greater than 148,000 m^3 (see section 4.12.5.5).

By focusing on the "worst-case" scenario for LNG transportation, there is a tendency to dismiss the potential hazards for other fuels and products commonly transported on our waterways. Some of the previously identified studies that calculate long hazard distances for LNG cargo fires also estimate similarly long distances for gasoline, propane, and jet fuel cargo fires. Also, it should not be assumed that the hazard distances identified are the assured outcome of an LNG vessel accident or attack, given the conservatisms in the models and the level of damage required to yield such large scale releases. Further, these "worst-case" intentional breach scenarios should not be misconstrued as defining an exclusionary zone. Rather the average most probable "worst-case" scenarios provide guidance in developing the operating restrictions for LNG vessel movements in the Chesapeake Bay, as well as in establishing potential impact areas for emergency response and evacuation planning.

4.12.5.4 LNG Vessel Transit to the AES LNG Terminal

Imported LNG could be obtained from exporting terminals throughout the world and delivered by LNG vessels to the proposed Project. Exporting countries include Algeria, Australia, Brunei, Indonesia, Malaysia, Nigeria, Oman, Qatar, Trinidad, and United Arab Emirates. In 2007, LNG imports to the United States included: 59 percent from Trinidad, 15 percent from Egypt, 12 percent from Nigeria, 10 percent from Algeria,

2 percent from Qatar, and 2 percent from Equatorial Guinea. AES expects to source LNG supplies from various countries.

Vessel Routes

The terminal site is located near the entrance of the Port of Baltimore approximately one mile east of the Francis Scott Key Bridge (Key Bridge) on the west side of the Sparrows Point peninsula. The transit route for LNG marine traffic from the entrance of the Chesapeake Bay to the terminal site would be approximately 164 nautical miles in length. Currently, LNG marine traffic transits 120 nautical miles through the lower portion of the Chesapeake Bay to the existing Dominion Cove Point LNG (Cove Point) terminal in Lusby, Maryland. More than 75 percent of the transit route to the Sparrow's Point site would use the same routes as this existing LNG marine traffic. See Appendix K for LNG marine traffic route figures to the proposed terminal.

The COTP Hampton Roads has established a Regulated Navigation Area (RNA) for all vessels 300 gross tons or greater that extends 12 nautical miles offshore from the mouth of the Chesapeake Bay. As is the case for existing LNG vessels on the Bay, LNG carriers bound for Sparrow's Point would be required to contact the Coast Guard Hampton Roads Sector Command Center / Joint Harbor Operations Center to obtain clearance prior to entering the RNA. Once in the RNA, the LNG vessels would transit through the Chesapeake Bay Approach Traffic Separation Scheme and Precautionary Zone.

Pilots from the Maryland Pilots Association would board the inbound LNG vessel and the Coast Guard may conduct inspections in the Precautionary Zone. Under the guidance of the pilot, the LNG carrier would then enter the Cape Henry Channel and cross the Chesapeake Bay Bridge-Tunnel (Bay Bridge-Tunnel). The Bay Bridge-Tunnel project is a four-lane 20-mile-long vehicular toll crossing of the lower Chesapeake Bay from Fisherman's Island on the north side to Virginia Beach on the south. The crossing consists of a series of low-level trestles and two one-mile-long tunnels which allow vessel crossings.

Under Title 33, CFR § 165.500 and 165.503, the Coast Guard currently has established a 500-yard radius safety and/or security zone around existing LNG marine traffic in the Chesapeake Bay. These regulations would apply to LNG vessels calling on the Sparrow's Point LNG facility as well unless and until changes to the CFR are made. Entry into or movement within 500 yards around the vessels would be prohibited unless authorized by the Coast Guard.

Transit of the Virginia Beach / Hampton Roads area would continue through the York Spit Channel. At the exit of this channel, the Chesapeake Bay opens to a width of more than 12 nautical miles and all deep draft vessels must remain toward the center of the Bay to remain in water with sufficient depth for safe navigation. Transit speeds for all LNG marine traffic would be approximately 12 to 14 knots depending on the weather, sea state, and vessel traffic in the area.

Shortly after passing Smith Point, the LNG vessel would enter the state waters of Maryland and into the area of responsibility of the COTP Sector Baltimore. Approximately 98 nautical miles after crossing the Chesapeake Bay Bridge Tunnel, the LNG carriers would pass more than 3 nautical miles to the east of the Calvert Cliffs Nuclear Power Plant and 2 nautical miles to the east of the Cove Point LNG facility berth. Constellation Energy Group's Calvert Cliffs Nuclear Power Plant (CCNPP) is located on the western shore of the Chesapeake Bay in Calvert County. The Cove Point LNG Terminal is an existing LNG import facility with a daily send out capacity of 1 billion cubic feet of natural gas located on the western shore of the Chesapeake Bay, approximately three miles south of the CCNPP.

From this point northward, there is currently no LNG marine traffic and LNG vessels would follow the same routes as other deep-draft vessels calling on the Port of Baltimore. Approximately 28 nautical miles north of the Cove Point terminal, LNG marine traffic heading for the Sparrow's Point terminal would cross under the William Preston Lane, Jr., Memorial Bridge (Chesapeake Bay Bridge), which spans 4.3 miles across the middle of the Chesapeake Bay. North of the Chesapeake Bay Bridge, there are a series of dredged and maintained channels which lead into the Port of Baltimore. The LNG vessels would use the Craighill and Brewerton Channels to enter the Patapsco River and make the final approach to the terminal. Tugs would

meet LNG marine traffic prior to crossing under the Chesapeake Bay Bridge at the entrance to the Brewerton Channel, and escort the carriers into the marine channel to the proposed facility's dock.

Although the Key Bridge, which crosses the Patapsco River with four lanes of elevated freeway, is located in the vicinity of the proposed terminal, no LNG marine traffic would pass underneath it. The existing marine channel is located more than 4,000 feet downstream from the Key Bridge and would be widened and dredged to a depth of 45 feet. Once in the marine channel, the LNG vessels would travel into the turning basin adjacent to the berthing area. The vessels would then be turned under tug assist and backed into one of the two proposed berths.

Hazard Zones Associated with the Proposed Route

The only area of land that is overlapped by Zone 1 in the LNG vessel's transit of the Chesapeake Bay is in the immediate vicinity of the proposed LNG terminal. However, no populated areas would be within Zone 1. Zone 2 would overlap a portion of beach at Sandy Point State Park. Zone 2 would also contact the land at both landward ends of the Key Bridge (both Hawkins Point and Soller Point to Coffin Point), along the causeway north of the Key Bridge and up to Turner Station, and for the western half of the Sparrows Point peninsula. These points of contact for Zone 2 and land are all within the final LNG vessel approach along the Brewerton Channel, the approach up the marine channel, and within the LNG turning basin. Zone 3 would overlap land along portions of the transit route north of Kent Island – including the southwestern shore of Kent Island, along Sandy Point including Sandy Point State Park, from Gibson Island north to Bodkin Neck, and from Bodkin Neck west and northwest to Rock Point and Hawkins Point. The communities of Rivera Beach and Orchard Beach would fall within Zone 3 along this final segment. Also, within Zone 3 would be the Hawkins Point industrial area, Turner Station, and the southern and western edge of Edgemere, and the entire remainder of the Sparrows Point industrial area.

4.12.5.5 Requirements for LNG Operations in Chesapeake Bay and the Patapsco River

The Coast Guard exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173; the Magnuson Act (50 USC Section 191); the Ports and Waterways Safety Act of 1972, as amended (33 USC Section 1221, et seq.); and the Maritime Transportation Security Act of 2002 (46 USC Section 701). The Coast Guard is responsible for matters related to navigation safety, vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment located in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. The Coast Guard also has authority for LNG facility security plan review, approval and compliance verification as provided in Title 33 CFR Part 105, and siting as it pertains to the management of vessel traffic in and around the LNG facility.

The Coast Guard regulations in 33 CFR 127 apply to the marine transfer area of waterfront facilities between the LNG vessel and the last manifold or valve located immediately before a storage tank. Title 33 CFR 127 regulates the design, construction, equipment, operations, inspections, maintenance, testing, personnel training, firefighting, and security of LNG waterfront facilities. The safety systems, including communications, emergency shutdown, gas detection, and fire protection, must comply with the regulations in 33 CFR 127. Under 127.019, AES would be required to submit two copies of its Operations and Emergency Manuals to the COTP for examination.

In accordance with 33 CFR 127, an applicant who intends to build an LNG import facility must submit a Letter of Intent (LOI) to the COTP at least 60 days prior to construction. However, FERC regulations under 18 CFR 157.21 require an applicant to submit an LOI to the Coast Guard at the same time the pre-filing process is initiated with the Commission. Consequently, AES notified the Coast Guard that it proposed to construct an LNG import terminal in Baltimore County, Maryland and submitted a LOI to the COTP Baltimore and Hampton Roads on March 3, 2006.

As required by its regulations (Section 127.009), the Coast Guard is responsible for issuing a Letter of Recommendation (LOR) as to the suitability of the waterway for LNG marine traffic with respect to the following items:

- physical location and description of the facility;
- the LNG vessel's characteristics and the frequency of LNG shipments to or from the facility;
- waterway channels and commercial, industrial, environmentally sensitive, and residential areas in and adjacent to the waterway used by LNG vessels en route to the facility, within 25 kilometers (15.5 miles) of the facility;
- density and character of marine traffic in the waterway;
- locks, bridges, or other manmade obstructions in the waterway;
- depth of water;
- tidal range;
- protection from high seas;
- natural hazards, including reefs, rocks, and sandbars;
- underwater pipes and cables; and
- distance of berthed vessels from the channel and the width of the channel.

On June 14, 2005, the Coast Guard published a Navigation and Vessel Inspection Circular – Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic (NVIC 05-05). The purpose of NVIC 05-05 was to provide Coast Guard COTPs/Federal Maritime Security Coordinators (FMSC), members of the LNG industry, and port stakeholders with guidance on assessing the suitability of a waterway for LNG marine traffic. The assessment should take into account conventional navigation safety/waterway management issues contemplated by the existing LOI/LOR process, but in addition, should also take completely into account maritime security implications.

In accordance with this guidance, each LNG project applicant is to submit a WSA to the cognizant COTP. The assessment is to address the transportation of LNG from entrance into U.S. territorial waters through its transit to and from the LNG receiving facility, including operations at the LNG vessel/facility interface. Issues related to navigational safety and port security introduced by the proposed LNG operation should be considered and addressed in the WSA.

AES's Waterway Suitability Assessment

NVIC 05–05 describes two phases in the applicant's development of the WSA. The first is the submittal of the Preliminary WSA which begins the Coast Guard review process for determining the suitability of the waterway for LNG marine traffic. The second is the submittal of the Follow-On WSA. This document is reviewed and validated by the Coast Guard and forms the basis for the Waterway Suitability Report to the FERC.

The Preliminary WSA provides an outline which characterizes the port community and the proposed facility and transit routes. It provides an overview of the expected major impacts LNG operations may have on the port, but does not contain detailed studies or conclusions. This document is used to start the scoping process for evaluating the suitability of the waterway for LNG marine traffic. On March 3, 2006, AES submitted the Preliminary WSA to both the COTP Baltimore and the COTP Hampton Roads for review.

The Follow-On WSA must provide a detailed and accurate characterization of the LNG facility, the LNG tanker route, and the port area. The assessment is to identify appropriate risk management measures for credible security threats and safety hazards. The purpose of the Follow-On WSA is to identify:

- federal, state, local, and private sector resources needed to carry out risk management measures;
- currently available resources; and
- ways in which the applicant can address any resource gaps.

In the development of the Follow-On WSA, the applicant typically consults with the Coast Guard, the Area Maritime Security Committee, and other port stakeholders. AES consulted with members of the Baltimore and Hampton Roads Area Maritime Security Committees representing: law enforcement, emergency management, environmental, and transportation agencies within the State of Maryland and Commonwealth of Virginia; the U.S. Department of Justice; Coast Guard Sectors Baltimore and Hampton Roads; the Maryland State Pilots; and local towing and maritime industry personnel. Workshops were held during June and July 2006.

Once the applicant submits a complete Follow-On WSA, the Coast Guard reviews the document to determine if it presents a realistic and credible analysis of the public safety and security implications from LNG marine traffic in the port. AES submitted the Follow-On WSA to the Coast Guard on October 25, 2006. The NVIC 05-05 directs the use of the Sandia Report as the best available information on LNG spills. Accordingly, the Follow-On WSA used three concentric Zones of Concern, based on LNG vessels with a cargo carrying capacity up to 148,000 m^3, to assess the maritime safety and security risks of LNG marine transportation on the Chesapeake Bay. The Zones of Concern are discussed in greater detail in section 4.12.5.3.

We recognize that the port's overall security picture may change over time. New port activities may commence, infrastructure may be added, or population density may change. Improvements in technology to detect, deter, and defend against intentional acts may also develop. Therefore, **we recommend that:**

- **<u>Until commencement of service</u>, AES should <u>annually</u> review its WSA relating to LNG marine traffic for the project; update the assessment to reflect changing conditions which may impact the suitability of the waterway for LNG marine traffic; provide the updated assessment to the cognizant Captain of the Port/Federal Maritime Security Coordinator for review and validation and if appropriate, further action by the Captain of the Port/Federal Maritime Security Coordinator relating to LNG marine traffic; and provide a copy to FERC staff.**

Coast Guard Waterway Suitability Report

As described in NVIC 05-05, the COTP submits a Waterway Suitability Report (WSR) to the FERC after review of the Follow-On WSA. The WSR contains the Coast Guard's preliminary determination on the suitability of the waterway for LNG marine traffic. Based on Coast Guard policy, the COTP can generally make one of three conclusions regarding the suitability of the waterway to support LNG marine traffic. The first is that the waterway is suitable without the implementation of additional measures. The second is that the waterway is unsuitable. The third is that to make the waterway suitable, additional measures are necessary to responsibly manage risks to navigation safety or maritime security associated with LNG marine traffic.

On February 25, 2008, the COTP for Baltimore and Hampton Roads provided the FERC with a WSR which summarized the required levels of safety and security mitigation measures, as well as the port community's capabilities to implement these measures. Based on its review of the WSA and its own independent risk assessment, the Coast Guard stated that the Chesapeake Bay is not currently suitable, but can be made suitable, for the type and frequency of LNG marine traffic associated with the proposed Sparrow's Point LNG facility. This preliminary determination was contingent upon the availability of additional measures necessary to responsibly manage the maritime safety and security risks. These measures are further detailed in the WSR and include, among others, the following requirements:

- Development of a Transit Management Plan (TMP) in consultation with the Coast Guard and participating agencies that would define the specific roles, responsibilities, and specific procedures

for the LNG vessel, the LNG terminal, and the various agencies that would be responsible for managing the risks of LNG marine traffic;

- Application of the safety/security zone requirements of 33 CFR § 165.500 and § 165.503 to LNG vessels transiting the Chesapeake Bay to the proposed terminal;
- Establishment of a fixed safety security zone of 300 yards while the LNG vessel is moored at the terminal;
- Restriction on the size of LNG ships transiting to the Project site to a capacity of 148,000 m3 until a completed site-specific risk analysis for larger ships is approved by the COTP Baltimore;
- Use of between one and four armed escort vessels to enforce the federal safety/security zones around any loaded LNG vessel navigating within the specified areas of the Chesapeake Bay (vessels may be provided by the Coast Guard; other federal, state, or local agencies; and/or private entities);
- Availability of at least one armed non-Coast Guard vessel to enforce the safety/security zone while an LNG vessel is moored at the facility site (additional armed law enforcement boats and the use of anti-boat barriers may be required during periods of heightened risk);
- Interoperable communications between the LNG vessel and all participating agencies involved in maritime safety;
- Notification and communication with owners/operators of certain critical infrastructure located along the transit route;
- Presence of one towing vessel with at least 50-ton bollard pull in the vicinity of the Bay Bridge;
- Availability of at least three towing vessels to assist LNG vessel maneuvers to dock, undock, moor, or unmoor;
- Landside surveillance by federal, state, local, and private agencies along the facility's waterfront and portions of the transit route during transit and off-load operations;
- Periodic aerial surveillance to monitor the shoreline ahead of the LNG vessel's transit with the capability of the transmitting real-time images to the Sector Hampton Roads and Baltimore Command Center;
- Landside and waterborne law enforcement resources to be dispatched to investigate anomalies during the vessel's transit;
- Performance of underwater security sweeps of the facility pier if deemed necessary by the COTP (divers would be arranged for and provided by the facility owner);
- Loaded LNG vessels would not be permitted to overtake, cross, meet in a head-on situation, or otherwise operate in close proximity to, high capacity passenger vessels while in the COTP Baltimore zone;
- Pre-arrival inspection and transfer monitoring of the LNG vessels and facility;
- Annual Coast Guard inspections of the LNG vessels and the facility; and
- Adequate means to notify the public along the transit route, including on-going public education, emergency notification systems, and drills and training. Education programs should meet the needs of all users of the waterway, including commercial and recreational boaters, local businesses, local residents, and tourists.

Each LNG carrier moored at the facility would be required to have dedicated resources necessary for these safety and security measures, even if there are two vessels moored at the same time. The measures outlined in

the WSR would also be applied to the outbound transit if the LNG vessel carries a significant amount of cargo beyond the heel. At no time would LNG vessels be allowed to anchor in the Chesapeake Bay.

As the Coast Guard has determined that additional measures beyond those proposed by AES in the WSA would be required to responsibly manage the maritime safety and security risks associated with the LNG marine traffic, **we recommend that:**

- **<u>Throughout the life of the facility</u>, AES should ensure that the facility and any LNG vessel transiting to and from the facility comply with all requirements set forth by the Coast Guard Captain of the Port Sector Baltimore/Hampton Roads, including all risk mitigation measures recommended in the WSR.**

In addition, Section 4.12.6 includes a recommendation that AES develop an ERP and a Cost-Sharing Plan which identifies the mechanisms for funding all Project-specific security/emergency management costs.

After issuance of the final EIS, the Coast Guard would complete its review and issue an LOR pursuant to 33 CFR § 127.009 to address the suitability of the waterway for LNG transport. If the Coast Guard issues an LOR finding the waterway suitable for additional LNG marine traffic with conditions, the necessary security measures would further be incorporated into the Coast Guard required TMP, which would become the basis for appropriate security measures for each maritime security threat level. This plan would clearly spell out roles, responsibilities, and specific procedures for LNG marine traffic transiting the Chesapeake Bay up to the terminal, as well as for all agencies involved in implementing security and safety during the operation. It would be required that, prior to the LNG vessel being granted permission to enter the shipping channels, both the vessel and facility must be in full compliance with the appropriate requirements of the Maritime Transportation Security Act and International Ship and Port Facility Security Code, and the security protocols to be established by the COTP in the TMP.

In addition, AES would provide security for the Terminal according to a Facility Security Plan that must be prepared under 33 CFR 105. This plan and any modifications to this plan would need to be approved by the Coast Guard COTP. The requirements of this plan may include:

- a Facility Security Assessment to identify site vulnerabilities, possible security threats, consequences of an attack, and facility protective measures;
- procedures for responding to security incidents;
- a designated FSO responsible for implementing and periodically updating the Facility Security Plan and Assessment;
- scalable security measures to provide increasing levels of security at increasing MARSEC levels;
- security exercises at least once each calendar year and drills at least every 3 months; and
- mandatory reporting of all breaches of security and security incidents.

Security at the facility would be provided by both active and passive systems. The entire site would be surrounded by a protective enclosure (i.e., a fence) with sufficient strength to deter unauthorized access. The enclosure would be illuminated with not less than 2.2 lux between sunset and sunrise. Intrusion detection systems and day/night camera coverage would identify unauthorized access. A separate security staff would conduct periodic patrols of the plant, and screen visitors and contractors. The security staff may also assist in maintaining security of the marine terminal during cargo unloading. AES would be required to submit any revisions to their Facility Security Plan to the COTP Baltimore for approval 60 days before commencement of operations.

4.12.6 Emergency Response and Evacuation Planning

Prior to commencing service of the proposed facilities, AES would be required to prepare final emergency procedures manuals, as required by 49 CFR Part 193.2509, that provide for: (a) responding to controllable

emergencies and recognizing an uncontrollable emergency; (b) taking action to minimize harm to the public including the possible need to evacuate the public; and (c) coordination and cooperation with appropriate local officials. Specifically, Section 193.2509(b)(3) requires "Coordinating with appropriate local officials in preparation of an emergency evacuation plan…"

While the exclusion zones evaluated for the onshore facility in section 4.12.4 and the consequence areas for marine spills in section 4.12.5 provide guidance on the maximum extent of potential hazards, they should not be assumed to represent the evacuation zone for every potential incident. As with any other fuel or hazardous material, the actual severity of the incident would determine what area needs to be evacuated, if any, rather than a worst-case maximum zone. It is anticipated that the emergency evacuation plans would identify evacuation distances based upon increasing severity of events.

Section 3A(e) of the Natural Gas Act, added by Section 311 of the Energy Policy Act of 2005, stipulated that in any Order authorizing an LNG terminal, the Commission shall require the LNG terminal operator to develop an ERP in consultation with the Coast Guard and state and local agencies. The FERC must approve the ERP prior to any final approval to begin construction. Therefore, **we recommend that:**

- **AES develop an ERP (including evacuation) and coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. This plan should include at a minimum:**
  - **a. designated contacts with state and local emergency response agencies;**
  - **b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;**
  - **c. procedures for notifying residents and recreational users within areas of potential hazard along the transit route;**
  - **d. evacuation routes/methods for residents and other public use areas that are within any transient hazard areas along the transit route of the LNG marine traffic;**
  - **e. locations of permanent sirens and other warning devices; and**
  - **f. an "emergency coordinator" on each LNG vessel to activate sirens and other warning devices.**

  The ERP should be filed with the Secretary for review and written approval by the Director of OEP prior to initial site preparation. AES should notify FERC staff of all planning meetings in advance and should report progress on the development of its ERP at 3-month intervals.

On several LNG import terminal proposals, a number of organizations and individuals have expressed concern that the local community would have to bear some of the cost of ensuring the security and emergency management of the LNG facility and the LNG vessels while in transit and unloading at the berth. In addition, Section 3A(e) of the Natural Gas Act (as amended by the Energy Policy Act of 2005) specifies that the ERP shall include a Cost-Sharing Plan that contains a description of any direct cost reimbursements the applicants agree to provide to any state and local agencies with responsibility for security and safety at the LNG terminal and in proximity to LNG vessels that serve the facility. Therefore, **we recommend that:**

- **The ERP should include a Cost-Sharing Plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies. In addition to the funding of direct transit-related security/emergency management costs, this comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. The Cost-Sharing Plan should be filed with the Secretary for review and written approval by the Director of OEP prior to initial site preparation.**

The cost-sharing plan must specify what the LNG terminal operator would provide to cover the cost of the state and local resources required to manage the security of the LNG terminal and LNG vessel, and the state and local resources required for safety and emergency management, including:

- Direct reimbursement for any per-transit security and/or emergency management costs (for example overtime for police or fire department personnel);
- Capital costs associated with security/emergency management equipment and personnel base (for example patrol boats, fire fighting equipment); and
- Annual costs for providing specialized training for local fire departments, mutual aid departments, and emergency response personnel; and for conducting exercises.

The cost sharing plan must include the LNG terminal operator's letter of commitment with agency acknowledgement for each state and local agency designated to receive resources.

4.12.7 Conclusions on LNG Vessel Safety

Based on review of the WSA and an independent risk assessment, the Coast Guard has preliminarily determined that the Chesapeake Bay while currently not suitable can be made suitable for the type and frequency of LNG marine traffic associated with the proposed Sparrow's Point LNG facility. This preliminary determination is contingent upon the availability of additional measures necessary to responsibly manage the maritime safety and security risks. If the Coast Guard issues an LOR finding the waterway suitable for additional LNG marine traffic with conditions, the necessary security measures would further be incorporated into the Coast Guard required TMP, which would become the basis for appropriate security measures for each maritime security threat level.

The operational safety of LNG vessels is under the jurisdiction of the Coast Guard. LNG marine traffic transiting the Chesapeake Bay would be subject to Coast Guard inspections and enforcement practices. It would be required that, prior to the LNG vessel being granted permission to enter the shipping channels, both the vessel and facility must be in full compliance with the appropriate requirements of the Maritime Transportation Security Act and International Ship and Port Facility Security Code, and the security protocols to be established by the COTP in the TMP.

4.12.8 Terrorism and Security Issues

The security requirements for the onshore component of the proposed project are governed by 49 CFR 193, Subpart J - Security. This subpart includes requirements for conducting security inspections and patrols, liaison with local law enforcement officials, design and construction of protective enclosures, lighting, monitoring, alternative power sources, and warning signs. Requirements for maintaining safety of the marine terminal are in the Coast Guard regulations in 33 CFR Part 127. Requirements for maintaining security of the marine terminal are in 33 CFR Part 105.

Since September 11, 2001, the FERC has been involved with other federal agencies in developing a coordinated approach to protecting the energy facilities of the United States. The FERC continues to coordinate with theses agencies, specifically with the Coast Guard to address this issue. The Coast Guard requires arriving ships to provide them with a 96-hour advance notice of arrival that includes key information about the vessel and its crew which allows the Coast Guard to conduct a terrorism risk assessment and put in place appropriate mitigation measures before the ship reaches the ship channel. In addition, interstate natural gas companies are actively involved with several industry groups to chart how best to address security measures in the current environment.

On October 22, 2003, the Coast Guard issued a series of six final rules that promulgated the maritime security requirements of the Maritime Transportation Security Act of 2002: Implementation of National Maritime Security Initiatives; Area Maritime Security; Vessel Security; Facility Security; Outer Continental Shelf Facility Security; and the Automatic Identification System. The entire series of rulemakings established a new subchapter H in 33 CFR. In support of the rulemakings, the Coast Guard applied a risk-based decision making process to comprehensively evaluate the relative risks of various target and attack mode combinations and scenarios for those vessel types and port facilities that pose a risk of a security incident. This approach provides a more realistic estimation of risk than a simple "worst-case outcome" assessment. Risk management

principles acknowledges that while risk generally cannot be eliminated, it can be reduced by adjusting operations to lower consequences, threats, or vulnerability, recognizing that it is easier to reduce vulnerabilities by adding security measures.

On December 29, 2003, terminal owners or operators subject to 33 CFR Part 105 were required to submit a Facility Security Assessment and Facility Security Plan to the Coast Guard Captain of the Port for review and approval. The Facility Security Plans were required to be implemented no later than July 1, 2004 or for facilities constructed after July 1, 2004, 60 days prior to operations. Some of the principal owner or operator responsibilities include:

- designating a Facility Security Officer (FSO) with a general knowledge of current security threats and patterns, risk assessment methodology, and the responsibility for implementing the Facility Security Plan and Assessment and performing an annual audit for the life of the project;
- conducting a Facility Security Assessment to identify site vulnerabilities, possible security threats and consequences of an attack, and facility protective measures;
- developing a Facility Security Plan based on the Facility Security Assessment, with procedures for responding to transportation security incidents, notification and coordination with local, state and federal authorities, prevent unauthorized access; measures and equipment to prevent or deter dangerous substances and devices, training, and evacuation;
- implementing scalable security measures to provide increasing levels of security at increasing MARSEC levels for facility access control, restricted areas, cargo handling, vessel stores and bunkers, and monitoring;
- conducting security exercises at least once each calendar year and drills at least every 3 months; and
- reporting of all breaches of security and security incidents.

Increased security awareness has occurred throughout the industry and the nation. President Bush established the Department of Homeland Security with the mission of coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. The Commission, in cooperation with other federal agencies and industry trade groups, has joined in the efforts to protect the energy infrastructure, including the more than 300,000 miles of interstate natural gas transmission pipeline and associated LNG facilities.

Safety and security are important considerations in any Commission action. The attacks of September 11, 2001 have changed the way pipeline operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities. However, the likelihood of future acts of terrorism or sabotage occurring at the proposed LNG import terminal, or at any of the myriad natural gas pipeline or energy facilities throughout the United States is unpredictable given the disparate motives and abilities of terrorist groups. However, existing and proposed security measures discussed in this section make significant impacts to human life and property from a terrorist attack unlikely. The continuing need to construct facilities to support the future natural gas pipeline infrastructure is not diminished from the threat of any such unpredictable acts.

4.12.9 Pipeline Safety Standards

The transportation of natural gas by pipeline involves some risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 1,000° F and is flammable at concentrations between 5.0 percent and 15.0 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

The DOT is mandated to provide pipeline safety under Title 49, U.S.C. Chapter 601. The RSPA's, OPS, administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. RSPA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards, while section 5(b) permits a state agency that does not qualify under section 5(a) to perform certain inspection and monitoring functions. A state may also act as DOT's agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement action. The majority of the states have either 5(a) certifications or 5(b) agreements, while nine states act as interstate agents.

The DOT pipeline standards are published in Parts 190-199 of Title 49 of the CFR. Part 192 of 49 CFR specifically addresses natural gas pipeline safety issues. Under a Memorandum of Understanding on Natural Gas Transportation Facilities (Memorandum) dated January 15, 1993 between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or shall certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act.

The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipeline under the Commission's jurisdiction. The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the Mid-Atlantic Express Pipeline Project must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR Part 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1 mile length of pipeline. The four area classifications are defined as follows:

Class 1	Location with 10 or fewer buildings intended for human occupancy.
Class 2	Location with more than 10 but less than 46 buildings intended for human occupancy.
Class 3	Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people during normal use.

Class 4 Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. All pipelines installed in navigable rivers, streams, and harbors must have a minimum cover of 48 inches in unconsolidated sediment or 24 inches in consolidated rock.

Class locations also specify the maximum distance to a sectionalizing block valve (e.g., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, maximum allowable operating pressure, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. In addition, all pipeline interconnects, and pipeline facilities within the fenced enclosures of the meter stations, launcher and receiver, and MLVs would be designed and constructed to meet Class 3 requirements.

If a subsequent increase in population density adjacent to the right-of-way indicates a change in class location above existing design for the pipeline, Mid-Atlantic Express would reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness, if required to comply with the DOT code of regulations for the new class location.

In 2002, Congress passed an act to strengthen the Nation's pipeline safety laws. The Pipeline Safety Improvement Act of 2002 (HR 3609) was passed by Congress on November 15, 2002, and signed into law by the President in December, 2002. Since December 17, 2004, gas transmission operators are required to develop and follow a written integrity management program that contains all the elements described in Section 192.911 and addresses the risks on each covered transmission pipeline segment. Specifically, the law establishes an integrity management program which applies to all high consequence areas (HCAs). The DOT (68 FR 69778, 69 FR 18228, and 69 FR 29903) defines HCAs as they relate to the different class zones, potential impact circles, or areas containing an identified site as defined in §192.903 of the DOT regulations.

OPS published a series of rules from August 6, 2002 to May 26, 2004 (69 Federal Register 29903), that defines HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate in 49 U.S.C. 60109 for OPS to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method an HCA includes:

- current class 3 and 4 locations;
- any area in Class 1 or 2 where the potential impact radius[9] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle[10]; or
- any area in Class 1 or 2 where the potential impact circle includes an identified site[11].

[9] The potential impact radius is calculated as the product of 0.69 and the square root of the maximum allowable operating pressure of the pipeline in psi multiplied by the pipeline diameter in inches.

[10] The potential impact circle is a circle of radius equal to the potential impact radius.

In the second method an HCA includes any area within a potential impact circle which contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

Once a pipeline operator has determined the HCAs on its pipeline, it must apply the elements of its integrity management program to those segments of the pipeline within the HCAs. The DOT regulations specify the requirements for the integrity management plan at Section 192.911.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. The proposed pipeline would be continuously monitored and controlled via computer and local logic controllers at the manned control center at the LNG terminal site. A locally based, full-time staff would be assigned to operate and maintain the natural gas pipeline. The staff would be fully trained in pipeline operations, maintenance, and normal, abnormal, and emergency procedures. The pipeline would be patrolled and inspected on the ground on a periodic basis per DOT requirements or better. The frequency of these inspections would be affected by activity along the pipeline route such as construction or possible encroachment. These inspections would identify conditions indicative of pipeline leaks, evidence of pipeline damage or deterioration, damage to erosion controls, loss of cover, third-party activities or conditions which may presently or in the future affect pipeline integrity, safety, or operation of the pipeline. The pipeline system would participate in the state "One Call" system.

Under Section 192.615, each pipeline operator must also establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency shutdown of system and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

Part 192 requires that each operator must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. Mid-Atlantic Express would provide the appropriate training to local emergency service personnel before the pipeline is placed in service. No additional specialized local fire protection equipment would be required to handle pipeline emergencies.

[11] An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

4.12.10 Pipeline Accident Data

Since February 9, 1970, 49 CFR Part 191 has required all operators of transmission and gathering systems to notify the DOT of any reportable incident and to submit a report on form F7100.2 within 20 days. Reportable incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization;
- required taking any segment of transmission line out of service;
- resulted in gas ignition;
- caused estimated damage to the property of the operator, or others, or both, of a total of $5,000 or more;
- required immediate repair on a transmission line;
- occurred while testing with gas or another medium; or
- in the judgment of the operator was significant, even though it did not meet the above criteria.

The DOT changed reporting requirements after June 1984 to reduce the amount of data collected. Since that date, operators must only report incidents that involve property damage of more than $50,000, injury, death, release of gas, or that are otherwise considered significant by the operator. Table 4.12.10-1 presents a summary of incident data for the 1970 to 1984 period, as well as more recent incident data for 1986 through 2005, recognizing the difference in reporting requirements. The 14.5-year period from 1970 through June 1984, which provides a larger universe of data and more basic report information than subsequent years, has been subject to detailed analysis, as discussed in the following sections[12].

TABLE 4.12.10-1

Natural Gas Service Incidents by Cause

Cause	Incidents per 1,000 miles of Pipeline (percentage)	
	1970-1984	1986-2005
Outside force	0.70 (53.8)	0.10 (38.5)
Corrosion	0.22 (16.9)	0.06 (23.1)
Construction or material defect	0.27 (20.8)	0.04 (15.4)
Other	0.11 (8.5)	0.06 (23.1)
Total	1.30	0.26

During the 14.5-year period, 5,862 service incidents were reported over the more than 300,000 total miles of natural gas transmission and gathering systems nationwide. Service incidents, defined as failures that occur during pipeline operation, have remained fairly constant over this period with no clear upward or downward trend in annual totals. In addition, 2,013 test failures were reported. Correction of test failures removed defects from the pipeline before operation. Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.9-1 provides a percentage

[12] Jones, D.J., G.S. Kramer, D.N. Gideon, and R.J. Eiber, 1986. "An Analysis of Reportable Incidents for Natural Gas Transportation and Gathering Lines 1970 Through June 1984." NG-18 Report No. 158, Pipeline Research Committee of the American Gas Association.

distribution of the causal factors as well as the annual frequency of each factor per 1,000 miles of pipeline in service.

The dominant incident cause is outside forces, constituting 53.8 percent of all service incidents. Outside forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.12.10-2 shows that human error in equipment usage was responsible for approximately 75 percent of outside forces incidents. Since April 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The "One Call" program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts. The 1986 through 2005 data show that the portion of incidents caused by outside forces has decreased to 38.5 percent.

The pipelines included in the data set in table 4.12.10-2 vary widely in terms of age, pipe diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

TABLE 4.12.10-2

Outside Forces Incidents by Cause (1970-1984)

Cause	Percent
Equipment operated by outside party	67.1
Equipment operated by or for operator	7.3
Earth movement	13.3
Weather	10.8
Other	1.5

The frequency of service incidents is strongly dependent on pipeline age. While pipelines installed since 1950 exhibit a fairly constant level of service incident frequency, pipelines installed before that time have a significantly higher rate, partially due to corrosion. Older pipelines have a higher frequency of corrosion incidents, since corrosion is a time-dependent process. Further, new pipe generally uses more advanced coatings and cathodic protection to reduce corrosion potential.

Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipelines, which have a greater rate of outside forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movements.

Table 4.12.10-3 clearly demonstrates the effectiveness of corrosion control in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the rate of failure compared to unprotected or partially protected pipe. The data shows that bare, cathodically protected pipe actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 4.12.10-3

External Corrosion by Level of Control (1970-1984)

Corrosion Control	Incidents per 1,000 miles per Year
None-bare pipe	0.42
Cathodic protection only	0.97
Coated only	0.40
Coated and cathodic protection	0.11

4.12.11 Impact on Public Safety

The service incident data summarized in table 4.12.11-1 include pipeline failures of all magnitudes with widely varying consequences. Approximately two-thirds of the incidents were classified as leaks, and the remaining third classified as ruptures, implying a more serious failure.

Table 4.12.11-1 presents the average annual fatalities that occurred on natural gas transmission and gathering lines from 1970 to 2005. Fatalities between 1970 and June 1984 have been separated into employees and nonemployees, to better identify a fatality rate experienced by the general public. Of the total 5.0 nationwide average, fatalities among the public averaged 2.6 per year over this period. The simplified reporting requirements in effect after June 1984 do not differentiate between employees and nonemployees. However, the data show that the total annual average for the period 1984 through 2005 decreased to 3.6 fatalities per year. Subtracting two major offshore incidents in 1989, which do not reflect the risk to the onshore public, yields a total annual rate of 2.8 fatalities per year for this period.

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in table 4.12.11-2 in order to provide a relative measure of the industry-wide safety of natural gas pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. Nevertheless, the average 2.6 public fatalities per year is relatively small considering the more than 300,000 miles of transmission and gathering lines in service nationwide. Furthermore, the fatality rate is approximately two orders of magnitude (100 times) lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

The available data show that natural gas pipelines continue to be a safe, reliable means of energy transportation. Based on approximately 301,000 miles in service, the rate of public fatalities for the nationwide mix of transmission and gathering lines in service is 0.01 per year per 1,000 miles of pipeline. Using this rate, the Mid-Atlantic Express Pipeline Project might result in a public fatality every 1,136 plus years. This would represent a slight increase in risk to the nearby public.

TABLE 4.12. 11-1

Annual Average Fatalities – Natural Gas Transmission and Gathering Systems a/, b/

Year	Employees	Nonemployees	Total
1970-June 1984	2.4	2.6	5.0
1984-2005 c/	-	-	3.6
1984-2005 c/	-	-	2.8 d/

a/ 1970 through June 1984 - American Gas Association, 1986.
b/ DOT Hazardous Materials Information System.
c/ Employee/nonemployee breakdown not available after June 1984.
d/ Without 18 offshore fatalities occurring in 1989 -- 11 fatalities resulted from a fishing vessel striking an offshore pipeline and 7 fatalities resulted from explosion on an offshore production platform.

TABLE 4.12.11-2

Nationwide Accidental Deaths a/

Type of Accident	Fatalities
All accidents	90,523
Motor vehicles	43,649
Falls	14,985
Poisoning	9,510
Fires and burns	3,791
Drowning	3,488
Suffocation by ingested object	3,206
Tornado, flood, earthquake, etc. (1984-93 average)	181
All liquid and gas pipelines (1978-87 average) b/	27
Gas transmission and gathering lines Nonemployees only (1970-84 average) c/	2.6

a/ All data, unless otherwise noted, reflects 1996 statistics from the U.S. Department of Commerce, Bureau of the Census, "Statistical Abstract of the United States 118th Edition."
b/ U.S. Department of Transportation, "Annual Report on Pipeline Safety - Calendar Year 1987."
c/ American Gas Association, 1986.

4.13 CUMULATIVE IMPACTS

The CEQ regulations for implementing NEPA require the FERC to consider the potential cumulative impacts associated with construction and operation of a Project. Cumulative impacts are defined in the CEQ regulations at 40 CFR 1508.7 as "the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions." These actions can include previously approved or conducted actions as well as pending actions with FERC or other federal, state, and local agencies, plus privately financed projects when they have overlapping impacts on the environmental resources that the Project would substantially impact.

Generally, we believe that cumulative impact could result from either the construction of other projects (including other dredging projects) in the same vicinity and time frame as the proposed facilities or from the operation of the proposed facilities and marine transportation activities simultaneous to operation of the proposed Ecron ethanol plant at Sparrows Point.

In addition to the Sparrows Point Project, we considered 17 activities and projects in our cumulative impact analysis (see table 4.13-1). These are known projects with potential impacts on the same resources for which some effect has been evaluated for Sparrows Point Project. Of these activities/projects, 7 are pertinent to the construction and operation of the LNG terminal, and 10 are pertinent to the Mid-Atlantic Express Pipeline. Among these 17 activities, we have considered the potential cumulative effects of 11 dredging projects on water quality of the Patapsco River within section 4.13.3 of this document.

TABLE 4.13-1

Existing, Approved, or Proposed Activities/Projects That Could Contribute to Cumulative Impacts Associated With Construction of the Sparrows Point Project a/

Activity/Project	Counties & States Where Projects Coincide with the Sparrows Point Project	Description	Timeframe
LNG Terminal Project			
Multiple Patapsco River Dredging Projects	Baltimore and Anne Arundel Counties, MD	For dredging projects in the Patapsco River and Baltimore Harbor that could overlap with the proposed dredging activities of the Sparrows Point Project, see table 4.13.3-1.	See table 4.13.3-1
Sparrows Point Power Plant	Baltimore Co., within the LNG site at Sparrows Point	Optional addition of a power plant at the Sparrows Point site.	Same as Sparrows Point LNG Terminal.
Ecron Ethanol Plant	Baltimore Co., adjacent to LNG site within Sparrows Point industrial area	Air Permit issued in April 2007. Project can commence construction.	Construction schedule yet to be determined
Belt's Corporation Contract Distribution Facility	Anne Arundel Co.; directly across the Patapsco River from Sparrows Point	Marley Neck Industrial Park. Expanding Belt's facility. 30 – 150 new jobs.	Facility completed in December 2007
MD-295	Anne Arundel Co. I-695 to I-195	Widen MD-295 from 4 to 6 lanes (1.5 mi). This is a major connector for traffic to and from I-695; and thus for traffic to and from Sparrows Point.	Engineering underway.
Wastewater Treatment Plant Upgrade – Patapsco	Baltimore Co., MD	Enhanced Nutrient Reduction (ENR) standards. Patapsco project involves upgrading existing 73 MMgd facility with Biological Nutrient Removal (BNR) and ENR.	Plan: 2005 Design: 2008 Constr: 2012
Wastewater Treatment Plant Upgrade – Cox Creek	Anne Arundel Co.; directly across the Patapsco River from Sparrows Point	Enhanced Nutrient Reduction (ENR) Program. Currently a 15 MMgd facility. ENR could have positive effect on the water quality of the Patapsco River at Sparrows Point.	Plan: 2007 Design: 2008 Constr: 2010
Mid-Atlantic Express Pipeline Project			
Wastewater Treatment Plant Upgrade – Back River	Baltimore Co, MD.	Enhanced Nutrient Reduction (ENR) standards. Back River project involves upgrading existing 180 MMgd facility with ENR technology. Project would have positive effect on water quality of the Back River.	Plan: 2007 Design: 2010 Constr: 2013
Maryland Metals Processing Expansion	Baltimore Co., MD – North Point Enterprise Zone	11,500 sq ft expansion. Machinery for new manufacturing line. 16 new jobs.	Unknown.
I-695 Baltimore Beltway	Baltimore Co., MD – I-695 from I-83 to I-95	Upgrade existing I-695 to 8-lanes. 11.38 miles.	Partial Engineering underway.
US 1, Bel Air Rd.	Baltimore Co., MD US 1 from Pinedale Dr. to MD-152	Study to reconstruct US 1 from MD-43 to MD-152 (8.46 mi). Wide outside curb lanes to accommodate bicycles.	Planning complete.
MD-7, Philadelphia Rd.	Baltimore Co., MD-7 from US-40 to I-695	Rosedale streetscape from I-40 to I-695.	Construction completion - Fall 2009.
Aberdeen Proving Ground – Base Realignment & Closure (BRAC)	Harford Co.	Due to extensive nature of BRAC, this project may affect socioeconomics of adjacent counties of Cecil and Baltimore.	Unknown.

TABLE 4.13-1

Existing, Approved, or Proposed Activities/Projects That Could Contribute to Cumulative Impacts Associated With Construction of the Sparrows Point Project a/

Activity/Project	Counties & States Where Projects Coincide with the Sparrows Point Project	Description	Timeframe
Transco, Sentinel Expansion Project – Pipeline	Chester Co., near Downingtown, PA.	Pipeline replacement project. Approximately 7.15 miles of 30-inch-diameter natural gas pipeline would be replaced with 42-inch-diameter pipeline within an existing utility corridor in Chester County. FERC Dockets PF06-32-000 and CP08-31-000.	2009
Pennsylvania Turnpike - The new Route 29 "Slip Ramp" Exit	Chester Co., PA	The new Route 29 "Slip Ramp" Exit is a brand-new Turnpike interchange now being planned for construction in Chester County. Located midway between the Downingtown exit (#312) and the Valley Forge exit (#326), the new facility will serve expanding corporate centers and business parks along the Route 29 corridor.	Construction will start in Fall, 2007.
Pennsylvania Turnpike	Chester & Montgomery Counties, PA	Reconstruct the Turnpike's mainline between Milepost 320 (eight miles east of the Downingtown Interchange) to Milepost 326 (Valley Forge Interchange).	Unknown.
Landfill Gas to Energy System	Chester Co.	Creating biogas from landfill.	Unknown.

a/ For dredging projects that may have cumulative impacts on water quality, aquatic vegetation, or estuarine emergent wetlands of the Patapsco River see table 4.13.3-1.

4.13.1 Geology

The Sparrows Point LNG Project would have minimal impacts on geological resources at the LNG facility site. No blasting would be required at the site. However, blasting may be required along the Mid-Atlantic Express Pipeline route. Blasting would be accomplished following completion of site-specific blasting plans. No other linear projects requiring blasting are known to be scheduled for the project area of the pipeline. If topographic contours and drainage conditions for the Project are restored to the extent practicable, cumulative impacts on regional drainage patterns would be avoided.

There would be no contribution to cumulative impacts on geology from either the facilities at the Sparrows Point LNG Terminal or from the construction and operation of the pipeline.

4.13.2 Soils

LNG Terminal

Clearing and grading associated with the construction of the Terminal facilities and the Ecron ethanol plant could accelerate soil erosion, and without adequate protection, could result in the discharge of sediment to adjacent waterbodies. AES would implement the BMPs of its ECP which would reduce the potential for soil erosion. Although the Ecron ethanol facility and the proposed Sparrows Point LNG facilities could be constructed and operated at the same time, the effect of these projects would not result in a net loss of soils for agricultural or natural land uses, since both facilities would be located in an industrial area. None of the lands proposed for the AES and Ecron construction are under active cultivation, and no prime farmland would be converted as a result of the projects. In addition, AES would implement the Project SPCC Plan to avoid or minimize the effects of construction spills of fuels or other chemicals.

Pipeline and Associated Aboveground Facilities

The Mid-Atlantic Express Pipeline would cause localized impacts to soils through erosion, compaction, delayed revegetation, or changes to hydric soils on a site-by-site basis. However, the cumulative losses or modification of uses of soils for the counties crossed by the pipeline would not be a major feature of change compared with natural processes and other man-made sources of disturbance such as development and urbanization. There are no additional significant linear projects, such as pipelines or utility lines, proposed in the project area other than Transco's relatively small Sentinel Pipeline Expansion Project; approximately 7.15 miles of natural gas pipeline replacement within an existing utility corridor in Chester County, Pennsylvania. Transco has agreed to use erosion measure to mitigate impacts. With the implementation of Mid-Atlantic Express's ECP, we do not expect the construction or operation of the pipeline to significantly contribute to a cumulative impact on soils.

4.13.3 Water Resources

LNG Terminal

We have identified 11 proposed dredging projects, including the ongoing maintenance dredging of the main shipping channels leading to Baltimore Harbor, as projects that could contribute to cumulative impact on the water quality of the Patapsco River (see table 4.13.3-1) during the construction of the proposed Project. We have assessed the impacts of dredging projects within the Patapsco River from major projects west of Bodkin and North Points including projects in the mainstream of the Patapsco River, the Middle Branch of the river, Curtis Bay, and other local projects that could affect the water quality of the Patapsco River near Sparrows Point and the confluence area of Bear Creek and the Patapsco River. We limited the projects considered to projects with pending or approved dredging applications, of 15,000 cy or greater that could be implemented within the time period of 2008 through 2012.

Of the 11 projects listed in table 4.13.3-1, the three projects that would dredge 30,000 cy or less (i.e., The General Ship Repair Corporation, Lafarge North American, and Millennium Chemicals) would probably have limited cumulative affects on the water quality of the Patapsco River. These projects should be accomplished in one month, more or less, and should have minimal and localized impacts on the water quality of the Patapsco River.

Of the remaining dredging projects, the three projects that could have the greatest interaction with the proposed project are: 1) Baltimore Harbor and channels, maintenance dredging; 2) the BWI – Sparrows Point LLC phase II dredging; and 3) the MPA Harbor Wide dredging.

Pipeline and Associated Aboveground Facilities

There are no large-scale linear projects in table 4.13-1 that would add cumulatively to the impacts on streams or rivers caused by the construction of this project. Within Chester County, Pennsylvania, Transco's proposed Sentinel Expansion Project would affect some of the same water basins or streams as the Mid-Atlantic Express Pipeline construction. But since the proposed Sentinel Expansion Project would cross these streams at locations different than that of the Mid-Atlantic Express Pipeline and both Transco and Mid-Atlantic Express would implement measure to mitigate the impacts, we believe that if approved, cumulative impacts to the watershed(s) and streams crossed by both projects would be minor.

TABLE 4.13.3-1

Summary of Dredging and Marine Projects in Baltimore and Anne Arundel Counties That Could Contribute to Cumulative Impacts Associated With Construction of the Sparrows Point LNG Project

Project Name	General Project Location	Public Notice or Permit Approval Date	Application Number	Volume of Proposed Dredging (cy)	Disposal Location
Baltimore Harbor and Channels, MD. Proposed maintenance dredging of the Craighill Entrance, Craighill Channel, Cutoff Angle Brewerton Channel, Ft. McHenry Channel, Brewerton Channel Eastern Extension, and Swan Point Channel	Channels detailed in project name	March 2006 (Public Notice)	unavailable	2,500,000	Hart-Miller Island and others.
BWI – Sparrows Point, LLC	Patapsco River, at Sparrows Point	Feb 2006	200464865	600,000	Hart-Miller Island disposal site. Phase 1 completed.
		May 2005 (approved)		2,600,000	To be determined; permit on hold until approval of dredge disposal site.
Masonville Dredged Material Containment Facility	Patapsco River upstream of the Key Bridge			NA – Placement Area	This would be a new dredge material placement area in the inner Patapsco River area. It would affect estuarine water bottom and wetlands.
CNX Marine Terminals Inc.	Patapsco River, Baltimore City	June 2004 Dec 2005 (approved)	200460762	1,800,000	Approved disposal site.
The General Ship Repair Corporation	Patapsco River, Baltimore City	May 2004 July 2004 (approved)	20060755	25,000	Hart-Miller Island disposal site.
Harbor Point/ Building Piers, Bulkhead & Dredging	Inner Harbor of the Northwest Branch of the Patapsco River. Baltimore City, MD	July 2005		116,000	Hart-Miller Island disposal site.
Kinder Morgan Chesapeake Bulk	Patapsco River, Baltimore City	May 2004 July 2004	200460834	375,000	Hart-Miller Island disposal site.
Lafarge North America	Curtis Creek, Baltimore City	August 2005 May 2006 (approved)	200564762	30,000	Hart-Miller Island disposal site.
Maryland Port Authority / Harbor Wide	Patapsco River and Chesapeake Bay. Baltimore City and County	January 2005 March 2005	200460754	6,485,000	Hart-Miller Island disposal site and/or Cox Creek disposal facility (over 10 years).
Millennium Chemicals	Patapsco River, Anne Arundel Co.	April 2004 September 2006 (approved)	200460752	18,000	Cox Creek DMP.

TABLE 4.13.3-1

Summary of Dredging and Marine Projects in Baltimore and Anne Arundel Counties That Could Contribute to Cumulative Impacts Associated With Construction of the Sparrows Point LNG Project

Project Name	General Project Location	Public Notice or Permit Approval Date	Application Number	Volume of Proposed Dredging (cy)	Disposal Location
Rukert Terminals Corporation – Berth "B" & Bulkhead	Patapsco River, Northwest Harbor, Baltimore City	December 2005 September 2006 (approved)	unavailable	427,000	Hart-Miller Island disposal site
Rukert Terminals Corporation - Dredging	Patapsco River, Baltimore City	February 2005	unavailable	150,000	Hart-Miller Island disposal site

Source: US Army Corps of Engineers, Baltimore District, at http://www.nab.usace.army.mil/Regulatory/Permit/tracking.htm.

4.13.4 Wetlands

LNG Terminal

The majority of the dredging projects in table 4.13.3-1 would not impact wetlands because they involve maintenance dredging of existing channels. Other facility projects such as CNX Marine Terminals Inc, the General Ship Repair Corporation, Harbor Point/ Building Piers, Bulkhead & Dredging, Kinder Morgan Chesapeake Bulk, Lafarge North America, Millennium Chemicals, Rukert Terminals Corporation – Berth "B" & Bulkhead, and Rukert Terminals Corporation – Dredging would have cumulative impacts on the emergent estuarine wetlands of the Patapsco River. However, each of these projects, by virtue of the COE permitting process would be required to have wetlands mitigations projects to offset any loss of wetlands.

The Sparrows Point LNG Project dredging would impact estuarine waters, but the areas to be dredged are already existing channels, turning basins, or ship docking areas. There would be no additional dredging landward of the existing shoreline bulkheads, nor any work affecting emergent wetlands along Sparrows Point.

The anticipated shoreline projects in Baltimore and Anne Arundel Counties that may coincide with the Sparrows Point terminal construction and dredging activities may have cumulative negative impacts on the emergent estuarine wetlands of the Patapsco River, the Sparrows Point LNG Project would not add to impacts on emergent estuarine wetlands in a significant way.

Based on field inspections by AES and historical data (see section 4.5.1) Submerged Aquatic Vegetation (SAV) is not present in the Project area. Terminal construction activities at Sparrows Point, including dredging, would not affect SAV, and thus would not contribute to any cumulative impacts to SAV in the Patapsco River system.

Pipeline

In general construction of pipelines across wetlands does not result in any net-loss of wetlands due to draining or filling, unless aboveground facilities required for the pipelines are placed in wetlands. However, wetland functional values may be temporarily or permanently altered, depending on the type of wetland being affected. The most significant change in wetlands caused by pipeline construction and operation is the temporary loss of emergent and scrub-shrub wetlands and alteration of forested wetlands. Temporary clearing of forested wetlands is considered a long-term impact, as forest regeneration can take 35 to 75 years. Clearing forested areas to create the pipeline operational right-of-way is considered a permanent impact, or loss, because only small trees, shrubs, or emergent vegetation are allowed to grow within the operational right-of-way.

Construction of the pipeline would temporarily impact about 19.4 acres of wetlands. The operation of the pipeline would permanently impact 4.5 acres of wetlands, by permanently converting forested wetlands to emergent and scrub-shrub wetlands (also see section 4.4.2.1). Construction of the proposed Sentinel Expansion Project would impact approximately 0.8 acre of wetlands. The operation of the proposed Sentinel Expansion Project would impact approximately 0.1 acre of wetlands. Impacts to wetlands resulting from construction and operation of the proposed Sentinel Expansion Project would not be significant due to the size of impact and the condition of impacted wetlands which were previously disturbed by past pipeline and utility projects. These impacts would modify forested wetland function and value and hence would incrementally contribute to long-term or permanent alteration of forested wetland impacts in the project area. However, cumulative impacts on forested wetlands are minimized by collocating pipeline rights-of-way which reduces forest fragmentation and associated edge effects created by new pipeline rights-of-way. The proposed pipeline would be parallel and adjacent to other existing, linear projects for about 85 percent of the right-of-way.

The impacts of development projects in the Project area are not easily quantifiable, but the total conversion of rural or natural landscapes to suburban and commercial developments is in the hundreds to thousands of acres over the time period of this project. Unlike pipeline projects, where at least the emergent wetlands can be restored, suburban or commercial projects permanently convert wetlands to a different land use and vegetation cover type. Therefore, we believe the incremental impact of the Project on wetlands would be small in

comparison to the large suburban-sprawl projects and commercial development that are occurring along the pipeline corridor, particularly in Baltimore and Harford Counties, Maryland, and in Chester County, Pennsylvania. These residential and commercial projects would likely cause adverse cumulative impacts on wetlands. However, Mid-Atlantic Express Pipeline has minimized wetland impacts by collocating pipeline route, where practicable along the existing rights-of-way. Appropriate wetland compensation plans would be developed pursuant to COE permit requirements.

4.13.5 Vegetation

Most pipeline impacts to herbaceous vegetation are temporary, except for the permanent right-of-way which would be maintained by mowing. Nonetheless, the impacts of construction on most herbaceous landscapes or agriculturally planted fields are temporary, for one season. The most important impacts on vegetation are to the forested or wooded portions of the pipeline route. There is no native vegetation on the LNG terminal site, so this segment of the project will not be discussed further.

Construction of the Sparrows Point Project would temporarily affect a total of 1285.5 acres of undeveloped land, of which, 862.9 acres (54 percent of the Project) are agricultural land; 312.1 (19 percent of the Project) are forested lands; and 110.5 acres (7 percent of the Project) are herbaceous vegetation/open land. Impacts would be short-term on herbaceous vegetation and agriculture lands, as they would revegetate within 1 to 3 years. Impacts would be long-term with limited permanent impacts for forested areas, and it may take greater than 30 years to return to pre-construction conditions. Operation of the Project would impact about 544.6 acres of currently undeveloped lands, of which, 276.1 acres are agricultural; 147.3 acres are forested; and 13.2 acres herbaceous vegetation/open land.

The project would affect a total of 312.1 acres of forest during construction of the pipeline, about 147.3 acres would be lost by maintenance of the permanent right-of-way, and the remainder would be allowed to revegetate to pre-construction conditions after construction is complete. About 45.8 miles (85 percent) of the proposed pipeline route is collocated. Collocation of the rights-of-way would minimize the cumulative impacts to forests in these areas. Loss of these forest acres would contribute to cumulative losses of this habitat in the five counties of the project.

Of the projects listed in table 4.13-1, most are facility improvements or facilities constructed in existing industrial or commercial business park settings. As such, these projects would not have significant impacts to natural vegetation. Of the linear projects, that is highway or utility projects, the roadway and highway projects are mostly within already established road rights-of-way and as such have already been converted from native vegetation to maintained public easements. There may be a few local exceptions, but these exceptions would not contribute to cumulative impacts on vegetation.

The one linear project, Transco's proposed Sentinel Expansion Project would impact vegetated lands as well as residential treed landscaping. The proposed Sentinel Expansion Project would impact approximately 5.2 acres of forest in Chester County during construction. Thus, the Project would significantly increase the temporary impacts to forested lands in Chester County, Pennsylvania. Some of the commercial and residential projects may involve significant conversion of forested land to commercial properties or residential lots. These projects are likely to increase forest impacts in the proposed AES project area. Collocation of the right-of-ways would minimize the cumulative impacts to forested areas

4.13.6 Terrestrial and Aquatic Species

This Project would alter terrestrial wildlife habitats primarily by clearing vegetation and thus may have a short-term cumulative impact on wildlife habitats in conjunction with land clearing activities. To minimize vegetation clearing, AES has sited the proposed facilities on existing developed or disturbed land to the extent practicable (e.g., the proposed LNG terminal is on an industrial site, and much of the pipeline route is co-located with or parallels existing utility rights-of-way). Herbaceous habitats would be allowed to revegetate to their pre-construction state. Mobile animal that relocated to adjacent areas due to disturbance for construction would return after construction is complete. Because of this, along with AES's adherence to its ECP, long-

term impacts to herbaceous habitats would be minimized. Thus, we believe that the Project would not have a measurable impact on these habitats.

Some of these commercial and residential projects may involve conversion of forested land to commercial properties or residential lots. The Project would result in 311.61 acres of forest loss during construction; approximately 147.30 acres within the permanent pipeline right-of-way would be lost permanently. While much of this forested acreage is along existing, maintained utility corridors. We believe widening of the corridor would have cumulative impacts on terrestrial species but on a smaller scale. The widening of such corridors would incrementally contribute to the loss of forest interior acreage and habitat because it would temporarily displace mobile species, may result in direct mortality to immobile species, and would reduce habitat quality and availability for forest interior dwelling species.

The Project would disturb bottom habitat in the Patapsco River near the proposed LNG terminal. AES would implement a dredging management plan and its ARMP to minimize such impacts. In addition, the dominant benthic species in sediments to be dredged near the proposed LNG terminal site are pollution-tolerant polychaete worms that would recolonize quickly after dredging was complete. Sediments suspended by dredging would create short-term impacts on aquatic habitats near the proposed LNG terminal site. Maintenance dredging of the channel would result in disturbances every 6 years at a site that would not be disturbed were it not for this Project. Thus, Project dredging may have short-term, cumulative impacts on the waters near the proposed LNG terminal in conjunction with nearby dredging projects.

In fresh waters crossed by the proposed pipeline, AES would implement its ECP, ARMP, and SPCC Plan to minimize impacts. Measures to reduce impacts to fresh waters include erosion and sediment controls, HDD under several watercourses, and storage for potentially hazardous materials at least 100 feet from a waterbody. Therefore, if AES abides by the recommendations in Section 4.6, we believe the contribution to aquatic cumulative impacts would be minimal.

The additional marine traffic resulting from this project would be only a minor addition to the number of vessels using the Chesapeake Bay and the waters of the Port of Baltimore. Along the waterway for LNG marine traffic, a release of LNG with or without ignition could cause thermal (heat or cold) shock to aquatic fauna (including EFH-designated fish and their prey) that come into contact or that are in the vicinity of the LNG pool in Zone 1 with impacts decreasing outward through Zones 2 and 3. Furthermore, the chances of such an incident are extremely remote. In addition, AES would implement measures to minimize impacts from vessel strikes along the waterway. Thus such LNG marine traffic is not expected to contribute cumulatively to aquatic species/EFH-designated species impacts.

4.13.7 Threatened, Endangered, and Other Special Status Species

We have determined that the proposed Project would have no effect on or is not likely to adversely affect federally-listed threatened and endangered species that potentially may occur in the Project area if AES abides by the recommendations in Section 4.7. Also, implementation of our recommendations, including consultation and developing mitigation plans with appropriate state agencies, would minimize impacts on state-listed species. Therefore, the proposed Project is not expected to contribute to cumulative impacts to these species. Potential effects from LNG marine traffic would be similar to those described for aquatic species in general (section 4.13.6), and thus no significant cumulative contributions are expected.

4.13.8 Land Use, Recreation, and Visual Resources

Land Use

Transco's proposed Sentinel Expansion Project would impact approximately 18.9 acres of agricultural land in Chester County during construction. By comparison, the proposed Pipeline would impact 398.8 acres of agricultural land in Chester County. Thus, the Project would significantly increase the temporary impacts to agricultural land in Chester County.

The Project would temporarily impact 862.9 acres of agricultural land and about 276.2 acres of agricultural land would be affected by the operation of the Project. All agricultural lands would be restored to preconstruction use within one or two seasons, whereas, the losses of agricultural land to commercial or residential development would be permanent.

Recreation

Recreational issues are discussed for the LNG terminal and the pipeline in sections 4.8.5.1 and 4.8.5.2. For the LNG terminal construction and operation, the main recreational issue revolves around the use of, and possible restriction on, the water way going into Bear Creek. We anticipate that small boats would not have restricted access in or out of Bear Creek during either construction dredging activities, or during operations and the calling of LNG ships to the dock. There may be some restrictions on larger draft boats (greater than, for instance, 5 feet) during the dredging in order to stay out of a restricted area within 200 feet of dredging. These deeper draft boats may also be affected by the Coast Guard security zone while the LNG ships are transiting the approach channel (known as the Sparrows Point Shipyard Channel, or as the Marine Channel), the turning basin, or during docking. This security zone could preclude deeper draft boats from hugging the east side of the Patapsco River from the bridge over Bear Creek to Fort Carroll. These boats may still have deep enough water in the center of the Patapsco River as it leads into Bear Creek to enter and exit Bear Creek at will during LNG vessel maneuvers in the approach channel and turning basin. If not, the timing restriction could be for 45 minutes to an hour for each LNG shipment to the terminal. There would be no additional cumulative impacts from other projects scheduled in the area.

Regarding the cumulative impacts to the recreational boating and fishing of Chesapeake Bay, the Project LNG traffic would have a cumulative impact to the normal ship traffic in Chesapeake Bay and the various ship channels leading up to the POB. The LNG ship traffic would be a small incremental portion (about 5 to 7%) of the deep draft traffic to the POB. However enforcement of the Coast Guard security zone around an LNG vessel would have an additional impact on small pleasure boats and fishing boats which are in or near the shipping channels. Currently, this type of restriction (passage of LNG ships with a moving security zone) is only experienced in Chesapeake Bay as far north as Cove Point. The Project LNG traffic would add to the frequency of this type of impact to boaters from the mouth of the Bay to Cove Point, and would be a new type of restriction for areas north of Cove Point to the POB. The security zone would cause vessels to stay out of the channel during the passage of an LNG vessel, and would possibly cause some vessels anchored within the security zone, to move out of the zone during the 45 minute to 1 hour passage of the vessel.

Visual Resources

Regarding cumulative impacts caused by the construction of the LNG terminal to the visual resources of this portion of the Patapsco River, the building of the LNG tanks and the docking of the LNG ships would be a visible change to the viewshed from the Key Bridge and to boaters in Bear Creek and portions of the Patapsco River. The nature of the LNG terminal would not be out-of-kind from the current industrial setting of Sparrows Point and the shipbuilding facilities. However the scale of the tanks and the LNG ships would be somewhat different from the current facilities.

Regarding the viewshed of the Chesapeake Bay and the views of ships and shipping from shore or from other boats and ships, the LNG ships should not be a substantial change from other large, deep draft vessels currently using the ship channels to the POB. Thus the siting of the LNG ships for 45 minutes to an hour, 4 to 6 times per week (two to three vessel round trips per week) from any point along the vessel transit should not be a significant contributor to changes in the viewshed along the vessel route.

Regarding the viewsheds along the proposed pipeline route, the contribution of the Project to cumulative changes of the visual environment would depend upon the status and quality of the viewshed at each point along the route. Where the pipeline follows existing pipeline rights-of-way in industrial or agricultural settings, the change in the viewshed would be minimal. Where the pipeline follows existing corridors through residential areas, the local changes would depend upon the width of the new construction, and the local impact

on removing ornamental vegetation or existing vegetation screens. Where landscape trees or shrubs are removed, the impact on the viewshed could be dramatic.

Also, where the pipeline follows an existing utility corridor through forested habitat, the change to local viewsheds could vary from slight to dramatic. Areas of forested habitat in highly used recreational areas, like the Gunpowder Falls State Park along the crossing of Gunpowder Falls and Little Gunpowder Falls would be a significant cumulative impact to the viewshed if the canopy of trees at the two water ways are opened to a contrasting open view of the sky from the park trails. The pipeline parallels a power line corridor at the crossing of the Little Gunpowder, the construction of the Project would widen the corridor. Other local viewsheds where the incremental changes to the viewshed from the Project might be measurable would be the crossings of forested riparian habitat of the Susquehanna River, Conowingo Creek, Deer Creek, Octoraro Creek, and Brandywine Creek. The visual impact to Conowingo Creek could be the most significant since the pipeline route parallels the creek bed for several tenths of a mile, and crosses the creek in an area that currently has a closed canopy of forest.

4.13.9 Socioeconomics

Construction of the projects and facilities listed in table 4.13-1 would generate temporary construction jobs, with much of the workforce residing locally. The influx of non-local workers for any of these facilities would not represent a measurable change in the population of Baltimore or Anne Arundel Counties. The vacant rental units available in the counties would be sufficient to handle the requirements of all the projects, although the cumulative effects of the Project and any other large project could temporarily and seasonally tax available local rental and motel space. Full occupancy is good for the inn- keeper, but potentially adverse to the customer in cost or availability of rooms. The affected counties have the necessary infrastructure to provide public services and utilities to all the projects concurrently.

Even though the environmental justice community of Turner Station is the closest residential community to the proposed LNG facility, we have determined that the siting of this facility would not disproportionately or otherwise result in adverse human health or environmental effects on minority or low income communities or Native American programs (also see section 4.9.7). No identified minority or low-income population would be disproportionately impacted by the other projects considered in this cumulative analysis.

There would be positive cumulative economic benefits from the Project and the projects listed in table 4.13-1, particularly the larger-scale facility projects listed as being cumulative to the construction of the LNG facility. Taxes from all of these projects would contribute to the local tax base. Wages from the employees of each project including the Sparrows Point LNG facility would have a cumulative benefit on personal income of the local population.

4.13.10 Cultural Resources

Of the projects reviewed in table 4.13-1, only the linear projects such as the highway modification projects and Transco's proposed Sentinel Expansion Project could reasonably be expected to have a potential impact on cultural resources. Since all of these projects are widening or improvement projects (i.e., MD 295, I-695, US 1, MD 7, Pennsylvania Turnpike) and since these highways will be expanding into exiting rights-of-way or easements that have already been modified and cleared for this purpose, it is unlikely that any of these projects would have a major impact on cultural resources. The remaining non-linear projects in table 13-1, that is site-specific facility projects, are mostly expansions of existing facilities (e.g., Wastewater Treatment Plant Upgrade – Patapsco and Cox Creek, Belt's Corporation Contract Distribution Facility, and the Ecron Ethanol Plant) or facilities sited in existing industrial complexes (e.g., Ecron Ethanol Plant). These facility projects are unlikely to have any significant impact on cultural resources in the counties affected by this Project. Thus, the Project should not have cumulative interactions with other major projects anticipated to occur in the Project area.

4.13.11 Air Quality and Noise

Construction of the proposed Sparrow's Point LNG terminal and Mid-Atlantic Express pipeline and some of the reasonably foreseeable projects and activities listed in table 4.13-1 would involve the use of heavy equipment that produces noise, air pollution and dust. In addition, AES is considering construction and operation of a (nonjurisdictional) power plant at the LNG terminal site. Operation of the proposed Sparrow's Point LNG terminal (including the Terminal and ships delivering LNG to the terminal), optional power plant, and the pipeline would also contribute cumulatively to ongoing air emissions and noise along with some of the reasonably foreseeable future projects.

The project counties (LNG terminal and pipeline) are currently in attainment or unclassifiable with air quality standards for CO, NO_2, PM_{10}, SO_2, and Pb. With respect to ozone, the project counties are all designated as nonattainment, with the exception of Lancaster County, PA. Lancaster County was redesignated to attainment for the 8-hour NAAQS under an EPA approved maintenance plan. With respect to $PM_{2.5}$, Cecil County is designated as attainment and the remaining four project counties are designated as nonattainment. Increases in industrial point source emissions could have a deleterious effect on local and regional air quality. However, each of these projects would be required to apply to the MDE for an air quality permit.

In addition, if some or all of the proposed projects are built, there could also be an increase in emissions during construction. As discussed in Section 4.11.1, a general conformity determination is being prepared for those counties designated as nonattainment or maintenance to assure compliance toward attaining or maintaining air quality standards due to construction and LNG vessel traffic.

As discussed in Section 4.11.1, detailed modeling was performed to quantitatively evaluate the impacts from operation of the Sparrow's Point LNG terminal, both with and without the nonjurisdictional power plant. The analysis indicated that operation of the terminal, with and without the power plant, would comply with the Maryland SIP. A decision regarding construction of the power plant has not yet been made. Should the power plant be constructed along with the LNG terminal, then PSD permitting requirements would apply and AES would be required to perform interactive modeling in accordance with MDE's PSD modeling requirements and assess potential impacts to Class I areas.

One foreseeable project, the ECRON ethanol production facility, would also be located on the Sparrow's Point peninsula. Therefore, MDE requested a cumulative modeling analysis of operational emissions from the LNG terminal and ethanol plant. The modeling developed by the applicant, at the direction of MDE and the FERC, includes seven scenarios for the LNG terminal (with and without the power plant) as well as a scenario including all Ecron sources. The results of this analysis are presented in table 4.13-11-1.

TABLE 4.13.11-1

Predicted Cumulative Ambient Air Quality Concentrations for LNG Terminal (With Power Plant) and Ecron Ethanol

Pollutant	Averaging Period	Predicted Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO	1-hour	34,836	40,000
	8-hour	5,094	10,000
NO_2	Annual	50.2	100
PM_{10}*	24-hour	100.2	150
	Annual	38.3	50
SO_2	3-hour	326.6	1,300
	24-hour	112.3	365
	Annual	31.8	80
Pb	3-Month	0.002	1.5

* Per EPA's October 1997 and April 2005 guidance on implementation of NSR requirements for $PM_{2.5}$, in the absence of a final implementation rule PM_{10} is being used as a surrogate. MDE is currently working on a plan and will submit a $PM_{2.5}$ SIP revision for the Baltimore area in February 2008.

In April 2007, MDE issued an air quality permit for the Ecron ethanol plant. Due to the proximity of the proposed ethanol plant to the proposed LNG terminal, construction schedules were reviewed to assess the potential for cumulative air impacts due to construction activities. Based on the schedule for issuance of the DEIS and the proposed construction schedule submitted by AES, it is anticipated that site work for the LNG terminal could occur by the first quarter of 2009. Based on discussions with MDE, a commence construction date for the ethanol plant is unknown at this time due to financing issues. Cumulative air quality impacts due to construction activities would be reviewed once schedules for the LNG terminal and ethanol plant are better known.

The Sparrow's Point LNG terminal and projects listed in table 4.13-1 may affect ambient noise levels during construction. Section 4.11.2 presents a detailed noise analysis of impacts during construction of the LNG terminal, including dredging operations. As demonstrated in the noise analysis, noise impacts during the construction phase would be localized and would attenuate quickly as the distance from the noise source increases. Because pipeline construction would proceed as a moving assembly line along the pipeline route, the duration of these activities and resultant noise at any given location would be limited and short term. AES has proposed mitigation strategies for noise impacts to residences along the pipeline route.

Cumulative noise impacts due to construction of the LNG terminal and ethanol plant are not expected to impact nearby residences as the closest NSAs to the LNG terminal are 5,450 to the north (NSA #1) and 9,400 feet to the east (NSA #2) of the LNG terminal. As discussed in Section 4.11.2, the most intense noise levels would be generated by pile driving for the LNG tank foundations. As a worst case scenario, AES modeled noise impacts from pile driving activities. Predicted noise levels from pile driving, discussed in Section 4.11.2, would be below the State of Maryland 90dBA threshold for daytime construction activities. Pile driving activities would not be conducted during nighttime hours. All other construction activities are expected to generate noise at less intense levels and would therefore not adversely affect nearby NSAs or land uses.

Stationary equipment at the proposed LNG terminal and power plant would generate noise during the operation of these facilities. As documented in the noise analysis (Section 4.11.2), operation of the LNG terminal would not increase the L_{dn} at any of the NSAs. Based on the noise analysis conducted, project noise levels at the NSAs would remain below our criteria. Therefore we conclude that no significant noise impacts would occur with the operation of the LNG terminal and optional power plant.

4.13.12 Reliability and Safety

Impacts on reliability and public safety would be mitigated through the implementation of applicable federal, state, and local rules and regulations for each individual project. The specific rules and regulations that apply to each individual project would ensure that the applicable design standards are implemented to protect the public and to prevent accidents and failures. The LNG terminal facilities would be sited, designed, constructed, operated, and maintained in compliance with the federal siting and design requirements for LNG facilities summarized in table 2.7.1-1. The pipelines and aboveground facilities associated with the Sparrows Point Project would be designed, constructed, operated, and maintained in accordance with DOT Minimum Federal Safety Standards in Title 49 CFR Part 192.

Several of the present or reasonably foreseeable future projects, including the proposed project, would involve facilities that could be expected to handle hazardous materials. Accidents involving such materials represent a potential impact on public safety. Continued growth in international commerce is likely to result in increased quantities of hazardous materials being shipped to and from the region.

It is difficult to evaluate the cumulative risk that such growth represents or has represented. In addition, it is difficult to assess the cumulative risk for an intentional attack on the LNG facility. It is reasonable to assume that the rate of ship accidents (including those involving the release of hazardous materials) is likely to rise with more vessel traffic, which could cumulatively increase the risk of an accident having an impact on public safety. To ensure safe transit, each LNG carrier would be under pilot control from Hampton Roads, Virginia near the mouth of the Chesapeake Bay, and have a tug escort from the Cut-off Angle prior to reaching the

Brewerton Channel which is approximately 6 miles from the terminal site. The Coast Guard would also enforce a moving safety zone and moored vessel security zone around LNG ships. These and other operational controls by the Coast Guard and vessel pilots would minimize the risk of accidents involving LNG ships. Furthermore, the implementation of federal, state, and local rules and regulations concerning security and the results of the WSA with its associated operations and Emergency Response Plan would minimize risks to LNG ships and the terminal.

Emergency response time is a key aspect of public health and safety. In the WSR for Sparrows Point LNG, the Coast Guard stated that it requested AES "to identify a source agency (federal, state, local or private agency) for each risk mitigating measure (RMM) it proposed and to determine the agency's current availability and capability, as well as its willingness to perform the proposed RMM. The results of AES's efforts to identify a source agency overwhelmingly indicate that the port community currently does not have the resources to implement the RMMs necessary to responsibly manage the maritime safety and security risks of the proposed LNG facility." Based on this and other factors, the Coast Guard went on to state in the WSR that "the Coast Guard has determined that the Chesapeake Bay is not currently suitable, but can be made suitable, for the type and frequency of LNG marine traffic associated with the proposed LNG facility, provided additional measures necessary to responsibly manage the maritime safety and security risks are in place.'' Thus, AES must achieve these additional RMMs, including identifying port and agencies with support infrastructure to implement these RMMs. Section 4.12.6 includes our recommendation that AES prepare an Emergency Response Plan and coordinate procedures with local emergency planning groups, fire departments, state and local law enforcement, the Coast Guard, and other appropriate federal agencies to be used in the event of an incident. AES has been working with the National Association of State Fire Marshals to meet with state and local emergency response services in the areas of the LNG terminal site and the proposed pipeline route. AES has indicated that training and resource needs for response to hazards associated with the project have been and would continue to be discussed with these agencies. AES would also require its construction contractors to contact and coordinate with fire departments and emergency response agencies prior to construction, and to establish relationships and response options with these agencies. As part of its Emergency Response Plan, AES also would be required to prepare a comprehensive plan that identifies cost sharing mechanisms for funding emergency response actions. With the implementation of the coordination procedures in the Emergency Response Plan and the funding of additional emergency management equipment and personnel, no cumulative impacts would be expected on emergency response services during operation of the proposed project.

4.13.13 Conclusions About Cumulative Impacts

We identified 17 existing, approved, or proposed activities/projects that could potentially result in cumulative impacts when considered with the Sparrows Point Project.

Of the 17 activities/projects, 7 are pertinent to the construction and operation of the LNG terminal. These include the possible Sparrows Point Power Plant that AES may build within the Sparrows Point LNG Terminal, an ethanol plant, a distribution facility, a highway widening, and two wastewater treatment plant upgrades. Also among these 17 activities are 12 dredging projects could have potential cumulative effects on the water quality of the Patapsco River. The other 10 are pertinent to the Mid-Atlantic Express Pipeline and include a wastewater treatment plant upgrade; an industrial facility expansion, five highway/road projects, a military base realignment/closure, a natural gas pipeline expansion (the Transco Sentinel Expansion, FERC Docket Nos. PF06-32 and CP08-31, Environmental Assessment scheduled to be issued in April 2008), and a landfill biogas project. Construction of the various projects for which a schedule is known is expected to occur between 2008 and 2013.

Cumulatively the proposed Project would result in more frequent impacts on the water quality and aquatic habitat of the Patapsco River; however, we expect impacts would be minimal and localized. With AES's implementation of BMPs in its ECP, the Project's contribution to cumulative impacts to the waters crossed by both projects would be minor. Specific resources to which the Project would have a cumulative contribution are:

- The Project's cumulative contribution to impacts on non-forested wetlands would be minimal and temporary, as these wetlands would be allowed to return to their preconstruction state following construction.
- There would be minimal (though small in comparison to ongoing region-wide development) contribution to cumulative loss of forest within the permanent pipeline right-of-way, as forested sites within the operational footprint of the Project would be maintained in an herbaceous state during the operation of the proposed facilities. This would contribute incrementally to forest interior habitat degradation. Of the total 312.1 acres of forest loss during the construction phase of the project about 164.8 acres would be outside the permanent right-of-way and be allowed to revegetate as forest after construction.
- Enforcement of the Coast Guard security zone around Project LNG vessels would add to the frequency of restrictions on vessel movement in Chesapeake Bay (currently experienced only as far north as Cove Point).
- Where the pipeline follows an existing utility corridor through forested habitat, the corridor would be widened.
- There would be positive cumulative economic benefits from the Project such as contribution to the local tax base and a benefit on personal income of the local population.
- Construction of the Project and some of the reasonably foreseeable projects/activities would have a cumulative impact to noise and air quality.
- Operation of the proposed Project, primarily at the LNG terminal and along the waterway for LNG marine traffic, would add to cumulative impacts to noise and air quality for the life of the project. The cumulative impacts regarding air quality would be addressed in the General Conformity Analysis where mitigation measures to reduce these impacts would be evaluated.