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Weaver's Cove LNG Project
Final Environmental Impact Statement

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ACRONYMS AND ABBREVIATIONS

ABSG	ABSG Consulting Inc.
AC	alternating current
ACEC	Areas of Critical Environmental Concern
ACEEE	American Council for an Energy Efficient Economy
ACHP	Advisory Council on Historic Preservation
AET	Apparent Effects Threshold
AL-CCC	Aquatic Life Criterion Continuous Concentration
AL-CMC	Aquatic Life Criteria Maximum Concentration
Algonquin	Algonquin Gas Transmission Company
APE	area of potential effects
AQCRs	Air Quality Control Regions
ASA	Applied Science Associates
ASTs	aboveground storage tanks
ATWS	additional temporary workspace
BA	biological assessment
BACT	Best Available Control Technology
Bcf	billion cubic feet
Bcfd	billion cubic feet per day
BFHYDRO	boundary-fitted hydrodynamic model
BG LNG	BG LNG Services, L.L.C.
bgs	below ground surface
BRA	Boston Redevelopment Authority
Btu	British thermal unit
Btu/ft^2-hr	British thermal unit per feet squared per hour
BUAR	Massachusetts Board of Underwater Archaeology
C	Celsius
C2D	Concept2Delivery
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAD	Confined Aquatic Disposal
CCMP	Narragansett Bay Comprehensive Conservation and Management Plan
CDF	Confined Disposal Facility
CEDS	Comprehensive Economic Development Strategy
CEII	Critical Energy Information Infrastructure
CEQ	Council on Environmental Quality
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
cfs	cubic feet per second
ChevronTexaco	ChevronTexaco Corporation
CIA	Massachusetts Commission on Indian Affairs
Class I	Mandatory Federal Class I
CMR	Code of Massachusetts Regulations
CO	carbon monoxide
CO_2	carbon dioxide
Coast Guard	U.S. Coast Guard
COC	contaminant of concern
COE	U.S. Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
CRMC	Rhode Island Coastal Resources Management Council

CSO	Combined Sewer Overflow
CWA	Clean Water Act
CZMA	Coastal Zone Management Act of 1972
CZMP	Coastal Zone Management Program
DAQC	Division of Air Quality Control
dBA	decibels of the A-weighted scale
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DEM	Rhode Island Department of Environmental Management
DEP	Massachusetts Department of Environmental Protection
DFW	Massachusetts Division of Fish and Wildlife
Distrigas	Distrigas of Massachusetts, L.L.C.
DMF	Massachusetts Division of Marine Fisheries
DO	dissolved oxygen
DOE	U.S. Department of Energy
DOER	Massachusetts Division of Energy Resources
DOT	U.S. Department of Transportation
DPA	designated port area
EA	Environmental Assessment
eastern Massachusetts	EMA
EFH	Essential Fish Habitat
EFSB	Massachusetts Energy Facility Siting Board
EI	environmental inspector
EIA	Energy Information Administration
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
El Paso	El Paso Global LNG
EN 1473	European Standard for LNG Facilities
ENF	Environmental Notice Form
EOEA	Massachusetts Executive Office of Environmental Affairs
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
ERL	Effects Range-Low
ERM	Effects Range-Median
ESA	Endangered Species Act of 1973
ESD	emergency shutdown
Excelerate	Excelerate Energy L.L.C.
F	Fahrenheit
FAA	Federal Aviation Administration
FAIR Plan	Fair Access to Insurance Requirements Plan
FERC	Federal Energy Regulatory Commission
FERC Plan	FERC's Upland Erosion Control, Revegetation and Maintenance Plan
FERC Procedures	FERC's Wetland and Waterbody Construction and Mitigation Procedures
Fish Run	Banks of or Land Under the Ocean, Ponds, Streams, Rivers, Lakes, or Creeks that Underlie an Anadromous/Catadromous Fish Run
FPC	Federal Power Commission
FSO	Facility Security Officer
FSRU	floating, storage, and regasification unit

ft^2	square feet
ft^3	cubic feet
ft/sec	feet per second
FWS	U.S. Fish and Wildlife Service
Gas Tanker Code	*International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk*
g	gravity
GBS	gravity-based structure
Governors Conference Report	New England Governors by the Power Planning Committee of the New England Governors' Conference, Inc.
gpm	gallons per minute
HAP	hazardous air pollutant
Harbor Plan	Fall River Harbor and Downtown Economic Development Plan
HCAs	high consequence areas
HDD	horizontal direction drill
HEL	highly erodible land
hp	horsepower
HUD	U.S. Department of Housing and Urban Development
IMO	International Maritime Organization
Iroquois	Iroquois Gas Transmission Company
ISCST3	industrial source complex short term version 3
KeySpan	KeySpan LNG, L.L.C.
kw	kilowatt
kw/m^2	kilowatts per square meter
kPa	kilopascals
L_{90}	sound level that is exceeded more than 90 percent of the time
L_{day}	daytime sound level
L_{dn}	day-night sound level
$L_{eq(24)}$	24-hour equivalent sound level
LNAPL	light non-aqueous phase liquid
LNG	liquefied natural gas
L_{night}	nighttime sound level
LPG	Liquefied Petroleum Gas
LSP	Licensed Site Professional
m	meters
m^3	cubic meters
m^3/hr	cubic meters per hour
MAAQS	Massachusetts Ambient Air Quality Standards
MACT	Maximum Achievable Control Technology
MAOP	maximum allowable operating pressure
MAPC	Metropolitan Area Planning Council
M&N	Maritimes & Northeast Pipeline, L.L.C.
MARSEC	Maritime Security
MassGIS	Massachusetts Geographic Information System
MassHighway	Massachusetts Highway Department
Master Plan	Comprehensive Master Plan for Fall River
MBDS	Massachusetts Bay Disposal Site
MBTA	Massachusetts Bay Transportation Authority

MCE	Maximum Considered Earthquake
MCP	Massachusetts Contingency Plan
Memorandum	Memorandum of Understanding on Natural Gas Transportation Facilities
MEPA	Massachusetts Environmental Policy Act
mg/L	milligrams per liter
MHC	Massachusetts Historical Commission
MLLW	mean lower low water
MMBtu/d	million British thermal units per day
MMBtu/hr	million British thermal units per hour
MMcfd	million cubic feet per day
MMLP	Merchants Mills Limited Partnership
MMPA	Marine Mammal Protection Act
MNI	Moffatt and Nichol International
MOU	Memorandum of Understanding
MP	milepost
mph	miles per hour
MRI	Marine Research, Inc.
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSI	Marine Safety International
MSL	mean sea level
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NE Report	New England Gas Infrastructure Report
NEPA	National Environmental Policy Act
Neptune LNG	Neptune LNG, L.L.C.
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NFPA 59A	Standards for the Production, Storage, and Handling of LNG
NGA	Natural Gas Act
NHPA	National Historic Preservation Act
nm	nautical mile
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NO_2	nitrogen dioxide
NOI	*Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Weaver's Cove LNG Project, Request for Comments on Environmental Issues, and Notice of Joint Public Scoping Meeting*
NO_x	nitrogen oxides
NPC	National Petroleum Council
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NWI	National Wetland Inventory
O_3	ozone

OBE	Operating Basis Earthquake
OCPC	Old Colony Planning Council
OCRM	Office of Coastal and Ocean Resource Management
OCZM	Massachusetts Office of Coastal Zone Management
OEP	Office of Energy Projects
OHM	oil and hazardous materials
OPS	Office of Pipeline Safety
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PAL	Public Archaeology Laboratory
Pb	lead
PCB	polychlorinated biphenyl
PD	Preliminary Determination on Non-Environmental Issues
PEL	Probable Effects Level
PGA	peak ground acceleration
PHEL	potentially highly erodible land
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLEM	pipeline end manifold
PM_{10}	particulate matter less than 10 microns in diameter
PNGTS	Portland Natural Gas Transmission System
PORTS	Physical Oceanographic Real Time Systems
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PSA	Purchase and Sale Agreement
PSD	Prevention of Significant Deterioration
PSHA	probabilistic seismic hazard assessment
psia	pounds per square inch
psig	pounds per square inch gauge
Quest	Quest Consultants, Inc
RICRMP	Rhode Island Coastal Resources Management Program
RISDS	Rhode Island Sound Disposal Site
RPG	rocket propelled grenade
RPT	rapid phase transition
RSPA	Research and Special Programs Administration
SAIC	Science Applications International Corporation
Sandia Report	*Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*
SAP	sediment sampling and analysis plan
SCR	Selective Catalytic Reduction
Shell Oil	Shell Oil Company
SHPO	State Historic Preservation Office
SILs	Significant Impact Levels
SIPs	state implementation plans
SMB	Southeastern Massachusetts Bioreserve
SML	sound monitoring location
SO_2	sulfur dioxide
SOLAS	*International Convention for the Safety of Life at Sea*
Somerset LNG	Somerset LNG, L.L.C.

SOPUS	Shell Oil Products United States
SPCC Plan	Spill Prevention, Containment and Countermeasure Plan
SRP	Special Review Procedure
SRPEDD	Southeastern Regional Planning and Economic Development District
SSDOSE	Suspended Sediment Dose model
SSE	Safe Shutdown Earthquake
SSFATE	Suspended Sediment Fate
STU	Stormwater Treatment Units
TB-10	turning basin core 10
Tcf	trillion cubic feet
TCLP	toxicity characteristic leaching procedure
Tennessee Gas	Tennessee Gas Pipeline Company
TMDL	Total Maximum Daily Load
TNT	trinitrotoluene
tpy	tons per year
Tractabel	Tractabel LNG North America, L.L.C.
TSA	Transportation Security Administration
TSS	total suspended solids
TWS	temporary workspace
UCL	Upper Confidence Limits
USC	United States Code
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USTs	underground storage tanks
UV/IR	ultraviolet/infrared
VOC	volatile organic compound
WPA	Massachusetts Wetlands Protection Act
WSR Act	Wild and Scenic Rivers Act

EXECUTIVE SUMMARY

This final environmental impact statement (EIS) for the Weaver's Cove LNG Project has been prepared by the staff of the Federal Energy Regulatory Commission (FERC or Commission) to fulfill the requirements of the National Environmental Policy Act (NEPA) and the Commission's implementing regulations under Title 18, Code of Federal Regulations, Part 380. The purpose of this document is to inform the public and the permitting agencies about the potential adverse and beneficial environmental impacts of the proposed project and its alternatives; and to recommend mitigation measures that would avoid or reduce any significant adverse impact to the maximum extent possible.

The vertical line in the margin identifies text that has been modified in the final EIS and differs from the corresponding text in the draft EIS.

Weaver's Cove Energy, L.L.C. indicates that its proposal would specifically provide: a new liquefied natural gas (LNG) import terminal and competitive source of imported LNG in the New England market area; a new facility for the storage of LNG; access to natural gas reserves in production areas throughout the world that are inaccessible by conventional pipelines; a new supply of natural gas to New England; strengthened gas supply to southeastern Massachusetts and Rhode Island; and a competitive source of LNG delivered by truck to LNG storage facilities throughout the region. To accomplish these purposes Weaver's Cove Energy, L.L.C. proposes to construct and operate an LNG terminal, and Mill River Pipeline, L.L.C. proposes to construct and operate two new natural gas pipelines and ancillary facilities in the Commonwealth of Massachusetts. Hereafter, Weaver's Cove Energy, L.L.C. and Mill River Pipeline, L.L.C. are referred to collectively as Weaver's Cove Energy. Weaver's Cove Energy's proposed facilities would transport up to 800 million cubic feet per day (MMcfd) of imported LNG to the United States market. In order to provide these services, Weaver's Cove Energy has requested the Commission's authorization to construct, install, and operate the following facilities.

The LNG terminal facilities would include:

- a ship unloading facility with a single berth capable of receiving LNG ships with cargo capacities of up to 145,000 cubic meters (m^3);
- a 200,000 m^3 (equivalent to 4.4 billion standard cubic feet of gas) full containment LNG storage tank;
- vaporization equipment, sized for a normal sendout of 400 MMcfd and a maximum sendout of 800 MMcfd;
- four LNG truck loading stations; and
- ancillary utilities, buildings, and service facilities.

The natural gas pipeline facilities would include:

- two 24-inch-diameter natural gas sendout pipelines (Northern and Western Pipelines), totaling approximately 6.1 miles in length; and
- two meter and regulation stations.

The Massachusetts Executive Office of Environmental Affairs (EOEA) issued a Certificate to Weaver's Cove Energy on August 28, 2003 that established a Special Review Procedure (SRP) to guide the Massachusetts Environmental Policy Act (MEPA) review of the Weaver's Cove LNG Project. This SRP provided for a coordinated NEPA/MEPA review. It also allowed the draft and final EISs to serve as the draft and final Environmental Impact Reports (EIRs) required under MEPA, provided the EISs address MEPA's EIR requirements, as specified in the MEPA scope for the project that was issued concurrently with the SRP on August 28, 2003. Pursuant to the established SRP, the EOEA reviewed the draft EIS and issued a Certificate on October 1, 2004 following the close of the comment period. In the Certificate, the Secretary of the EOEA determined that the draft EIS did not sufficiently address several issues critical to understanding the project design and how the project meets state regulatory requirements and thus required Weaver's Cove Energy to prepare a supplemental draft EIR. The Secretary of the EOEA stated that its decision was directed at the deficiencies of the joint federal\state document only as it relates to the state requirements under MEPA. Weaver's Cove Energy responded and submitted a supplemental draft EIR to the Secretary of the EOEA on November 1, 2004. On December 17, 2004, the Secretary of the EOEA determined that the supplemental draft EIR did not adequately and properly comply with the MEPA and its implementing regulations. Because the decision of the Secretary of the EOEA was based on the inadequacy of the supplemental draft EIR to meet state regulatory requirements, the FERC continued to complete its analysis of the project for federal review purposes and to prepare this final EIS pursuant to the Council on Environmental Quality's (CEQ) NEPA implementing guidelines. Nevertheless, we believe this final EIS will help satisfy the requirements of the MEPA.

PROJECT IMPACTS

The environmental issues associated with construction and operation of the Weaver's Cove LNG Project are analyzed in this final EIS using information provided by Weaver's Cove Energy and further developed from data requests; field investigations by the Commission staff; literature research; alternative analyses; comments from federal, state, and local agencies; and input from legislators, public groups, and individual citizens.

Geology

Construction and operation of the project would have minimal impact on geologic resources in the area, and the potential for geologic hazards or other natural event to significantly impact the project is low. The LNG storage tank and other critical structures at the terminal site would be designed to address predicted ground shaking associated with a seismic event. The elevation of the southern parcel of the site would be raised and the existing seawall would be fortified, which would minimize the potential for impacts associated with ocean-derived flooding and flash flooding associated with a hurricane or tsunami.

Soils and Sediments

Construction of the project facilities would increase the potential for erosion and loss of soil productivity. Weaver's Cove Energy would minimize the impacts on soils through its implementation of the erosion and sedimentation control measures contained in the FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan* (FERC Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (FERC Procedures), as well as a site-specific erosion and sedimentation control plan and stormwater management plan.

The 2.6 million cubic yards of sediment dredged from the Taunton River and Mount Hope Bay would be transported to the LNG terminal site in barges, processed and stabilized with portland cement, and then utilized on the LNG terminal site as general fill material. Our analysis indicates that the concentration of oils and other hazardous materials in the dredged material would not pose a significant

risk to human health. As requested by the Massachusetts Department of Environmental Protection (DEP), Weaver's Cove Energy conducted additional testing of the soils at the LNG terminal site to provide a further basis for compliance with the anti-degradation provision of the Massachusetts Contingency Plan (MCP). Based on the results of this testing, we have concluded that use of the stabilized dredged sediment on the LNG terminal site would not significantly degrade site conditions. The DEP has not yet made a final determination regarding the upland placement of the dredged materials. If the DEP does not verify Weaver's Cove Energy's compliance with the anti-degradation provision of the MCP, Weaver's Cove Energy would not be able to use the proposed site for upland placement of the dredged material. If this occurs, Weaver's Cove Energy would need to identify an alternative disposal site. For this reason, we have recommended that Weaver's Cove Energy provide a revised sediment placement plan if it is unable to verify the consistency of the proposed plan with the MCP.

Weaver's Cove Energy conducted Tier III testing of the sediments to determine their suitability for open water disposal. Weaver's Cove Energy's analysis of these results indicates that most of the proposed dredged material would be suitable for open water disposal. However, the U.S. Army Corps of Engineers (COE) and U.S. Environmental Protection Agency (EPA) are currently reviewing the Tier III testing results and have not concurred with Weaver's Cove Energy's determination regarding the suitability of the material for offshore disposal. Any alternative disposal options, including open water disposal, identified by Weaver's Cove Energy would require additional environmental review and FERC approval prior to dredging or construction of any of the proposed facilities.

Water Resources

Groundwater

There are no private or public drinking supply wells near the proposed facilities and there are no federal or state sole-source aquifers, protected aquifers, or wellhead protection areas in the project vicinity. Groundwater and soil at the LNG terminal site are contaminated with petroleum from prior petroleum storage and distribution activities, and an active groundwater remediation plan is being implemented at the site in accordance with the MCP. We do not expect the physical effects of placing a large volume of dredged material on the LNG terminal site, modification to the existing timber bulkhead, or the installation of stone columns beneath the LNG tank, would have a significant impact on the groundwater flow regime or the configuration of the existing petroleum plumes. In accordance with the MCP, Weaver's Cove Energy would need to monitor groundwater levels and the effectiveness of remediation system during construction and would implement measures to prevent the migration of petroleum products to the Taunton River. The DEP has stated that if the construction of this facility requires Weaver's Cove Energy to conduct a response action, Weaver's Cove Energy must be included on the Tier 1B Permit as a responsible party, potentially responsible party, or other party. Modifications to the existing remediation system may require that a revised Phase IV Remediation Plan, Phase V Operations and Maintenance Plan, and Remedial Operations Status Plan be submitted to the DEP.

Construction of the proposed pipelines could temporarily affect groundwater along the pipeline routes but these effects would be mitigated by Weaver's Cove Energy's plan to backfill the trench with native material and restore natural contours and drainage patterns in accordance with the FERC Plan and the FERC Procedures. Because the pipelines would be constructed near several known contaminated sites, there is a potential to encounter contaminated soils or groundwater during construction. We have recommended that Weaver's Cove Energy prepare a plan for the discovery and management of contaminated soils or groundwater to address potential impacts if contaminated groundwater or soil is encountered during construction. There is also a potential for a spill of hazardous material during construction that could impact groundwater. Weaver's Cove Energy would minimize the potential impact of a spill by implementing a Spill Prevention, Containment, and Countermeasure Plan (SPCC Plan).

Surface Water

The proposed dredging activities and shoreline modifications would impact the Taunton River and Mount Hope Bay by suspending sediment into the water column. Sediment fate and transport modeling indicates that suspended sediment impacts would be temporary and primarily localized to the dredging areas. Our analysis indicates that contaminants associated with the dredged sediment would not likely pose a significant hazard. Elutriate test results indicate that most of the chemicals in the sediments would remain tightly bound to the sediments and would not be released in significant quantities into the water column. The proposed pipelines would cross the Taunton River and 14 other perennial or intermittent streams using an open-cut construction technique. Weaver's Cove Energy would minimize impacts on these waterbodies by implementing a SPCC Plan, adhering to the protective measures contained in the FERC Procedures, and complying with the requirements of its National Pollutant Discharge Elimination System permits. Impacts on the Taunton River would also be minimized by Weaver's Cove Energy's implementation of a Stormwater Management Plan.

Wetlands

The proposed shoreline stabilization and construction of the ship unloading facility offshore of the southern parcel would result in the filling of 0.04 acre of estuarine salt marsh, 0.94 acre of other intertidal habitat, and 0.19 acre of subtidal habitat. The administration building and parking lot on the northern parcel would fill 1.9 acres of palustrine emergent/scrub shrub wetlands. Dredging would impact another 191 acres of subtidal habitat and about 0.23 acre of intertidal habitat. Construction of the Northern and Western Pipelines would temporarily disturb 2.82 acres of wetlands, of which approximately 0.47 acre would be converted to other wetland types. Weaver's Cove Energy would minimize impacts on wetlands by implementing the FERC Procedures and proposes to compensate for permanent wetland impacts that cannot be avoided by implementing a wetland mitigation plan. This plan includes the restoration and creation of about 0.74 acre of salt marsh on the site and the creation of about 0.18 acre of freshwater wetland in an upland area on the site. About 0.13 acre of tidal creek would be constructed in the restored and created salt marsh to connect this area with the Taunton River. We have recommended that Weaver's Cove Energy consult with the COE and the National Oceanic and Atmospheric Administration (NOAA) Fisheries regarding mitigation of wetlands as well as intertidal and subtidal habitats and file with the Secretary the results of these consultations and the COE-approved Wetland Mitigation Plan prior to construction.

Aquatic Resources

The proposed dredging activities (disturbing 191 acres subtidal habitat) and shoreline modifications would have both direct and indirect impacts on aquatic resources, including fish, shellfish, and benthic organisms. Direct alteration of the benthic substrate via dredging would remove the existing benthic community and may adversely affect prey species, suitable cover, settlement structure, and/or nursery and spawning habitat. Dredging would also directly and permanently impact an estimated 21 acres of quahog habitat. To reduce impacts on quahogs, Weaver's Cove Energy would coordinate with federal and state resource agencies to harvest and relay quahogs from the proposed dredging footprint prior to dredging and develop and fund a plan to reseed quahogs in the areas where quahogs were harvested.

Dredging, construction of the ship unloading facility, and proposed shoreline modifications would also resuspend sediment in the water column, which along with site runoff and prop wash associated with the transit of LNG ships during operations could affect aquatic organisms. Weaver's Cove Energy conducted elutriate tests and computer simulation modeling to determine the potential effects of dredging on aquatic organisms. As mentioned above, the elutriate test results suggest that some

chemicals could be released from the sediments into the water column. However, the concentrations of these chemicals would be diluted by the surrounding water and thus are unlikely to pose a significant risk to aquatic organisms, particularly since the DEP would require a water quality monitoring program during construction. Sediment modeling results indicate that the maximum suspended sediment concentration during dredging would not exceed the minimum effects concentration for any species at any life stage. The modeling also indicates that the deposition of suspended sediment on the river bed would not exceed the minimum effects threshold for any life stage of any species except winter flounder eggs. According to the results of the modeling, the redeposition of sediments from the current proposed dredging would impact about 6.2 acres of winter flounder egg habitat. In addition, dredging of the existing turning basin wider and deeper could directly affect another 11 acres of winter flounder egg habitat.

NOAA Fisheries reported that the Taunton River and Mount Hope Bay have been designated as Essential Fish Habitat (EFH) for 14 federally managed fish species. The draft EIS included an EFH Assessment as necessary for compliance with the Magnuson-Stevens Fishery Conservation and Management Act. The EFH Assessment determined that the proposed project could affect water column, benthic habitat, and man-made structure EFH, and has the potential to affect anadromous fish and shell fish, two of the primary prey groups for the managed fish species. Based on its review of the EFH Assessment in the draft EIS, NOAA Fisheries provided conservation recommendations to further avoid, minimize, and mitigate adverse effects on EFH. These recommendations include: prohibiting in-water, silt-producing activities between January 15 and May 31 to protect winter flounder spawning and juvenile development; requiring mitigation to offset permanent loss of winter flounder spawning and juvenile development habitat resulting from expansion of the turning basin; and requiring mitigation to offset for the placement of fill within intertidal, salt marsh, and subtidal areas during site development. We agree with these conservation recommendations and believe additional measures would be necessary to mitigate for benthic habitat destruction and alteration, including direct and indirect impacts on winter flounder spawning habitat. For this reason, we have recommended that Weaver's Cove Energy avoid in-water, silt disturbing construction activities during the winter flounder spawning period (January 15 through May 31), develop a mitigation plan in consultation with federal and state agencies to offset permanent loss of winter flounder spawning and juvenile habitat, and continue developing its proposed wetland mitigation plan to compensate for permanent impacts on wetlands and intertidal and subtidal habitats.

Vegetation and Wildlife

Development of the LNG terminal would result in the permanent clearing of about 10.7 acres of forest land and the disturbance of 5.1 acres of vegetated open land. Following construction, previously vegetated areas that are not covered by buildings, roads, or other permanent structures would be restored and revegetated in accordance with a landscape design plan that would include plantings native to the area. Construction of the Northern and Western Pipelines would disturb 56.6 acres of vegetation consisting of 5.4 acres of upland forest, 39.6 acres of upland shrub land, 6.6 acres of upland fields, 2.8 acres of wetlands (discussed above), and 2.2 acres of landscaped lawns. Impacts on fields and lawns would be temporary and short term. Impacts on trees and other woody vegetation would be longer term. Additionally, woody vegetation on the permanent right-of-way and meter and regulation station sites, which includes 3.9 acres of forest land, would be permanently removed.

Construction of the proposed facilities and associated vegetation clearing would affect wildlife by removing habitat and temporarily displacing wildlife from the construction work areas into surrounding areas. The removal of forest land would result in a long-term loss of habitat. Weaver's Cove Energy would minimize the effect of forest clearing by collocating its facilities in mostly open areas or along existing, previously cleared rights-of-way.

Threatened and Endangered Species

The U.S. Fish and Wildlife Service reported that one federally listed species under its jurisdiction, the bald eagle, could potentially occur near the proposed project. NOAA Fisheries identified four additional federally listed endangered or threatened sea turtle species that could potentially occur in the general vicinity of the proposed project. We have determined that the project would have no effect on the bald eagle and is not likely to adversely affect the four sea turtle species.

In its comments on the draft EIS for a nearby proposed LNG project (i.e., the KeySpan LNG Facility Upgrade Project), NOAA Fisheries stated that an increase in vessel traffic in Narragansett Bay could potentially affect federally listed marine mammals as a result of vessel strikes. Of particular concern is the North Atlantic right whale. NOAA Fisheries has developed a Strategy to Reduce Ship Strikes of Right Whales, which is not yet finalized, but would establish speed restrictions within 20 to 30 miles of the approaches in specific areas. In addition, the U.S. Coast Guard (Coast Guard) has been coordinating with NOAA Fisheries on various measures to reduce vessel strikes. We have determined that these measures are important for the protection of right whales from ship strikes. Because the proposed rule has not yet been finalized or implemented, we have recommended that Weaver's Cove Energy coordinate with NOAA Fisheries to determine appropriate speed and seasonal restrictions or other applicable measures to avoid or minimize impacts on right whales and to file the results of that coordination with the FERC. Such protective measures may also facilitate avoidance and/or minimization of impacts on other federally protected marine animals such as other whale species and sea turtles with the potential to occur in the project area. With the adherence to restrictions developed through coordination with NOAA Fisheries, we conclude that the project is not likely to adversely affect North Atlantic right whale (or other federally listed species) and are requesting NOAA Fisheries' concurrence with this finding.

The draft EIS (which served as a Biological Assessment) was sent to NOAA Fisheries along with a letter that initiated consultation under section 7 of the Endangered Species Act. We have not yet received a concurrence letter from NOAA Fisheries on our determinations.

Land Use, Recreation, and Visual Resources

The LNG terminal would be developed on 73 acres of industrially zoned property (consisting of a 55-acre southern parcel and an 18-acre northern parcel) that Weaver's Cove Energy has an option to purchase from the current landowner. The 55-acre southern parcel of the LNG terminal site is a contaminated site which was previously used as a petroleum products storage and distribution facility from the 1920s to the 1990s. Construction of the terminal would affect a total of 69.3 acres of the 73-acre property. Construction of the Northern and Western Pipelines would affect another 65.5 acres of land. The project would also require the dredging of up to about 2.6 million cubic yards of sediment from the Taunton River and Mount Hope Bay to facilitate LNG ship transit. This dredging would disturb about 191 acres of the bed of the river and bay. Following construction, about 54.3 acres of the LNG terminal site would be retained as industrial/developed land. Approximately 38.3 acres of the land used to construct the pipelines and meter and regulation stations would be retained as permanent right-of-way.

The mayor, city councilors of Fall River, and town councils and boards of selectmen of Swansea, Somerset, and several other towns along the ship route have expressed opposition to the project. However, based on our review, we have found that the project would be consistent with the existing plans, policies, designations, and guidelines that have been established for land use development in the project area by state, regional, and local entities. The Weaver's Cove LNG Project is subject to a federal coastal zone consistency review because it would involve activities within the coastal zones of Massachusetts and Rhode Island and would require several federal permits and approvals. Weaver's

Cove Energy has not yet completed the process for the federal consistency certification with either the Massachusetts Office of Coastal Zone Management (OCZM) or Rhode Island Coastal Resources Management Council (CRMC). Weaver's Cove Energy will need to demonstrate consistency with each state's Coastal Zone Management Plan and obtain concurrence of consistency from both agencies prior to the FERC approving the start of any construction.

There are approximately 12,000 people living in 5,100 housing units within 1 mile of the proposed LNG storage tank. Of these, about 1,200 units are located within 0.5 mile of the proposed tank. There are another 35 residences along the pipeline routes that would be within 50 feet of construction work areas. Impacts on residences near the LNG terminal could include visual impacts, increased traffic and noise during construction, changes in air quality, and potential safety hazards. Residences near the pipelines could experience similar effects during construction. The LNG storage tank would be the most prominent visual feature at the proposed terminal site. Weaver's Cove Energy's construction of an earthen landform on the southern parcel of the site would partially reduce the visibility of the LNG facilities and the LNG storage tank. Weaver's Cove Energy would also implement a landscape design plan at the LNG terminal that would include plantings that are native to the area. To minimize construction related impacts on residences along the pipeline routes, Weaver's Cove Energy would prepare site-specific residential mitigation plans. Weaver's Cove Energy has also incorporated two additional route variations into the proposed route since issuance of the draft EIS to avoid or minimize residential impacts and visual resources.

We have determined that project would not have a substantial adverse affect on the Taunton River's potential designation as a Wild and Scenic River, although we have not yet received a concurrence letter from the U.S. Department of the Interior on our determination.

Overall, construction and operation of the project facilities are not expected to significantly affect recreational activities in the project area. Recreational boaters could experience temporary impacts as a result of human activity and noise associated with construction of the proposed ship unloading facility and the pipeline across the Taunton River, but these impacts would be temporary and localized to the area of construction. Weaver's Cove Energy would schedule the dredging activities in coordination with the COE, NOAA Fisheries, the Massachusetts Division of Marine Fisheries and other regulatory agencies to minimize disruption and conflicts with other uses of the river. Weaver's Cove Energy would also develop a Navigation Work Plan in consultation with the COE, Coast Guard, local harbor masters, and the Northeast Marine Pilots Association. The Navigation Work Plan would include measures to ensure the safe passage of waterborne transportation and recreational use of the waterway during construction activities.

Operation of the LNG terminal would not affect recreational boating during periods between LNG deliveries. However, recreational boats, fishermen, and others engaged in marine-based activities could be affected by the safety and security zones that would be imposed by the Coast Guard during periods when an LNG ship is in transit to or berthed at the LNG terminal. Many recreational boats should be able to go around the LNG ships at points in the river that are sufficiently wide for them to be outside of the safety and security zone. In locations were the waterway is narrow, a recreational craft attempting to travel in the opposite direction of an LNG ship may experience a delay; however, because the safety and security zone would be a moving zone around the ship, the delays would be temporary as the ship passes. We estimate that delays of up to 60 minutes may result depending on the travel speed of the LNG ship. For boaters near or upstream of the facility, an additional 60 minute delay may be experienced while the LNG ship is berthed or turned. Weaver's Cove Energy would be in regular contact with the Coast Guard and other waterway users to ensure that the arrivals of the LNG ships are coordinated with other ship traffic to minimize disruption on waterway users. The Coast Guard would routinely provide Notice to Mariners prior to the arrival and departure of LNG ships as the Coast Guard currently does for

liquefied petroleum gas vessels and for other activities. In addition, Weaver's Cove Energy has indicated that it would be willing to consider limiting LNG ship transits during peak weekend hours and using early morning periods, subject to tidal conditions. With the agreement of the Coast Guard and pilots, Weaver's Cove Energy would also explore the possibility of eventually using nighttime transits for the LNG ships to minimize impacts on recreational boating.

Socioeconomics

Construction of the project would result in a temporary increase in population, traffic, and the demand for temporary housing and public services. These effects would be temporary and limited to the period of construction. Construction and operation of the project would have a beneficial impact on local tax revenues and economies, although some of the tax benefits of the project could be eroded by the additional costs required to provide security during LNG ship transit and offloading. Operation of the LNG terminal facilities would result in minor long-term impacts on vehicle and shipping transportation, but is not expected to have a major impact on most public services. There is, however, a concern that an incident at the LNG terminal could exceed the current response capacity of the Fall River police and fire departments. Weaver's Cove Energy would coordinate with local fire departments to develop an emergency response plan to be used in the event of an incident. Weaver's Cove Energy has also indicated that it would be willing to provide funding for the local emergency response services and stated that it would be willing to cover the costs of security in Fall River at a level similar to what the existing Distrigas LNG facility has been providing to the City of Everett, where it is located.

There is also concern about the potential for bridge closures to result in significant traffic delays during the passage of LNG ships. Weaver's Cove Energy has committed to adjust ship transit plans, as necessary, to prevent the simultaneous closing of the Braga and Brightman Street Bridges, which would minimize the impact of any bridge closures that are required. Although bridge closures are one of the tools available, the Coast Guard has determined that it would not normally be necessary to close the Pell (Newport) Bridge, Mount Hope Bridge, and Braga Bridge every time an LNG ship passes. The potential impacts on vehicular traffic in the event that these bridges, including the Brightman Street Bridge, are completely closed during passage of LNG ships would include maximum average traffic delays ranging during peak use periods from 4.9 minutes at the Pell Bridge to 12.1 minutes at the Brightman Street Bridge. The impacts on traffic at the bascule-type Brightman Street Bridge would be similar to those that currently occur during the transit of coal vessels and the previous transit of large oil tankers. Weaver's Cove Energy has stated that it would develop a Traffic Management Program in consultation with the Massachusetts Highway Department, the Rhode Island Department of Transportation, the Coast Guard, the Massachusetts State Police, and other local authorities if it receives approval from the FERC and the EOEA.

We have determined that the potential impacts of the project would not have a disproportionately high or adverse effect on environmental justice areas near the proposed LNG terminal and federal navigation channel.

Cultural Resources

Weaver's Cove Energy conducted aboveground cultural resource surveys, terrestrial archaeological reconnaissance and intensive surveys, site examination archaeological surveys, and underwater reconnaissance surveys for the LNG terminal, pipeline facilities, and the turning basin. The aboveground cultural resource surveys documented seven aboveground resources that are listed in or recommended eligible for listing in the National Register of Historic Places (NRHP) within the viewshed of the LNG terminal, and a historic cemetery near the terminus of the Northern Pipeline. The terrestrial archaeological reconnaissance and intensive surveys and site examination surveys documented nine sites

along the pipeline facilities. Weaver's Cove Energy characterized all nine of these sites as either not significant or not eligible for listing in the NRHP. No sites were identified during the underwater archaeological surveys.

Additional consultation with the Massachusetts State Historic Preservation Office (SHPO) is required to assess project effect, and additional information is needed on some of the identified resources. As a result, we have recommended that Weaver's Cove Energy defer construction of the project facilities until these tasks have been completed, and any additional required survey reports or treatment plans, and the SHPO's comments on the reports and plans are filed with the Commission for review and approval by the Director of the Office of Energy Projects.

Air Quality and Noise

Construction and operation of the proposed LNG terminal and pipelines would result in air emissions. The fugitive dust and tailpipe emissions associated with construction activities would be temporary and intermittent, and would not result in a long term impact on air quality. Dust emissions would be minimized by the application of water during the construction of the LNG terminal. To reduce tailpipe emissions, we have recommended that Weaver's Cove Energy use transportation grade or better diesel fuel in all construction equipment. The operational air emissions from the LNG terminal would not cause or significantly contribute to a violation of an ambient air quality standard. The primary pollutants emitted during operation of the LNG terminal would be nitrogen oxide (NO_x) and carbon monoxide. These operational air emissions would be minimized by using ultra dry low NO_x water/glycol heaters, and Weaver's Cove Energy would meet the federal and state air emission requirements by implementing best available control technology and undergoing an air plan approval process through the DEP. The operational air emissions from the LNG terminal, including the facility stationary sources and LNG trucks and ships, would not exceed an ambient air quality standard. To address potential odor issues related to the dredged material, we have recommended that Weaver's Cove Energy prepare a nuisance odor complaint and abatement plan for implementation during the dredging operations.

Noise receptors in the immediate vicinity of construction activities would experience an increase in noise levels. In most areas, the increase in noise would be localized, temporary, and limited primarily to daylight hours. Noise associated with dredging operations, however, could occur up to 24 hours a day for a period of three years. To address this impact, we have recommended that Weaver's Cove Energy prepare a noise mitigation plan that would ensure that the dredging and stabilization operations do not contribute more than 55 decibels of the A-weighted scale (dBA) day-night sound level (L_{dn}) to the ambient noise level at any noise sensitive areas (NSA). The predicted operational noise from the LNG terminal would be below the FERC's 55 dBA L_{dn} criterion at the nearest NSAs and in compliance with Massachusetts noise regulations. We have recommended that noise surveys be conducted after the LNG terminal is in service to ensure that the LNG terminal operates in compliance with these guidelines.

Reliability and Safety

We evaluated the safety of both the proposed LNG import terminal facility and the related LNG vessel transit through Narragansett Bay to Fall River. With respect to the onshore facility, we completed a cryogenic design and technical review of the proposed terminal design and safety systems. Several areas of concern were noted and specific recommendations to be addressed prior to construction have been identified. We evaluated the thermal radiation and flammable vapor dispersion exclusion zones of the proposed LNG terminal. The analysis found that no excluded uses were within the exclusion zones, although a small section of the 1,600 British thermal unit per feet squared per hour (Btu/hr-ft^2) zone would extend off the property and we have recommended that Weaver's Cove Energy demonstrate legal control over this area, or secure a waiver, before we allow any construction.

Thermal radiation and flammable vapor hazard distances were also calculated for an accident or an attack on an LNG vessel. For 2.5-meter and 3-meter diameter holes in an LNG cargo tank, we estimated distances to range from 4,340 to 4,810 feet for a thermal radiation level of 1,600 Btu/hr-ft^2, the level which is hazardous to unprotected persons located outdoors. However, the evaluation of safety is more than an exercise in calculating the consequences of worst case scenarios. Rather, it is a determination of the acceptability of risk which considers: the probability of events; the effect of mitigation; and the consequences of events. Based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the Coast Guard and the local pilots, the likelihood of a cargo containment failure and subsequent LNG spill from a vessel casualty – collision, grounding, or allision – is highly unlikely. For similar reasons, an accident involving the onshore LNG import terminal or LNG trucking from the terminal is unlikely to affect the public. As a result, the risk to the public from accidental causes should be considered negligible.

Unlike accidental causes, historical experience provides little guidance in estimating the probability of a terrorist attack on an LNG vessel or onshore storage facility. For a new LNG import terminal proposal, having a large volume of energy transported and stored near populated areas, the perceived threat of a terrorist attack is a primary concern of the local population and requires that resources be directed to mitigate possible attack paths. While the risks associated with the transportation of any hazardous cargo can never be entirely eliminated, they can be managed.

Several commentors have expressed the concern that local communities would have to bear some of the costs of ensuring the security of the LNG facility and the LNG vessel while in transit and unloading at the dock. As a result of its recently completed security workshops, the Coast Guard has identified a robust security plan that requires significant Coast Guard, public, and private resources that would be necessary to implement security measures. To meet its anticipated security responsibilities, the Coast Guard has initiated a formal proposal for additional resources through its internal budgeting process for inclusion in the 2006 appropriations bill. A determination on that proposal is pending. Weaver's Cove Energy has committed to providing funding for direct transit-related security costs; the potential costs to the states and local communities have not been estimated. As an indication of these costs, another proposed LNG import terminal near Providence, Rhode Island (KeySpan LNG, L.L.C.'s KeySpan LNG Facility Upgrade Project) estimated state and local security costs for its LNG deliveries at $40,000 to $50,000 per vessel port call. In addition to these direct transit-related state and local security costs, there may be a need to fund additional capital costs associated with security and emergency response, such as equipment and personnel. Therefore, we have recommended that Weaver's Cove Energy provide a comprehensive plan identifying the mechanisms for funding all project-specific security and emergency response/management costs that would be imposed on state agencies and local communities, including capital costs.

ALTERNATIVES CONSIDERED

Alternatives

We evaluated the alternatives of no action or postponed action, system alternatives, alternative LNG terminal sites, LNG terminal layout alternatives, pipeline route alternatives, and dredging/dredge disposal alternatives. While the no action or postponed action alternative would eliminate the environmental impacts identified in this EIS, the project objectives of providing LNG tanker discharge services to LNG suppliers and providing a new source of natural gas and LNG deliveries to the New England market would not be met.

Given the no action or postponed action alternative could also lead to the development of other natural gas infrastructure projects, we also considered existing or proposed LNG facilities and natural gas

pipelines as alternative systems that could be used to meet the objectives of the Weaver's Cove LNG Project. This included consideration of existing and proposed facilities (including other new offshore LNG import terminals) within and outside of the New England region. At this time, it is not possible to foresee which (if any) of the LNG import projects proposed in the New England region will move forward and be constructed. Regardless, when considered independently, none of the LNG import projects in the region would be capable of serving as an alternative to the Weaver's Cove LNG Project. In any event, we expect that new pipelines or proposals to modify existing pipelines will continue to increase the capacity of existing systems delivering natural gas to the New England region. This will allow access to new or growing sources of natural gas outside of the region, including new LNG import terminals that will likely be constructed outside of the region (e.g., Canadian LNG facilities). Nevertheless, projects outside of the region would not be able to meet all of the objectives stated for the Weaver's Cove LNG Project. When considered together, however, several of the projects in or outside of the region could meet many of the project objectives. As discussed in the EIS, construction or expansion of alternative natural gas infrastructure facilities would result in specific environmental impacts that would be less than, similar to, or greater than those associated with the Weaver's Cove LNG Project.

We considered alternative locations for an LNG import terminal in the New England region, and determined that there are no alternative LNG terminal sites at onshore locations that are reasonable and/or would be environmentally preferable to the proposed project. Difficulties associated with identifying suitable locations in the New England region include finding property available for industrial development in an area accessible to LNG ships where there would be fewer environmental impacts.

One of the site alternatives that was identified during the EIS scoping process and received several specific comments in response to the draft EIS is located at Brayton Point in Somerset, Massachusetts. This site includes a number of potential environmental and economic advantages compared to the proposed site. Even the disadvantages of LNG trucking or dredging at this site could conceivably be managed depending on the specific design of an LNG facility. However, an LNG terminal at Brayton Point can only be considered conceptually and may never be a practicable and feasible alternative for the Weaver's Cove LNG Project because the property was recently purchased by Dominion. Because of this new ownership of the property, it would appear that Weaver's Cove Energy cannot reasonably pursue developing an LNG terminal at this location.

To minimize potential visual and wetland impacts, we also considered alternative LNG terminal layouts. We concluded that reducing the size, profile, and/or location of the LNG tank while still maintaining the project storage capacities could not be reasonably achieved. Additionally, we considered an alternative site layout that would not include the landform created by the disposal of dredged materials on the LNG terminal site.

Our alternatives analysis included the evaluation of alternative pipeline routes that would allow delivery of natural gas to the Algonquin natural gas pipeline system. Because of the limited capacity of the Algonquin system laterals, no single pipeline from the LNG terminal would be able to accommodate the project volumes. Alternative pipeline routes to the east and south of the LNG terminal would both result in greater environmental impacts than either the Northern or Western Pipeline. To avoid or minimize environmental impacts from construction of the pipelines, we also examined route variations to the proposed pipelines. Since issuance of the draft EIS, Weaver's Cove Energy adopted three minor route variations along the Northern Pipeline that would reduce residential impacts and potential impact on the riparian areas of the Taunton River.

Finally, we reported on dredging and dredge disposal alternatives that might avoid or minimize impacts associated with dredging up to about 2.6 million cubic yards of sediment from the Mount Hope Bay/Taunton River federal navigation channel and turning basin. Alternatives requiring less dredging

would not be able to safely accommodate LNG ships. Additionally, we summarized disposal alternatives including offsite upland reuse, offsite upland disposal (landfill or dewatering), offshore disposal, confined aquatic disposal cells, confined disposal facilities, and island/habitat creation. Based on consultations with other agencies, we analyzed the impact of restricting dredging during times of the year when sensitive aquatic organisms (e.g., winter flounder, anadromous species) could be adversely affected and we considered offshore disposal of dredged materials in more detail. Based on the new/existing Brightman Street Bridge construction delays, we believe that our recommended time-of-year restriction to avoid dredging from January 15 to May 31 to minimize impacts on winter flounder would not impact the in-service date of the project or necessitate offshore disposal. Additionally, we believe that the offshore, open water disposal alternative would be environmentally acceptable if the COE and EPA determine that a significant volume of sediments are suitable for offshore, open water disposal. However, we have also determined that offshore disposal of suitable dredged material is not without impacts and is not clearly environmentally preferable to Weaver's Cove Energy's proposed reuse of the dredged material as general site fill at the LNG terminal site. This conclusion assumes that Weaver's Cove Energy is able to resolve the regulatory and legal disputes of its proposed sediment reuse plan at the LNG terminal site.

PUBLIC INVOLVEMENT AND AREAS OF CONCERN

On July 11, 2003, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Weaver's Cove LNG Project, Request for Comments on Environmental Issues, and Notice of Joint Public Scoping Meeting* (NOI). The NOI announced that the FERC staff was initiating its NEPA Pre-filing review of the Weaver's Cove LNG Project under Docket No. PF03-4-000.[1] The NOI was sent to 1,241 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers; residents within a 1/2 mile of the proposed LNG terminal; and property owners along the proposed pipeline routes and adjacent to the utility corridors in which the pipelines would be located. On December 31, 2003, the FERC issued a *Notice of Status Change of Environmental Review and Expiration of Scoping Period for the Proposed Weaver's Cove LNG Project*. This second notice announced the filing of an application by Weaver's Cove Energy and a final opportunity to submit comments. The EOEA established a closing date in August 2003 for receiving comments while the FERC's comment period closed on January 30, 2004. Due to errors and omissions in the mailing list provided by Weaver's Cove Energy, the FERC sent the second notice to an additional 64 landowners along the pipeline routes on January 23, 2004 and provided a 30-day comment period for these landowners ending on February 23, 2004. FERC staff continued to receive, accept, and consider scoping comments until June 28, well beyond the February 23 deadline. In total, 805 comment letters were received either by the EOEA, Massachusetts Energy Facility Siting Board (EFSB), and/or FERC in response to the notices.

On July 29, 2003, staff of the FERC and EOEA conducted a joint public scoping meeting in Swansea, Massachusetts to provide an opportunity for the general public to learn more about the proposed project and to participate in our analysis by commenting on issues to be included in the EIS. Twenty-two people commented at the meeting. A transcript of these comments is part of the public record for the Weaver's Cove LNG Project. The EFSB conducted a public hearing on January 27, 2004 in Fall River to receive comments on the proposed project. The EFSB submitted a transcript of this hearing, its comments on the project, and written comments it received to the FERC on January 30, 2004.

On May 4, 2004, the FERC conducted a site review of the proposed terminal site that was open to and attended by the public, including several state and local officials. The next day, the FERC conducted a cryogenic design and technical conference in Swansea, Massachusetts to discuss design and engineering

[1] The purpose of the pre-filing process is to involve interested stakeholders early in project planning and to identify and resolve issues before an application is filed with the Commission.

aspects of the Weaver's Cove LNG Project. The meeting was limited to existing parties to the proceeding (i.e., anyone who specifically requested to intervene as a party). Attendees included agency representatives (U.S. Department of Transportation Office of Pipeline Safety, EFSB, EPA), elected officials and their representatives, industry representatives, and other interested parties.

In addition to the public notice and scoping process discussed above, the FERC conducted numerous interagency meetings with representatives of federal and state resource agencies to identify issues that should be addressed in this EIS. These agencies included the COE, Coast Guard, DEP, EFSB, EOEA, CRMC, and Rhode Island Department of Environmental Management.

The most frequently identified concerns about the project during the public involvement period have been related to the safety of operating an LNG facility in a populated urban setting. Specific safety concerns have been expressed regarding the impacts on the surrounding area if there is a fire at the proposed terminal, or a fire associated with an LNG ship spill in route to the terminal. Considerable concern has also been raised about the potential for the terminal and LNG ships to be targets of a terrorist attack and the impact of such an attack on surrounding communities. We have also received numerous comments regarding alternatives; environmental justice; the impacts of potential bridge closures during LNG ship transit; the effect of the proposed facilities on surrounding property values and insurance rates; the demand of the project on local services, especially the costs of providing police and fire protection; and a variety of other environmental issues, including the impact of dredging on water quality and aquatic resources, the risk of contamination associated with placing the dredged sediments on the terminal site, and the compatibility of the project with existing land uses and development plans.

The FERC prepared a draft EIS for the Weaver's Cove LNG Project and issued a Notice of Availability (NOA) of the draft EIS and the draft General Conformity Determination on July 30, 2004. In accordance with CEQ's regulations implementing NEPA, the NOA established a 45-day comment period ending on September 20, 2004; described procedures for filing comments on the draft EIS; and announced the time, date, and location of public comment meetings. The NOA also indicated that additional project information could be obtained from the Commission's Office of External Affairs and on the FERC's Internet website. The EOEA noticed the issuance of the draft EIS (serving as its draft EIR) in the Environmental Monitor on August 25, 2004 and established a comment period ending on September 24, 2004. A formal notice was also published in the Federal Register on August 6, 2004, indicating that the draft EIS was available and had been mailed to individuals and organizations on the mailing list prepared for the project.

The FERC mailed 1,891 copies of the draft EIS to interested parties, including federal, state, and local officials and agencies; special interest groups; parties to the proceedings; area libraries and newspapers; and individuals and affected landowners who requested a copy of the draft EIS. The FERC also conducted public comment meetings in Swansea, Massachusetts on September 8 and in Middletown, Rhode Island on September 9, 2004. A total of 67 people provided comments at these two meetings. In addition, the FERC received 729 comment letters (554 of these letters were mass mailings such as comment cards or form letters) and the MEPA received another 38 comment letters regarding the draft EIS. Transcripts of the public meeting comments and the comment letters are part of the public record for the Weaver's Cove LNG Project. The final EIS was mailed to the agencies, individuals, and organizations on the mailing list and submitted to the EPA for formal issuance of a NOA.

Even though the proposed LNG terminal would meet federal safety standards and have limited adverse environmental impact, we recognize that the project would introduce a new risk to the public in Fall River, Massachusetts and to the shoreline communities adjacent to the LNG vessel route through Narragansett Bay, Mount Hope Bay, and the Taunton River. In this regard, there has been considerable opposition to the proposed project by elected and public officials, municipality representatives, special interest groups, and some of the public near the LNG terminal site and along the federal navigation

channel. Based on public meeting comments and comment letters on the draft EIS, elected and public officials that have identified themselves or have been identified by others as opposed to the project include, but are not necessarily limited to, the following: U.S. Senator Jack Reed, U.S. Senator Edward M. Kennedy, U.S. Senator John F. Kerry, U.S. Congressman Barney Frank, U.S. Congressman James McGovern, U.S. Congressman Edward Markey, Massachusetts Governor Mitt Romney, Massachusetts State Representative David Sullivan, Rhode Island State Representative Bruce Long, Rhode Island State Representative Joseph Amaral, Rhode Island State Representative Raymond Gallison, Massachusetts Attorney General Tom Reilly, Rhode Island Attorney General Patrick Lynch, Mayor Edward Lambert of Fall River, the Fall River City Council, the Swansea Board of Selectmen, the Somerset Board of Selectmen, the Newport City Council, the Bristol Town Council, the Portsmouth Town Council, the Jamestown Town Council, the Little Compton Town Council, the Town of Narragansett Planning Board, the Conservation Commission of Somerset, and the Massachusetts House Committee on Homeland Security and Federal Affairs. Additionally, on May 24, 2004, the Massachusetts Senate, and on May 27, 2004, the Massachusetts House of Representatives, passed non-binding resolutions in opposition to the Weaver's Cove LNG Project which were sponsored by Senator Joan Menard and House Representative Robert Correia. On March 15, 2005, six Rhode Island representatives proposed a resolution in opposition to the proposed Weaver's Cove LNG and KeySpan LNG Facility Upgrade Projects and the associated LNG ship traffic in Narragansett and Mount Hope Bays.

MAJOR CONCLUSION

Review of the proposed action indicates that Weaver's Cove Energy has designed its proposal to mitigate most of the adverse environmental impacts that could result from the construction and operation of its project. Where we have identified remaining adverse impacts, we have developed, as appropriate, specific mitigation measures to reasonably avoid or minimize those impacts. We are recommending that these mitigation measures be attached as conditions to any authorization issued by the Commission. We conclude that if it is constructed and operated in accordance with Weaver's Cove Energy's proposed mitigation and our recommended mitigation measures, the proposed action would meet federal safety standards, can be operated safely, and would have limited adverse environmental impact. Also, the implementation of the Coast Guard's security plan that controls the LNG vessels operating through Narragansett Bay to/from the proposed terminal will further ensure the public safety.

The primary reasons for our conclusion are:

- the project would make use of an existing industrialized site within a designated port area, which was previously used as a petroleum products storage and distribution terminal;
- the proposed LNG terminal would meet the federal safety regulations regarding the thermal radiation and flammable vapor dispersion exclusion zones;
- Weaver's Cove Energy has incorporated appropriate safety features into the design and operation of the LNG import terminal and the LNG vessels;
- Weaver's Cove Energy would develop appropriate emergency evacuation and emergency response plans, and would ensure that Weaver's Cove Energy provides a means for funding state and local agencies for project-specific security/emergency response costs;
- the proposed maintenance and improvement dredging would primarily occur within an existing federal navigation channel and adjacent to the existing turning basin;

- Weaver's Cove Energy has verified that the proposed LNG terminal site could accommodate the reuse of all the dredged sediments (including 2-feet of overdredged material);

- the sediments would not pose a significant risk to human health and placement of the stabilized dredged sediment on the site would not significantly degrade site conditions;

- use of the dredged material to construct a landform, and our recommendation for a landscaping plan, would reduce visual impacts associated with the LNG facilities and storage tank;

- Weaver's Cove Energy would implement the FERC staff's Plan and Procedures to mitigate impacts on soils, wetlands, and waterbodies;

- the majority of the Northern Pipeline and Western Pipeline routes would either overlap or be adjacent to existing pipeline or other linear rights-of-way;

- implementation of our aquatic resource recommendations would avoid or minimize impacts on winter flounder by prohibiting dredging during the spawning period and would mitigate the permanent loss of winter flounder habitat and impacts on quahog within the proposed turning basin;

- Weaver's Cove Energy would develop a noise mitigation plan to ensure that both dredging operations and operation of the LNG facility are in compliance with our noise level criteria;

- the appropriate consultations with the NOAA Fisheries, the National Park Service, SHPO, Massachusetts OCZM and Rhode Island CRMC would be completed before Weaver's Cove Energy would be allowed to start construction;

- operational controls would be imposed by the local pilots and the Coast Guard to direct the movement of LNG vessels, and security measures would be employed to deter attacks by potential terrorists and to ensure the safe passage of LNG vessels;

- the Coast Guard's December 2004-March 2005 workshops with federal, state, and local agencies to mitigate specific risks resulted in the development of a Vessel Transit Security Plan, which will be the basis for appropriate security measures; and

- our environmental inspection and mitigation monitoring program would ensure compliance with all mitigation measures that become conditions of any FERC authorization.

While a majority of the physical environmental impacts described in the final EIS would be temporary and most significant during the construction period, there are several adverse impacts associated with project operations that are unavoidable. These include:

- vehicle traffic delays resulting from temporary closure of the Brightman Street Bridge (as long as 16 minutes), and the possible temporary closures of the Pell Bridge, Mount Hope Bridge, and the Braga Bridge (ranging from as long as 6 to 8 minutes) during LNG vessel transit;

- recreational boating delays of up to 60 minutes as a result of the anticipated LNG vessel safety and security zones imposed by the Coast Guard would occur during the arrival and departure of the 50 to 70 LNG ships per year;

- the LNG storage tank (280 feet in diameter and about 195 feet high) and the proposed landform would introduce new prominent visual features into the Fall River and Somerset landscape, and the large LNG ships (950 feet in length) would also result in visual impacts while in transit and docked at the LNG terminal; and

- the impact on aquatic resources due to ballast water withdrawals during the LNG unloading and due to prop wash associated with the transit of LNG ships in Narragansett Bay, Mount Hope Bay, and the Taunton River.

1.0 INTRODUCTION

On December 19, 2003, Weaver's Cove Energy, L.L.C. and its affiliate Mill River Pipeline, L.L.C. filed applications with the Federal Energy Regulatory Commission (FERC or Commission) under sections 7(c) and 3(a) of the Natural Gas Act (NGA).[1] The applications were noticed by the FERC on December 30, 2003 and the notice was published in the Federal Register on January 9, 2004. In Docket No. CP04-36-000, Weaver's Cove Energy, L.L.C. seeks authorization to site, construct, and operate a liquefied natural gas (LNG) terminal in Fall River, Massachusetts. In Docket No. CP04-41-000, Mill River Pipeline, L.L.C. seeks a Certificate of Public Convenience and Necessity (Certificate) to site, construct, and operate two new natural gas pipelines and ancillary facilities to connect the proposed LNG terminal to the interstate gas transmission facilities of Algonquin Gas Transmission Company (Algonquin). Mill River Pipeline, L.L.C. also requests in Docket No. CP04-42-000 a blanket certificate to perform routine activities in connection with the future construction, operation, and maintenance of the proposed natural gas pipelines, and in Docket No. CP04-43-000 authority to provide open-access transportation of natural gas to others. Hereafter, Weaver's Cove Energy, L.L.C. and Mill River Pipeline, L.L.C. are referred to collectively as Weaver's Cove Energy.

Weaver's Cove Energy's proposed facilities would transport up to 800 million cubic feet per day (MMcfd) of imported natural gas to the U.S. market. In order to provide LNG import, storage, and pipeline transportation services, Weaver's Cove Energy requests Commission authorization to construct, install, and operate an LNG terminal and natural gas pipeline facilities.

The LNG terminal facilities would include:

- a ship unloading facility with a single berth capable of receiving LNG ships with cargo capacities of up to 145,000 cubic meters (m^3);
- a 200,000 m^3 (equivalent to 4.4 billion standard cubic feet of gas) full containment LNG storage tank;
- vaporization equipment, sized for a normal sendout of 400 MMcfd and a maximum sendout of 800 MMcfd;[2]
- four LNG truck loading stations; and
- ancillary utilities, buildings, and service facilities.

The natural gas pipeline facilities would include:

[1] On April 14, 2004, the Commission denied a request for a Preliminary Determination on Non-Environmental Issues (PD) for the Weaver's Cove LNG Project. Because the LNG terminal portion of Weaver's Cove Energy's application was filed under section 3 of the NGA, it is not necessary to determine whether construction, operation, and maintenance of the proposed facilities would meet the criteria of public convenience and necessity. Under section 3, the Commission will approve an application unless it finds that the proposal is "not consistent with the public interest". The denial of the PD prior to completion of the environmental review will not prejudice any further actions by the Commission. Final action on any FERC authorization will not occur until after the environmental review is completed, all environmental issues have been appropriately addressed, and a final Order is issued by the Commission.

[2] FERC's July 11, 2003 *Notice of Intent to Prepare and Environmental Impact Statement for the Proposed Weaver's Cove LNG Project, Request for Comments on Environmental Issues, and Notice of Joint Scoping Meeting* incorrectly indicated that the project would have an average sendout capacity of 400 million British thermal units per day (MMBtu/d) and a peak sendout capacity of 800 MMBtu/d. These sendout capacities were corrected to 400 and 800 million cubic feet per day, respectively, in the FERC's December 31, 2003 *Notice of Status Change of Environmental Review and Expiration of Scoping Period for the Proposed Weaver's Cove LNG Project.*

- two 24-inch-diameter natural gas sendout pipelines, totaling approximately 6.1 miles in length; and

- two meter and regulation stations.

Improvements would also need to be made to Algonquin's existing 16-inch-diameter G-20 lateral pipeline and 22-inch-diameter G-22 lateral pipeline to accommodate the delivery of natural gas from Weaver's Cove Energy's sendout pipelines. The required improvements would involve uprating the maximum allowable operating pressure (MAOP) of the existing G-20 lateral from 750 pounds per square inch gauge (psig) to 983 psig and uprating the MAOP of the G-22 lateral from 750 psig to 972 psig. Hydrostatic testing would be required to uprate the MAOP of the laterals. In addition, certain tap and check valves would need to be replaced on both laterals.

The vertical line in the margin identifies text that has been modified in the final EIS and differs from the corresponding text in the draft EIS.

1.1 PURPOSE AND SCOPE OF THIS STATEMENT

The FERC is the federal agency responsible for authorizing applications to construct and operate onshore LNG import and interstate natural gas transmission facilities. As such, the FERC is the lead federal agency for the preparation of this Environmental Impact Statement (EIS) in compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40, Code of Federal Regulations (CFR) 1500-1508), and the FERC's regulations implementing NEPA (18 CFR 380). A draft EIS was prepared and issued for public comment on July 30, 2004. This document is a final EIS that has been prepared to respond to comments received on the draft EIS. The distribution list for the final EIS is provided in Appendix A.

Our[3] principal purposes in preparing this EIS are to:

- identify and assess potential impacts on the natural and human environment that would result from the implementation of the proposed actions;

- describe and evaluate reasonable alternatives to the proposed actions that would avoid or minimize adverse effects on the human environment;

- identify and recommend specific mitigation measures, as necessary, to minimize the environmental impacts; and

- facilitate public involvement in identifying the significant environmental impacts.

The FERC will consider the findings in this final EIS in its determination of whether the project should be approved. A final approval will only be granted if after a consideration of both environmental and non-environmental issues, the FERC finds that the proposed project is in the public interest. The environmental impact assessment and mitigation development discussed herein will be important factors in this final determination.

This EIS has also been prepared to help satisfy the requirements of the Massachusetts Environmental Policy Act (MEPA). The Massachusetts Executive Office of Environmental Affairs

[3] The pronouns "we," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

(EOEA) issued a Certificate to Weaver's Cove Energy on August 28, 2003 that established a Special Review Procedure (SRP) to guide the MEPA review of the Weaver's Cove LNG Project. This SRP provides for a coordinated NEPA/MEPA review. It also allows the draft and final EISs to serve as the draft and final Environmental Impact Reports (EIRs) required under MEPA, provided the EISs address MEPA's EIR requirements, as specified in the MEPA scope for the project that was issued concurrently with the SRP on August 28, 2003. Additional discussion of the NEPA/MEPA coordination is provided in section 1.2.

Our analysis in this EIS focuses on the facilities that are under the FERC's jurisdiction (i.e., the LNG import terminal and two sendout pipelines proposed to be constructed by Weaver's Cove Energy) as well as an electric substation that would be constructed on the north end of the LNG terminal site to supply power to the LNG terminal facilities.

The topics addressed in this EIS include geology; soils and sediments; water use and quality; wetlands; vegetation; wildlife; fish and marine invertebrates; threatened, endangered, and special-status species; land use, recreation, and visual resources; cultural resources; socioeconomics and traffic; air quality and noise; reliability and safety; cumulative effects; and alternatives. The EIS describes the affected environment as it currently exists, discusses the environmental consequences of the proposed project, and compares the project's potential impact to that of alternatives. The EIS also responds to public comments on the draft EIS and presents our conclusions and recommended mitigation measures.

1.2 COORDINATION OF NEPA/MEPA REVIEW

On February 14, 2003 (and supplemented on May 8, 2003), Weaver's Cove Energy filed a request with the FERC to use the NEPA Pre-filing Process. At that time, Weaver's Cove Energy was in the preliminary design stage of the project and no formal application had been filed with the FERC. Weaver's Cove Energy's request to use the NEPA Pre-filing Process was approved on May 20, 2003, and a pre-filing docket number (PF03-4-000) was established to place information filed by Weaver's Cove Energy and related documents issued by the FERC into the public record. The NEPA Pre-filing Process provided opportunities for interested stakeholders to become involved early in project planning, facilitated interagency cooperation, and assisted in the identification of issues prior to Weaver's Cove Energy filing its application with the FERC.

The project must also undergo an environmental review pursuant to MEPA regulations. The MEPA process is specifically designed to inform project proponents and participating agencies; ensure public participation in the state environmental permitting process; maximize consistency between agency actions; ensure that state permitting agencies have adequate information on which to base their permit decisions and section 61 Findings; and ensure that potential environmental impacts on state resources are fully described and avoided, minimized, or mitigated to the maximum feasible extent. The MEPA review does not alter the permitting authority of any agency; however, no Massachusetts agency can issue a permit until the Secretary of the EOEA has determined that the final EIR is adequate and 60 days have elapsed following publication of the notice of availability in the Environmental Monitor.

To initiate MEPA review and facilitate the NEPA Pre-filing Process, Weaver's Cove Energy filed an Expanded Environmental Notice Form (ENF) with the Secretary of the EOEA on June 30, 2003. Weaver's Cove Energy included in the ENF a request to the Secretary of the EOEA to conduct a coordinated review of the project with the FERC. The Secretary of the EOEA responded to this request on August 28, 2003, and issued a Certificate of the Secretary of Environmental Affairs establishing a SRP. The Secretary of the EOEA also issued a Certificate of the Secretary of Environmental Affairs on the ENF. Copies of these Certificates are included in Appendix B.

In the Certificate on the ENF, the Secretary of the EOEA determined that the project requires the preparation of an EIR pursuant to sections 11.03 (1) (a) 1, and (3) (a) 1.b. of the MEPA regulations. Specifically, the Secretary of the EOEA indicated that an EIR is required because the project would involve alteration of more than 50 acres of land and alteration of 10 acres of non-vegetated wetlands. The project also meets MEPA filing thresholds related to wetlands alteration (section 11.03 (3) (b) 1.c), dredging (section 11.03 (3) (b) 3), and dredged material disposal (section 11.03 (3) (b) 4). In the Certificate on the ENF, the Secretary of the EOEA also issued a scope to guide the preparation of the EIR and indicated that MEPA's jurisdiction extends to any aspect of the project that has the potential to cause significant "Damage to the Environment" as defined in MEPA statute and that is within the subject matter of required or potentially required state permits and approvals.

In the Certificate on the ENF establishing a SRP, the Secretary of the EOEA indicated that the SRP would benefit the project by allowing for a coordinated NEPA/MEPA review of an EIS/EIR document consistent with the requirements and constraints imposed by FERC regulations.[4] Under the established SRP, the FERC's draft and final EISs could serve as the EOEA's draft and final EIRs provided the EISs address MEPA's EIR requirements, as specified in the MEPA scope for the project that was issued concurrently with the SRP on August 28, 2003. Table 1.2-1 is a cross reference index to aid reviewers in finding information relevant to the EIR process in the EIS, and to identify which sections of the EIS correspond to the form and content of the EIR specified in the Secretary of the EOEA's scope and requirements of 301 Code of Massachusetts Regulations (CMR) 11.07.

Pursuant to the established SRP, the EOEA reviewed the draft EIS and issued a Certificate on October 1, 2004 following the close of the comment period. In the Certificate the Secretary of the EOEA determined that the draft EIS did not sufficiently address several issues critical to understanding the project design and how the project meets state regulatory requirements and thus required Weaver's Cove Energy to prepare a supplemental draft EIR. The Secretary of the EOEA stated that its decision was directed at the deficiencies of the joint federal\state document only as it relates to the state requirements under MEPA. A copy of the Certificate containing this decision is included in Appendix B. Weaver's Cove Energy submitted a supplemental draft EIR to the Secretary of the EOEA on November 1, 2004.[5] On December 17, 2004, the Secretary of the EOEA determined that the supplemental draft EIR did not adequately and properly comply with the MEPA and its implementing regulations. The Secretary of the EOEA required that Weaver's Cove Energy prepare a second supplemental draft EIR. Because the decision of the Secretary of the EOEA was based on the inadequacy of the supplemental draft EIR to meet state regulatory requirements, the FERC continued to complete its analysis of the project for federal review purposes and to prepare this final EIS pursuant to the CEQ's NEPA-implementing guidelines.

[4] The term coordinated review as used in the Secretary of the EOEA's Certificate and in MEPA regulations refers to the practice of allowing a single set of documents to serve simultaneously as both an EIS under NEPA and an EIR under MEPA. This is not the same as a joint review since both the FERC and the EOEA will retain independent authority to judge the adequacy of the information in the document pursuant to their respective statutory and regulatory responsibilities.

[5] A similar procedure was used for the Phase III/HubLine Project. Specifically, the FERC issued the draft EIS and the Secretary of the EOEA determined that a supplemental draft EIR was needed. The applicant prepared the supplemental draft EIR, which was accepted by the Secretary of the EOEA. Following issuance of the supplemental draft EIR, the FERC prepared the final EIS.

TABLE 1.2-1 **Cross Reference Index for MEPA Requirements**	
MEPA Requirement	Applicable Draft EIS Section
Secretary's Certificates	Appendix B
Summary	Executive Summary and Section 5.0
Project Description	Section 2.0
Alternatives to the Project	Section 3.0
Regional Planning Issues	Section 4.8.2
Cumulative Impacts	Section 4.13
Existing Environment	Section 4.0
Wetlands/Drainage	Sections 4.4 and 4.5
Waterways/Chapter 91	Section 4.3.2
Water Quality/Dredging/Sediment Management	Sections 2.4.1.3, 3.4, 4.2.2, and 4.3.2
Coastal Zone Impacts	Section 4.8.4
Safety	Section 4.12
Environmental Justice	Section 4.9.7
Land Alteration	Section 4.8.1
Transportation	Sections 4.8.4 and 4.9.4
Air Quality	Section 4.11.1
Noise	Section 4.11.2
Article 97	Section 4.8.6
Archaeology	Section 4.10
Site Remediation	Sections 4.2.2 and 4.3.1
Construction Period	Sections 2.4 and 2.5
Assessment of Impacts	Section 4.0
Statutory and Regulatory Standards and Requirements	Section 1.4
Mitigation Measures	Sections 4.0 and 5.0 and Appendix H
Proposed section 61 Findings	Appendix H
Comments and Responses to Comments	Section 4.0 and Appendices C and K

1.3 PROJECT PURPOSE AND NEED

Weaver's Cove Energy proposes to bring a new LNG supply to New England to serve the natural gas needs of the New England market, particularly in southeastern Massachusetts and Rhode Island. The Weaver's Cove LNG Project would specifically provide:

- a new LNG import terminal and competitive source of imported LNG in the New England market area;
- a new facility for the storage of LNG;
- access to natural gas reserves in production areas throughout the world that are inaccessible by conventional pipelines;
- a new supply of natural gas to New England;
- strengthened gas supply to southeastern Massachusetts and Rhode Island; and

- a competitive source of LNG delivered by truck to LNG storage facilities throughout the region.

We received comments on the draft EIS suggesting that one or more of these purposes may be unimportant, could be ignored, or may be satisfied by other means such as conservation or renewable energy sources. Some commentors, for example, questioned whether additional natural gas supplies are needed. Other commentors questioned the importance of LNG storage and in particular the need to truck LNG from the LNG import terminal to satellite LNG storage facilities. Several reports have addressed these issues in detail and identified each of these specific purposes as important in New England. The following paragraphs provide a summary of recent assessments of New England's energy supply and infrastructure needs.

Each year the Energy Information Administration (EIA) of the U.S. Department of Energy (DOE) assesses the key energy issues, including economic growth, energy prices, energy consumption, energy intensity, electricity generation, energy production and imports, and carbon dioxide emissions. According to the EIA's Annual Energy Outlook 2005 with Projections to 2025 Report (EIA, 2005a), energy consumption is predicted to increase nationally an average of about 1.4 percent per year until 2025. Energy consumption is expected to increase in all sectors, particularly in the transportation sector (1.8 percent increase per year), electric generation sector (1.8 percent increase per year), and the commercial sector (1.9 percent increase per year). Nationally, the demand for natural gas is projected to increase during the same timeframe at an annual rate of 1.5 percent. The EIA estimates that natural gas demand nationally could be as high as 30.7 trillion cubic feet (Tcf) annually by 2025, which represents an almost 33 percent increase in demand over the 2002 level of about 23 Tcf (EIA, 2005a). Several other studies, including those by Global Insights, Inc.; the National Petroleum Council (NPC), Energy Ventures Analysis, Inc.; PIRA Energy Group; Deutsche Bank; and McKinsey & Company/National Energy Board Canada, also predict similar trends in gas consumption.

Use of natural gas for electricity generation and industrial applications are expected to account for almost 75 percent of the projected growth in natural gas demand. This compares to increases in projected demand for coal of 1.5 percent per year, petroleum of 1.5 percent per year, and renewable fuels, including ethanol and wind, of 1.5 percent per year during the same period. As described in the EIA's report, the projections for natural gas demand and other fuels are sensitive to cost and other factors. For example, the EIA reduced its projections for energy consumption from all energy sources except nuclear energy between 2004 and 2005 due in part to higher energy prices; lower projected growth rates in industrial production; specific updates in the chemical, pulp, and paper industries; revisions to the capital cost of generating technologies; and revisions to transportation sector vehicle miles traveled.

The EIA projections for New England are similar to the nation as a whole. The EIA estimates that energy consumption in New England will rise from 3.565 quadrillion British thermal units (Btu) in 2003 to about 4.493 quadrillion Btu in 2025. Consumption of natural gas during this same period is expected to increase from 0.820 quadrillion Btu to about 1.110 quadrillion Btu, which represents an average annual increase in gas consumption of about 1.4 percent per year over 22 years. During this same period, consumption of energy from both petroleum and coal is predicted to increase 1.0 and 1.1 percent a year, respectively, whereas consumption of energy from nuclear power is only expected to increase 0.1 percent. The consumption of renewable energy is expected to increase by 1.1 percent a year. The majority of the increase in renewable energy generation in New England is expected to come from wind power.

Natural gas is used in New England for home heating and cooking, commercial heating, a variety of industrial applications, and increasingly for electrical power generation. In December 2003, the FERC issued the New England Gas Infrastructure Report (NE Report), Docket No. PL04-01-000, which

analyzed the interstate natural gas supply and storage in New England. The purpose of this report was to determine if there is adequate natural gas pipeline and storage capacity to meet the increasing demand from gas-fired electric generation and other uses. The report was prepared by the Commission in consultation with the DOE and included contacts with state public utility commissions, the New England Conference of Public Utility Commissions, the New England Independent System Operators, and the Northeast Gas Association. The FERC also contracted with Energy and Environmental Analysis, Inc, and Merrimack Energy Group for pipeline, gas use, and transportation contract information.

As explained in the NE Report, natural gas provides approximately 18 percent of New England's energy needs, and natural gas is used to heat approximately one third of New England homes. Natural gas is also an important fuel for generating electricity. According to a March 2005 report to the New England Governors by the Power Planning Committee of the New England Governors' Conference, Inc. (Governors Conference Report), entitled *Meeting New England's Future Natural Gas Demands, Nine Scenarios and Their Impacts,* natural gas accounted for 40 percent of the fuel used to generate electricity in 2003. Natural gas is currently supplied to the region by four separate sources: eastern and south-central United States, which together provide approximately 55 percent of the region's supply; western Canada and Sable Island in eastern Canada, which together account for about 30 percent of the region's supply; and LNG from the Distrigas LNG terminal in Everett, Massachusetts, which provides about 15 percent of the region's supply.[6] The Distrigas LNG facility is currently the only operating LNG import terminal in the region; it contains two storage tanks with a combined storage capacity of about 3.5 billion cubic feet (Bcf) of natural gas. This LNG import terminal is owned and operated by Tractabel LNG North America, L.L.C. (Tractabel).

In considering the current balance of gas supply to New England, it is important to recognize that the sources of natural gas are not static. Based on a review of historical well production data from the lower 48 states and western Canada that analyzed initial production rates, production decline rates, and total well recoveries for each major producing basin, a 2003 study by the NPC concluded that:

> "…conventional gas production will inevitably decline in the future, and that the overall level of indigenous production will be largely dependent on the industry's ability to increase its production of nonconventional gas. Nonconventional gas includes gas from tight formations, shales, and coal seams. Given the relatively low production rates from nonconventional wells, the analysis further suggests that even in a robust future price environment, industry will be challenged to maintain overall production at its current level" (NPC, 2003).

The situation is compounded in New England by the failure of natural gas production and reserves off of Sable Island, Nova Scotia to meet initial expectations. In fact, current production offshore of Nova Scotia is already experiencing some decline. The supply available to New England may also be affected by other regional markets. For example, growth in the New York and mid-Atlantic areas will likely compete with New England for the natural gas from producing basins in the Gulf of Mexico. In short, there is strong evidence that indigenous sources of natural gas supplies will not be able to keep up with future demand without the addition of new sources of gas in the form of LNG from overseas.

The winter months from December through February are the peak natural gas use period in New England. During this period, New England's interstate pipeline systems, which include Algonquin, Granite State Gas Transmission, Inc., Iroquois Gas Transmission System, L.P. (Iroquois), Maritime and Northeast Pipeline L.L.C. (M&N), Portland Natural Gas Transmission System (PNGTS), and Tennessee Gas Pipeline Company (Tennessee Gas), are operating at almost full capacity. New England has no

[6] The recent Governors Conference Report states that the Distrigas LNG terminal serves as a critical link in the region's energy infrastructure and supplies 20 percent of the region's annual natural gas.

underground natural gas storage and relies on bulk underground storage in New York and Pennsylvania to augment supplies. For New England customers to have access to the gas in underground storage in New York and Pennsylvania, capacity must be available on interstate pipelines to carry the gas from storage to New England. However, interstate pipelines operating at or near full capacity between the storage fields and New England limit access to gas in underground storage, and many New England customers rely on aboveground LNG storage located within New England and imported LNG to meet demand. The Distrigas LNG facility receives between 60 and 70 LNG tanker shipments per year. In 2003, the Distrigas LNG terminal received the equivalent of 158 Bcf of natural gas (Power Planning Committee, Inc., 2005). In addition to the Distrigas LNG terminal, there are 46 liquefaction and satellite storage tanks in New England operated by local distribution companies, which have a combined LNG storage capacity of about 15 Bcf of natural gas. The LNG for these satellite LNG storage tanks is supplied by trucks from the Distrigas facility. In 2003, Distrigas trucked about 14 Bcf of LNG to these satellite LNG storage tanks (Power Planning Committee, Inc., 2005). Cumulatively, the vaporization capacity of these storage facilities (which totals approximately 0.715 billion cubic feet per day (Bcfd) for Distrigas and 1.22 Bcfd for the satellite LNG storage tanks) can supply as much as 30 percent of the region's peak day needs according to the Northeast Gas Association.

The critical importance of the Distrigas LNG facility and the satellite LNG storage tanks, including the existing KeySpan LNG facility located in Providence, Rhode Island, has been widely recognized. In his February 2005 comments on the draft EIS, Rhode Island Governor Donald Carcieri stated that on peak winter days, the existing KeySpan LNG facility provides 25 percent of Rhode Island's natural gas. The importance of stored natural gas was also recognized in the March 2005 Governors Conference Report. This report states that the Distrigas LNG facility and the satellite LNG storage tanks are critical to meeting the region's peak winter natural gas demand. More specifically, the report indicates that:

> "Stored natural gas is a critical economic and engineering component of the region's natural gas delivery system. Were it not for gas storage, our economy would be constrained by the willingness of the market to invest in expansion of pipeline capacity to meet both long-term demand growth and the day-to-day demand fluctuations. Thus natural gas storage bolsters system reliability by allowing for an economic means to meet winter peak demand requirements by maintaining vital pressure in the pipeline system. Storage also contributes to the diversity of the regional gas supply portfolio and reduces our reliance on the availability and price-competitiveness of any individual supply source."

Our analysis indicates that natural gas infrastructure expansion in New England to date has kept up with demand, yet with little margin for error. It appears that: 1) the existing natural gas infrastructure capacity can meet demand through 2005; 2) by 2009 there will be demand for an additional 500 MMcfd of additional peak day demand; and 3) with the addition of the proposed projects that either have certificates or are in some stage of the certification process, projected demand can be met through 2010.[7] These conclusions are generally supported by the Governors Conference Report. Specifically, the conference report indicates that the anticipated additional demand for natural gas by 2009 will be between 420 MMcfd and 590 MMcfd, and the region's existing gas delivery systems[8] will be able to meet peak day demands for gas for space heating and electric generation at least through 2010 if the region has continued use of the Distrigas LNG facility and the satellite LNG storage tanks. However, the region could have insufficient gas supply to meet the needs of all customers for space heating as early as 2005 or

[7] We note that some of the projects assumed in the FERC's analysis such as the Islander East Pipeline Project have not yet been constructed. Additionally, it is possible that some of these projects may never be constructed.

[8] The Governors Conference Report assumed the existing gas delivery systems include one recently approved LNG tank in Connecticut and two previously approved pipeline system expansions.

2006 in the extreme case that stored gas from the satellite LNG tanks is depleted as a result of an extended cold weather period lasting many days (Power Planning Committee, Inc., 2005).

The NE Report concludes that there is little opportunity for the existing natural gas system to rely on excess capacity as a buffer against curtailment. On the demand side, the New England market is characterized by relatively inelastic uses (residential and gas-fired generation) that do not provide meaningful opportunities for fuel switching in the event of supply disruption or high prices (Carcieri, 2004). Moreover, should the unexpected occur, a localized curtailment of service is the likely outcome. According to the Governors Conference Report, the consequences of a shortfall in pipeline capacity or supplies could be dire. Furthermore, a shortfall in pipeline reserve margins and subsequent pressure drop in the local distribution company's distribution pipelines could set off an extended gas outage that would risk public safety in freezing temperature conditions (Power Planning Committee, Inc., 2005).

The NE Report also concludes that a new source of LNG in proximity to both Boston and Providence would be a valuable addition to New England's natural gas infrastructure and could reduce but not eliminate the need for new pipeline capacity. This report also indicates that construction of additional peakshaving LNG storage facilities, which are used by local distribution companies as a short-term hedge against service curtailment or higher than anticipated demand, would help to ensure more reliable service until additional pipeline capacity is constructed.

In summary, natural gas provides a large percentage of New England's energy needs and will remain important in the region as energy demands continue to increase. LNG storage facilities currently play and will continue to play an important role in satisfying New England's energy needs both in terms of storage and as a new source of natural gas supply. The Weaver's Cove LNG Project would supply a new competitive source of imported LNG to help meet the increasing future demand for natural gas. The Weaver's Cove LNG Project's trucking services would also provide a new source of LNG to other peakshaving and satellite LNG storage facilities, which are critical to maintain a reliable source of natural gas to the region during peak use periods and to maintain price stability.

1.4 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

As the lead federal agency for the Weaver's Cove LNG Project, the FERC is required to comply with section 7 of the Endangered Species Act of 1973 (ESA), the Magnuson-Stevens Fishery Conservation and Management Act (MSA), section 106 of the National Historic Preservation Act (NHPA), and section 307 of the Coastal Zone Management Act of 1972 (CZMA). Each of these statutes has been taken into account in the preparation of this document.

Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by a federal agency (e.g., the FERC) should not "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical" (16 United States Code (USC) § 1536(a) (2) (1988)). The FERC, or the applicant as a non-federal party, is required to consult with the U.S. Fish and Wildlife Service (FWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitat occur in the vicinity of the proposed project. If, upon review of existing data or data provided by the applicant, the FERC determines that these species or habitats may be affected by the proposed project, the FERC is required to prepare a biological assessment (BA) to identify the nature and extent of adverse impact, and to recommend measures that would avoid the habitat and/or species, or would reduce potential impacts to acceptable levels. See section 4.7.1 of this EIS for the status of this review.

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a federal fisheries management plan. The MSA requires federal agencies to consult with the NOAA Fisheries on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH (MSA §305(b) (2)). Although absolute criteria have not been established for conducting EFH consultations, the NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, or the ESA (50 CFR 600.920(e)) to reduce duplication and improve efficiency. As part of the consultation process, the FERC has prepared an EFH Assessment included in section 4.6.2 of this EIS. NOAA Fisheries is a cooperating agency assisting in the preparation of this EIS.

Section 106 of the NHPA requires the FERC to take into account the effects of its undertakings on properties listed on or eligible for listing on the National Register of Historic Places (NRHP), including prehistoric or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance, and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. The FERC has requested that Weaver's Cove Energy, as a non-federal party, assist in meeting the FERC's obligation under section 106 by preparing the necessary information and analyses as required by the ACHP procedures in 36 CFR 800. See section 4.10 of this EIS for the status of this review.

The CZMA calls for the "effective management, beneficial use, protection, and development" of the nation's coastal zone and promotes active state involvement in achieving those goals. As a means to reach those goals, the CZMA requires participating states to develop management programs that demonstrate how these states will meet their obligations and responsibilities in managing their coastal areas. In the Commonwealth of Massachusetts, the Office of Coastal Zone Management (OCZM) of the EOEA is the agency responsible for administering Massachusetts' Coastal Zone Management Program (CZMP). In the State of Rhode Island, the Coastal Resources Management Council (CRMC) is responsible for administering Rhode Island's CZMP. Because section 307 of the CZMA requires federally licensed or permitted activities to be consistent to the maximum extent practicable with the enforceable policies of a management program, the FERC has requested that Weaver's Cove Energy seek a determination of consistency with Massachusetts' and Rhode Island's CZMPs. See section 4.8.4 of this EIS for additional discussion of these CZMPs.

At the federal level, required permits and approval authority outside of the FERC's jurisdiction include compliance with the Clean Water Act (CWA), the Rivers and Harbors Act, the Clean Air Act (CAA), and U.S. Coast Guard (Coast Guard) regulations relating to LNG waterfront facilities.

The U.S. Army Corps of Engineers (COE) is the primary agency responsible for reviewing the dredging aspects of the project and has authority to issue dredging and wetland permits pursuant to section 10 and section 404 of the River and Harbors Act and CWA, respectively. The U.S. Environmental Protection Agency (EPA) has the authority to review and veto COE decisions on section 404 permits. The EPA is also responsible for reviewing the stormwater and hydrostatic test water discharge activities of the project and has authority to issue National Pollutant Discharge Elimination System (NPDES) permits pursuant to section 402 of the CWA (some NPDES permits are issued jointly with the Massachusetts Department of Environmental Protection (DEP)). The Coast Guard has the primary responsibility for reviewing and approving the navigational and security aspects of the project in accordance with 33 CFR 127 and 66. All three of these federal agencies are cooperating agencies assisting in the preparation of the EIS.

Weaver's Cove Energy must also obtain Water Quality Certifications pursuant to section 401 of the CWA. The federal authority to issue Water Quality Certifications in Rhode Island and Massachusetts has been delegated to state agencies, specifically, the Department of Environmental Management (DEM) in Rhode Island and the DEP in Massachusetts.

In addition to the federal permits and approvals discussed above, Weaver's Cove Energy would obtain other permits and approvals from state and local agencies. Table 1.4-1 lists the major federal, state, and local permits, approvals, and consultations for the Weaver's Cove LNG Project.

The FERC encourages cooperation between applicants and state and local authorities, but this does not mean that state and local agencies, through application of state and local laws, may prohibit or unreasonably delay the construction or operation of facilities approved by the FERC. Any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any Certificate the FERC may issue.[9]

1.5 PUBLIC AND AGENCY OUTREACH CONDUCTED BY WEAVER'S COVE ENERGY

Since initiating the project in 2002, Weaver's Cove Energy has conducted several meetings[10] with federal and state agencies to discuss the project. Prior to the issuance of the draft EIS, these included at the federal level several meetings with representatives of the FERC, three meetings with representatives of the Coast Guard, four meetings with representatives of the COE, five meetings with representatives of the EPA, three meetings with representatives of NOAA, and one meeting with representatives of the U.S. Department of Transportation (DOT). Weaver's Cove Energy's meetings with representatives of Massachusetts agencies included: six meetings with the DEP; one meeting with the Office of Commonwealth Security; 12 meetings with the Energy Facility Siting Board (EFSB); four meetings with the OCZM of the EOEA; one meeting with the MEPA Office of the EOEA; one meeting with the State Police; one meeting with the Executive Office of Public Safety; and two meetings with the Department of Energy Resources. In Rhode Island, Weaver's Cove Energy has met with representatives of the CRMC twice, representatives of the DEM three times, and representatives of the State Police once. Weaver's Cove Energy has continued to consult and meet with agencies prior to the issuance of this final EIS.

Weaver's Cove Energy initiated a community outreach and information effort in early 2003. Beginning in March 2003, representatives from Weaver's Cove Energy met individually with 27 property owners in the area immediately to the east of the LNG terminal site to introduce the project and present Weaver's Cove Energy's voluntary real estate program. Weaver's Cove Energy indicated that this voluntary real estate program is being offered to nearby property owners to provide compensation for inconveniences during the construction of the facility and to preserve the existing character and uses of these properties. One program was offered to the owners of properties located closest to the proposed terminal site (25 parcels between the railroad tracks and North Main Street, owned by 14 people, zoned for industrial use). Another program was offered to the property owners further from the proposed terminal site (15 parcels, owned by 13 people, east of North Main Street, zoned "General Residence"). A package of materials on the project and the appropriate real estate program documents were provided to each landowner and negotiations are ongoing.

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[9] See, e.g., Schneidewind v. ANR Pipeline Co., 485 U.S. 293 (1988); National Fuel Gas Supply v. Public Service Commission. 894 F.2d 571 (2d Cir. 1990); and Iroquois Gas Transmission System, L.P., et al., 52 FERC ¶ 61,091 (1990) and 59 FERC ¶ 61,094 (1992).

[10] In some cases these meetings included more than one agency. For example, Weaver's Cove Energy met jointly with the FERC and the Coast Guard on July 30, 2003. For the purposes of this final EIS, this joint meeting is described as one meeting with the FERC and one meeting with the Coast Guard.

TABLE 1.4-1

Major Permits, Approvals, and Consultations for the Weaver's Cove LNG Project

Agency	Permit/Approval/Consultations	Anticipated Application Filing/Consultation Date
FEDERAL		
Federal Energy Regulatory Commission	Authorization to construct and operate an LNG import facility under section 3 (a) of the Natural Gas Act (NGA) (15 USC § 717b (a), and Part 153, 18 CFR §§153.1 et seq.)	Application Submitted December 2003; Draft EIS Issued July 2004
	Certificate of Public Convenience and Necessity to construct, install, own, operate, and maintain two pipelines under section 7(c) of the NGA (15 USC § 717(f) (c))	
	Blanket Certificate to perform certain routine activities and operations under Subpart F of Part 157 (18 CFR § 157.1 et seq.)	
	Blanket Certificate to provide open access transportation of natural gas to others under Subpart G of Part 284 (18 CFR § 284.1 et seq.)	
	Assessment of environmental impact under the National Environmental Policy Act (42 USC §§ 4321 et seq., 18 CFR Part 380)	
Advisory Council on Historic Preservation	Comment on the project under section 106 of the National Historic Preservation Act (16 USC § 470(f))	Consultation pending FERC review
U.S. Army Corps of Engineers (COE)	Authorization for activities that will occupy, fill, or grade land in a floodplain, streambed, or channel of a stream under section 10 of the Rivers and Harbors Act of 1899 (33 USC § 403)	Submitted March 2004
	Authorization to discharge dredged or fill material into waters of the United States under section 404 of the Clean Water Act (CWA) (33 USC § 1344)	Submitted March 2004
U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA)		
Office of Coastal Zone Management	Federal Consistency Certification (1465 and 15 CFR Part 930, 16 USC §§ 145) (permitting authority delegated to the Massachusetts Office of Coastal Zone Management and the Rhode Island Coastal Resources Management Council)	Submitted July 2004 (see Massachusetts and Rhode Island Permits)
NOAA Fisheries	Consultation regarding compliance with section 7 of the Endangered Species Act; the Magnuson-Stevens Fishery Conservation and Management Act; and the Marine Mammal Protection Act (16 USC §§ 1856 et seq.)	Consultation ongoing

TABLE 1.4-1 (cont'd)

Major Permits, Approvals, and Consultations for the Weaver's Cove LNG Project

Agency	Permit/Approval/Consultations	Anticipated Application Filing/Consultation Date
U.S. Department of the Interior		
U.S. Fish and Wildlife Service	Consultation regarding compliance with section 7 of the Endangered Species Act, the Migratory Bird Treaty Act, and the Fish and Wildlife Coordination Act (16 USC § 1531 et seq.)	Consultation ongoing
U.S. National Park Service	Consultation regarding the National Wild and Scenic River Act (16 USC § 1271-1287)	Consultation ongoing
U.S. Environmental Protection Agency	Water Quality Certification under section 401 of the CWA, (33 USC § 1341, 40 CFR § 131) (permitting authority delegated to the Massachusetts Department of Environmental Protection and the Rhode Island Department of Environmental Management)	See Massachusetts and Rhode Island Permits
	National Pollutant Discharge Elimination System (NPDES) permits for stormwater and wastewater under section 402 of the CWA, (33 USC § 1342 and 40 CFR §§ 122-125), (some NPDES permits are issued jointly with Massachusetts Department of Environmental Protection)	Second Quarter 2005
	Section 404 of the CWA (veto power for wetland permits issued by the COE)	See COE Permits
	Spill Prevention, Control and Countermeasures Plan (33 USC § 1321(j) and 40 CFR § 112)	Second Quarter 2005
	Clean Air Act permits for the construction of a stationary source of air pollutant emissions and for operation of the source (42 USC §§ 7401 et seq., 40 CFR § 52.21) (permitting authority delegated to the Massachusetts Department of Environmental Protection)	See Massachusetts Permits
U.S. Department of Homeland Security		
U.S. Coast Guard	Letter of Intent (33 CFR 127); Waterfront Facilities Handling Liquefied Natural Gas and Liquefied Hazardous Gas; Permission to establish Aids to Navigation (33 CFR Part 66, 14 USC §§ 84-86)	Submitted May 2004
Federal Aviation Administration	Stack Construction Notification (Form 7460) (49 USC § 44718)	Submitted June 2004; Determination of No Hazard Issued October 2004

TABLE 1.4-1 (cont'd)

Major Permits, Approvals, and Consultations for the Weaver's Cove LNG Project

Agency	Permit/Approval/Consultations	Anticipated Application Filing/Consultation Date
STATE		
Massachusetts Executive Office of Environmental Affairs		
Office of Coastal Zone Management	Federal Consistency Review with CZMP Program Policies (15 CFR 923, 15 CFR 930, G.L. c 21A § 4A, 301 CMR 20.00 and 21.00)	Informational Draft Submitted July 2004
Environmental Policy Act Office	Compliance with MEPA regulations (G.L. c. 30 §§ 61 through 62H, 301 CMR 11.00)	Submitted June 2003; Supplemental Draft EIR Submitted November 2004
Massachusetts Energy Facilities Siting Board	Review and comment on FERC-regulated energy projects (69J, G.L. c. 164 §§ 69H, 980 CMR)	No formal application required
Massachusetts Department of Environmental Protection	Water Quality Certification pursuant to section 401 of the CWA (G.L. c. 21, 314 CMR 4.00 and 9.00)	Submitted April and May 2004
	Non-Major Comprehensive Plan Approval (310 CMR 7.02(4))	Submitted May 2004
	Water Supply Cross Connection Permit (G.L. c. 111 § 160A, 310 CRM 22.22)	Second Quarter 2005
	Asbestos Abatement Permit (310 CMR 7.15, 453 CMR 6.12) (application to be filed by former site owner)	Second Quarter 2005
	Chapter 91, Waterways License (G.L. c. 91, 310 CMR 9.00)	Submitted April and May 2004
	Wetlands Protection Act Permit (G.L. c. 131 § 40, 310 CMR 10.00) (permit application will be filed with local Conservation Commissions); a superceding Order of Conditions would be necessary form the Massachusetts Department of Environmental Protection in the event of an appeal of the Local Order of Conditions	Submitted May and June 2004
	Massachusetts Contingency Plan approval(G.L. c. 21E, 310 CMR 40.00)	Consultation Ongoing
Massachusetts State Fire Marshall	Storage of Liquids and Inflammable Materials (G.L. c. 148 §§ 9, 10, 28, and 37, G.L. c. 22 § 14, 527 CMR 9.00, 520 CMR 12.00, G.L. c 148 §§ 9, G.L. c 148 § 13, G.L. c. 148 §28)	Second Quarter 2005
Massachusetts Department of Public Safety	Tank Approval for Storage Tanks over 10,000 Gallons (G.L. c. 148 § 37, 520 CMR 12.00); Hazardous Substances Tank Approval (527 CMR 18.00)	Second Quarter 2005
Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement, Natural Heritage and Endangered Species Program	State-listed threatened and endangered species consultations (G.L. c.131 § 5B, 321 CMR 10.00)	Consultation ongoing

TABLE 1.4-1 (cont'd)

Major Permits, Approvals, and Consultations for the Weaver's Cove LNG Project

Agency	Permit/Approval/Consultations	Anticipated Application Filing/Consultation Date
Massachusetts Historical Commission	Review and comment on undertakings potentially affecting cultural resources (section 106, National Historic Preservation Act, G.L. c. 9 § 26 through 27c, 950 CMR 71.00)	Consultation ongoing
Massachusetts Board of Underwater Archaeological Resources	Review and comment on undertakings potentially affecting underwater cultural resources (section 106, National Historic Preservation Act)	Consultation ongoing
Massachusetts Division of Marine Fisheries	Marine fisheries consultations	Consultation ongoing
Massachusetts Highway Department	State Highway Access Permit (G.L. c. 81 § 21)	Second Quarter 2005
Rhode Island Department of Environmental Management	Water Quality Certification pursuant to section 401 of the CWA	Submitted July 2004
	State-listed threatened and endangered species consultations	Consultation ongoing
Rhode Island Coastal Resources Management Council	Federal Consistency Review with CZMP Program policies for dredging and disposal (15 CFR 923, 15 CFR 930, sections 300.1, 300.8, and 300.9)	Submitted July 2004
Rhode Island Historic Preservation and Heritage Commission	Review and comment on undertakings potentially affecting cultural resources (section 106, National Historic Preservation Act)	Consultation ongoing
LOCAL		
City of Fall River, Towns of Somerset, Freetown, and Swansea	Order of Conditions for Wetlands and Riverfront Areas, issued through the local Conservation Commission (G.L. c. 131 § 40, 310 CMR 10.00)	Submitted May and June 2004; Order Issued July 2004 (Freetown); Applications Denied (Swansea – September 2004; Fall River – November 2004); Hearings ongoing (Somerset)
Fall River City Council	Removal of curbing for installation of private driveway, Permit to Install LNG, Permit to Store LNG, Permit to Install Tank, Registration of Tank (§ 30-35)	Second Quarter 2005
Fall River Water and Sewer Department	Permit to Connect from Sewer Commissioner, Department of Public Works, and City Engineer (§§ 74-112, 74-200, and 74-191); Water Hook Up Permit from administrator of public utilities, (§§ 74-323 and 74-333)	Second Quarter 2005

In July 2003, Weaver's Cove Energy sponsored informational open houses. Elected and appointed officials were invited to an initial open house on July 21, 2003. The first public open house was held the following day on July 22. A second public open house was held on July 29, 2003 to coincide with the FERC/EOEA public scoping meeting. Invitations to the public open houses were sent to landowners within a 1/2 mile radius of the LNG terminal site (601 residences/businesses), landowners adjacent to or along the proposed pipeline rights-of-way (283 residences/businesses), and approximately 40 elected officials and agency representatives. In addition, invitations were hand delivered to landowners between 1/2 mile and 1 mile radius of the LNG terminal site (about 3,700 addresses). In addition to the mailings and hand delivered invitations, notices were published in the *Fall River Herald News, Fall River Spirit, Somerset Spectator,* and *O Jornal*, a Portuguese language newspaper.

Weaver's Cove Energy also established a project web site (www.weaverscove.com) in late July 2003, which is periodically updated with project information.

Within 3 days of filing its application with the FERC and in accordance with the Commission's regulations and Orders 609 and 609-A, Weaver's Cove Energy notified affected landowners and residents within 1/2 mile of the LNG terminal site that it filed its application. Weaver's Cove Energy also published a notice of its application in newspapers that are in general circulation in the project area and placed copies of its application at the Fall River City Hall and in the Fall River, Somerset, Freetown, and Swansea libraries.

1.6 PUBLIC REVIEW AND COMMENT

On May 2, 2003, FERC staff participated in an interagency meeting in Fall River, Massachusetts to discuss the project and the environmental review process with Weaver's Cove Energy and other key federal and state agencies. These agencies included the COE, Coast Guard, DEP, EFSB, EOEA, CRMC, and DEM.

On July 11, 2003, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Weaver's Cove LNG Project, Request for Comments on Environmental Issues, and Notice of Joint Public Scoping Meeting* (NOI). The NOI was sent to 1,241 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers; residents within a 1/2 mile of the proposed LNG terminal; and property owners along the proposed pipeline routes and adjacent to the utility corridors in which the pipelines would be located. Issuance of the NOI signified the start of the time period for receiving written comments. On December 31, 2003, the FERC issued a *Notice of Status Change of Environmental Review and Expiration of Scoping Period for the Proposed Weaver's Cove LNG Project*. This second notice announced the filing of an application by Weaver's Cove Energy and a final opportunity to submit comments. The EOEA established a closing date in August 2003 for receiving comments while the FERC's comment period closed on January 30, 2004. Due to errors and omissions in the mailing list provided by Weaver's Cove Energy, the FERC sent the second notice to an additional 64 landowners along the pipeline routes on January 23, 2004 and provided a 30-day comment period for these landowners ending on February 23, 2004. The FERC staff continued to receive, accept, and consider scoping comments until June 28, well beyond the February 23 deadline. In total, 805 comment letters were received either by the EOEA, EFSB, and/or FERC in response to the notices.

On July 29, 2003, staff of the FERC and EOEA conducted a joint public scoping meeting in Swansea, Massachusetts to provide an opportunity for the general public to learn more about the proposed project and to participate in our analysis by commenting on issues to be included in the EIS. Twenty-two people commented at the meeting. A transcript of these comments is part of the public record for the Weaver's Cove LNG Project.

The EFSB conducted a public hearing on January 27, 2004 in Fall River to receive comments on the proposed project. The EFSB submitted a transcript of this hearing, its comments on the project, and written comments it received to the FERC on January 30, 2004.

On May 4, 2004, the FERC conducted an inspection of the proposed terminal site that was open to and attended by the public, including several state and local officials. The next day, the FERC conducted a cryogenic design and technical conference in Swansea, Massachusetts to discuss design and engineering aspects of the Weaver's Cove LNG Project. The meeting was limited to existing parties to the proceeding (i.e., anyone who specifically requested to intervene as a party). Attendees included agency representatives (DOT Office of Pipeline Safety (OPS), EFSB, and EPA), elected officials and their representatives, industry representatives, and other interested parties.

In addition to the public notice and scoping process discussed above, the FERC conducted agency consultations or participated in interagency meetings to identify issues that should be addressed in this EIS. These consultations included: meetings with representatives of the CRMC and DEM on July 28 and December 8, 2003; a meeting with representatives of the EFSB on July 28, 2003; meetings with representatives of the DEP on July 28, December 9, and December 10, 2003; meetings with representatives of the OCZM of the EOEA on July 28 and December 8, 2003; a meeting with a representative of the Massachusetts Division of Marine Fisheries (DMF) on December 8, 2003; meetings with representatives of the Coast Guard on July 30 and November 4, 2003; meetings with representatives of the COE, NOAA Fisheries, and EPA on July 30 and December 9, 2003; an interagency meeting with the COE, NOAA Fisheries, EPA, OCZM, CRMC, and DEP on March 9, 2004; and an interagency meeting with NOAA Fisheries, EPA, OCZM, CRMC, and DEP on June 30, 2004.

The FERC attended a meeting with the Coast Guard at the Fall River City Council on September 23, 2003 to discuss the proposed LNG project with city councilors. A representative of Weaver's Cove Energy provided an overview of the project at this meeting and several residents provided comments on the project. The FERC also participated in a public meeting with the Coast Guard, CRMC, DEM, and Rhode Island Economic Development Corporation on June 30, 2004 in Tiverton, Rhode Island. This meeting was sponsored by Rhode Island State Representative Joseph Amaral to enable the public to provide comments on the proposed project to the state and federal agencies. The FERC participated in a public meeting with the Coast Guard and others on September 1, 2004 in Bristol, Rhode Island that was sponsored by Rhode Island State Representative Raymond Gallison. This meeting, like the one in Tiverton, provided a public forum for interested parties to comment on the project. In addition, FERC Chairman Pat Wood, FERC Commissioner Suedeen Kelly, and other FERC staff met with the following elected officials on January 24, 2005 to discuss the proposed project: U.S. Senator Edward Kennedy, U.S. Senator John Kerry, U.S. Congressman James McGovern, Ranch Kimball (representing Massachusetts Governor Mitt Romney), Massachusetts State Representative David Sullivan, and City of Fall River Mayor Edward Lambert. A transcript of this meeting is available on the FERC's website under the docket number for the Weaver's Cove LNG Project.

Finally, prior to the publication of the draft EIS, the FERC prepared an advance draft EIS that was distributed in whole or part to the COE, NOAA Fisheries, EPA, Coast Guard, MEPA, OCZM, DEP, DEM, and CRMC for review. Sections of the draft EIS were written with the cooperation and assistance of these agencies.

The FERC prepared a draft EIS for the Weaver's Cove LNG Project and issued a Notice of Availability (NOA) of the draft EIS and the draft General Conformity Determination on July 30, 2004. In accordance with CEQ's regulations implementing NEPA, the NOA established a 45-day comment period ending on September 20, 2004, described procedures for filing comments on the draft EIS, and announced the time, date, and location of public comment meetings. The NOA also indicated that additional project

information could be obtained from the Commission's Office of External Affairs and on the FERC's Internet website. The EOEA noticed the issuance of the draft EIS (draft EIR) in the Environmental Monitor on August 25, 2004 and established a comment period ending on September 24, 2004. A formal notice was also published in the Federal Register on August 6, 2004, indicating that the draft EIS was available and had been mailed to individuals and organizations on the mailing list prepared for the project.

Due to the large number of comments received on the draft EIS, the FERC continued to accept and respond to comments received after the close of the comment period. Also, on January 19, 2005, the FERC extended the comment period for those persons who requested additional information under the FERC's critical energy infrastructure information (CEII) regulation. These individuals were granted an additional 30 days after the information was made available to submit any comments on the draft EIS related to the information obtained as part of the CEII request.

The FERC mailed 1,891 copies of the draft EIS to interested parties, including federal, state, and local officials and agencies; special interest groups; parties to the proceedings; areas libraries and newspapers; and individuals and affected landowners who requested a copy of the draft EIS. The FERC also conducted public comment meetings in Swansea, Massachusetts on September 8 and in Middletown, Rhode Island on September 9, 2004. A total of 67 people provided comments at these two meetings. In addition, the FERC received 729 comment letters in response to the draft EIS (554 of these letters were mass mailings such as comment cards or form letters). The MEPA received another 38 comment letters regarding the draft EIS. Transcripts of the public meeting comments and the comment letters are part of the public record for the Weaver's Cove LNG Project. Table K-2 in Appendix K summarizes the comments received on the draft EIS by mid-January 2005 and our responses to these comments. Our responses to the comments are also provided in the various sections of this final EIS. The substantive changes in the final EIS are indicated by vertical bars that appear in the margins. The changes were made both in response to comments received on the draft EIS and as a result of updated information that became available after issuance of the draft EIS.

The final EIS was mailed to the agencies, individuals, and organizations on the mailing list provided in Appendix A and submitted to the EPA for formal issuance of a NOA. In accordance with CEQ's regulations implementing NEPA, no agency decision on a proposed action may be made until 30 days after the EPA publishes a NOA of the final EIS. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal process that allows other agencies or the public to make their views known. In such cases, the agency decision may be made at the same time the notice of the final EIS is published, allowing both periods to run concurrently. Should the FERC issue authorization for Weaver's Cove Energy's for the proposed action, it would be subject to a 30-day rehearing period. Therefore, the FERC could issue its decision concurrently with the EPA's NOA.

There has been considerable opposition to the proposed project by elected and public officials, municipality representatives, special interest groups, and the public. Based on public meeting comments and comment letters on the draft EIS, elected and public officials that have identified themselves or have been identified by others as opposed to the project include but not necessarily limited to the following: U.S. Senator Edward Kennedy, U.S. Senator John Kerry, U.S. Senator Jack Reed, U.S. Congressman Barney Frank, U.S. Congressman James McGovern, U.S. Congressman Edward Markey, Massachusetts Governor Mitt Romney, Massachusetts State Representative David Sullivan, Rhode Island State Representative Bruce Long, Rhode Island State Representative Joseph Amaral, Rhode Island State Representative Raymond Gallison, Massachusetts Attorney General Tom Reilly, Rhode Island Attorney General Patrick Lynch, Mayor Edward Lambert of Fall River, the Fall River City Council, the Swansea Board of Selectmen, the Somerset Board of Selectmen, the Newport City Council, the Bristol Town Council, the Portsmouth Town Council, the Jamestown Town Council, the Little Compton Town Council,

the Town of Narragansett Planning Board, the Conservation Commission of Somerset, and the Massachusetts House Committee on Homeland Security and Federal Affairs. On May 24, 2004, the Massachusetts Senate, and on May 27, 2004, the Massachusetts House of Representatives, passed a non-binding resolution in opposition to the Weaver's Cove LNG Project which was sponsored by Senator Joan Menard and House Representative Robert Correia. On March 15, 2005, six Rhode Island representatives proposed a resolution in opposition to the proposed Weaver's Cove LNG and KeySpan LNG Facility Upgrade Projects and the associated LNG ship traffic in Narragansett and Mount Hope Bays.

Table 1.6-1 briefly summarizes the primary issues identified and comments received during the scoping process, which helped us focus the analysis in the draft EIS on the potentially significant environmental issues related to the proposed action. Since the issuance of the draft EIS, the most frequently raised concerns about the project have been related to the safety of operating an LNG facility in a populated urban setting. Specific safety concerns have been expressed regarding the impacts on the surrounding area if there is a fire at the proposed terminal, or a fire associated with an LNG ship spill in route to the terminal. Considerable concern has also been raised about the potential for the terminal and LNG ships to be targets of a terrorist attack and the impact of such an attack on surrounding communities. We have also received numerous comments regarding alternatives; environmental justice; the impacts of potential bridge closures during LNG ship transit; the effect of the proposed facilities on surrounding property values and insurance rates; the demand of the project on local services, especially the costs of providing police and fire protection; and a variety of other environmental issues, including the impact of dredging on water quality and aquatic resources, the risk of contamination associated with placing the dredged sediments on the terminal site, and the compatibility of the project with existing land uses and development plans.

1.7 NONJURISDICTIONAL FACILITIES

Electrical power to operate the LNG terminal facilities would be provided by a new 115/13.8 kV substation that would be constructed by National Grid/Massachusetts Electric Company on the north end of the southern parcel of the LNG terminal site just south of the existing 320-foot tall electric transmission tower. The new substation would receive electricity from the existing 115 kV power lines that cross the Taunton River at the northern edge of the project site. The substation would include two 115 kV to 13.8 kV transformers, circuit breakers, a distribution bus, and lightning protection; all of which would be located within a 0.6 acre fenced area. Just outside the fence, there would be a small control building and parking for service vehicles. Access to the substation would be from the LNG terminal emergency service road. An environmental assessment of these nonjurisdictional facilities is included in this EIS.

TABLE 1.6-1

Primary Issues Identified and Comments Received During the Public Scoping Process for the Weaver's Cove LNG Project

Issue	Specific Comments	EIS Section Where Comments are Addressed
ALTERNATIVES	alternatives including the no action alternative, alternative energies, the geographic range of potential alternatives, system alternatives, alternative onshore terminal sites including sites in less populated areas, the potential for offshore alternatives, alternative disposal options, and alternative pipeline routes and construction methods to minimize dredging, water and aquatic resource impacts, and visual and residential impacts	3.0
SOILS AND SEDIMENTS	the nature and level of potential contamination of soils and sediments, the effect and compatibility of placing the dredged sediments on the site, and potential impacts on the existing site remediation systems	4.2
WATER RESOURCES	dredging requirements including proposed equipment and timing, project impacts on water quality, need for future dredging, impacts of increased turbidity and the potential for release of chemicals into the water column, impacts on river flow, impacts of pipeline crossings	4.3
WETLANDS	impacts on wetlands and other sensitive habitats including salt marsh, forested wetlands, and intertidal areas, and mitigative measures to avoid or minimize wetland impacts	4.4
AQUATIC RESOURCES	impacts on fishery resources including federally managed species, quahogs, fish migration, spawning, and juvenile fish development, and mitigative measures to avoid or minimize impacts	4.6.2
LAND USE	land use impacts including impact on the future use of the property, effect on other ship and boat traffic in the Taunton River and Mount Hope Bay, consistency of the project with existing development and growth plans, impact on future commuter train service, impact on docks and marinas, impact on future plans to modify Route 79, consistency with coastal zone management policies and existing property deed restrictions, effect on the status of the Taunton River as a candidate for designation as a Wild and Scenic River, potential for easements to be acquired by eminent domain, the public benefit of dredging, recreational impacts including the impact on the Battleship Cove tourist area, and visual impacts associated with tree clearing, the storage tank, and lighting	4.8
SOCIOECONOMICS	socioeconomic issues including environmental and economic justice, impacts on traffic and emergency services during construction and operation of the proposed facilities, potential for and economic impact of bridge closures, impacts on property values and insurance rate, the demand of the project on local police and fire services, responsible parties to provide and finance required local services, and employment opportunities	4.9
CULTURAL RESOURCES	impacts on cultural resources including architectural resources and marine archaeological sites	4.10
AIR QUALITY AND NOISE	air and noise impacts including the effects of dust and emissions from construction equipment and during operations, the potential for odors, and noise associated with construction and operation of the proposed facilities	4.11
RELIABILITY AND SAFETY	reliability and safety issues including the nature of LNG, the safety of storing, shipping, and trucking LNG, the nature and adequacy of safety codes and regulations, safety and security measures to protect ships and the terminal and the expectation of the local community to be able to provide these services, the potential for terrorism, and the impact of thermal radiation and a vapor cloud in the event of an accident or attack, and evacuation plans	4.12
CUMULATIVE IMPACTS	cumulative impacts on the Taunton River and Mount Hope Bay as a result of the project and existing industrial activities	4.13

2.0 DESCRIPTION OF PROPOSED ACTION

2.1 EXISTING FACILITIES

The LNG terminal would be located at a contaminated site along the Taunton River in the City of Fall River, Massachusetts. The 73-acre site consists of a 55-acre riverfront parcel located between the CSX railroad and the river (referred to as the southern parcel) and an 18-acre parcel located between the railroad and North Main Street (referred to as the northern parcel). An aerial photograph showing the existing site conditions is provided on figure 2.1-1.

The industrial site was previously owned by Shell Oil Company (Shell Oil), who operated a marine petroleum products terminal at the site from the 1920s to the 1990s. Petroleum products (fuel oil, gasoline, kerosene, and naphtha) were transported to the facility via marine vessels, offloaded at an existing pier, and stored in numerous aboveground tanks. The products were shipped from the facility by truck, rail, and two pipelines (a 6-inch-diameter products pipeline and a 20-inch-diameter naphtha pipeline). Shell Oil discontinued the petroleum products operations in the 1990s, removed most of the storage tanks and associated facilities, and implemented a groundwater remediation program. The only existing structures remaining from Shell Oil's operation on the site include eight storage tanks, a wooden pier, an office building, and miscellaneous structures on the southern parcel. There are no existing structures on the northern parcel.

Shell Oil sold the property in 2001 to Fall River Marine, L.L.C., who added a small temporary pier in the Taunton River adjacent to the existing Shell Oil pier. Fall River Marine, L.L.C. is currently using the southern parcel of the site for the storage of construction equipment and materials and as a construction staging area for the Brightman Street Bridge project. Fall River Marine, L.L.C. is currently not using the northern parcel.

2.2 PROPOSED PROJECT

The Weaver's Cove LNG Project would consist of an LNG import terminal, two natural gas pipelines, and two meter and regulation stations located in Bristol County, Massachusetts. Weaver's Cove Energy proposes to construct and operate the LNG terminal in Fall River and the natural gas pipeline facilities in the City of Fall River and the Towns of Somerset, Swansea, and Freetown. The two meter and regulation stations would be located in Freetown and Swansea at the end of the two pipelines. A general project location map is provided on figure 2.2-1.

2.2.1 LNG Terminal

The LNG terminal facilities would include a ship unloading facility (marine terminal), an LNG storage tank, vaporization and vapor handling systems, LNG truck loading stations, and administrative and support buildings. All of these facilities except the administrative building would be constructed on the southern parcel. The administrative building and access roads would be constructed on the northern parcel. A layout of the proposed facilities is provided on figure 2.2.1-1.

2.2.1.1 Ship Unloading Facility (Marine Terminal)

The proposed project would include the construction and operation of a marine terminal that would be capable of handling LNG ships with cargo capacities up to 145,000 m^3. The facility would be capable of mooring and offloading one LNG ship at a time. Weaver's Cove Energy anticipates that approximately 50 to 70 ships per year would offload LNG at the proposed facility.

Insert figure

2.1-1 2003 Aerial Photograph of Proposed LNG Terminal Site

Insert figure

2.2-1 General Project Location

Insert figure

2.2.1-1 Proposed LNG Terminal Site Plan

The marine terminal would be located in the Taunton River approximately 225 feet from the shore to the outer edge of the unloading platform. It would consist of an 8,500 square foot unloading platform, a 3,400 square foot service platform, a pipeway/roadway trestle from the unloading platform to the shore, a trestle from the service platform to the shore, two breasting dolphins, four mooring dolphins, and access bridges connecting the dolphins to the platforms. A control room would be located along the jetty to the unloading platform to facilitate monitoring of ship unloading operations. The platforms would be cast-in-place reinforced concrete slabs supported on steel piles. A total of about 110 piles would be installed to support the platforms and trestles. The unloading platform and associated trestle would be constructed of curbed concrete decking and incorporated into the spill impoundment system (see section 2.8.1.1) to prevent the accidental release of LNG into the Taunton River.

An LNG transfer system would be installed on the unloading platform to transfer the LNG from the ship to the storage tank. This transfer system would consist of three 16-inch-diameter unloading arms for liquid transfer to the storage tank and a 16-inch-diameter arm for vapor return to the ship. A 30-inch-diameter cryogenic transfer line would connect the liquid unloading arms to the tank and a 20-inch-diameter line would connect the tank to the vapor return arm. Onboard ship pumps would be used to pump the LNG through the transfer system and into the storage tank. An additional 4-inch-diameter cooldown line would be installed through the transfer line to maintain the system in a cold condition between ship unloadings.

Weaver's Cove Energy would design the marine terminal in accordance with applicable codes and standards, including but not limited to the Oil Companies International Marine Forum, Society of International Gas Tanker and Terminal Operators, American Petroleum Institute, and American Society of Civil Engineers. The facility would be designed to provide a safe berth for the receipt and support of LNG ships and to ensure the safe transfer of LNG cargoes from the ships to the onshore storage tank.

2.2.1.2 LNG Storage Tank

LNG unloaded from the ships would be stored in a 200,000 m^3 full containment storage tank at a pressure up to 3.0 psig. Figure 2.2.1-2 shows the conceptual design of Weaver's Cove Energy's proposed storage tank. The double-walled tank would have a primary inner container and a secondary outer container and would be designed so that both the self-supporting primary container and secondary container could independently contain the LNG. The inner container would be made of 9 percent nickel steel and the outer container would be pre-stressed reinforced concrete. A carbon steel domed roof would be constructed over the outer container. The diameter of the outer container and associated ring wall would be about 280 feet and the height of the storage tank would be about 195 feet from grade to top of the dome roof. The elevation of the bottom and top of the storage tank would be 25 and 220 feet above mean sea level (MSL), respectively. The storage tank would be supported on a stone column foundation system.

The insulated tank would be designed to store LNG at a temperature of -260° Fahrenheit (F). The annular space between the sidewalls of the inner and outer containers would be insulated with loose-fill expanded perlite and a fiberglass blanket. The suspended deck at the top of the tank would be insulated with fiberglass blanket and the bottom of the tank would be insulated with foam glass blocks.

Insert figure

2.2.1-2 Conceptual Design of LNG Storage Tank

Transfer piping would enter and exit from the top of the tank. There would be no penetrations through the inner or outer walls or bottom of the tank. Five low-pressure sendout pumps would be installed at the bottom of the tank to pump the LNG to external high-pressure pumps and the vaporizers.

An earthen dike would be installed around the storage tank to prevent LNG from flowing offsite in the event of an outer tank failure. The dike would be 15 feet high, 1,300 feet long, and 400 feet wide and would be capable of retaining greater than 100 percent of the total tank volume.

2.2.1.3 Vaporization System

LNG from the storage tank would be pressurized to 1,345 psig by five high pressure pumps and then vaporized so that natural gas can be sent out via the proposed natural gas pipelines. The pressurized LNG would be vaporized in four closed-loop shell and tube heat exchangers. This process would involve warming the LNG and converting it to back to a gaseous phase. Heat for the process would be provided by a 200° F water/ethylene-glycol mixture circulating through the heat exchanger. The water/ethylene-glycol mixture would be heated in 12 natural gas-fired heaters. The heaters would each be rated for 59 million British thermal units per hour (MMBtu/hr) input and would be equipped with ultra low nitrogen oxides (NO_x) burners. After leaving the vaporizers, the high pressure gas would be metered and odorized prior to discharge into the sendout pipelines.

Vaporization capacity under normal operating conditions would be 400 MMcfd. During peak demand periods, the system would be capable of vaporizing at a maximum rate of 800 MMcfd. The system would be designed to allow for future expansion to a vaporization capacity of 1,000 MMcfd.

2.2.1.4 Vapor Handling System

During normal operation, ambient heat input into the LNG storage tank would cause a small amount of LNG to vaporize, commonly referred to as boil-off gas. Some boil off of LNG would also be caused by other factors, such as barometric pressure changes, heat input from the LNG pumps, and ship vapor flashing. The boil off from the LNG storage tank would be compressed by the low pressure compressors and then passed through a condenser system where it would be combined with the outgoing LNG before being pumped up to pipeline pressure in the second stage pumps. During ship offloading, a portion of this vapor would be returned to the ship to compensate for the volume of liquid pumped out of the ship into the onshore LNG storage tank. During periods of no or minimal vaporization, a high pressure compressor would send the boil-off gas directly into the sendout pipelines. The vapor handling system would be a closed system designed to prevent the escape (venting) of vapor into the atmosphere; however, for safety reasons, two pressure relief valves (a heated atmospheric vent and a cold atmospheric vent) would be installed on the storage tank to prevent over pressuring within the tank.

2.2.1.5 Air Injection System

Depending on the source, the imported LNG may have a Btu content that is higher than the pipelines can accept. Weaver's Cove Energy would install an air injection system to reduce the heating value of the vaporized LNG so that the natural gas discharged from the facility would meet the specification of the Algonquin natural gas pipeline system. The system would consist of two parallel compressor trains, each containing a first-stage centrifugal compressor and a second-stage reciprocating compressor, injecting air into the vaporized LNG.

2.2.1.6 Truck Loading Stations

The LNG terminal would include four truck loading stations with scales to supply LNG to regional peak shaving facilities. The stations would be designed to load four LNG trucks simultaneously at a rate of 350 gallons per minute (gpm), and a maximum of 100 trucks per day. Weaver's Cove Energy anticipates that on average about 50 trucks per day would transport LNG from the facility. These trucks typically have a cargo capacity of 10,000 to 11,000 gallons (about 38 m^3). LNG trucks would gain access to the facility via New Street and Route 79 (see figure 2.2.1-1). Trucks arriving from the north and departing to the south would use the southbound ramps to Route 79 at the intersection of North Main Street and New Street. Trucks arriving from the south and departing to the north would travel on approximately 1,300 feet of North Main Street between the northbound ramps of Route 79 and New Street. Weaver's Cove Energy is currently consulting with the Massachusetts Highway Department (MassHighway) to determine if improvements to the North Main Street/Route 79 interchange are deemed necessary.

2.2.1.7 Boat Ramp

Weaver's Cove Energy proposes to construct a boat ramp at the site to provide access for Coast Guard security vessels and state and local safety vessels. The boat ramp would be located on the northern portion of the southern parcel. The ramp would be constructed of cast-in-place concrete slab-on-grade adjacent to a sheet pile bulkhead and pre-cast concrete panels supported on piles from the high tide line into the river. A floating dock with access ladders would be located near the end of the ramp.

2.2.2 LNG Ships

LNG could be shipped from a variety of sources around the world, including Algeria, Egypt, Nigeria, Qatar, Trinidad, and Venezuela. At this time, Weaver's Cove Energy has neither identified the source(s) of LNG supplies nor the LNG vessels that would be used in the trade. Although LNG vessels and their operation are directly related to the use of the proposed import terminal, they are not subject to the section 3 authorization sought in this application.

The ships that transport LNG are specially designed and constructed to carry LNG for long distances. LNG ship construction is highly regulated and consists of a combination of conventional ship design and equipment, with specialized materials and systems designed to safely contain liquids stored at temperatures of -260° F.

The following sections present a brief overview of the main design and safety features of a typical LNG ship that may transport LNG to the proposed terminal.

Profile

LNG ships have a distinctive appearance compared with other transport ships. An LNG ship has a high freeboard (i.e., that portion of the ship above water) because of the comparatively low density of the cargo. Because of the high freeboard, when compared with vessels such as an oil tanker, wind velocity can adversely affect the maneuverability of the ship, particularly at slow speed, such as during docking.

Hull System

All LNG ships are constructed with double hulls while most other liquid transport ships presently in use have single hull construction. Double hull construction increases the structural integrity of the hull

system and provides protection for the cargo tanks in case of an accident. The space between the inner and outer hulls is used for water ballast. The *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (Gas Tanker Code) and Coast Guard regulations require that LNG ships meet a Type IIG standard of subdivision, damage stability, and cargo tank location.

The Type IIG design ensures the LNG ship could withstand flooding of any two adjacent compartments without any adverse effect upon the stability of the ship. Type IIG design also requires that the cargo tanks must be a minimum of 30 inches from the outer hull and a minimum distance above the bottom of the ship equal to the beam of the ship divided by 15, or 6.5 feet, whichever is less. This distance is intended to prevent damage to the cargo tanks in case of low energy type accidents that might occur in harbors and during docking. Most large LNG ships have a distance of 10 to 15 feet between the outer hull and cargo tank.

Containment Systems

An LNG containment system on the ships consists principally of the cargo tank (sometimes called a primary barrier), the secondary barrier, and insulation. The containment system also includes cargo monitoring and control and safety systems.

Three basic tank designs have been developed for LNG cargo containment: prismatic free-standing, spherical, and membrane. The earliest form of LNG containment is the prismatic free-standing tank. It consists of an aluminum alloy or 9 percent nickel steel, self-supporting tank that is supported and restrained by the hull structure. Insulation consists of reinforced polyurethane foam on the bottom and the sides, with fiberglass on the top. The spherical tank design, also known as the Moss design, uses an unstiffened, spherical, aluminum alloy tank that is supported at its equator by a vertical cylindrical skirt, with the bottom of the skirt integrally welded to the ship's structure. This free-standing tank is insulated with multi-layer close-cell polyurethane panels. In the membrane containment system, the ship's hull constitutes the outer tank wall, with an inner tank membrane separated by insulation. Two forms of membrane are commonly used: the Technigaz membrane using stainless steel and the Gas-Transport membrane using Invar.

LNG tankers are of the double-hulled design regardless of the containment system used. A double bottom and double sides are provided for the full length of the cargo area and arranged as ballast tanks, independent of the cargo tanks. The double-hulled design provides greatly increased reliability of cargo containment in the event of grounding and collisions. Further, the segregated ballast tanks prevent ballast water from mixing with any residue in the cargo tanks.

Pressure/Temperature Control

A basic goal of all LNG containment systems is to maintain the LNG cargo at or near atmospheric pressure at the boiling temperature of the LNG (about -260° F). This is accomplished using "auto-refrigeration," a phenomenon that results from the constant heat flow into the tank and the removal of the associated vapor. The vapor ranges from 0.25 to 0.15 percent (by volume) per day and is used to supplement the bunker fuel in the ship's boilers. As a result, LNG ships have reduced emissions when compared with conventional oil-fired ships. LNG cargo tanks remain under a gas atmosphere to prevent contact with oxygen.

Ballast Tanks

Sufficient ballast water capacity must be provided to permit the ship to return to the loading port safely under various sea conditions. LNG cargo tanks are not used as ballast tanks because these tanks

must contain a minimal amount of LNG to remain at cryogenic temperatures. Consequently, LNG ships must be designed to provide adequate ballast capacity in other locations.

Ballast water tanks on LNG ships are arranged within the LNG ship's double hull. It is essential that ballast water not leak into the LNG containment system. To reduce the potential for leakage, the ballast tanks, cofferdams, and void spaces are typically coated to reduce corrosion. LNG ships are also periodically inspected to examine the coating and to renew it as necessary.

A ballast control system, which permits simultaneous ballasting during cargo transfer operations, is also incorporated into each LNG ship. This system allows the LNG ship to maintain a constant draft during all phases of its operation to enhance performance. Under normal operating conditions, ballast water would be taken onto the ship during LNG offloading at the marine terminal. A typical LNG ship would take on up to 14 million gallons of ballast water during offloading operations. The ballast water would be pumped at a maximum rate of about 16,000 gpm and an average rate of about 12,000 gpm over a 12- to 16-hour period. The intake aperture on the ships would be about 25 to 30 feet below the water surface. Ballast water would not be discharged to the Taunton River or Mount Hope Bay during unloading operations.

Ship Safety Systems

The LNG vessels used in this project must comply with all federal and international standards regarding LNG shipping. As such, ships that transport LNG to the project would be fitted with an array of cargo monitoring and control systems. These systems would automatically monitor key cargo parameters while the ship is at sea and during the remote control phase of cargo operations at the unloading facility.

The system includes provisions for pressure monitoring and control, temperature monitoring of the cargo tanks and surrounding ballast tanks, emergency shutdown of cargo pumps and closing of critical valves, monitoring of tank cargo levels, and gas and fire detection.

The LNG ships that transport LNG to the terminal would be fitted with many navigation and communication systems including:

- two separate marine radar systems, including automatic radar plotting and radio direction finders;
- LORAN-C receivers;
- echo depth finders; and
- a satellite navigation system.

All LNG ships also have redundant, independent steering control systems that are operable from the bridge or steering gear room to maintain rudder movement in case of a steering system failure.

Fire Protection

All LNG ships arriving at the terminal would be constructed according to structural fire protection standards contained in the *International Convention for the Safety of Life at Sea* (SOLAS). This would be done under the review and approval procedures of the Coast Guard.

LNG ships using the terminal would also be fitted with active fire protection systems that meet or exceed design parameters in Coast Guard regulations and international standards, such as the Gas Tanker Code and SOLAS including:

- a water spray (deluge) system that covers the accommodation house and central room, and all main cargo control valves;
- a traditional fire water system that provides water to fire monitors on deck and to fire stations found throughout the ship;
- a dry powder extinguishing system for LNG fires; and
- a carbon dioxide (CO_2) system for protecting the machinery, ballast pump room, emergency generators, cargo compressors, etc.

Crew Qualifications and Training

All officers and crews of the LNG ships using the terminal would comply with the *International Convention Standards of Training, Certification and Watch Keeping for Seafarers*. Key members of the crew must have specific training in the handling of LNG and the use of the safety equipment. Officers must receive simulator training in the handling of the ship and the cargo systems specific to the conditions at the project site. In addition, a North East Marine Pilot would board each ship at the mouth of Narragansett Bay and guide it through the federal navigation channel. According to Weaver's Cove Energy, a second pilot would board the ship prior to the Brightman Street Bridge to assist in transiting the bridge.

Ship Selection

The specific identity of LNG ships that would offload at the terminal would depend on the commercial terms of the LNG purchase agreements. Transportation could be provided by either the LNG buyer or supplier. The different contractual arrangements for LNG transport can result in ships of different sizes and countries of origin being used to transport LNG to the project. The LNG terminal would be designed to accommodate vessels with membrane containment systems and cargo capacities up to 145,000 m^3. An LNG vessel of this size would typically have a total length of about 950 feet, a beam (width) of about 145 feet, and a loaded draft of about 37.5 feet. Due to height restrictions at two of the bridges along the shipping route to the proposed LNG terminal (see section 4.12.5.1), large capacity vessels with Moss-type spherical cargo tanks would not be able to deliver LNG to the facility.

Ships using the terminal would comply with the Coast Guard regulations for LNG ships. This compliance is demonstrated by the operator of the LNG ship having proper certificates authorizing the transport of LNG as follows:

- United States Flag LNG Ship - The Coast Guard Certificate of Inspection must be valid and endorsed for the ship to transport LNG (46 CFR 154, 1979).
- Foreign Flag LNG Ship - The ship must have a valid Certificate of Compliance issued by the Coast Guard. The certificate is issued after the ship has proved that it complies with the Coast Guard regulations and after it has been satisfactorily inspected by a Coast Guard Marine Safety Office (46 CFR 154, 1979).

Both United States and foreign flagships must be annually inspected by the Coast Guard and the flag state. A Coast Guard Certificate of Inspection is required every 2 years. Coast Guard officers from

the Providence Marine Safety Office would board the LNG ships arriving at the mouth of Narragansett Bay to perform a security inspection and to assure compliance with safety standards. Weaver's Cove Energy would continually monitor ship operations to ensure that the operations are according to their established procedures and to ensure that the ships are maintained to all standards.

2.2.3 Pipeline Facilities

The natural gas pipeline facilities to connect the LNG terminal with the Algonquin interstate pipeline system would consist of two pipelines, totaling about 6.1 miles:

- a 24-inch-diameter, 2.5-mile-long pipeline that would be installed along a westerly route to Algonquin's 20-inch-diameter G-22 lateral; referred to as the Western Pipeline; and
- a 24-inch-diameter, 3.6-mile-long pipeline that would be installed along a northerly route to Algonquin's 16-inch-diameter G-20 lateral; referred to as the Northern Pipeline.

Both pipelines would have a design maximum pressure of 1,440 psig. Figures 2.2.3-1 and 2.2.3-2 show the locations of the Northern and Western Pipeline routes, respectively.

For most of its length, the Northern Pipeline route follows an abandoned naphtha pipeline right-of-way, adjacent to a single-track CSX railroad, through Fall River and into Freetown. About 2.7 miles of the Northern Pipeline route is located in Fall River and about 0.9 mile is located in Freetown. The Western Pipeline route crosses the Taunton River and mostly follows existing electric transmission line rights-of-way through Somerset and into Swansea. About 0.3 mile of the Western Pipeline route is located in Fall River, about 1.3 miles in Somerset, and about 0.9 mile in Swansea.

Aboveground facilities associated with the proposed pipelines include pig receiver and launcher facilities[1] at the beginning and end of each pipeline and meter and regulation stations at the interconnect of each pipeline with the Algonquin pipeline system. The meter and regulation station for the Northern Pipeline would be located within the Riverfront Business Park in Freetown adjacent to the Algonquin pipeline right-of-way. The meter and regulation station for the Western Pipeline would be located in Swansea adjacent to existing rights-of-way for the Algonquin pipeline and an electrical transmission line.

2.3 LAND REQUIREMENTS

2.3.1 LNG Terminal

The LNG terminal would be located on a 73-acre site on the east side of the Taunton River in Fall River. As discussed previously, the 73-acre site consists of two parcels: a 55-acre southern parcel and an 18-acre northern parcel, which are divided by an existing CSX railroad corridor (see figure 2.1-1). About 52.3 acres of the southern parcel would be used to construct the LNG terminal (i.e., LNG storage tank, process area, and ancillary facilities), the dredged material fill areas/landform, and access roads. About 17 acres of the 18-acre northern parcel would be used during construction for parking, a construction laydown area, and access roads. After construction, use of the northern parcel would be limited to about 2.0 acres for an administrative building, associated parking, access roads, and a small area for the stormwater drainage system. A layout of the proposed facilities is provided on figure 2.2.1-1. Additional information on the land use and requirements for the LNG terminal site is provided in section 4.8.1.1.

[1] A pig is an internal tool used to clean and dry a pipeline or to inspect a pipeline for damage or repair.

Insert figure

2.2.3-1 Proposed Northern Pipeline Route

Insert figure

2.2.3-2 Proposed Western Pipeline Route

The completed ship unloading facilities associated with the LNG terminal (i.e., unloading platform, service platform, trestles, breasting dolphins, mooring dolphins, and connecting walkways) would occupy an area about 150 feet wide and 1,080 feet long in the Taunton River and would replace the existing pier.

The dredging of the federal navigation channel and turning basin would disturb a total of about 191 acres of river bottom in Mount Hope Bay and the Taunton River. Of this total, about 136 acres would be associated with dredging of the federal navigation channel and about 54 acres would be disturbed to deepen and widen the turning basin. Another 1.3 acres of disturbance would be associated with dredging of a temporary construction access channel and installation of the pipeline across the river. Additional information on the proposed dredging activities is presented in section 2.4.1.3.

2.3.2 Pipeline Facilities

Construction of the pipeline facilities would disturb a total of about 65.5 acres of land, including the pipeline construction rights-of-way, temporary extra workspace, a pipe storage yard, aboveground facilities, and access roads. Of this total, 58.7 acres would be disturbed by the pipeline construction rights-of-way, 0.4 acre would be disturbed by temporary extra workspace, 4.0 acres would be disturbed by a pipe storage yard, 2.3 acres would be disturbed by aboveground facilities, and less than 0.1 acre would be disturbed by access roads.

Approximately 38.3 acres of the 65.5 acres used for construction would be required for operation of the project. Of this total, 36.0 acres would be for the pipeline permanent rights-of-way and 2.3 acres would be for the aboveground facilities. The remaining 27.2 acres would be allowed to revert to its former use. Table 2.3.2-1 summarizes the land requirements for the pipeline facilities.

Of the 3.6 miles of the Northern Pipeline route, about 3.5 miles (97 percent) would be constructed within an existing utility right-of-way, specifically the existing Shell Oil easement that includes two pipelines (a 6-inch-diameter former products pipeline and a 20-inch-diameter former naphtha pipeline) (2.2 miles), or adjacent to a transportation (i.e., road or railroad) right-of-way (1.3 miles). The remaining 0.1 mile (3 percent) would be constructed on newly created right-of-way located at the end of the pipeline route. The Northern Pipeline, as well as the existing utility right-of-way, is also routed along a single-track CSX railroad for about 2.8 miles. Of the 2.5 miles of the Western Pipeline route, about 1.8 miles (72 percent) would be constructed adjacent to or within existing utilities. The remaining 0.7 mile (28 percent) would be constructed on newly created right-of-way. The 0.7 mile of newly created right-of-way is comprised of 0.4 mile across the Taunton River and 0.3 mile at the end of the pipeline route.

Weaver's Cove Energy proposes to use a maximum 75-foot-wide construction right-of-way for the majority (89 percent) of the Northern Pipeline route. About 10 percent of the Northern Pipeline route would be constructed using a 50-foot-wide construction right-of-way to avoid buildings or structures or to stay within the existing Shell Oil easement. The remaining 1 percent of the route would be located across roads where the right-of-way would be as permitted by the local agencies. The majority of the Western Pipeline route (71 percent) would be constructed using a maximum of a 100-foot-wide construction right-of-way. About 24 percent of the Western Pipeline route would be constructed using a reduced construction right-of-way that would vary from 50 to 80 feet wide. The remaining 5 percent of the route would be located across roads where the right-of-way would be as permitted by the local agencies. For both the Northern and Western Pipeline routes, a 50-foot-wide permanent right-of-way would be maintained for operation and maintenance of the pipelines in all areas except at road crossings where the right-of-way width would be as permitted by the local agencies. The typical right-of-way cross sections that Weaver's Cove Energy would use for the Northern and Western Pipeline routes are provided in Appendix D.

TABLE 2.3.2-1

Summary of Land Requirements Associated with Construction and Operation of the Pipeline Facilities for the Weaver's Cove LNG Project

Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Northern Pipeline Route		
Pipeline Right-of-Way a/	32.2	21.7
Temporary Extra Workspace b/	0.0	0.0
Pipe Storage Yard	4.0	0.0
Aboveground Facilities	0.9	0.9
Access Roads	0.0	0.0
Northern Pipeline Route Subtotal	37.1	22.6
Western Pipeline Route		
Pipeline Right-of-Way c/	26.5	14.3
Temporary Extra Workspace	0.4	0.0
Pipe Storage Yard	0.0	0.0
Aboveground Facilities	1.4	1.4
Access Roads	<0.1	0.0
Western Pipeline Route Subtotal	28.4	15.7
Pipeline Facilities Subtotal		
Pipeline Right-of-Way	58.7	36.0
Temporary Extra Workspace	0.4	0.0
Pipe Storage Yard	4.0	0.0
Aboveground Facilities	2.3	2.3
Access Roads	<0.1	0.0
Pipeline Facilities Total	65.5	38.3

a/ Based on a maximum of a 75-foot-wide construction right-of-way. Some areas would have a reduced construction right-of-way to avoid buildings or structures or to stay within an existing right-of-way. Operation acreage is based on a 50-foot-wide permanent right-of-way in all areas except at road crossings where the right-of-way width would be as permitted by the local agencies (assumed to be about 15 feet).

b/ Weaver's Cove Energy has not yet identified temporary extra workspace requirements for the Northern Pipeline route.

c/ Based on a maximum of a 100-foot-wide construction right-of-way. Some areas would have a reduced construction right-of-way to avoid powerlines and other structures. Operation acreage is based on a 50-foot-wide permanent right-of-way in all areas except at road crossings where the right-of-way width would be as permitted by the local agencies (assumed to be about 15 feet).

In addition to the construction right-of-way, Weaver's Cove Energy has identified two temporary extra workspaces that would be required along the Western Pipeline route. The first temporary extra workspace would be located at about milepost (MP) 0.5 and is needed to facilitate the crossing of the Taunton River. This temporary extra workspace would require 0.2 acre of open land. The second temporary extra workspace would be located at about MP 2.2 and is needed to install an underground AC mitigation structure. This temporary extra workspace would require 0.2 acre of forested land. Weaver's Cove Energy has not yet identified temporary extra workspace requirements along the Northern Pipeline route.

To support construction of the Northern and Western Pipelines, Weaver's Cove Energy proposes to use one pipe storage yard located near the end of the Northern Pipeline route within the Riverfront Business Park. The yard would require about 4.0 acres of open land that was previously used as a pipe/contractor yard.

Weaver's Cove Energy proposes to construct two meter and regulation stations, one at the end of the Northern Pipeline (MP 3.6) and one at the end of the Western Pipeline (MP 2.5) where each interconnects with the Algonquin pipeline system. A portion of each meter and regulation station site would be fenced and would include metering and regulation facilities; pig launcher and receiver facilities; a data acquisition building that would house communication and other electronic equipment; an area reserved for future regulators, heaters, and filters; a light pole; and a paved driveway and parking area. The meter and regulation station at the end of the Northern Pipeline route would require 0.9 acre for construction and operation. The meter and regulation station at the end of the Western Pipeline route would require 1.4 acres for construction and operation. The fenced area would be about 1.0 acre with the remaining 0.4 acre consisting of a cleared area around the perimeter of the fence.

Weaver's Cove Energy proposes to use existing public roads to gain access to the construction right-of-way associated with the Northern Pipeline route. Access to the meter and regulation station at the end of the Northern Pipeline would be on existing paved roads within the Riverside Business Park. Weaver's Cove Energy would construct one new access road to the construction right-of-way associated with the Western Pipeline route at about MP 1.5. The proposed access road would use portions of a small existing gravel road from Wellesley Drive. Weaver's Cove Energy would extend the road to the construction right-of-way. Less than 0.1 acre of forested land (0.03 acre) would be affected by construction and operation of this access road. The affected area is within a proposed permanent extension of Wellesley Drive. Weaver's Cove Energy would also construct an access road to the meter and regulation station at the end of the Western Pipeline. The proposed access road would be from Stevens Road and would utilize the existing Algonquin G-22 pipeline right-of-way. The existing drive covers about 0.4 acre of open land. The proposed access road would be built within the footprint of the existing drive and would not require any additional land.

2.4 CONSTRUCTION PROCEDURES

This section describes the general procedures proposed by Weaver's Cove Energy for construction of the LNG terminal and pipeline facilities. Refer to section 4 for more detailed discussions of proposed construction and restoration procedures as well as additional measures that we are recommending to mitigate environmental impacts.

The proposed LNG terminal and natural gas pipelines would be designed, constructed, operated, and maintained in accordance with federal safety standards that are intended to ensure adequate protection for the public and to prevent LNG and natural gas pipeline accidents or failures.

Under the provisions of the Natural Gas Pipeline Safety Act of 1968, as amended, Weaver's Cove Energy would design, construct, operate, and maintain the LNG terminal facilities in accordance with the DOT Federal Safety Standards for Liquefied Natural Gas Facilities, 49 CFR 193. The facilities would also meet the National Fire Protection Association (NFPA) Standards for the Production, Storage, and Handling of LNG (NFPA 59A). These standards specify siting, design, construction, equipment, and fire protection requirements for new LNG facilities. The ship unloading facilities and any appurtenances located between the LNG ships and the last valve immediately before the LNG storage tank would comply with applicable sections of the Coast Guard regulations for Waterfront Facilities Handling LNG, 33 CFR 127 and Executive Order 10173.

The proposed pipeline facilities would be designed, constructed, operated, and maintained in accordance with DOT regulations in 49 CFR 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards. Among other design standards, 49 CFR 192 specifies pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel. In addition, Weaver's Cove

Energy would comply with the siting and maintenance requirements in 18 CFR 380.15 and other applicable federal and state regulations.

Weaver's Cove Energy would construct the facilities in accordance with the FERC's Upland Erosion Control, Revegetation and Maintenance Plan (FERC Plan) and Wetland and Waterbody Construction and Mitigation Procedures (FERC Procedures). The FERC Plan and FERC Procedures are provided in Appendices E and F, respectively.

Weaver's Cove Energy would be required to develop onshore and offshore Spill Prevention, Containment and Countermeasure Plans (SPCC Plans) to be implemented during construction of the facilities. The SPCC Plans must address potential spills of fuels, lubricants, and other hazardous materials and describe spill prevention practices, spill handling and emergency notification procedures, and training requirements.

2.4.1 LNG Terminal

Construction of the LNG terminal facilities would include onsite reuse of the dredged material from the Taunton River and Mount Hope Bay; construction of the LNG storage, process, and support facilities; and construction of the ship unloading facility along the shoreline of the Taunton River. Associated construction activities would include dredging of the federal navigation channel and turning basin in the Taunton River and Mount Hope Bay.

2.4.1.1 LNG Storage and Process Facilities

Site Preparation

The first step in the construction of the LNG storage tank and process facilities would be site preparation, including demolition and removal of existing petroleum tanks and structures and placement of fill material. The tanks, structures, equipment, and piping associated with the abandoned petroleum products facility would be removed and salvaged or disposed of at an approved landfill. Underground utilities, paved areas, dikes, berms, walls, and perimeter fencing would be left in place for at least portions of the construction process. Some of the concrete foundations would be removed while others would be left in place and covered with fill material. The current owner of the property, Fall River Marine, L.L.C., would be responsible for removing the remaining storage tanks and structures prior to the sale of the property to Weaver's Cove Energy.

Weaver's Cove Energy proposes to reuse the sediments generated during the maintenance and improvement dredging of the federal navigation channel and turning basin at the LNG terminal site (see section 2.4.1.3). The dredged material would be dewatered and supplemented with a portland cement admixture to improve workability and handling characteristics and to provide a structurally stable material for site development (see section 4.2.2). Pre-mixed and ready to use portland cement would be obtained from a local company. Depending upon contractor preference, production rates, efficiency, and end product suitability, one or more of the following methods would be used to mix the dredged material and Portland cement at the site:

- mixing mill (i.e., pug mill, batch plant) – the dredged material would be mechanically or hydraulically offloaded from the barges/scows into the mill hopper feed stock and mixed with portland cement in the mixing mill. The stabilized material in the mill output would be transported by conveyor belt to a temporary stockpile and then hauled by truck to the final placement location;

- spread and till (i.e., land application followed by harrowing or tilling) – the dredged material would be mechanically offloaded from the barges/scows into trucks and hauled to the final placement location. The dredged material would be spread into about 12-inch-thick lifts within contained areas. Portland cement would be applied to the surface of the material and tilled or harrowed to incorporate the cement into the dredged material; and

- in-barge (i.e., mechanical mixing in barge using hydraulic excavator) – the portland cement would be added directly to the dredged material in the barges/scows and mixed using a hydraulic excavator. Once the dredged material/portland cement mixture cures, the stabilized material would be mechanically offloaded from the barges/scows and hauled to the final placement location.

After the portland cement is mixed with the dredged material, the stabilized material would be placed on the site in earthen lifts and compacted to specifications. The stabilized dredged material would be used to raise the site up to design grade, to construct an earthen berm around the storage tank and process facilities, and to construct an earthen landform east of the process facilities. The depth of dredged material placed at the site would range from 5 feet in the process area to 25 feet in the marine and LNG service areas. About 70 to 80 feet of dredged material would also be placed in the landform area. The landform would be constructed in phases and stabilized using a combination of perimeter retaining walls and earthen sideslopes. Figure 2.4.1-1 shows the approximate ground surface elevations of the LNG terminal site after the dredged material is placed and graded on the southern parcel and figure 2.4.1-2 shows conceptual typical cross sections.

Shoreline Stabilization

The shoreline would be stabilized using sheet pile and stone rip rap. The majority of the shoreline (approximately 2,300 feet) would be stabilized with a combination of sheet pile and rip rap. The new sheet pile bulkhead would be installed landward of the existing timber bulkhead and rip rap. About 350 feet of additional shoreline along the northern end of the southern parcel would be stabilized with only a sheet pile bulkhead constructed landward of an existing coastal dune located in this area.

Foundation Installation

Once the site has been filled, compacted, and graded to the required level and the shoreline stabilized, the next step would be construction of foundations for the storage tank, buildings, major equipment, and pipe racks. Based on geotechnical and seismologic studies (Environmental Resource Management et al., 2003), Weaver's Cove Energy determined that the foundation for the storage tank would need to be supported on stone columns installed in a grid pattern at 8 to 10 foot on-center and to a depth of 50 to 55 feet below the ground surface. Structural fill material would be placed on top of these stone columns to maintain the required grade, and the concrete foundation for the tank would be constructed on the columns at finished grade. Stabilized dredged material would not be used for structural fill material in the tank area. Concrete foundations for other major structures, including buildings, major equipment, and pipe racks, would be installed on the stabilized dredged material at finished grade.

Insert figure

2.4.1-1 Proposed Ground Surface Elevation on Southern Parcel

Insert figure

2.4.1-2 Conceptual Typical Cross Sections

Storage Tank Installation

One of the more labor intensive and time-consuming activities would be the construction of the full containment storage tank, requiring about 28 months. After the foundation of the tank is installed with embedded heating system conduits, to prevent sub-base freezing from the stored LNG, tank construction would consist of the following sequential activities:

- construction of the outer concrete walls to full height;
- installation of the outer bottom on the foundation;
- construction of the outer steel roof and suspended deck;
- installation of the bottom insulation;
- installation of the liner plates to the inner wall of the outer concrete container;
- construction of the 9 percent nickel steel inner container;
- installation of internal tank accessories, roof platforms, walkways, and piping;
- hydrostatic testing of the inner tank; and
- installation of insulation in the annulus between the inner and outer container walls.

The storage tank would be hydrostatically tested in accordance with DOT regulations to ensure that the tank is capable of operating at the design pressure. Approximately 32 million gallons of water obtained from either a municipal source or from the Taunton River would be used to test the tank. If brackish water from the Taunton River would be used for testing, special procedures (e.g., rinsing with freshwater, limiting exposure time) would be implemented to prevent corrosion of the inner tank and components. The testing process involves filling the inner tank to about 60 percent capacity and maintaining it for about 2 weeks. No chemicals would be added to the test water. After testing, the water would be discharged to the Taunton River in accordance with the FERC Procedures and permits issued by the EPA or the DEP.

Other Facility Construction

During the construction of the storage tank, other facility structures and buildings would be constructed and major mechanical and electrical equipment, process and utility piping, and instrumentation would be installed. The facilities would be connected to municipal water and sewer systems using existing connections at the site. An electrical substation and a new 115kV tap would be constructed at the north end of the site to provide electrical power to the LNG terminal. All of these facilities would be completed and pre-commissioned in readiness for completion of the storage tank.

Final Grading and Site Restoration

Areas on the southern parcel disturbed during reuse of the dredged material and construction of the LNG terminal would be final graded at elevations generally ranging from 20 to 40 feet above MSL. A large earthen landform with a maximum height ranging between about 148 feet and 188 feet MSL would be constructed with stabilized dredged material in the southern parcel between the railroad tracks and the process area. After final grading, the areas around the process buildings, equipment, piping, and storage tank would be covered with geotextile fabric, as needed, and crushed rock. Other disturbed areas, including the earthen landform, would be covered with a layer of topsoil, if needed to support vegetation, and planted with vegetation in accordance with a landscaping plan and/or covered with material other than vegetation (e.g., crushed rock). Weaver's Cove Energy has indicated that for safety reasons the earthen dike and portions of the earthen landform (i.e., the lower elevations of the landform along the western slope) would be covered with crushed rock. Other areas such as around the pipeline launchers, adjacent to the remediation building, the boat ramp access road, and along the shoulders of other access

roads would also be covered with crushed rock. A computer-generated image of the southern parcel of the proposed LNG terminal is provided on figure 2.4.1-3.

Based on preliminary design plans, the northern parcel of the LNG terminal site would be mostly cleared and filled with stabilized dredged material from the dredging operations. The southern portion of the northern parcel would be cleared for use as a temporary laydown and parking area during construction. Weaver's Cove Energy does not have any plans for this area after construction of the terminal facilities and would restore it to existing conditions. The northern portion of northern parcel may also be used for temporary construction laydown and parking but existing mature trees would be maintained to the extent practicable. The middle portion of the northern parcel would be developed with an administrative building, parking lot, access roads, and a stormwater management system and restored in accordance with Weaver's Cove Energy's grading and landscaping plans. A 15-foot-wide vegetated buffer zone would be maintained along the property line adjacent to North Main Street both during and after construction, and mature trees in this buffer zone would be maintained as part of the landscaping plan. In addition, the existing trees along the property line adjacent to the railroad tracks would also be maintained to the extent practicable.

Hydrostatic Testing

Weaver's Cove Energy is currently planning on obtaining water for hydrostatic testing of the LNG storage tank and LNG plant piping from the City of Fall River. Weaver's Cove Energy would coordinate with the City to ensure that water requirements for hydrostatic testing from municipal sources would not impact public water availability. Approximately 32 million gallons of water would be needed to test the LNG tank and piping. Based on current plans to obtain water from the City of Fall River, Weaver's Cove Energy estimates that filling the LNG storage tank would take between 5 to 11 days at a withdrawal rate of between 2,000 to 4,000 gpm. If the City of Fall River is not able to provide the required volumes for testing, Weaver's Cove Energy may obtain hydrostatic test water for the LNG storage tank and LNG plant piping directly from the Taunton River. If water is appropriated from the Taunton River, Weaver's Cove Energy would attach a temporary 12- to 14-inch-diameter pipe to the newly constructed pier. The intake pipe would be set at a depth of 5 feet below mean lower low water (MLLW) and would be fitted with a fine mesh screen to minimize potential entrainment and impingement of aquatic organisms. If water is appropriated from the Taunton River, Weaver's Cove Energy estimates that the appropriation rate would need to be increased by approximately 3,000 gpm (i.e., a withdrawal rate of between 5,000 to 7,000 gpm) to reduce the residence time in the LNG tank and the potential for microbiologically influenced corrosion.

Based on the sources and appropriation rates described above, the hydrostatic test water would not require pre-treatment and no chemical additives (e.g., biocides or neutralizing agents) would be mixed with the water during the testing or prior to discharge. After the hydrostatic testing is completed, Weaver's Cove Energy proposes to discharge the test water directly into the Taunton River over a period of several days. The water would be filtered prior to discharge and would be returned at a rate and location that would minimize bottom disturbance and potential impacts on aquatic resources. The discharge of hydrostatic test water would be conducted in accordance with the FERC Procedures and the NPDES permit(s) issued by the DEP and/or EPA. The discharge of water would also be controlled, as necessary, to prevent erosion or scouring of the banks or bed of the river.

Insert figure

2.4.1-3 Computer-Generated Image of Proposed LNG Terminal

2.4.1.2 Ship Unloading Facility

After the existing wooden pier and associated structures are removed and the adjacent shoreline stabilized with sheet piling, the berthing area in the vicinity of the mooring structures would be dredged to a depth of 41 feet to allow for LNG ship access. The berthing area would be dredged in conjunction with the dredging of the turning basin. Section 2.4.1.3 provides additional information on the proposed dredging and dredged material reuse activities.

Construction of the ship unloading facility would consist of driving steel piles; erecting structures for the mooring and breasting dolphins and the unloading and service platforms on the piles; installing unloading arms, piping, decking, bridges, and other equipment and instrumentation on the dolphins and platforms; and constructing the trestles from the shore to the unloading and service platforms. Concrete elements would include cast-in-place slabs and pile caps and pre-cast planks.

2.4.1.3 Dredging and Dredge Disposal

The proposed dredging and dredge disposal activities would include dredging the sediments within the federal navigation channel and turning basin and reusing the dredged material at the LNG terminal site. These dredging and dredged material reuse activities are summarized in this section. A more detailed description of these activities is provided in Weaver's Cove Energy's *Dredging Program Report* (Concept2Delivery (C2D), 2003). An electronic copy of this report is available under the "Proposal" link on Weaver's Cove Energy's website at www.weaverscove.com.

Dredging Activities

Weaver's Cove Energy proposes to dredge select areas within the federal navigation channel and turning basin to accommodate passage of LNG ships to the facility. The proposed dredging areas are shown on figure 2.4.1-4. Up to about 2.6 million cubic yards of sediment would be dredged from about 191 acres of the Taunton River and Mount Hope Bay as summarized in table 2.4.1-1.

TABLE 2.4.1-1

Summary of Dredge Volume and Area Estimates

Dredge Segment	State	Dredge Volume (cubic yards)			Dredge Area (acres)
		Target Depth	Overdredge a/	Total	
Federal Channel – Mount Hope Bay	Rhode Island	144,012	88,494	232,506	33
	Massachusetts	312,497	133,693	446,190	55
Federal Channel – Taunton River	Massachusetts	619,512	156,470	775,982	48
Turning Basin – Taunton River	Massachusetts	987,464	81,577	1,069,041	54
Construction Access Channel – Taunton River	Massachusetts	40,052	3,548	43,600	0.8
Western Pipeline Crossing – Taunton River	Massachusetts	33,000	0	33,000	0.5
TOTALS		2,136,537	463,782	2,600,319	191

a/ These dredge volume estimates are based on Weaver's Cove Energy's proposed 1 foot of overdredge.

Insert figure

2.4.1-4 Proposed Dredging Areas

The main federal navigation channel would be dredged to a target depth of 37 feet below MLLW. This target depth is 2 feet deeper than the federally authorized depth of 35 feet below MLLW. The horizontal limits of the dredging would be confined to the existing 400-foot-wide channel. A small portion of the East Channel, a channel with a federally authorized depth of 30 feet below MLLW located upstream of the Braga Bridge, would also be dredged to 37 feet below MLLW. This area would be dredged to facilitate ship maneuvering through the channel bends upstream of the bridge. Weaver's Cove Energy is proposing to bring the LNG ships to the proposed LNG terminal during a rising tide. Because the mean tidal range is 4.4 feet, the effective depth of the dredged navigation channel would be about 41 feet. The turning basin would be widened to a width of about 550 to 1,400 feet and deepened to a depth of 41 feet below MLLW to facilitate turning or moving LNG ships under any tidal conditions.

Weaver's Cove Energy has indicated that dredging depths would include a 1-foot allowance for overdredging. However, several agencies have commented that 2 feet is the typical allowance for mechanical dredging projects in this region, including the Providence River and Harbor Maintenance Dredging Project. These agencies believe that it is not practical to maintain 1-foot of overdredge using large excavators or cranes with clamshell buckets in deeper water. Furthermore, these agencies believe that the 1-foot overdredge allowance proposed by Weaver's Cove Energy may underestimate the total dredge volume for the project. Using a 2-foot overdredge allowance, an additional 464,000 cubic yards could be dredged, resulting in a total dredge volume of up to about 3.1 million cubic yards. Overdredge allowances are further discussed in section 4.2.2.

Dredging within the federally authorized limits of the navigation channel (i.e., 35 feet deep and 400 feet wide in the main channel and 30 feet deep in the East Channel) and the permitted limits of the turning basin is considered maintenance dredging. Maintenance of a federal navigation channel is generally the responsibility of the COE. Dredging beyond the federally authorized limits is considered improvement dredging. Of the total amount of dredging required, about 34 percent (by volume) would be maintenance dredging and about 66 percent (by volume) would be improvement dredging (which includes 1 foot of overdredge). Weaver's Cove Energy proposes to conduct and finance both the improvement and maintenance dredging for the project.

The sediments would be dredged mechanically using a spud-secured, barge-mounted crane (or long-arm excavator) with buckets ranging in size from 7 to 26 cubic yards. To minimize impacts on aquatic resources (see section 4.6.2), Weaver's Cove Energy has indicated that it would use closed buckets to dredge the fine-grained depositional sediments and open buckets to dredge the more coarse-grained native materials. Open buckets are open at the top and not sealed at the mouth, which allows dredged material to spill out while the bucket is hoisted through the water column. A closed bucket is sealed and does not allow the material to spill out during dredging. The dredged material would be placed in scows or on barges for transport to the LNG terminal site. As an additional mitigative measure, Weaver's Cove Energy has indicated that it would not allow any significant scow overflow during the dredging operations. Weaver's Cove Energy anticipates that 15 to 20 scows or barges with capacities of 4,000 cubic yards each would be used on the project.

Tugs would be used to position the dredge barge and to haul scows to and from the disposal site. Other equipment used in the dredging operations would include deck barges and work boats to transport fuel, equipment, raw materials, and personnel to the dredge site. At this time, Weaver's Cove Energy anticipates that the dredging operations would need two tugs, two deck barges, two work boats, and a survey vessel. The LNG terminal site and existing piers and ramps in the project area would be used for staging areas, launch facilities, and offices to support the dredging operations.

Based on studies conducted to characterize the sediments and model the fate and transport of resuspended sediments in the channel and on consultations with state and federal agencies regarding the

dredging operations (see sections 4.3.2 and 4.6.2), Weaver's Cove Energy proposes to use the following bucket types and operating limits:

- Within the federal navigation channel downstream of the Braga Bridge which includes all of the dredging required in Rhode Island waters, Weaver's Cove Energy proposes to use a maximum 15 cubic yard bucket year round;

- Within the federal navigation channel upstream of the Braga Bridge, Weaver's Cove Energy proposes to use a maximum 26 cubic yard bucket year round; and

- Within the turning basin, Weaver's Cove Energy proposes to use a maximum 26 cubic yard closed bucket for dredging the fine-grained depositional sediments and a maximum 15 cubic yard open bucket for dredging the native materials. To minimize impacts on aquatic organisms, no dredging would be conducted in the turning basin during the months of February, March, and April.

Weaver's Cove Energy proposes to optimize the dredge production rates in the federal navigation channel and turning basin with the dredged material stabilization and placement production rates on the terminal site to the extent practicable. These production rates would vary depending on the dredging area, the types of sediments, and the dredged material placement area. Weaver's Cove Energy estimates that optimum production rates would range from about 2,000 cubic yards per day for dredging the navigation channel downstream of the Braga Bridge and placing the dredged material near the top of the earthen landform to about 8,000 to 10,000 cubic yards per day for dredging the turning basin and placing the dredged material to about 40 feet above MSL on the terminal site. Dredging and stabilization operations would be conducted up to 24 hours a day and placement of the material on the site would be conducted during daylight hours.

Dredged Material Reuse Activities

The dredged material would be transported in the scows or barges to the LNG terminal site for upland reuse. Once the barges and scows are transported to the site, any excess water would be removed by pumping into an upland settling basin for further clarification or directly into the Taunton River. The discharge method would be determined based on testing of the discharge water and the discharge limits for total suspended solids specified in the permits for the dredging activities. The portland cement would be added to the dewatered dredged material and then the stabilized material would be placed on the terminal site in earthen lifts and compacted to specifications (see section 2.4.1.1).

Weaver's Cove Energy proposes to place most of the stabilized dredged material on the southern parcel of the LNG terminal site. Some stabilized dredged material would be placed on the northern parcel and used as engineered fill material to establish the final grade. As discussed previously, a large landform would be constructed on the southern parcel, using some of the stabilized dredged material, to facilitate the placement of all the material on the site (see figure 2.4.1-3). Using Weaver's Cove Energy's estimated dredge volume (2.6 million cubic yards, which includes 1 foot of overdredge), the addition of 8 percent (by mass) of portland cement and a sediment reduction factor of 0.80, we have estimated that the volume of stabilized dredged material to be placed on the site would be about 2.1 million cubic yards (see section 4.2.2). Using preliminary grading plans provided by Weaver's Cove Energy, we estimated that the southern parcel could accommodate over 3 million cubic yards of stabilized dredged material. Our analysis is supported by Weaver's Cove Energy's comments on the draft EIS, which documented that the entire LNG terminal site could accommodate up to 3.3 million cubic yards of stabilized dredged material. Therefore, it appears that all of the proposed dredged material could be reused on the site, even if the proposed overdredge allowance of 1 foot is exceeded by an additional 1 foot.

In response to agency comments, Weaver's Cove Energy conducted a Tier III sediment analysis to evaluate the feasibility of disposing a portion of the dredged material at an offshore location (see section 4.2.2). Based on the results of this analysis, Weaver's Cove Energy determined that the dredged material would be suitable for offshore disposal. If the COE and EPA concur with this determination, the dredged material could be disposed of at an offshore site and thus less dredged material would need to be reused on the LNG terminal site. Any future offshore disposal proposal or change in the proposed project design would require an additional review and approval process from the FERC.

2.4.2 Pipeline Facilities

Construction of the Northern and Western Pipelines would primarily involve standard cross-country pipeline construction techniques as described in section 2.4.2.1. Due to constraints which limit the work area and the width of the construction right-of-way (e.g., residences and structures within 25 feet of the proposed construction right-of-way), a special construction technique referred to as stovepipe construction would be used to install portions of the pipelines. Special construction techniques would also be used when constructing the pipelines across waterbodies, wetlands, residential areas, roads, and railroads. These special construction techniques are described in section 2.4.2.2.

2.4.2.1 General Construction Techniques

Figure 2.4.2-1 shows the typical steps of cross-country pipeline construction. Standard pipeline construction proceeds in the manner of an outdoor assembly line composed of specific activities that make up the linear construction sequence. These operations collectively include survey and staking of the right-of-way, clearing and grading, trenching, pipe stringing and bending, welding and coating, lowering-in and backfilling, hydrostatic testing, and cleanup.

Survey and Staking

Before construction, Weaver's Cove Energy crews would survey and stake the centerline and exterior boundaries of the construction right-of-way. The exterior boundary stakes would mark the limit of approved disturbance areas and would be maintained throughout the construction period. Utility lines would be located and marked to prevent accidental damage during pipeline construction. During this period, equipment involved in pipeline construction would be moved onto the right-of-way using existing roads for access wherever practicable.

Clearing and Grading

Weaver's Cove Energy would clear the right-of-way of shrubs and trees, treating timber in accordance with agency regulations or the preferences of private landowners. Trees would be stockpiled to the side or removed from the right-of-way before any soil disturbance activities in order to prevent soil mixing with cut timber. Because Weaver's Cove Energy has indicated that it would follow the FERC Plan, a maximum of 12 inches of topsoil would be required to be stripped from the trench and spoil storage area and placed at the edge of the right-of-way in residential areas. If there is inadequate space for segregating topsoil, the FERC Plan would allow for the importation of topsoil in residential areas.

Insert figure

2.4.2-1 Typical Pipeline Construction Sequence

Trenching

Backhoes or trenching machines would be used to excavate a trench approximately 5 to 6 feet deep to provide a minimum 3-foot depth of cover. The trench walls would generally be sloped outward. Depending on soil conditions, the top of the trench would typically be 9 to 12 feet wide and the bottom of the trench would typically be between 3 and 4 feet wide. In unstable and saturated soils, the trench could be wider. For the Northern Pipeline, the existing naphtha pipeline would be removed during the trenching and the new pipeline would be installed in this trench to the extent practicable.

Spoil material excavated during trenching operations would be temporarily piled to one side of the right-of-way adjacent to the trench. In areas where topsoil stripping is required, the topsoil and subsoil would be stored in separate windrows or piles on the construction right-of-way and would not be allowed to mix. Where trench dewatering is needed, water would be discharged directly to the ground if there is adequate vegetation along the right-of-way to function effectively as a filter medium. Where vegetation is sparse or absent, or in environmentally sensitive areas (e.g., adjacent to streams or wetlands), hay bale filters or suitable filtering alternatives would be used to limit siltation.

Stringing and Bending

Either before or after trenching, individual joints of pipe would be strung along the right-of-way adjacent to the excavated trench and arranged to be accessible to construction personnel. This operation typically involves specially designed stringing trucks to deliver pipe from the pipe yard to the right-of-way. Small portable cranes and/or side-boom tractors are used to unload the stringing trucks and place the pipe along the trench line. A mechanical pipe-bending machine would bend individual joints of pipe to the desired angle to accommodate changes in the natural ground contour or pipeline alignment. In certain areas, prefabricated fittings would be used where field bending is not practicable.

Welding and Coating

After stringing and bending are complete, pipe sections would be aligned, welded together, and placed on temporary supports along the edge of the trench. Weaver's Cove Energy would inspect all welds, both visually and radiographically (i.e., x-ray), and would make repairs, if necessary. The pipe is typically delivered with a factory coating of fusion-bonded epoxy or similar material. Weaver's Cove Energy would apply coating at welded joints and would electronically inspect the entire pipeline coating to locate any flaws. All flaws in the coating would be repaired before the pipe is lowered into the trench.

Lowering-in and Backfilling

After welding and coating are completed, the pipe would be lowered into the trench by side-boom tractors. Bladed equipment or a specially designed backfilling machine would be used to backfill the trench. No construction debris, including wooden supports, welding rods, containers, brush, trees, or refuse of any kind, would be permitted in the backfill. If rocks are present in the backfill, the pipeline would be protected with rock shields or similar protective coating and/or backfilled with clean padding prior to backfilling with the rocky material.

Hydrostatic Testing

After backfilling, Weaver's Cove Energy would hydrostatically test the pipeline in accordance with DOT regulations to ensure that the system is capable of operating at the design pressure. The testing process involves filling a segment of the pipeline with water and maintaining a prescribed pressure for a

specified amount of time. If a leak or break in the line were to occur during testing, Weaver's Cove Energy would repair and retest that section of pipe until DOT specifications are met.

The length of individual test segments would be determined by topography and water availability. Weaver's Cove Energy is currently planning on obtaining water for hydrostatic testing of the Northern and Western Pipelines from the City of Fall River. If the City of Fall River is not able to provide the required volumes for testing, Weaver's Cove Energy may obtain hydrostatic test water directly from the Taunton River. Approximately 445,000 gallons would be needed to test the Northern Pipeline and approximately 315,000 gallons would be needed to test the Western Pipeline. The procedures for appropriating and discharging the hydrostatic test water are described in section 2.4.1.1.

Cleanup

After hydrostatic testing is completed, Weaver's Cove Energy would regrade and restore work areas as nearly as practicable to the original contour of the land. Topsoil would be respread over areas from which it was originally removed. Permanent soil stabilization efforts would primarily include revegetation of the right-of-way. Fences that are removed to install the pipelines would be reconstructed across the right-of-way.

Disposal of timber, slash, and rock would be in accordance with the desires of the landowner and consistent with local regulations and the FERC Plan. Marketable timber would be harvested, with logs stockpiled for later use by the landowner, disposed offsite, or chipped. Slash would be left in place to provide habitat diversity (with landowner consent), hauled offsite, or burned onsite in accordance with local regulations. Excess rock would be stockpiled onsite if requested by the landowner, or disposed of in an alternative, landowner- and FERC-approved upland area or permitted landfill.

Revegetation

The restored construction right-of-way would be revegetated in accordance with the FERC Plan, other permit requirements, and site-specific landowner requests. Turf, ornamental shrubs, and other landscaping material would be restored in accordance with landowner agreements.

2.4.2.2 Special Construction Techniques

Constricted Work Areas

Stovepipe construction techniques would be used in areas where site-specific conditions constrict the work area and limit the width of the construction right-of-way. This technique would involve excavating limited segments of open trench and installing the pipeline one pipe section at a time. Depending on the amount of workspace available, the excavated material would be either temporarily stored on the reduced construction right-of-way or hauled offsite for temporary storage. Once the pipe section is placed in the open trench, associated pipeline installation activities such as welding, radiography, and pipe coating would be conducted in the trench. The trench would be backfilled at the end of each day after the welding and coating processes are completed. If any open trench remains at the end of the work day, it would be covered with steel plates.

Waterbody Crossings

Weaver's Cove Energy proposes to install the pipeline across all minor waterbodies (i.e., waterbodies less than 10 feet wide) and the Taunton River, the only major waterbody (i.e., waterbodies greater than 100 feet wide), using the open-cut construction method. There are no intermediate

waterbodies (i.e., waterbodies between 10 and 100 feet wide) along either pipeline route. The waterbody crossings would be constructed in accordance with the FERC Procedures and applicable permits.

The minor waterbody crossings would involve excavation of the pipeline trench across the waterbody, installation of the pipeline, and backfilling of the trench with native material with no effort to isolate flow from construction activities. Excavation and backfilling of the trench would be accomplished using backhoes or other excavation equipment operating from one or both banks of the waterbody. Trench spoil would be stored at least 10 feet from the stream banks (topographic conditions permitting). Sediment barriers, such as silt fence and staked straw bales, would be installed to prevent spoil and sediment-laden water from entering the stream.

The Taunton River crossing would involve: dredging a pipeline trench in the river bottom to a depth of 10 feet below the existing bottom; welding and coating pipeline segments on a barge in the river; laying the pipe in the trench from the barge; and backfilling the trench with more coarse-grained material dredged from the deepest portion of the turning basin or other suitable material. The approximately 33,000 cubic yards of material dredged from the pipeline trench would be placed in a barge and transported to the LNG terminal site for stabilization and placement with the other dredged material. Material excavated near the banks of the river would be stockpiled at least 10 feet from the banks and enclosed with sediment barriers. Trench plugs would be installed on both sides of the river crossing to prevent water from entering the upland portions of the pipeline trench.

Wetland Crossings

Weaver's Cove Energy would construct the pipelines across wetlands in accordance with the FERC Procedures and applicable permits using standard cross country methods (i.e., excavating the pipeline trench across the wetland, stringing and welding the pipeline adjacent to the trench, installing the pipeline, and backfilling the trench with native material).

Woody vegetation would be cut off at ground level and removed from the wetlands leaving the root systems intact. Temporary erosion control devices would be installed as necessary immediately after initial disturbance of wetlands or adjacent upland areas to prevent sediment flow into wetlands, and would be maintained until revegetation is complete. Timber mats or terra mats would be used where necessary to stabilize the right-of-way for equipment, minimize rutting, and prevent the mixing of topsoil and subsoil. The pulling of stumps would not be permitted except in the area of the pipeline trench and in other areas where their removal is necessary for safety reasons.

In accordance with the FERC Procedures, topsoil would be stripped over the trench line to a maximum depth of 12 inches in unsaturated soils and placed in a separate spoil pile. Following installation of the pipe, the trench would be backfilled and the topsoil replaced. Trench plugs would be installed as necessary to maintain wetland hydrology. Natural contours of the wetland would be restored, any required permanent erosion control measures would be installed, and the area would be temporarily stabilized with appropriate vegetation to protect the wetland soil from erosion. Materials such as timber mats placed in wetlands during construction would be removed during final cleanup.

Residential Areas

Weaver's Cove Energy has indicated that it would use stovepipe construction techniques as described above near some residences along the pipeline routes to reduce the width of the construction rights-of-way and thus minimize the disturbance area. Weaver's Cove Energy would also install safety fencing along the edge of the right-of-way following clearing and grading in locations where residences are located within 100 feet of work areas; coordinate the crossings of private roads or driveways with area

residents; and develop site-specific construction plans for residences located within 50 feet of the construction rights-of-way. These plans would address concerns such as dust control, noise minimization, access by landowners or occupants, and safety near open trenches. Additional measures that would be implemented to minimize construction-related impacts on residences are discussed in section 4.8.3.

Roads and Railroads

Weaver's Cove Energy would construct road and railroad crossings in compliance with applicable state and local permits and approvals. Crossings at highways, paved roads, and railroads would be installed by boring underneath the crossing (bored crossing). Other roads and driveways would be bored or crossed by trenching across the road (open-cut crossing). If the road is open cut, the pipeline would be installed and the road repaired as quickly as possible. Any open trenches across roads would either be fenced or covered with steel plates during non-working hours.

Weaver's Cove Energy would also construct the Western Pipeline adjacent to two roads in Somerset (Riverside Avenue and Clifford M. Holland Road). The stovepipe method described above would generally be used to install the pipeline adjacent to these roads. Pipeline trenches adjacent to the roads would be backfilled or covered with steel plates daily. In addition, steel plates would be readily available to cover the trench in the event of an emergency that requires access across the trench.

2.5 CONSTRUCTION SCHEDULE

Weaver's Cove Energy proposes to begin construction of the Weaver's Cove LNG Project in mid-2005 after all permits and approvals have been obtained and anticipates that the entire project would take approximately 3 years to construct. Weaver's Cove Energy's planned in-service date would be in 2008.

After the initial site mobilizations and preparation activities are completed, installation of the stone columns for the storage tank would begin. Dredging, dredged material stabilization, and the placement and grading of the stabilized dredged material would also begin at this time and would be conducted almost continuously until the end of the project. Weaver's Cove Energy has indicated that these three activities, particularly the rate at which dredged material can be placed and graded on the site, would determine the length of time required to construct the proposed facilities.

Construction of the LNG storage tank would begin in 2005 and would take approximately 28 months to complete. Construction of the ship unloading and LNG process facilities would begin in 2006 after the filling and grading has been completed in these areas. Pipeline construction would be completed in the final year (2008).

The in-service date of the proposed LNG terminal is dependent on the schedule of the Brightman Street Bridge project, which is located downstream of the LNG terminal site. Due to their large size, LNG ships could not deliver LNG to the proposed terminal until after the new Brightman Street Bridge is completed and the existing bridge and associated bridge piers are removed. On October 13, 2004, we received a letter from the MassHighway indicating that construction of the new Brightman Street Bridge and demolition of the existing bridge would be completed some time in 2010. Based on this schedule, it appears that the proposed LNG terminal would not be able to receive any LNG and thus not be able to send out any natural gas until some time in 2010.

2.6 ENVIRONMENTAL COMPLIANCE, INSPECTION, AND MITIGATION MONITORING

In preparing construction drawings and specifications for the project, Weaver's Cove Energy would incorporate mitigation measures identified in its application as well as requirements of federal, state, and local agencies. Contractors would also be provided copies of applicable environmental permits.

Weaver's Cove Energy would conduct training for its construction personnel regarding proper field implementation of the FERC Plan and FERC Procedures and other mitigation measures. Environmental training would be conducted before and during construction.

Weaver's Cove Energy would be represented by its Chief Inspector, who would be responsible for quality assurance and compliance with mitigation measures, other applicable regulatory requirements, and company specifications. The Chief Inspector would be assisted by one or more craft inspectors and at least one full-time Environmental Inspector during construction of the pipelines. The Environmental Inspector would report directly to the Chief Inspector and would have stop-work authority. The Environmental Inspector's duties are described in the FERC Plan and FERC Procedures and would include ensuring compliance with environmental conditions attached to any FERC authorization and to other permits or authorizations and to Weaver's Cove Energy's environmental designs and specifications.

In addition, FERC staff would conduct inspections to monitor the project for compliance with the Commission's environmental conditions.

2.7 OPERATION AND MAINTENANCE PROCEDURES

2.7.1 LNG Terminal

Imported LNG would be obtained from liquefaction plants throughout the world (e.g., Trinidad, Nigeria, Algeria, Qatar, and Venezuela) and delivered via LNG ships to the proposed terminal. At the mouth of Narragansett Bay, the Coast Guard would inspect the ship and a Coast Guard vessel may escort the ship to the terminal. A North East Marine Pilot would also board the ship at the mouth of Narragansett Bay and pilot the ship to the terminal. According to Weaver's Cove Energy, a second pilot would board the ship prior to the Brightman Street Bridge to assist in transiting of the bridge. The ship would be escorted by a tractor tug with fire-fighting capabilities through Narragansett Bay. At Sandy Point, two additional tractor tugs with fire-fighting capabilities would assist in escorting the LNG ship in the federal navigation channel in Mount Hope Bay and the Taunton River. These tractor tugs would be secured firmly to the ship and would have complete control of the ship until securely moored at the unloading facility. The about 21-nautical mile transit from the mouth of Narragansett Bay to the LNG terminal would take about 4 hours.

Upon arrival at the terminal, the ship would dock securely at the berth of the unloading facility, attach to the unloading arms, and transfer LNG to the storage tank using the ship's LNG pumps. The unloading arms would be designed to offload LNG from the ships at a rate up to 11,400 cubic meters per hour (m^3/hr) (50,000 gpm). One arm would return vapor to the cargo tanks to maintain a gas atmosphere and prevent air intrusion. As the LNG is offloaded, ballast water would be taken on to compensate for the loss of cargo. No ballast water or sanitary waste would be discharged into the river. After the LNG is offloaded, the ship would be detached from the unloading arms and mooring and breasting dolphins, moved from the berth with tug assistance, and turned to face down river. The entire unloading process from ship arrival to departure would take less than 24 hours.

LNG would be stored in the storage tank at a temperature of approximately -260° F. Boil-off gas generated from vaporization of LNG while in the storage tank, and piping and flash gas from pump

circulation would be compressed by boil-off gas compressors and then passed to a condenser system where it would be condensed into the outgoing LNG.

A series of in-tank and second stage sendout pumps would be used to pressurize the stored LNG to pipeline pressure and to pump the pressurized LNG to the vaporizers. The LNG would be vaporized in a closed loop shell and tube heat exchanger system. Air would be injected into the vaporized LNG, as needed, to lower the Btu content to pipeline specifications. The natural gas would be odorized and then discharged into the sendout pipelines for delivery to markets.

While the vast majority of the LNG received at the terminal would be vaporized and sent out on the pipelines, some LNG would also be transported from the terminal via trucks. The LNG trucks would access the loading stations, load LNG, and then transport it to peakshaving facilities.

Weaver's Cove Energy would operate and maintain the facilities in compliance with 49 CFR 193, 33 CFR 127, NFPA 59A, and other applicable federal and state regulations. In accordance with 49 CFR 193.2503 and 193.2605 and sections 11.3.1 and 11.5.2 of NFPA 59A, Weaver's Cove Energy would be required to prepare operation and maintenance manuals that address specific procedures for the safe operation and maintenance of the LNG storage and process facilities. These manuals would address startup, shutdown, cooldown, purging, and other routine operation, maintenance, and monitoring procedures. In accordance with 33 CFR 127.305, Weaver's Cove Energy would also prepare an operation manual that addresses specific procedures for the safe operation of the ship unloading facility. These manuals would include training requirements and programs for operations and maintenance personnel.

2.7.2 Pipeline Facilities

The pipeline system would be operated under an agreement between Weaver's Cove Energy and Algonquin. Algonquin would be responsible for operating and maintaining the pipeline facilities in accordance with 49 CFR 192, Minimum Federal Safety Standards for the Transportation of Natural and Other Gas by Pipeline, as required by the DOT. Section 4.12 presents a discussion of the DOT's safety regulations and requirements for natural gas pipelines and describes how these requirements would be met by the pipeline operator.

Both pipelines would be regularly inspected by aerial patrols or on-the-ground inspections to observe general right-of-way conditions and to identify any indications of leaks, construction activity on or near the permanent right-of-way by outside parties, evidence of possible pipeline damage, or damage to erosion-control structures. All inspections would be in accordance with DOT standards. Any erosion or unstable conditions observed on the right-of-way would be repaired as necessary. The aboveground facilities would be inspected at intervals that meet or exceed DOT requirements. During these inspections, equipment would be tested, recalibrated, and repaired as needed.

2.8 SAFETY CONTROLS

2.8.1 LNG Terminal Facilities

The LNG terminal facilities would be sited, designed, constructed, operated, and maintained in compliance with federal safety standards. Federal siting and design requirements for LNG facilities are summarized in table 2.8.1-1.

TABLE 2.8.1-1 **Federal Siting and Design Requirements for LNG Facilities**	
Requirement	Description
Thermal Radiation Protection (49 CFR 193.2057 and section 2.2.3.2 of NFPA 59A)	This requirement is designed to ensure that certain public land uses and structures outside the LNG facility boundaries are protected in the event of an LNG fire.
Flammable Vapor-Gas Dispersion Protection (49 CFR 193.2059 and sections 2.2.3.3 and 2.2.3.4 of NFPA 59A)	This requirement is designed to prevent a flammable vapor cloud associated with an LNG spill from reaching a property line that can be built upon.
Wind Forces (49 CFR 193.2067)	This requirement specifies that all facilities be designed to withstand wind forces of not less than 150 miles per hour without the loss of structural integrity.
Impounded Liquid (section 2.2.3.8 of NFPA 59A)	This requirement specifies that liquids in spill impoundment basins cannot be closer than 50 feet from a property line that can be built upon or a navigable waterway.
Container Spacing (section 2.2.4.1 of NFPA 59A)	This requirement specifies that LNG containers with capacities greater than 70,000 gallons must be located a minimum distance of 0.7 times the container diameter from the property line or buildings.
Vaporizer Spacing (section 2.2.5.2 of NFPA 59A)	This requirement specifies that integral heated vaporizers must be located at least 100 feet from a property line that can be built upon and at least 50 feet from other select structures and equipment.
Process Equipment Spacing (section 2.2.6.1 of NFPA 59A)	This requirement specifies that process equipment containing LNG or flammable gases must be located at least 50 feet from sources of ignition, a property line that can be built upon, control rooms, offices, shops, and other occupied structures.
Marine Transfer Spacing (33 CFR 127.105)	This requirement specifies that each LNG unloading flange must be located at least 985 feet from any bridge crossing a navigable waterway.

2.8.1.1 Spill Impoundment System

A spill impoundment system would be constructed at the LNG terminal in accordance with the requirements of 49 CFR Part 193 and NFPA 59A. The system would include concrete pads and curbing under all LNG-containing equipment and piping, concrete trenches to drain spilled LNG away from the equipment and piping, and sumps to collect the spilled LNG. An impoundment sump for collecting major spills (designed to collect a 10-minute spill from the 30-inch-diameter LNG unloading line) would be located north of the process area. This earthen sump would be 140 feet wide, 140 feet long, and 5 feet deep. Another sump for collecting spills from the process area (designed to collect a 10-minute spill from the 16-inch-diameter storage tank withdrawal line) would also be located north of the process area. This concrete sump would be 59 feet long, 59 feet wide, and 4 feet deep. The impoundment sumps would be integrated to allow the concrete sump to fill first and then overflow into the large earthen sump.

Both impoundment sumps would contain pumps to remove collected stormwater. Any stormwater collected in the spill containment system would be routinely pumped from the impoundment sumps to the on site stormwater management system. The sumps would be equipped with automatic level control activators and low-temperature sensors and switches to prevent operation of the pumps in the event of an accidental release of LNG to the basin.

An earthen berm would be constructed around the LNG storage tank and process facilities to prevent the offsite release of spilled LNG. The berm would be 15 feet high, 400 feet wide, and 1,300 feet long and would be capable of containing over 100 percent of the maximum liquid capacity of the tank.

2.8.1.2 Fire and Hazard Detection System

Fire and hazard detectors would be installed throughout the facility to provide operating personnel early detection of releases of flammable gases and fires and to show the general location of a release or fire. The fire and hazard detection system would include:

- combustible gas and low temperature detectors to monitor for potentially hazardous conditions;
- high temperature, smoke, and ultraviolet/infrared (UV/IR) flame detectors to monitor for fire;
- an integrated system that would be monitored from a main control room; and
- automatic emergency shutdown capabilities in the event of hazard or fire detections.

Locations where smoke, combustible gas, and UV/IR flame detectors would be installed are summarized in table 2.8.1-2.

High-temperature detectors would be installed on the relief valve of the LNG storage tank to detect a fire on the vent pipe of the tank. As discussed in the previous section, low-temperature detectors would be installed in the spill impoundment sumps to prevent the start-up of the stormwater pumps should an accidental release of LNG be collected in the sumps. Additional low-temperature detectors would be installed in the spill collection trenches, process/vaporization area, truck loading area, unloading platform jetty, and storage tank roof platform. The facility would have protection from lightening strikes.

Weaver's Cove Energy would also install a closed-caption television monitoring system to provide visual monitoring of the process areas and ship unloading platform. Closed-circuit television monitors would be installed in the guardhouse, main control room, and administration building. This system would be used to detect visual evidence of LNG releases, fires, or other emergencies as well as to monitor site security.

TABLE 2.8.1-2

Proposed Locations of Smoke, Combustible Gas, and UV/IR Flame Detectors at the LNG Terminal

Detector Location	Combustible Gas a/	UV/IR Flame a/	Smoke a/
SERVICE BUILDINGS			
Administration Building			4
Marine Services Building			2
Guardhouse	1		2
PROCESS BUILDINGS			
Main Control Room	4		4
Jetty Control Room	2		2
Maintenance Shop	2		2
MCC Building	2		2
Utility Building	2		2
Heater Building	4	4	2
Boil-off Gas Compressor Building	2	2	2
Air Injection Compressor Building	2	2	2
Odorant Building	2		
PROCESS AREAS			
Utilities Area	2	2	
Process/Vaporization Area	4	4	
Truck Loading Area	4	4	
Metering Area	2	2	
SHIP UNLOADING AREAS			
Unloading Platform Jetty	4	2	
LNG STORAGE TANK			
Roof Platform	2	2	
Base of Tank	2		

a/ Numbers represent the number of detectors to be installed at each location.

2.8.1.3 Fire and Hazard Control System

Both passive and active measures for fire and hazard prevention or control would be incorporated into the design and construction of the LNG terminal. Passive measures would prevent or minimize a fire or hazard and would include spill impoundment systems, ignition source control, and fireproofing. Active control measures would be implemented in the event of a fire or the release of LNG and would include the following fire-fighting systems and equipment:

- a looped, underground firewater distribution piping system with multiple hydrants and monitors;
- portable wheeled dry chemical units at plant process areas;
- two skid-mounted dry chemical units located on the unloading platform jetty;

- a dry chemical extinguishment and/or nitrogen gas snuffer system located on the pressure relief valves of the storage tank; and

- hand-held CO_2 dry chemical fire extinguishers throughout the plant.

The locations of the fire protection equipment at the proposed LNG terminal are provided in table 2.8.1-3.

TABLE 2.8.1-3

Proposed Locations of Fire Protection Equipment at the LNG Terminal

	Fire Water		Fire Extinguishers			
Location	Hydrants	Monitors	Skid Mount Dry Chem	Wheeled Dry Chem	Hand Held Dry Chem	Hand Held CO_2
SERVICE BUILDINGS						
Administration Building	X					X
Marine Services Building	X					X
Guardhouse	X				X	X
PROCESS BUILDINGS						
Main Control Room						X
Jetty Control Room					X	X
Maintenance Shop					X	X
MCC Building						X
Utility Building					X	X
Heater Building					X	X
Boil-off Gas Compressor Building					X	X
Air Injection Compressor Building					X	X
Odorant Building					X	
PROCESS AREAS						
Utilities Area	X	X		X	X	
Process/Vaporization Area	X	X		X	X	
Truck Loading Area	X	X		X	X	
Metering Area	X	X		X	X	
SHIP UNLOADING AREAS						
Services Platform Jetty					X	
Unloading Platform Jetty	X	X	X	X	X	
Firewater Connection to Ship	X					
LNG STORAGE TANK						
Roof Platform				X	X	
Pressure Relief Valve Stacks			X			

2.8.1.4 Firewater System

A firewater distribution system would be provided for extinguishing Class A fires; cooling the tank, structures, and equipment exposed to thermal radiation; and dispersing flammable vapors. Water for the system would be supplied by a City of Fall River 16-inch-diameter watermain located along North Main Street. The primary components of the system would include an underground/aboveground piping

distribution system, hydrants with hose reels, and two firewater booster pumps located in the utility building.

2.8.1.5 Emergency Shutdown System

The proposed LNG terminal would have an emergency shutdown (ESD) system that would isolate and shut off sources of combustible gas and automatically shut down process equipment. ESD pushbuttons would be located at various locations throughout the LNG terminal to manually activate a shutdown of the ship unloading facility (ESDS-I) or a shutdown of the overall LNG terminal (ESDS-II). An ESD could also be activated automatically by the fire and hazard detection system (see section 2.8.1.2) upon detection of a fire or a release of combustible gas. In addition, ESD systems on the LNG ships would be interfaced with the terminal ESD system during ship unloading operations. When an ESD is activated, audible alarms would be activated throughout the facility and visual alarms would be activated in the main control room and the jetty control room. After an ESD, normal operations would be stopped until the emergency is resolved and the ESD system has been reset in the main control room.

2.8.2 Pipeline Facilities

The pipelines and aboveground facilities associated with the Weaver's Cove LNG Project would be designed, constructed, operated, and maintained in accordance with DOT Minimum Federal Safety Standards in 49 CFR 192. These safety standards are discussed in section 4.12.

2.8.2.1 Corrosion Protection and Detection Systems

Weaver's Cove Energy would add a protective coating of fusion bond epoxy on the exterior of the pipe to prevent or minimize corrosion. A cathodic protection system would also be installed to prevent or minimize corrosion and to mitigate alternating current (AC) interference from the overhead electric transmission lines. Direct current in the ground flows from sacrificial anodes in zinc ground bed systems through the earth to the pipelines (cathode). This system reverses the natural current flow from the pipelines to the ground, which could result in corrosion at imperfections in the pipeline coating.

2.8.2.2 Emergency Response Procedures

Pipeline system emergencies can include gas leaks, fire or explosion, and/or damage to the pipeline and aboveground facilities. In accordance with DOT regulations, Algonquin (the proposed pipeline operating company) would develop a new plan or revise its existing plan to address procedures to be followed in the event of an emergency along the pipelines. This plan would include training of employees on emergency procedures; establishing liaisons with appropriate fire, police, and other community officials; and informing the public on how to identify and report an emergency condition on the pipeline routes.

2.9 FUTURE PLANS AND ABANDONMENT

Weaver's Cove Energy has no future plans for expansion or abandonment of the proposed LNG terminal or pipelines. However, if there is a future demand for additional natural gas in the market area, the maximum sendout capacity could be increased from 800 MMcfd to 1,000 MMcfd by installing additional heaters and a vaporizer. Should the facilities be expanded or abandoned, a FERC authorization or Certificate and the associated environmental and non-environmental analyses would be required. In addition, the expansion or abandonment would be subject to appropriate federal, state, and local regulations in effect at that time.

Future dredging of the federal navigation channel and turning basin would be needed to maintain the navigational depth of the federal channel and to maintain safe access to the LNG terminal. Weaver's Cove Energy has not yet determined the frequency and volume of maintenance dredging that would be needed nor identified any potential disposal sites for the dredged material. Based on studies conducted by the CZMP (Maguire Group, 1997), we have estimated potential maintenance dredging needs for the Weaver's Cove LNG Project. The CZMP estimated an average sediment accumulation rate of 136 cubic yards per acre per year for the designated port area and navigation channel in the Taunton River near Fall River. Based on this estimate and the area of the navigation channel and turning basin proposed by Weaver's Cove Energy (190 acres), we estimate that about 25,800 cubic yards of sediment could accumulate throughout the project footprint on an annual basis. Assuming that maintenance dredging would be conducted on a 10-year cycle, approximately 258,400 cubic yards (about 10 percent of the currently estimated project dredging volume) of sediment would need to be dredged and disposed of during each maintenance dredging cycle. The actual maintenance dredging schedule would be based on bathymetric surveys and an assessment of LNG ship navigation. A suitable disposal site would need to be identified in the project area or at an offshore location. Based on geochemical stratification analyses of sediment cores conducted during the preparation of the EIS for the Providence River and Harbor Maintenance Dredging Project (COE, 2001), it is possible that sediments dredged during future maintenance activities for the Weaver's Cove LNG Project would be suitable for offshore disposal.

Any future dredging would require permits from the appropriate federal and state agencies. Because maintenance dredging would be needed below the federally authorized depth of 35 feet, we anticipate that Weaver's Cove Energy would be responsible for maintaining the federal navigation channel to the proposed target depth of 37 feet below MLLW.

3.0 ALTERNATIVES

In considering Weaver's Cove Energy's proposal, the FERC will review both the environmental and non-environmental record in deciding whether it is in the public convenience and necessity to issue any authorization for the project. In accordance with NEPA and Commission policy, we have evaluated a number of alternatives to the Weaver's Cove LNG Project to determine if any are reasonable and environmentally preferable to the proposed action. Alternatives described in the following sections include no action or postponed action, system alternatives, LNG terminal site alternatives, LNG terminal layout alternatives, pipeline alternatives, and dredging/dredge disposal alternatives.

The evaluation criteria for selecting potentially reasonable and environmentally preferable alternatives include whether they:

- are technically and economically feasible, reasonable, and practical;
- offer significant environmental advantage over the proposed project; and
- meet the project objectives of providing a new LNG import terminal, including a new LNG storage facility, in New England and source of imported LNG for New England markets; access to natural gas reserves in production areas throughout the world; a new supply of natural gas for New England, and the ability to deliver LNG by truck to LNG storage facilities throughout the region (see section 1.3).

With respect to the first criteria, it is important to recognize that not all conceivable alternatives are technically and economically feasible and practical. Some alternatives may be impracticable because they are unavailable and/or incapable of being implemented after taking into consideration costs, existing technologies, and logistics in light of the overall project purpose. In conducting a reasonable analysis, it is also important to consider the environmental advantages and disadvantages of the proposed action and to focus the analysis on those alternatives that may reduce impacts and/or offer a significant environmental advantage.

Through the application of evaluation criteria and subsequent environmental comparisons, each alternative was considered to a point where it was clear that the alternative was not reasonable or would result in significantly greater environmental impacts that could not be readily mitigated. Those alternatives that appeared to be the most reasonable with less than or similar levels of environmental impact are reviewed in the greatest detail.

3.1 NO ACTION OR POSTPONED ACTION

The Commission has three alternative courses of action in processing applications to construct an LNG import terminal and natural gas pipeline. It may: 1) deny the approvals; 2) postpone action pending further filings or study; or 3) grant the approvals with or without conditions.

If the Commission denies the Certificate or postpones action on the application, the short- and long-term environmental impacts identified in this EIS would not occur. If the Commission selects the no action or postponed action alternative, however, the objectives of the proposed project would not be met and Weaver's Cove Energy would not be able to provide a new and competitively priced supply of natural gas and the ability to deliver LNG by truck to the New England region in the near future. It is purely speculative to predict the resulting effects and actions that could be taken by other suppliers or users of natural gas in the region as well as any associated direct and indirect environmental impacts. However, since the existing natural gas pipeline system in New England is nearly at capacity during peak

use months (FERC, 2003) and demand for energy in New England is predicted to increase, customers would have fewer and potentially more expensive options for obtaining natural gas and LNG supplies in the near future. Higher natural gas prices could adversely influence the regional economy by reducing realized household incomes and business profits (Greenspan, 2003). Higher natural gas prices (or the threat of higher gas prices) could also lead to alternative proposals to develop natural gas delivery or storage infrastructure, increased efficiency and conservation or reduced use of natural gas, and/or the use of other sources of energy. The effect of high natural gas prices on the increased demand for other fuels is supported by the energy consumption projections provided in EIA's Annual Energy Outlook 2004 report. The projections for the national growth of total coal consumption increased 0.3 percent from 2003 to 2004 primarily due to higher natural gas prices. Higher natural gas prices were also cited as a reason for the projected increased demand for total renewable fuels (EIA, 2004).

Alternative Natural Gas Infrastructure Proposals

The adoption of the no action alternative would result in the need for other LNG facilities or additional pipeline capacity to meet the increasing demand for natural gas in the New England region (FERC, 2003). This might include constructing or expanding regional pipelines as well as LNG import and storage systems. Any construction or expansion work would result in specific environmental impacts that could be less than, similar to, or greater than those associated with the Weaver's Cove LNG Project. We have conducted and included in this EIS an analysis of what appear to be the most reasonable natural gas and LNG system alternatives that have the potential to meet the project objectives (see section 3.2). Section 4.13 includes additional discussion of the need for natural gas in the region as well as the potential impacts on natural gas infrastructure if one or more LNG projects are (or are not) built.

Conservation and Other Sources of Energy

Denying or postponing a decision on Weaver's Cove Energy's application could limit access to new supplies of natural gas in the future, which could in turn contribute to higher natural gas prices. Higher prices could potentially result in customers conserving or reducing the use of natural gas. There is no doubt that both conservation and increased efficiency have an important role to play in the future energy needs of New England. Beginning with the energy crisis of the 1970s, numerous aggressive energy conservation programs have been developed in the New England region. As an example, Massachusetts enacted the 1997 Electric Industry Restructuring Act that requires customers of electric distribution companies to pay a charge to support energy efficiency programs. Specifically, these programs include developing and enforcing commercial/residential building codes to ensure that construction meets certain energy standards; Energy Star programs; tax credits for energy efficiency; utility restructuring programs; and regional energy efficiency initiatives. In 2004, the Massachusetts Division of Energy Resources (DOER) reported several benefits of energy efficiency programs (DOER, 2004). These benefits included:

- improved reliability and lowered retail electricity prices through demand reduction by almost $1.2 million in 2002;
- participant savings of over $21.5 million in their 2002 electric bills;
- projected bill savings of an estimated $249,000,000 over the lifespan of the installed measures for an investment of $138 million;
- creation of an estimated 1,778 new jobs, contributing $139 million to the gross state product in 2002; and

- improved air quality in Massachusetts and New England.

A 2003 report by the American Council for an Energy Efficient Economy (ACEEE) also analyzed projected energy demands in the Northeast. The ACEEE reviewed the national and regional relationship between natural gas price effects of energy efficiency and renewable energy practices and policies (ACEEE, 2003). The report found that increased installation of renewable energy generation could affect natural gas price and availability. The report concluded that energy efficiency and renewable energy measures could result in a 0.9 percent reduction by 2008 in natural gas consumption in the northeastern states, which include the New England states as well as New York, New Jersey, Pennsylvania, Delaware, and Maryland. However, the study also recognized that energy efficiency and renewable energy are not the only policy solutions required to address the future natural gas needs of the United States and that additional sources of natural gas will be required either from domestic sources or through the importation of gas in the form of LNG. An EIA study, which considers renewable energy as well as other energy sources, supports this conclusion and suggests that nuclear or renewable energies such as hydroelectric, wind, or solar, while important to the overall mix of available energy sources, will not replace the demand for natural gas over the next 20 years (EIA, 2005). Furthermore, each of these sources of energy would have project- and site-specific environmental issues such as the disposal of toxic materials, alterations to hydrological/biological systems, and visual impacts.

Denying or postponing a decision on Weaver's Cove Energy's application could also force potential customers of the natural gas provided by the project to seek regulatory approval to use other forms of energy. These might include renewable sources of energy, nuclear power, or other fossil fuels.

Renewable energy sources, including wind, hydropower, municipal solid wastes, wood and other biomass, and solar, are projected to have some role in meeting New England's future energy needs. According to the EIA (2003a), several renewable energy sources are being used or have potential to be used in New England, including hydropower; solar energy collected with flat-plate collectors; wind energy, which has good to excellent potential in many areas of New England; and biomass energy in the form of wood from forests or sawmills. The EIA estimates that in 2005, energy consumption in New England from renewable sources such as hydroelectric, geothermal, wood and wood waste, municipal solid waste, other biomass, wind, ethanol, photovoltaic, and solar thermal sources will account for about 9 percent of the region's total energy consumption as compared to estimates of 23 percent from natural gas, 51 percent from petroleum, 6 percent from coal, 10 percent from nuclear power, and about 1 percent from electricity imports. The EIA also predicts that consumption of renewable energy will increase by 1.1 percent a year until 2025. The majority of the increase in renewable energy generation is expected to come from wind power. The EIA predicts that natural gas consumption will increase over the same period by 1.4 percent per year, consumption of petroleum and coal will increase by 1.0 and 1.1 percent per year, respectively, and there will be virtually no increase in consumption of energy from nuclear power (EIA 2005).

The issue of natural gas demand and scenarios to address this demand were assessed in the recent Governors Conference Report (Power Planning Committee, 2005). The report concluded that the region must substantially reduce demand or increase its development of infrastructure before 2010 to ensure reliable delivery of natural gas in the winters beyond 2010 (see more discussion of this topic in section 1.3). The report also concluded that various demand reduction or resource development scenarios could be pursued, each providing a different degree of success, to meet the region's energy and other public policy goals of reliability of the fuel delivery infrastructure, fuel diversity, price mitigation or reduction, price stabilization, and security. The demand reduction scenarios evaluated in the report include expansion of fuel switching (this scenario assumes gas electric generation plants will be able to switch to oil for limited periods for the purpose of serving peak day demand); expansion of energy efficiency programs beyond those currently in place; construction of new renewable electric generation; construction

of a new coal gasification plant; and construction of a new nuclear generation plant. The resource development scenarios include construction of onshore, in-region LNG expansion projects like the proposed KeySpan LNG Facility Upgrade Project (see section 3.2.1.2); construction of one or more new onshore, in-region LNG terminals like the proposed Weaver's Cove LNG Project; construction of one or more new offshore, in-region LNG terminal similar to the Northeast Gateway or Neptune LNG, L.L.C. (Neptune LNG) Projects (see section 3.2.2.1); and construction of one or more new onshore, out-of-region LNG terminals (see section 3.2.3) The report found that expansion of fuel switching (power plants engaging in short-term switching from natural gas to oil), energy efficiency, and renewable energy programs may be the least expensive ways to improve gas supply reliability while improving fuel diversity. The expanded investments in gas energy efficiency programs may yield even greater reliability enhancements and even lower overall costs than most other scenarios. The expansion of LNG delivery and storage terminals, however, would provide considerably greater improvements to gas supply reliability than any of the other scenarios.

The Governors Conference Report does not identify or evaluate the likelihood of funding or market support for the various scenarios, nor does it critically evaluate the timeframes for passing legislation, planning, permitting, or constructing the necessary facilities for each scenario. The report also does not critically evaluate the likelihood of obtaining permits or approvals for each scenario. In our opinion, any proposal for a coal gasification or nuclear plant would generate considerable public opposition and would likely take longer to plan, study, and construct than the report indicates. Nuclear energy in particular, which currently accounts for about 10 percent of the energy consumed in the New England region, is not expected to provide an additional source of energy over the next few years. New nuclear facilities are unlikely to be built in the region given public opposition, environmental issues, and regulatory hurdles. Additionally, cost overruns that occurred during nuclear facility construction in the 1970s and 1980s make financing new nuclear facilities problematic (EIA, 2004). It is also important to note that the Governors Conference Report did not consider the environmental impact of any of the nine scenarios.

Compared to other fossil fuels such as coal or oil, natural gas is a relatively clean and efficient fuel that can reduce the emission of regulated pollutants (e.g., nitrogen oxides, sulfur dioxide, and particulate matter) or unregulated greenhouse gases (e.g., carbon dioxide). Given there are emissions associated with producing, processing, transmitting, and distributing natural gas and other fossil fuels, it is difficult to accurately quantify the impact of an LNG import project on air quality. However, credible estimates of air emissions can be developed based on reasonable assumptions regarding burning natural gas delivered by the project compared to burning fossil fuels that would likely be utilized if the gas from the project was not available. Table 3.1-1 lists the emissions that would result from the Weaver's Cove LNG Project assuming it provides about 400 MMcfd of natural gas to the New England market and the corresponding emissions that would result if an equivalent amount of energy were generated using coal or fuel oil in lieu of natural gas. It is clear from the table that the use of either fuel oil or coal would increase emissions significantly. Additionally, to comply with current air emission regulations, emission control technologies could be required that could limit the economic viability of any new oil- or coal-fired facility.

In addition to the increased emissions associated with the burning of coal or fuel oil, each of these fuels would also have to be imported into the project area and stored, similar to the proposed LNG. The distribution of these fuels to market would require more truck, barge, and train trips than the distribution of an equivalent amount of energy derived from natural gas, which would increase emissions and traffic congestion.

TABLE 3.1-1

Comparison of Air Emissions from Burning Fossil Fuels a/

Fossil Fuel	SO_2 (tpy)	NO_x (tpy)	PM_{10} (tpy)	CO_2 (tpy)	C (tpy)
Natural Gas	44	6,622	530	7,333,333	2,000,000
Fuel Oil	34,657	13,245	751	10,633,333	2,900,000
Coal	92,714	46,357	2,053	13,933,333	3,800,000

a/ The emissions generated by coal, fuel oil, and natural gas were estimated using the most recent Best Available Control Technology (BACT) analyses identified on the EPA Reasonably Available Control Technology/BACT/Lowest Achievable Emission Rate Clearinghouse for boilers with heat input ratings between 100 and 250 million British thermal units per hour. The emissions from each fuel source are estimated based on a total annual fuel use of 146,000,000 million British thermal units (Btu) per year (400 million cubic feet per day, 365 days per year, 1000 Btu/cubic foot).

SO_2 = Sulfur Dioxide
NO_X = Nitrogen Oxides
PM_{10} = Particulate Matter
CO_2 = Carbon Dioxide
C = Carbon
tpy = tons per year

No Action or Postponed Action Conclusions

As described in section 1.3, a recent FERC study suggests that by 2009 there will be demand during peak periods of use in New England for an additional 500 MMcfd of natural gas above what the current infrastructure is able to provide (FERC, 2003). This increasing demand is largely expected to come from demand for additional capacity to generate electricity. Although not expected, it is conceivable that this demand could be reduced by increasing use of other energy sources and/or conservation. Because natural gas is the cleanest of the fossil fuels, the increased use of other fossil fuels would result in higher air emissions that can contribute to climate change, acid rain, and smog. The economic, ecological, and human health benefits of reduced air emissions have been well documented (EPA, 1999). It is also conceivable that increasing energy efficiency and use of renewable sources of energy could reduce the projected future demand for natural gas. However, it is noteworthy that a report by the ACEEE (2003) concluded that additional energy efficiency and renewable energy projects could reduce the consumption of natural gas in the Northeast by only about 0.9 percent by 2008. EIA (2004) estimates, which include increased use of renewable energies, support this conclusion. Neither conservation measures nor renewable energy sources are expected to replace or significantly offset the demand for additional natural gas supplies in the New England region.

As noted above, if the no action or postponed action alternative is adopted there are two likely outcomes: 1) negative environmental and economic impacts associated with more limited supplies of natural gas; and/or 2) the development of other natural gas infrastructure projects that meet some or all of the project objectives identified by Weaver's Cove Energy.

3.2 SYSTEM ALTERNATIVES

System alternatives are options to the proposed action that would make use of other existing or proposed LNG or natural gas facilities to meet the stated objectives of the proposed project. A system alternative would make it unnecessary to construct all or part of the proposed project even if some modifications or additions to the existing or proposed facilities are necessary. These modifications or additions would result in environmental impacts that could be less, similar to, or greater than those associated with construction of the proposed project. Ultimately, the purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with

the construction and operation of the Weaver's Cove LNG Project could be avoided or reduced by using another system.

The New England natural gas and LNG market is concentrated in Massachusetts, Connecticut, Rhode Island, and the southernmost portions of New Hampshire and Maine. Currently, this market area is supplied with natural gas and vaporized LNG through interstate pipeline systems and an existing LNG import terminal in Everett, Massachusetts (the Distrigas LNG facility). As described in section 1.3, the objectives of the Weaver's Cove LNG Project are to construct and operate a new LNG import terminal that could provide a new source of natural gas and trucked LNG deliveries to the New England market. Specifically, the Weaver's Cove LNG Project would provide:

- a new LNG import terminal and competitive source of imported LNG in the New England market area;
- a new facility in New England for the storage of up to 200,000 m^3 of LNG;
- access to natural gas reserves in production areas throughout the world that are inaccessible by conventional pipelines;
- a new supply of natural gas to New England (normal pipeline sendout of 400 MMcfd and a maximum sendout of 800 MMcfd);
- strengthened gas supply to southeastern Massachusetts and Rhode Island; and
- a competitive source of LNG delivered by truck to LNG storage facilities throughout the region (normal trucked LNG sendout of 100 trucks per day).

The analysis below examines other potential existing, modified, or proposed LNG and pipeline systems and considers whether these systems could meet some or all of the project objectives.

3.2.1 Existing and Proposed Onshore LNG Facilities in New England

Companies that supply natural gas to the New England region use LNG from storage facilities to help meet peak demand during periods of high natural gas use. Currently, there are 46 LNG storage facilities scattered throughout New England. Although several of these storage facilities are capable of liquefying natural gas during periods of low demand, it is frequently not economical to do so. As such, the New England LNG market is supplied largely from the Distrigas LNG import facility. Providing a new source of LNG from outside of the New England region would require trucking LNG from one of the other existing LNG import terminals in the United States. The closest of these terminals is the LNG import facility in Cove Point, Maryland, which is located about 475 miles from the project area. The other LNG import terminals are located considerably further away. One LNG ship is able to transport the equivalent of about 3,300 LNG trucks. Due to the transportation costs associated with trucking LNG over long distances, we believe the option of transporting LNG from an import terminal outside of the New England region is not a reasonable alternative.

The two existing LNG facilities in the New England market area that are reasonable to consider as potential system alternatives are the Distrigas LNG facility and the KeySpan LNG facility. Additionally, there have been public announcements to construct LNG import terminals in Long Island Sound, off the coast of Massachusetts, and in Maine. These offshore proposals are discussed in section 3.2.2. Although there have been reports in the press that Somerset LNG, L.L.C. (Somerset LNG) may propose an LNG import facility at Brayton Point in Somerset, Massachusetts, the FERC has not yet

received a formal application nor has there been any recent news regarding the development of the project. As such, we considered an LNG terminal at Brayton Point as a site alternative rather than a system alternative (see section 3.3.3). Our system alternative analysis of existing and proposed onshore LNG facilities in New England, therefore, includes the Distrigas LNG facility, the KeySpan LNG facility, and potential LNG projects in Maine. The general locations of all of the existing and proposed LNG facilities in the New England region are illustrated on figure 3.2.1-1.

3.2.1.1 Distrigas LNG Facility - Everett, Massachusetts

The only existing LNG import terminal in New England is the Distrigas LNG facility owned by Tractabel. The facility occupies a 24-acre site on the Mystic River in Boston Harbor that is surrounded by industrial development on all sides. In service since 1971, the Distrigas facility is the oldest LNG import terminal in the United States. In 2000 and 2001, the FERC authorized installation of a vapor recovery system to recover flash gas during ship unloading, replacement of all vaporizers to be compatible with a new adjacent power plant, and the installation of additional vaporizers and pumps to provide natural gas service to the power plant. The Distrigas LNG facility has two tanks that can store 974,000 barrels (155,000 m^3) of LNG and an installed vaporization capacity of 1.035 billion cubic feet per day, although maximum sendout is limited to 715 MMcfd due to pipeline capacity. A significant quantity of LNG is loaded onto LNG trucks and delivered to peakshaving facilities throughout New England. The four-bay truck station on the site can fill up to 100 trucks per day. In 2003 and 2004, 53 and 68 LNG ships, respectively, made deliveries to this facility (Katulak, 2005).

The Distrigas LNG facility is dedicated to LNG imported by Tractabel and is not operated as an open-access import terminal that provides terminalling services to other parties. To provide the same service as proposed by Weaver's Cove Energy, it would be necessary to add 1,250,000 barrels of storage and 800 MMcfd of vaporization. There is no space on the existing 24-acre site to construct the additional facilities associated with the proposal, nor is there available adjoining property to accommodate these facilities and the associated exclusion zones. There are no pending proposals to expand the Distrigas LNG facility. While it does not appear this existing facility could be reasonably expanded to satisfy all of the objectives of the Weaver's Cove LNG Project, it is conceivable that the facility could be expanded to provide some additional natural gas sendout capacity. For example, in 2003 the FERC received an application for the Everett Extension Project. Although this proposal was later withdrawn by the proponents because it was not thought to be economically viable, the Everett Extension Project would allow the Distrigas LNG facility to mitigate some take-away constraints and allow sendout of an additional 110 MMcfd of natural gas via a pipeline operated by Algonquin. The proposed project would include construction of the Deer Island Lateral, which was approved by the FERC in 2002 but never constructed, and a new lateral pipeline that would extend the Deer Island Lateral to a connection with Algonquin's existing J-System, which interconnects with the Distrigas LNG facility. The facilities required for the project would include reconfiguration of existing vaporization equipment within the existing boundaries of the Distrigas property and new pipeline facilities to be constructed by Algonquin.

Insert Figure

3.2.1-1 New England Pipeline Systems and Existing/Proposed/Planned LNG Facilities

The pipeline facilities for the Everett Extension Project would include 12.4 miles of pipeline (which includes the Deer Island Lateral Pipeline). About 4.2 miles of this pipeline would be onshore. The remaining 8.2 miles would be offshore pipeline in Boston Harbor, of which about 2.4 miles would be installed by horizontal directional drill (HDD); the rest of the offshore pipeline would be installed by dredging, jetting, or plowing. About 36 percent of the pipeline would be adjacent to or within roads or other utility rights-of-ways. Construction of the onshore facilities would disturb about 75 acres of land. Construction of the offshore pipeline would disturb about 860 acres of seabed. Impacts would include temporary disruption of local roadways and recreational trails, noise during construction, increased turbidity and sedimentation as a result of offshore construction, and direct and indirect impacts on aquatic resources. Because of environmental and permitting constraints, the working conditions in Boston Harbor, and other factors, the Everett Extension Project was not considered economically viable. We are not aware of other ways in which the Distrigas LNG facility could be reasonably expanded to allow additional natural gas sendout or provide more LNG storage.

3.2.1.2 KeySpan LNG Facility - Providence, Rhode Island

KeySpan owns and operates an existing LNG facility on a 17.5-acre site in an industrial section of Providence, Rhode Island. The 600,000 barrel (95,000 m^3) tank is filled by LNG trucks primarily from the Distrigas LNG facility. During periods of peak demand throughout the winter months, natural gas is either vaporized into New England Gas Company's medium pressure pipeline system, or loaded onto LNG trucks and delivered to local natural gas distribution companies. The plant has an LNG barge unloading and cargo transfer system on the dock that it shares with the St. Lawrence Cement Company, its neighbor to the south. The unloading facility was used only once for the LNG barge *Massachusetts* in July 1974, and has not been used since. Although there were plans to expand this facility to accommodate LNG ships during the 1970s, the necessary upgrades were never completed.

On April 30, 2004, KeySpan filed an application with the FERC to modify its existing facility to allow import of LNG by ships, potentially as soon as late 2005 (see FERC docket number CP04-223-000). The FERC issued a draft EIS for this project on November 30, 2004 and a final EIS for the project is scheduled to be issued in May 2005. The project would include modifications to the sendout system that would increase maximum vaporization capacity from 150 to 525 MMcfd and construction of facilities to allow docking and unloading of LNG ships. BG LNG Services, L.L.C. (BG LNG) would be responsible for shipping LNG to the KeySpan facility after the expansion is completed. On average, about one LNG ship per week would unload its cargo at the KeySpan facility. Associated with this project is a proposal by Algonquin to construct a 7,400-foot-long, 24-inch-diameter pipeline that would interconnect with Algonquin's existing G-12 lateral to the north of the terminal. The KeySpan and Algonquin proposals are subject to approval of the FERC under sections 3 and 7(c) of the NGA.

The KeySpan facility is located adjacent to the Fox Point Reach of the Providence River federal navigation channel. The COE recently approved and began dredging this portion of the channel to a depth of 40 feet below MLLW. As part of ongoing industrial operations in the area, the COE also authorized St. Lawrence Cement Company to dredge 11,800 to 32,000 cubic yards of material from the common dock area immediately in front of the KeySpan facility to a depth that would accommodate LNG ships. After the authorized dredging has been completed and the existing barge unloading dock replaced with a new unloading facility, LNG ships would be able to access the site. Given the depths of the Providence River federal navigation channel, LNG ships could move up the Providence River to the KeySpan facility even during periods of low tide. Furthermore, ships accessing the KeySpan facility would only pass under the Newport Bridge; whereas ships accessing the proposed terminal site would pass under the Newport Bridge and under or through three other bridges (see section 4.12).

One issue that the KeySpan site has in common with the proposed site is its location within an industrial area near residential neighborhoods. However, the density of industrial development surrounding the KeySpan site is greater than at the proposed site while the number of residences within 0.5 mile of the site is lower (60 residential structures within 0.5 mile of the KeySpan site compared to 290 residential structures within 0.5 mile of the proposed site). Another similarity between the two sites is the relatively long distance that LNG ships must transit navigation channels to reach the sites. After entering Narragansett Bay, the ship route to the KeySpan site would be about 25.5 nautical miles long, about 2.75 nautical miles longer than the route to the proposed site in Fall River.

The primary disadvantages of the KeySpan facility is the limited capacities of the LNG tank and vaporization system. The current vaporization capacity of 150 MMcfd and planned expansion up to 525 MMcfd is below the peak sendout of 800 MMcfd in Weaver's Cove Energy's proposal. On a sustained basis, it appears that the KeySpan facility would only be able to deliver about 200 MMcfd of natural gas (about half of the average sendout capacity of the Weaver's Cove LNG Project). Also, the existing tank at the KeySpan facility is only capable of storing 600,000 barrels (95,000 m^3) which is about half (48 percent) the volume of the proposed tank (see section 2.2.1.2). Therefore, it does not appear that the KeySpan facility could fully unload LNG ships up to the 145,000 m^3 capacity of the proposed project. To be capable of storing similar volumes of LNG as the Weaver's Cove LNG Project, the KeySpan facility would have to be expanded to accommodate additional storage of LNG. As such, an additional storage tank with capacity of about 650,000 barrels would need to be added at the site or the existing tank would need to be replaced by a new tank with a capacity of about 1,250,000 barrels (200,000 m^3). KeySpan has not proposed any tank expansion plans, nor is there adequate space on the 17.5-acre site to accommodate the thermal exclusion zones of an additional or larger LNG storage tank. We are not aware that the adjacent properties are available and could be used to expand the existing KeySpan facility.

Another disadvantage of the KeySpan facility is the limited capacity of its truck loading station, which is capable of loading up to 24 LNG trucks per day. KeySpan is not proposing to expand its truck loading station. Consequently, the KeySpan facility would not be able to provide the level of truck loading of the proposed facility, which would have a truck loading capacity of up to 100 trucks per day.

The KeySpan expansion would meet several project objectives by providing a new LNG import terminal in New England and source of imported LNG for New England markets, access to natural gas reserves in production areas throughout the world, a new supply of natural gas for New England, and the ability to deliver LNG by truck to LNG storage facilities throughout the region. Based on the limited capacity of the existing LNG tank and the planned increase of the vaporization system, the KeySpan expansion would only provide a partial system alternative in meeting the objectives of the Weaver's Cove LNG Project.

Based on recent projections of natural gas demand in the New England region, by 2009 there will be demand for an additional 500 MMcfd of natural gas above what the current infrastructure is able to provide during peak periods of use (FERC, 2003). Even if it is expanded, the KeySpan facility would not likely be able to deliver this volume of natural gas on a sustained basis (i.e., the average sendout capacity of the KeySpan facility would be about 200 MMcfd). Although it is conceivable that the expansion of the KeySpan facility could be combined with another LNG import terminal that is slightly smaller than the one proposed by Weaver's Cove Energy (e.g., with an average natural gas sendout capacity of around 300 MMcfd), the economics of a new and smaller terminal do not appear practical. See section 4.13 for additional discussion of natural gas infrastructure in the New England region.

3.2.1.3 Proposed LNG Projects in Maine

Over the last 1 to 2 years, several companies have evaluated or are currently evaluating construction and operation of LNG import terminals along the coast of Maine. Proposals for facilities in Harpswell, Sears Island, Cousins Island, Hope Island, and Corea appear to all have been abandoned because the project developers could not obtain control of property suitable for an LNG import terminal. Although in the early stages of development, Quoddy Bay, L.L.C. appears to be the only developer moving forward with plans to construct and operate an LNG import terminal in Maine. Quoddy Bay's proposal includes developing an LNG import terminal in cooperation with the Passamaquoddy Indian Reservation in Pleasant Point, Maine (see figure 3.2.1-1). The proposed Pleasant Point Energy Facility would be located on a 40 to 50 acre site and have an LNG storage capacity of 150,000 to 200,000 m^3. The proposed facility could accommodate 52 LNG vessels per year that would dock and unload at a 3,400-foot-long pier. Because the ships would dock in waters about 85 feet in depth, no significant dredging would appear to be required for the project. We are not aware of any plans to use this facility as a source of trucked LNG. In addition, because the site is located at least 350 miles from the Boston area, it does not appear ideally suited to serve the LNG peakshaving market which is concentrated in southern New England.

The Pleasant Point Energy Facility would interconnect with the M&N pipeline system via a new 36- to 42-mile-long sendout pipeline. The new LNG import terminal would have a sendout capacity of 500 MMcfd (average) to 1,000 MMcfd (maximum). The M&N pipeline system provides gas to markets in both the United States and Canada. Currently, the M&N system appears capable of transporting about 350 MMcfd of natural gas to markets in northern Massachusetts. It appears that the M&N pipeline system could be expanded to deliver at least another 400 to 500 MMcfd to northern Massachusetts, primarily through the addition of compression to its system. Presumably, additional looping of its pipeline system would allow even greater volumes to be transported. The specific details of a possible pipeline expansion project are not available at this time, although M&N has recently completed an open season to determine the potential for a future expansion of its system (Northeast Gas Association, 2005).

The future of the Pleasant Point Energy Facility also remains uncertain despite the approval of the majority of the Passamaquoddy Indians. Some tribal members are concerned with the potential environmental impacts the proposed project may cause. Additionally, many residents adjacent to the reservation and activist groups (e.g., Save Passamaquoddy Bay and We Take Care of the Homeland) are opposed to the proposed LNG terminal due to potential impacts on commercial and recreational fisheries, local businesses, and the safety of residences and schools in the proximity of the proposed project site. Additionally, when the neighboring town of Perry, Maine sold the property where the LNG facility is proposed to the Passamaquoddy Indians in 1986, the town stipulated that its voters would have the opportunity to review and approve future industrial uses of the property (Bangor Daily News, 2005). In a recent referendum held in Perry, voters rejected the development of the proposed LNG facility.

Given the early stage of the Pleasant Point Energy Facility and because no formal application has been submitted to the FERC, we believe it would be highly speculative at this time to consider this as a viable alternative to the Weaver's Cove LNG Project.

3.2.2 Proposed Offshore LNG Facilities in New England

To avoid many of the environmental issues and safety concerns associated with siting an LNG facility onshore, many companies have considered siting LNG import terminals in offshore areas. Offshore LNG import terminals located in federal waters fall under the jurisdiction of the DOT and the Coast Guard (pursuant to the Deepwater Port Act of 1974, as amended by the Maritime Transportation

Security Act of 2002). Offshore LNG import terminals located in state waters fall under the jurisdiction of the FERC (pursuant to the NGA).

Companies have introduced various strategies for operating an LNG import terminal in offshore waters (LNG Express, 2003). These strategies include:

- offshore docking/onshore storage
- fixed offshore terminals (gravity based structures or platforms)
- transport/regasification vessels; or
- floating, storage, and regasification units (FSRU).

Offshore Docking/Onshore Storage

Where deepwater access to a coastal port or harbor is unavailable, LNG can be transported to onshore storage tanks from ships using specially designed cryogenic pipelines. Such facilities enable LNG ships to berth and transfer their LNG cargo to the cryogenic pipeline at docking facilities in offshore areas where natural water depths exceed 40 feet. Although feasible, a number of technical factors related to transporting LNG in a pipeline place limits on the practical maximum length of such a pipeline to about 3 miles. This approach has been used at the existing Cove Point LNG terminal where the ship docking/unloading platform is located in the Chesapeake Bay about 1 mile from the shoreline. Similar facilities have been proposed for the Irving Oil LNG site in New Brunswick, Canada, and the Keltic Petrochemicals LNG and Bear Head LNG facilities in Nova Scotia, Canada. While it would be possible to transfer LNG to shore through a cryogenic pipeline from an offshore docking structure, such a design would still require locating LNG storage tanks and process facilities at an onshore location, which would involve most of the same disadvantages of an onshore terminal in addition to the disadvantages associated with an offshore docking structure and pipeline (see section 3.2.2.1 for a discussion of impacts associated with offshore pipelines). Furthermore, industrial ports in the New England region are largely situated along narrow waterfronts that are accessible only from narrow navigational channels. Therefore, an offshore docking structure and a cryogenic pipeline would have to be located relatively close to a navigational channel, which could interfere with other port operators or marine traffic. Although considered, we did not identify a site where the use of this approach appeared practical.

Fixed Offshore Terminals

There are basically two different types of fixed structures that can be used as an offshore LNG import terminal, either a gravity based structures (GBS) located directly on the seafloor or pile-based platforms.

A GBS facility would include placing LNG storage tanks and associated facility platforms on foundations directly on the seafloor. LNG could be offloaded from conventional LNG ships, placed in storage tanks, and then vaporized for delivery as natural gas to the onshore market via an undersea pipeline. GBS terminals would only be feasible in areas of relatively shallow water, where the depths range between 45 and 100 feet. Given the costs associated with constructing and operating a GBS, it appears that these facilities are only economically feasible for projects with relatively large LNG storage (e.g., 250,000 to 330,000 m^3) and large natural gas sendout volumes (e.g., 800 to 2,000 MMcfd). ChevronTexaco Corporation (ChevronTexaco) has received approval from the Coast Guard to build a facility of this design in the Gulf of Mexico (the Port Pelican Project), but is still seeking approval from the Coast Guard and Texas regulators for its GBS construction yard in Corpus Christi, Texas. The

construction of Port Pelican is currently on hold until ChevronTexaco identifies an LNG source. Another potential obstacle for the project is cost, which current reports indicate have increased to nearly three times the cost projected by ChevronTexaco last year (LNG Express, 2004a).

Another strategy using a fixed offshore terminal involves constructing or converting existing offshore platforms to LNG use. Because these platforms are or would be anchored using fixed-tower structures, they could be located in a much broader range of water depths than a GBS unit. These platforms could be fitted with docking, unloading, storage, and vaporization equipment. Similar to the GBS design, LNG could be unloaded from a conventional LNG ship, vaporized at the platform, and sent as natural gas to the onshore market via an undersea pipeline. Depending on the specific design, the use of an offshore platform may not include significant offshore storage of LNG. Crystal Energy, L.L.C. recently proposed to use an existing platform as a terminal to import natural gas to markets in California. Given the lack of existing offshore platforms in the New England region, this approach would require construction of a new platform.

Currently, no company is proposing to build a fixed offshore LNG import terminal in the waters off of New England.

Transport/Regasification Vessels and Floating, Storage, and Regasification Units

Another strategy for importing LNG to an offshore terminal includes the use of conventional LNG ships fitted with regasification equipment (e.g., transport/regasification vessels) or a floating, storage, and regasification unit. Both of these strategies are currently being proposed in the New England region and are discussed below in sections 3.2.2.1 and 3.2.2.2.

3.2.2.1 Neptune LNG and Northeast Gateway Projects – Gloucester, Massachusetts

A deepwater port application to build an LNG facility offshore of Gloucester, Massachusetts was filed with the Coast Guard by Neptune LNG, (a subsidiary of Tractabel) on February 15, 2005.[1] In addition, Excelerate Energy, L.L.C. (Excelerate) and Algonquin filed environmental notification forms for the Northeast Gateway Deepwater Port and associated pipeline projects with the Secretary of the EOEA on March 15, 2005. Because these two projects would utilize similar technology and would be located in essentially the same area of Massachusetts Bay, we have combined the discussion of both projects.

The Neptune LNG and Northeast Gateway Projects would both be located in federal waters about 12 miles east of Marblehead and 10 miles southeast of Gloucester, Massachusetts (see figure 3.2.2-1). Both proposed projects would utilize two turret buoys (docking stations) and varying lengths of subsea pipeline that would interconnect with the existing HubLine pipeline system (operated by Algonquin). Neptune LNG has indicated that the project would have an average sendout capacity of 400 MMcfd and a peak capacity of 750 MMcfd. Excelerate has indicated that its Northeast Gateway Project would have a baseload capacity of 400 MMcfd and a peak capacity of 800 MMcfd. However, it appears the 800 MMcfd capacity could rarely if ever be achieved and that the actual maximum delivery capacity of the project would likely be between 500 and 690 MMcfd.[2]

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[1] The discussion of the Neptune LNG Project in this EIS is based on a preliminary review of the Deepwater Port Act application that was submitted to the Coast Guard and the other agencies participating in the NEPA process. Specific project details and the analysis of environmental impacts may be refined and/or change as a result of the Coast Guard's review of the Neptune LNG Project.

[2] In its November 16, 2004 letter to the FERC regarding the Weaver's Cove LNG Project, Excelerate indicated that as currently planned, the Northeast Gateway Project is intended to deliver baseload natural gas supplies of 400 MMcfd.

INSERT FIGURE

3.2.2-1 Northeast Gateway and Neptune LNG locations

Additional physical structures that would be needed for either project include pipeline end manifolds (PLEMs) to connect each turret buoy with the sendout pipelines, and anchor arrays to support the docking stations and ships during unloading. In addition to the PLEMs and anchor arrays, the Neptune LNG Project would also require a central pipeline manifold to regulate flows from each of the docking stations and a transition manifold upstream of the connection with the HubLine pipeline. Algonquin has indicated that minor modifications to its existing metering facilities in Methuen, Salem, and Weymouth, Massachusetts would be needed to regulate gas entering its system from the Northeast Gateway terminal. We assume similar metering additions would also be needed for the Neptune LNG Project.

Excelerate indicated that for the Northeast Gateway Project the Coast Guard would probably require a minimum 1,640-foot safety and security zone around each docking station. Excelerate and the Coast Guard would also request from the International Maritime Organization (IMO) an additional *No Anchor Area* of about 1 nautical mile in diameter around each buoy. In addition, Excelerate indicated they would request the Coast Guard to establish an *Area to be Avoided* of 2.2 nautical miles around each docking station. Although not a restricted area, the *Area to be Avoided* would be posted on nautical charts to provide a warning to vessels operating in the vicinity of the port. Neptune LNG has indicated that operational activities would limit offshore recreational activities within 2,600 feet of each terminal (or 0.49 nautical mile). The Neptune LNG application did not discuss the additional safety and security areas described by Excelerate, but it is reasonable to expect similar safety and precautionary zones would also be established for the Neptune LNG Project.

Existing Pipeline Capacity

There is a question about the ability of the existing HubLine pipeline to carry the sendout volumes planned by either Neptune LNG or Excelerate. The HubLine EIS states that the combined Maritimes Phase III / HubLine Project was designed to transport up to 230.5 MMcfd of natural gas (FERC, 2001). Excelerate indicates that the HubLine pipeline facilities would be capable of transporting the proposed 400 MMcfd of additional incremental volume without displacing existing deliveries of natural gas being transported on the HubLine pipeline. These volume differences appear significant, and raise the question whether improvements may be necessary to the existing pipeline infrastructure to deliver the baseload sendout volumes proposed by either the Neptune LNG or Northeast Gateway Projects.

Operational Sea Conditions

After anchoring and connecting to the docking buoy, LNG would be vaporized on the LNG ships for either project and sent out through the pipeline as natural gas. The vaporization and unloading process would take about 7 days for each shipment of LNG. Due to the length of time required to offload and the location of the docking facilities further offshore, there would be an increased potential for delays associated with inclement weather and seas. For the Northeast Gateway Project, the following docking and transfer design criteria have been established: a 16-foot sea condition maximum for connecting at the docking station, and a 39-foot sea condition maximum discharge (unloading). The Neptune LNG Project has established slightly lower operational sea conditions of 11.5 feet for connections and 36 feet for unloading. Similar docking systems are currently in use for crude oil transfers in the North Sea where docking maneuvers have occurred in seas up to 18 feet and loading/unloading operations have occurred in seas of 43 feet (Coast Guard, 2003).

To evaluate the sea conditions in the area that both Neptune LNG and Excelerate are considering for their projects, we examined wave height data from the National Data Buoy Center for Station Number 44013. This buoy is located about 16 nautical miles east of Boston at 42º 21’ 14’’ North and 70º 41’ 29’’

East, and has a relatively continuous record of meteorological data extending back to 1986 (NOAA, 2004a). Wave height data were missing for the first 5 months of 1986, but we evaluated wave height data for the remainder of 1986 and even-numbered years[3] from 1986 through 2002, as well as 2003. Seasonal average wave heights ranged from 3.4 feet (winter) to 1.6 feet (summer); suggesting that the 11.5- and 16-foot sea conditions for connecting to the buoys are achievable throughout much of the year. Because peak demand for natural gas is likely to coincide with periods of the worst weather conditions, we also looked at maximum wave heights for the months of November through March. Maximum wave heights ranged from 26.4 feet in December 2003 to 5.2 feet in March 1988. Maximum wave heights during the winter and early spring months suggest that the 39-or 36-foot sea conditions chosen for unloading conditions may also be achievable in most years.

Potential Environmental Impacts

Potential environmental impacts associated with the Neptune LNG or Northeast Gateway Projects would result from both construction and operation of the facilities. Construction-related impacts would result from installing the physical structures necessary for the system to function. Operational impacts would result from docking procedures and vaporization of LNG prior to injecting the natural gas into the sendout pipeline(s). These potential impacts are discussed in the following sections.

Impacts Associated With the Port Anchor Array

Operation of the docking stations for either project would require the construction and use of a large, permanently-fixed anchor array. Each array would likely consist of eight anchors located in a circular fashion between 1,148 to 4,000 feet from the docking buoy depending on the orientation of the anchor positions. Depending on the design of the anchors, the entire anchor array for each project would disturb between 0.01 and 0.18 acre. At either project location, additional seafloor disturbance from anchor chain movements would occur each time the turret buoys are raised and lowered to dock and release the LNG vessels. The additional disturbance area would likely range between 4 and 42 acres according to information filed by Excelerate. This disturbance would be a periodic and long-term impact on the seafloor for the life of either project.

Impacts Associated With the Pipeline Facilities

The Neptune LNG and Northeast Gateway Projects would involve construction of 11.1 and 16.4 miles of pipeline, respectively, in the offshore waters off the coast of Massachusetts. Impacts associated with offshore pipeline construction would depend on the specific construction techniques used and whether or not the pipelines would be buried. Pipelines installed in waters less than 200 feet deep need to be buried in the seafloor as required by DOT regulations (49 CFR 192.319(c)). Pipelines installed in waters greater than 200 feet deep (at least in federal waters) would likely be placed directly on the sea floor. Assuming a similar level of impact per mile as was projected for other offshore pipeline projects in the region, we estimate that construction of the Northeast Gateway pipeline could disturb between 1,190 and 1,876 acres of seafloor. Much of this impact would be associated with anchor strikes and cable sweep as a result of positioning and stabilization of construction equipment. Neptune LNG has indicated that it would use dynamically positioned construction vessels. Because these vessels do no require the use of anchors, pipeline installation would likely impact less than 100 acres of seafloor (assuming that dynamically positioned vessels would be feasible for the entire route). In addition to the direct impacts associated with the pipeline, trenching equipment, and anchors/cables, indirect impacts from both projects could result from the suspension, transport, and redeposition of sediments during construction. Impacts

[3] We limited our evaluation of wave height data to even-numbered years because of the large size of the data set available.

associated with offshore pipeline construction in this region are discussed in detail in the EIS for the Phase III / HubLine Project (see FERC Docket Nos. CP01-4-000, CP01-5-000, or CP01-8-000).

The sendout pipelines for the Neptune LNG and Northeast Gateway Projects would both cross about 9 miles of the South Essex Ocean Sanctuary. In addition, the pipeline for the Northeast Gateway Project would cross about 2.8 miles of the Northshore Ocean Sanctuary. The Ocean Sanctuaries Program is administered by the Massachusetts Department of Conservation and Recreation. Crossing these sanctuaries requires a Chapter 91 license and review and comment by the Ocean Sanctuaries staff under MEPA regulations.

Aquatic Resources

The impacts of pipeline construction on aquatic resources would depend on the habitats that are crossed and the organisms that occur there. Potential impacts could include covering epibenthos and the smothering of sessile invertebrates through the clogging of their respiratory structures, and potential impacts on eggs and juveniles of bottom-dwelling finfish. Habitat conversion would occur in areas where fine sediments suspended by construction cover cobble, gravel, or other hard bottom substrates. Our review of the substrates along the proposed pipeline route for the Neptune LNG Project (Butman et al., 2004a and 2004b) indicates that much of the currently proposed route across areas requiring pipe burial would impact a mixture of hard and medium bottom substrates. The areas of hard bottom are likely composed of erosional lag deposits of gravel and cobble covering drumlin-like features. Substrates along the HubLine pipeline route near the proposed interconnect with the Neptune LNG pipeline were reported to include coarse-grained sediments, medium- and fine-grained sediments, fine- to coarse-grained sediments, and fine- to medium-grained sediments (FERC, 2001). Based on this information, it seems probable that some hard substrate (e.g., coarse-grained substrate) would be encountered along the pipeline route for the Neptune LNG Project. Algonquin has routed the pipeline associated with the Northeast Gateway Project to avoid areas of hard-bottom substrate as much as practicable; however, similar impacts on aquatic resources (with less hard bottom habitat impacts) would be likely from installation of the Northeast Gateway pipeline.

Essential Fish Habitat

According to information from NOAA Fisheries (NOAA, 2004b), the pipeline for the Neptune LNG Project would cross two EFH areas. The pipeline for the Northeast Gateway Project would cross the same two areas and a small portion of a third EFH area. There are a total of 28 federally managed fish species that occur in these three areas, including Atlantic cod, haddock, whiting, red hake, white hake, redfish, witch flounder, winter flounder, yellow tail flounder, summer flounder, windowpane, American plaice, ocean pout, Atlantic halibut, Atlantic sea scallop, Atlantic sea herring, monkfish, black sea bass, long finned squid, short finned squid, Atlantic butterfish, Atlantic mackerel, and bluefin tuna. All three areas include designated EFH for all four life stages (e.g., eggs, larvae, juveniles, and adults) of 14 of these species. One of the areas also includes pollock (all four life stages), and juveniles and adults of bluefish, scup, surf clam, and spiny dogfish. The potential impacts of both projects on EFH would include degradation of water quality through temporary increases in turbidity and potential introduction of chemical contaminants such as fuel and lubricants from equipment operating in and over the water. Additionally, the resuspension 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 a temporary displacement of motile organisms and may stress or kill sessile benthic organisms within the affected area.

Lobstering Areas

The sendout pipelines associated with both projects would be located primarily within Massachusetts DMF Statistical Reporting Areas 3 and 19, which are productive lobstering areas. The Northeast Gateway pipeline would also cross a small portion of Area 2. According to 2002 Massachusetts lobster fishery statistics, these areas yielded more than 12 percent of the state's territorial catch, or between 1 and 2 million pounds of the lobster landings in 2002 (Dean et al., 2004). Potential impacts on lobster would include temporary loss of habitat and burial, injury, or death of lobsters in and adjacent to the pipeline trench. Early benthic-phase lobster larvae may be particularly susceptible to the latter impact. In deep waters (i.e., greater than 200 feet) where the pipeline may not be buried, the pipeline could create a several mile long barrier to lobster migration, which lobsters may have difficulty crossing.

Based on the information provided by Northeast Gateway, the Coast Guard's safety and security zones and *No Anchor Area* would encompass about 1 nautical mile around each docking buoy. We expect similar zones would be established for the Neptune LNG docking buoys. These zones would preclude other vessel traffic and thus would permanently exclude fisherman, including lobster fisherman, and other boaters from fishing or using about 2 square miles or 1,330 acres of the ocean during the operational life of either facility.

Threatened and Endangered Species

In addition to finfish and lobsters, several federally listed threatened and endangered species could also potentially occur in the area that would be occupied by the deepwater ports and crossed by the pipelines for both projects. These include six whale species (North Atlantic right, humpback, fin, sei, sperm, and blue) and five sea turtle species (leatherback, loggerhead, Kemp's ridley, green, and hawksbill).

North Atlantic right whales generally occur in the area from January through April but have been known to occur in the area throughout the year. Fin and humpback whales generally are in the area from April to October. These whales are known to frequent Stellwagen Bank, which is near both project areas, but could also occur closer to shore. Potential impacts on whales could include vessel noise, blasting (if any is necessary), ship strikes or collisions with construction vessels and LNG ships, loss of feeding habitat and prey items, and fuel spills. Additionally, although the final EIS for the HubLine Pipeline Project concluded that it was unlikely that an endangered whale would be affected by that project, this finding was in large part due to the nearshore location of the HubLine Pipeline Project and its distance from Stellwagen Bank and Cape Cod Bay. It has not yet been determined if this same conclusion could be reached for the Neptune LNG or Northeast Gateway Projects, which would be much further from shore and closer to Stellwagen Bank. The potential impacts of both projects on North Atlantic right, fin, and humpback whales and other federally listed species would need to be determined based on consultations with the NOAA Fisheries under section 7 of the ESA.

The sea turtles generally occur in the project area from May through October and could be affected by trench excavation, construction vessel traffic, blasting (if any is necessary), and fuel spills. However, the majority of potential impacts on sea turtles would be avoided because both projects have indicated that pipeline construction would be restricted to the winter months, when the turtles are not in the area. Similar to the Weaver's Cove LNG Project, impacts on endangered sea turtles from LNG ship traffic would still be possible during port operations since LNG vessels would arrive and depart throughout the year (see section 4.7.1).

Impacts Associated With Facility Operations

Operation of the LNG import terminals proposed by Excelerate and Neptune LNG would result in air emissions and impacts on aquatic resources.

Air Emissions

The unloading process used by an LNG transport and regasification ship involves the vaporization of LNG and injection of natural gas directly into the sendout pipeline(s). The vessels to be used for the Northeast Gateway Project would employ a shell and tube vaporizer system that operates in both open- and closed-loop modes. In the open-loop mode, seawater is pumped through the shell and tube system to provide the heat necessary to convert the LNG to the vapor phase. In the closed-loop system, a natural gas-fired boiler is used to heat water circulated in a closed-loop through the shell and tube vaporizer and a steam heater. Excelerate has indicated that only closed-loop vaporization would be used to regasify LNG at the Northeast Gateway terminal. The vaporization equipment that would be utilized by the Neptune LNG Project is a combination of closed-loop recirculating propane and closed-loop shell and tube water-based heat exchangers. Based on the environmental notification forms filed by Excelerate, each LNG ship has a capacity of 138,000 m^3 of LNG (this is equivalent to about 2.95 billion cubic feet of natural gas). The vessels proposed for use by the Neptune LNG Project are similar in size and capacity. Using the closed-loop vaporization process indicated for both projects, it would take about 7 to 8 days to unload a single cargo of LNG. The closed-loop vaporization process would result in longer durations of unloading than those at the proposed Weaver's Cove LNG facility.

The longer unloading times required to discharge a cargo at the offshore ports would result in increased air quality impacts. Regasification would require each LNG ship to remain at the offshore terminal for about 7 days. Regardless of the mode of vaporization, the ship would need to operate its engines throughout the unloading process, resulting in air quality impacts. Excelerate and Neptune LNG have both indicated that vessels unloading LNG at the terminal would operate using natural gas in place of diesel during cargo discharge operations. The use of either the Northeast Gateway or Neptune LNG facility to provide baseload gas supplies would require one ship to be docked at an unloading platform every day of the year. Closed-loop vaporization would require the use of a gas-fired boiler to operate the vaporizers. Based on the environmental assessment (EA) for the Gulf Gateway Project (Coast Guard, 2003), the onboard boilers used for the Northeast Gateway Project would use 7,117 million Btu per day, or 4.98×10^{10} Btu per cargo of LNG. We expect similar emissions would result from cargo discharges associated with the Neptune LNG Project. The estimated air emissions presented below do not account for those times when two LNG ships would be unloading simultaneously to maintain baseload sendout and, therefore underestimate potential air quality impacts slightly (see table 3.2.2-1). As noted in Neptune LNG's application, additional air emissions would result from the standby vessel that would be present at all times during port operation. We assume a similar support vessel would be required for the Northeast Gateway Project.

Although we recognize that air quality impacts occur within a broader global context, prevailing winds in the area are to the east, which might mitigate some of the direct air quality impacts within the onshore areas of the United States.

TABLE 3.2.2-1

Estimated Air Emissions from LNG Vessel Operations During Offshore Cargo Unloading

NO_x		CO		CO_2		SO_2		VOC	
lb/delivery a/	tpy	lb/delivery	tpy	lb/delivery	tpy	lb/delivery	tpy	lb/delivery	tpy
9,464	247	4,186	109	5,978,280	155,862	30	0.78	39	7.1

a/ delivery is based on 400 MMcfd vaporization rate using closed-loop vaporization (about 7 days per shipload)
NO_x oxides of nitrogen
CO carbon monoxide
CO_2 carbon dioxide
SO_2 sulfur dioxide
VOC volatile organic compounds
lb/delivery pounds per LNG ship delivery
tpy tons per year; (lb/day x 365 days/ year)/ 2000 lb per ton

Aquatic Resources

Similar to the Weaver's Cove LNG Project, eggs and larvae of various marine species would be subject to entrainment and impingement impacts from ballasting operations (see section 4.6.2). According to Northeast Gateway, the LNG ships would arrive at the port carrying no ballast water. We assume this would also be the case for vessels operated by Neptune LNG. As the LNG ships offload their cargo, ballast water must be taken onboard to maintain ship stability. Each LNG ship used for the Northeast Gateway Project would utilize about 13.8 million gallons of ballast water per cargo delivery. The regasification ships that would be utilized by the Northeast Gateway Project are currently configured with sea chest intakes equipped with 21 millimeter slotted grates for appropriating ballast water (Coast Guard, 2003). We have assumed a similar grate-slot size for estimating potential impacts from the Neptune LNG Project. Grates of this size would minimize the entrainment of foreign objects and larger marine organisms, but would not prevent impingement or entrainment of the eggs and larvae of many fish species.

To quantify the potential for entrainment and impingement of ichthyoplankton from ballast water withdrawals, we used data provided in the Neptune LNG deepwater port application. Neptune LNG summarized ichthyoplankton data collected by NOAA Fisheries as part of the MARMAP project from the portion of Massachusetts Bay where both projects would be located. Based on these data and assuming one ship per week and 13.8 million gallons of ballast water for each ship (as reported by Northeast Gateway), we estimate that entrainment or impingement could be as high as about 168,000 eggs and 29,000 larvae (from a variety of fish species) for each shipload of LNG. Although these numbers appear quite large, we note that impacts on ichthyoplankton can be difficult to interpret due to the low natural survival rates of fish eggs and larvae. However, these numbers are generally similar to those we have estimated for the Weaver's Cove LNG Project (see section 4.6.2).

Safety and Security Issues

Various commentors have expressed the opinion that an offshore LNG terminal would generally be a preferable alternative to the proposed Weaver's Cove LNG Project. The commentors state that an offshore LNG terminal would avoid public safety concerns of populations adjacent to LNG ship routes and onshore terminals. Based on the potential area affected by an LNG spill on water (discussed in section 4.12), our review finds that more people could be potentially affected by a major spill at the proposed Weaver's Cove LNG terminal than at either the Neptune LNG or Northeast Gateway deepwater

port sites. As a result, section 4.12 describes numerous protective plans and mitigation measures as part of the detailed discussion of public safety and security issues associated with the Weaver's Cove LNG Project.

Conclusions for the Neptune LNG and Northeast Gateway LNG Projects

If the Neptune LNG or the Northeast Gateway Projects were constructed, either project could potentially meet some of Weaver's Cove Energy's objective of providing a new source of imported LNG in the New England market area. However, the reliability of the supply remains uncertain. To meet peak winter demand in New England, it is essential that an offshore system have the proven reliability to meet both the average baseload and maximum sendout during the most severe offshore weather. Although the Coast Guard has approved the Gulf Gateway Project for offshore Louisiana, and this port has received its first cargo, the reliability of this type of system to provide continuous service during the most severe offshore conditions has not yet been demonstrated in practice. At present only one LNG regasification ship is available for the Northeast Gateway Project. As noted earlier, Excelerate expects delivery of its second vessel in late April 2005, and the third ship is not expected to be delivered until October 2006. In addition, service reliability of this alternative is dependent on these specially designed regasification ships because docking and cargo transfers that would be necessary for the facility to function cannot presently be performed by conventional LNG ships. Furthermore, to provide continuous baseload service, Excelerate would need to have all three ships operating. Until all of Excelerate's ships are constructed and commissioned, reliable baseload operations at the Northeast Gateway terminal may not be possible.

The specialized regasification vessels required for the Neptune LNG Project are not yet under construction. As noted earlier, construction of vessels such as these typically requires about 27 months per vessel (Engineering News Record, 2004). In addition, Neptune LNG has indicated that it would not award contracts for the final design and construction of the vessels until the deepwater port license is approved by the Coast Guard and DOT (Neptune LNG, 2005). Since review of the license application could take up to 18 months, construction of the LNG regasification vessels would not likely begin before perhaps July 2007. As with the Northeast Gateway Project, Neptune LNG would need all three of its regasification vessels to provide continuous baseload gas service.

It has yet to be determined whether the Neptune LNG or Northeast Gateway Projects would be able to provide the service reliability of a traditional onshore LNG storage facility. Additionally, neither the Neptune LNG Project nor the Northeast Gateway Project could provide an additional source of LNG to meet the needs of existing peakshaving facilities, which are currently critical in meeting peak winter demand in the New England region (Power Planning Committee, 2005). Because LNG cannot be practically transported by pipeline more than about 3 miles, the Neptune LNG and Northeast Gateway Projects would not be able to transport LNG to onshore facilities. Although we recognize the potential for offshore docking and LNG regasification ships to have a future role in the gas supply mix in New England as well as other areas, these facilities by themselves would not be a viable alternative that meets all of the objectives of the proposed Weaver's Cove LNG Project.

3.2.2.2 Broadwater LNG Facility – Long Island Sound

In November 2004, TransCanada Corporation and Shell US Gas & Power, L.L.C. announced plans to develop an offshore LNG import terminal in Long Island Sound. Referred to as the Broadwater LNG Project, the proposed terminal would be capable of receiving, storing, and regasifying imported LNG for delivery as natural gas to the onshore markets via an existing offshore pipeline (Broadwater, 2004). The Broadwater LNG terminal would be located in New York State waters near the center of Long Island Sound about 9 miles off the coast of New York and 11 miles off the coast of Connecticut (see figure 3.2.1-1). The terminal would consist of an FSRU. Basically, an FSRU is an oversized, moored

LNG vessel fitted with LNG vaporization and docking/unloading equipment that would be about 1,200 feet long by 180 feet wide. The FSRU would be permanently moored in 90 feet of water where it would receive conventional LNG ships every 2 to 3 days. These LNG ships would unload their cargo into the FSRU, which would be designed to store about 350,000 m^3 of LNG. The LNG would then be available for vaporization and sendout through a new 25-mile-long offshore pipeline that would be connected to the existing Iroquois pipeline at an offshore location where the Iroquois pipeline crosses Long Island Sound. According to information provided by the project sponsors, the Broadwater LNG terminal would be able to send out about 1 Bcfd of natural gas to the Iroquois pipeline system.

According to the project sponsors, the Broadwater LNG terminal would be located in an area that avoids the need for onshore development and would not require a shoreline crossing. Thus the project would avoid sensitive areas found in coastal habitats and beaches as well as avoid the need to construct and operate the facility in populated areas. In early 2005, we initiated an environmental review of the Broadwater LNG Project using our Pre-Filing Process. Pending further review of this proposed project, we feel that our recent analysis of the Islander East pipeline project is illustrative of the various environmental issues associated with construction of natural gas facilities in Long Island Sound (FERC, 2002). Based on this information and our initial review of information available for the Broadwater LNG Project, we anticipate environmental issues associated with the project would include those related to aesthetics, water quality, biological communities, socioeconomics, fishing and lobstering, and air quality.

The FSRU would be constructed at a shipyard and be towed to the project location for permanent mooring. As such, environmental impacts in the Long Island Sound would largely be limited to the construction of the mooring system and the subsea pipeline. As discussed previously for the Neptune LNG and Northeast Gateway Projects, equipment necessary to lay, excavate a trench for, and backfill the subsea pipeline as well as site the anchors and cables associated with the construction vessels would all result in disturbances to the seafloor (e.g., resuspension and redeposition of bottom sediments). Moreover, it is anticipated, due to its greater length, that the subsea pipeline for the Broadwater LNG Project would likely have more impact on the seafloor than the subsea pipelines for either the Neptune LNG or Northeast Gateway Projects. Additionally, the FSRU mooring tower would permanently impact about 0.2 acre of seafloor. The particular impacts that these disturbances would have on aquatic resources depend on the habitats affected and the organisms that occur in the area. Potential impacts could include covering epibenthos and the smothering of sessile invertebrates through the clogging of their respiratory structures and potential impacts on eggs and juveniles of bottom-dwelling finfish. Marine sediment resuspension and redeposition during construction should be temporary and localized and would not be expected to result in sediment disturbance outside the siting area.

Water for hydrostatic testing of the pipeline or as ballast for the LNG ships would be withdrawn from the Long Island Sound. These periodic withdrawals could result in the impingement and entrainment of ichtyophytoplankton.

The Coast Guard would most likely establish security zones around the FSRU and LNG ships. Although the size of these zones has not yet been determined, the project sponsors predict that commercial/recreational boating and fishing activities within about 0.5 mile of the FSRU would be permanently limited. The security zones around incoming or outgoing LNG ships may also temporarily create minor delays in other marine traffic in the Long Island Sound. However, the location of the FSRU away from major shipping lanes would minimize these delays.

A new LNG import terminal in New England has the potential to help reduce overall air emissions in the region by reducing dependency on less clean fossil fuels. However, construction vessels, LNG ships, and equipment on the FSRU (e.g., submerged combustion vaporizers) would result in localized emissions.

The FSRU would rise 75 to 100 feet above the water line and would include operational lighting. As such, this facility could potentially impact the offshore viewshed. Because the facility would be located 9 to 11 miles from shore, the FSRU and LNG ships would be barely visible (even on clear days) and would resemble a conventional ship or freighter from a distance. Additionally, the project sponsors suggested that they would limit lighting of the facility to levels necessary for safe operation of both the FSRU and any other area vessel traffic. Cut-off or directional lighting could be used to focus and direct light generally towards work areas.

From a technical perspective, we have some concerns as to whether the existing Iroquois pipeline system is capable of delivering 1,000 MMcfd. Currently, it is our understanding that the Iroquois system has a delivery capacity of about 500 MMcfd into New York City and Long Island. Even if 500 MMcfd were sent to New York and 500 MMcfd were sent to Connecticut, the Iroquois system may require upgrades that would be indirectly related to construction and operation of the Broadwater LNG Project. Further, to provide any of this gas to southeastern New England, additional upgrades to the existing Algonquin pipeline system could be required. These issues will be evaluated in more detail as part of the FERC's review of the Broadwater LNG Project. As noted above in the discussion of the Neptune LNG and Northeast Gateway Projects, an offshore facility would not be able to provide a source of truckable LNG for the New England peakshaving market. Consequently, the Broadwater LNG Project would also not be able to satisfy one of the objectives of the Weaver's Cove LNG Project. Although we recognize the potential for offshore FSRU facilities as another source of natural gas to the New England region, the Broadwater LNG Project cannot satisfy all of the objectives of the proposed Weaver's Cove LNG Project.

3.2.3 Proposed or Existing Sources of Natural Gas Outside of New England

As an alternative to developing a new LNG import terminal in New England, we considered the feasibility of accessing existing or proposed sources of natural gas outside of the region. Natural gas currently used in the eastern United States comes from existing production areas in Canada, the central and western United States, and the Gulf Coast. Generally, the production of natural gas from these sources is not expanding or is expanding slowly to meet the growing demand for natural gas (NPC, 2003). One promising source of new supplies of natural gas includes LNG imports. As previously discussed, the Distrigas LNG facility currently provides natural gas to New England from vaporization of imported LNG. Outside of the New England region there are existing LNG import terminals along the East Coast at Cove Point, Maryland and Elba Island, Georgia as well as two facilities in the Gulf Coast region. Additionally, there have recently been numerous proposals to develop new LNG import terminals throughout North America. Those that have recently been approved are listed in table 3.2.3-1.

The use of an existing or proposed source of natural gas outside of the region would require the utilization or expansion of existing pipeline systems to provide an equivalent amount of natural gas to the New England market as that proposed by Weaver's Cove Energy. Existing pipeline systems in the New England region include those owned and operated by Algonquin, Tennessee Gas, Iroquois, M&N, and PNGTS (see figure 3.2.1-1). For the most part, these pipeline systems provide natural gas from production areas in Canada, central United States, and the Gulf Coast. While new supplies of natural gas might be developed outside of the market area, including the construction or expansion of other LNG import facilities along the Gulf and Atlantic Coasts, the interstate pipelines serving the New England market are already operating at or near capacity during the winter months (Tobin, 2001; FERC, 2003). Continued reliance on existing pipeline systems in the face of increasing demands for natural gas in the region will likely result in future supply problems associated with regional and/or localized capacity constraints (Tobin, 2001; FERC, 2003).

TABLE 3.2.3 -1

Recently Approved LNG Import Terminals a/

Project /Owner	Location	Sendout Capacity	Storage Tanks, Capacity	Status
Gulf Coast LNG Import Terminals				
Cameron LNG Project *Sempra Energy*	Hackberry, Louisiana	1.5 Bcfd	Three 160,000 m^3 tanks	FERC approval issued September 2003; construction pending.
Freeport LNG Project *Cheniere Energy, Inc.*	Freeport, Texas	1.5 Bcfd	Two 160,000 m^3 tanks	FERC approval issued June 2004; facility currently under construction.
Gulf Gateway Project *Excelerate*	Lease Block West Cameron 603, Cameron, Louisiana	0.5 Bcfd	Transport and regasification vessel; no storage	Coast Guard and DOT approvals issued in January 2004; facility began operation in March 2005.
Port Pelican Offshore Deepwater Port Project *ChevronTexaco*	Vermillion Block 140, Offshore Louisiana	1.6 Bcfd	Gravity-based structure; 330,000 m^3 of storage capacity	Coast Guard and DOT approvals issued in November 2003; construction pending.
Sabine Pass LNG Project *Sabine Pass LNG LP*	Sabine Pass Channel, Louisiana	2.6 Bcfd	Three 160,000 m^3 tanks	FERC approval issued December 2004; facility currently under construction.
Gulf Landing Project *Shell US Oil and Gas*	38 miles off the coast of Louisiana in West Cameron lease block 213	1.0 Bcfd	Gravity-based structure; 200,000 m^3 of storage capacity	Initial Coast Guard and DOT approvals issued February 2005.
Cheniere Corpus Christi LNG Terminal Project *Corpus Christi LNG LP*	Corpus Christi, Texas	2.6 Bcfd	Three 160,000 m^3 tanks	FERC approval issued April 2005; construction pending.
Canadian LNG Import Terminals				
Irving Oil LNG and Multi-purpose Pier Project *Irving Oil*	Saint John, New Brunswick	1.0 Bcfd	Three 160,000 m3 tanks	Canadian government approvals issued August 2004
Bear Head LNG Project *Anadarko Petroleum Corp.*	Point Tupper, Nova Scotia	1.0 Bcfd (Phase I) 1.5 Bcfd (Phase II)	Two 180,000 m3 tanks (Phase I) One 180,000 m3 tanks (Phase II)	Canadian government approvals issued Mid-2004. Construction began in late 2004.

a/ Project information as of April 19, 2005. Obtained from LNG Express (Vol. XV, No.6, March 2005), U.S. Environmental Protection Agency informal dockets, and project applications and Environmental Impact Statements. More specific information for many of these projects, included in-depth environmental analyses, can be obtained through the Coast Guard or FERC document management systems (see http://dms.dot.gov/ and http://www.ferc.gov/docs-filing/elibrary.asp).

Expanding or modifying the existing pipeline systems to be able to deliver natural gas to the New England market would result in a variety of environmental impacts depending on the project size, length, and design. It is typical for significant pipeline construction projects in the region to result in short- or long-term impacts on water resources, upland vegetation, wetlands, wildlife habitats, traffic patterns, and

land use. Substantial expansion or modifications to the existing pipeline systems would be required to deliver the gas volumes (up to 800 MMcfd) to the New England market as proposed by Weaver's Cove Energy. In addition to construction-related effects, the operation of pipeline compressor stations also results in permanent noise and air quality impacts. The construction of new pipeline facilities would likely result in higher rates being charged for natural gas transmission, additional costs that are ultimately passed on to the consumer.

Specific issues associated with accessing sources of natural gas outside of the New England region are discussed below.

3.2.3.1 United States/Gulf Coast Sources of Natural Gas

Of the recently approved LNG projects listed in table 3.2.3-1, the seven projects located along the Gulf Coast are too far from the New England region to efficiently provide the natural gas delivery volumes proposed by Weaver's Cove Energy. Additionally, the use of the Gulf Coast projects as alternatives would likely require substantial expansion of the existing pipeline systems, which could have significant environmental impacts.

In addition to general construction-related effects noted above, the expansion and operation of new compressor stations along the existing pipeline systems needed to deliver additional gas volumes to New England would also result in noise and air quality impacts. Depending on the design parameters, interstate pipeline systems have compressor stations located at 40 to 120 mile intervals. About 5.0 to 8.5 percent of the gas delivered long distances on interstate pipeline systems is used to power the pipeline compressor stations. By comparison, the vaporization process for the Weaver's Cove LNG Project would consume only about 1.5 to 2.0 percent of the natural gas delivered to the New England market. As shown in table 3.2.3-2, the estimated emissions from transporting 400 MMcfd of natural gas from the Gulf of Mexico to New England are much higher than the emissions that would be generated by vaporizing the same volume of natural gas from LNG as proposed by Weaver's Cove Energy. If all other considerations are equal, the direct delivery of LNG to the market where the natural gas is consumed is environmentally and economically more efficient than delivering LNG to locations where the natural gas would need to be delivered long distances. Because Weaver's Cove Energy could efficiently deliver high pressure natural gas to the Algonquin pipeline system, the need for compression facilities (and hence noise and air emissions) along Algonquin's pipeline system would be reduced.

TABLE 3.2.3-2

Comparison of Air Emissions Associated With Transporting Natural Gas Via Pipeline From the Gulf of Mexico Versus Vaporizing LNG in New England a/

Delivery Mechanism	SO_2 (tpy)	NO_x (tpy)	PM_{10} (tpy)	CO_2 (tpy)
Pipeline Transport From Gulf of Mexico	19	557	37	619,199
LNG Vaporization	1	132	11	158,939

a/ Assumes the transmission or vaporization of 400 MMcfd of natural gas.
SO_2 = Sulfur Dioxide
NO_X = Nitrogen Oxides
PM_{10} = Particulate Matter
CO_2 = Carbon Dioxide

The interstate pipelines serving the New England market are already operating at or near capacity during the winter months (Tobin, 2001; FERC, 2003). Consequently, existing pipeline systems would

have to be expanded to allow significant volumes of additional natural gas to reach markets in the region. As an example of the technical issues and costs associated with such an expansion, Algonquin recently provided information regarding modifications to its system that would allow delivery of an additional 375 MMcfd of natural gas to New England (see FERC Docket No. CP04-358-000). Specifically, the theoretical expansion would allow additional volumes of natural gas to be delivered from its interconnection with the Texas Eastern pipeline system in New Jersey to a potential delivery point south of Boston (general market area served by the Weaver's Cove LNG Project). This expansion would include:

- replacing (relaying) about 94 miles of 24- and 26-inch-diameter mainline and mainline loop with a 42-inch-diameter pipeline;
- looping about 6.5 miles of its 24-inch-diameter mainline and mainline loop with another 36-inch-diameter pipeline;
- installing additional 15,000 to 30,000 hp compression units at seven of Algonquin's existing compressor stations;
- uprating existing compressor units at two of Algonquin's existing compressor stations;
- installing appropriate cooling equipment at five of Algonquin's existing compressor stations; and
- updating meter stations as necessary to accommodate changes in operating pressures.

Algonquin's preliminary estimate of the cost of these facilities is approximately $700 million. Although this would be a significant expansion of the region's pipeline infrastructure that would allow additional volumes of natural gas to reach New England from the south (potentially originating from new sources of natural gas in the Gulf Coast region), this would satisfy only a portion of the natural gas deliveries proposed by Weaver's Cove Energy.

3.2.3.2 Canadian Sources of Natural Gas

New sources of natural gas located to the north of the New England region include two recently approved LNG import terminals in Canada: the Bear Head LNG Project in Nova Scotia and the Irving Oil LNG Project in New Brunswick.

The Bear Head LNG Project is proposed by Anadarko Petroleum and will include a new LNG import terminal located off the Straight of Canso near Point Tupper, Nova Scotia. The proposed LNG facility will include two 180,000 m^3 storage tanks, with space available for a third tank in the future. A jetty will be constructed to allow unloading of 70 to 135 LNG ships per year. Because the jetty will be constructed out to a depth of 59 feet, significant dredging to allow access for LNG ships will not be necessary. The Bear Head facility will be able to initially vaporize and sendout about 1.0 Bcfd of natural gas to the M&N pipeline system (this system runs from Goldboro, Nova Scotia to Dracut and Beverly, Massachusetts). Future expansion of the facility could allow natural gas deliveries of up to 1.5 Bcfd. The Bear Head LNG terminal will be constructed on a 160-acre parcel that is currently designated for heavy industrial development. An analysis of the environmental impacts associated with construction and operation of this facility was prepared by Access Northeast Energy, Inc. (2004) and environmental approvals for the project have been obtained. Construction of the facility began in late 2004 and it is expected to be in-service by November 2007.

The Irving Oil LNG Project is proposed by Irving Oil, Ltd and will include a new LNG import terminal and multi-purpose pier at the Irving Canaport facility in Saint John, New Brunswick. Current land use in the general area of the proposed site is residential, commercial, and industrial. Although the proposed site is zoned for industrial use and is adjacent to the Irving Canaport facility, the site is currently forest land. The proposed LNG terminal will include three 160,000 m^3 single containment storage tanks. A 1,000-foot-long pier will be built from the shore to the docking/unloading facilities which will be located in water depths greater than 82 feet. Due to the depth of water at the proposed site for the docking/unloading facilities, dredging and disposal of sediments will not be necessary. The proposed facility could accommodate 80 to 120 LNG vessels a year with cargo capacities up to 200,000 m^3. The LNG terminal will be able to vaporize and sendout about 1.0 Bcfd of natural gas. Natural gas sendout will be via a 5.6-mile-long pipeline that will connect to the Irving Refinery. In addition to the Irving Refinery, the project will supply natural gas to other markets in Canada and the northeastern United States (presumably through the M&N pipeline system). An analysis of the environmental impacts associated with construction and operation of this facility was prepared by Irving Oil Ltd. (2004) and environmental approvals for the project have been obtained. Similar to the Bear Head LNG Project, the Irving Oil LNG Project is expected to be in-service by late 2007.

For New England to receive new supplies of natural gas from either of these Canadian LNG facilities, the M&N pipeline would have to be expanded. Currently, the M&N system is able to deliver 350 to 400 MMcfd of natural gas to markets in New England. It appears that this system could be expanded to deliver at least another 400 to 750 MMcfd of natural gas to New England, through the addition of pipeline loops and compression to its system. As an example, M&N proposed its Phase IV Project in 2002 as a way to increase the capacity of its system by about 385 MMcfd (see FERC Docket No. CP02-78-000). Although this project was withdrawn because the source of the new natural gas supplies was never developed, the Phase IV Project was proposed to include about 31 miles of pipeline looping, four new compressor stations, and modifications at three existing compressor stations. Costs for the expansion were estimated to be $250 million. As noted earlier, both of the Canadian LNG projects discussed above have been approved. Currently there are no proposals to expand the M&N pipeline system to allow additional deliveries to New England. We note, however, that M&N has recently concluded an open season to assess the potential for new suppliers and consumers of natural gas to utilize the M&N system to transport additional volumes of natural gas (Northeast Gas Association, 2005; M&N, 2005). The final outcome of this open season is expected sometime in June 2005 (M&N, 2005). Potential expansion of the M&N system could be as large or larger than the Phase IV Project described above. In addition, Tennessee Gas has recently announced a non-binding open season for its Atlantic Supply Expansion Project (Northeast Gas Association, 2005). This project is also designed to respond to the development of LNG terminals in eastern Canada and Maine. The project could supply up to an additional 250 MMcfd to the Tennessee Gas system at its Dracut, Massachusetts interconnect with the joint facilities of M&N and PNGT. However, this project could not be constructed unless an expansion of the M&N system capable of delivering the additional gas volumes was also constructed.

As with the potential offshore LNG facilities in the New England region and the potential LNG facilities in Maine, these Canadian LNG facilities could not provide a source of LNG for the New England peakshaving market.

3.2.4 Existing or Proposed System Alternative Conclusions

As discussed in section 3.1, if the no action or postponed action alternative is adopted there are several potential effects. Two likely outcomes would be: 1) negative environmental and economic impacts associated with more limited supplies of natural gas (see section 3.1); and/or 2) the development of other natural gas infrastructure projects that meet some or all of the project objectives identified by Weaver's Cove Energy. At this time, it is not possible to foresee which (if any) of the LNG import

projects proposed in the New England region will move forward and be constructed. Regardless, when considered independently, none of the LNG import projects in the region would be capable of serving as an alternative to the Weaver's Cove LNG Project.

In any event, we expect that new pipelines or proposals to modify existing pipelines will continue to increase the capacity of existing systems delivering natural gas to the New England region (EIA, 2003b). A case in point is Tennessee Gas' recently announced Northeast ConneXion – New England Project, which is proposed to provide an additional 136 MMcfd of natural gas from long-haul sources in Texas and Louisiana (Northeast Gas Association, 2005). The additional volumes would be supplied by increasing compression capacity at existing compressor stations in New York and Massachusetts. Projects such as this will allow access to sources of natural gas outside of the region, including new LNG import terminals that are constructed. However, because of the seasonal nature of energy demand in New England, pipeline infrastructure designed to provide natural gas from outside the region during peak periods of use would be underutilized during most of the year. As a result, the cost of natural gas from outside of the New England region would also generally be higher. Nevertheless, these projects would not be able to meet all of the objectives stated for the Weaver's Cove LNG Project (e.g., a new LNG import terminal and competitive source of imported LNG in the New England market area, an LNG storage facility that would be able to provide a new source of LNG for delivery via truck to peakshaving facilities throughout the region). When considered together, however, several of the projects in or outside of the region could meet many of the project objectives. Table 3.2.4-1 summarizes the capabilities of the various existing or proposed projects in comparison to the Weaver's Cove LNG Project.

3.3 LNG TERMINAL SITE ALTERNATIVES

The examination of alternative sites for an LNG import terminal involved a comprehensive process that considered environmental, engineering, economic, safety, and regulatory factors. The first step included determining the most suitable area for an LNG terminal based on the stated purpose of the project of providing a new LNG import terminal as well as a new supply of natural gas and LNG deliveries to the New England market. The second step included identification of a specific port capable of accommodating ships that can transport up to 145,000 m^3 of LNG. The third step included comparatively evaluating specific sites within suitable ports that are capable of supporting the necessary docking, storage, and regasification facilities.

3.3.1 Regional Review

As discussed in section 1.3, there is a current and growing demand for natural gas in the New England region. Due to the limitations in the existing pipeline systems serving the region as well as the other disadvantages discussed in section 3.2.3, we believe an LNG import facility located north of the southern terminus of the M&N pipeline system or west of the Iroquois Pipeline system would not efficiently serve the New England market (see figure 3.3.1-1). As such, we did not consider alternative LNG terminal sites north of the Massachusetts/New Hampshire border or west of New Haven, Connecticut. In support of this determination, a separate FERC analysis of natural gas infrastructure in the region concluded that siting an LNG import terminal between Boston and New York City would be ideally suited to free up capacity on the Algonquin and Tennessee Gas pipeline systems, thereby providing access to natural gas in the storage fields in New York and Pennsylvania. This would have the effect of reducing New England's reliance on limited aboveground storage, pipeline imports, and LNG during periods of peak natural gas demand during the winter months (FERC, 2003).

TABLE 3.2.4-1

Existing and Proposed System Alternatives Compared to the Weaver's Cove LNG Project

Weaver's Cove LNG Project Objectives	Distrigas LNG	KeySpan LNG	Neptune LNG or Northeast Gateway LNG	Broadwater LNG	Quoddy Bay LNG	Natural Gas Sources Outside of New England
New LNG import terminal in New England	No (existing LNG import terminal)	Yes (expansion of storage facility would allow LNG import)	Yes (construction of new facility would allow LNG import)	Yes (construction of new facility would allow LNG import)	Yes (construction of new facility would allow LNG import)	No (new LNG facilities would be outside of the region)
New facility in New England region capable of storing up to 200,000 m3 of LNG	No (existing LNG storage of 155,000 m3)	No (existing LNG storage of 95,000 m3)	No (new facility would not allow LNG storage)	Yes (new facility would allow LNG storage of 350,000 m3)	Yes (new facility would allow LNG storage of 150,000 to 200,000 m3)	No (new LNG facilities would be outside of the region)
New facilities allowing access to "stranded" natural gas reserves	No (existing LNG import terminal)	Yes (expansion of storage facility would allow LNG import)	Yes (construction of new facility would allow LNG import)	Yes (construction of new facility would allow LNG import)	Yes (construction of new facility would allow LNG import)	Yes (construction of LNG import terminals outside of the region and regional pipeline expansions)
New natural gas deliveries in New England averaging 400 MMcfd (max. 800 MMcfd)	No (existing sendout of up to 715 MMcfd; expansion could allow an additional 100 MMcfd of sendout)	No (existing sendout of up to 150 MMcfd; expansion could allow an additional 50 (average) to 375 (maximum) MMcfd of sendout)	No (new facility would allow sendout of 400 (average) to 500 (maximum) MMcfd)	Yes (new facility would allow sendout of 1.0 Bcfd)	Yes (new facility would allow sendout of 500 MMcfd (average) to 1.0 Bcfd (maximum))	Yes (although there is no formal proposals, expansion of Algonquin and M&N/PNGTS is conceivable)
Strengthened gas supply to southeastern Massachusetts and Rhode Island	No (expansion would indirectly strengthen southeastern Massachusetts and Rhode Island gas supply via deliveries to Boston area)	Yes (expansion would directly serve Providence area)	Yes (new facility would add natural gas to the Algonquin system south of Boston)	No (new facility indirectly strengthen southeastern Massachusetts and Rhode Island gas supply via deliveries to New York (Long Island) and Connecticut)	No (new facility indirectly strengthen southeastern Massachusetts and Rhode Island gas supply via deliveries to northern New England markets)	Yes (although there is no formal proposals, expansion of Algonquin could conceivably provide additional deliveries to southeastern Massachusetts and Rhode Island)
A competitive source of trucked LNG (normal trucked LNG sendout of 100 trucks per day)	No (currently Distrigas is the only major source of trucked LNG with delivery of 100 trucks/day)	No (expansion would allow delivery of 24 LNG trucks/day)	No (new facility would not allow LNG trucking)	No (new facility would not allow LNG trucking)	No (new facility would not appear to include LNG trucking)	No (existing or proposed LNG facilities outside of New England are too distant for LNG trucking)

Insert Figure

3.3.1-1 New England Pipeline Systems and Coastal Ports

3.3.2 Port Review

Ships that are presently used to transport LNG typically have capacities of up to 138,000 m^3. The larger ships are from 950 to 1,000 feet long with typical drafts up to 38 feet. To ensure that the LNG ships do not easily or frequently run aground, up to an additional 2 feet of water is desirable under the keel. This means that LNG ships will typically only access areas with depths of 40 feet.[4] Although dredging in shallow water areas could provide access for LNG ships, the dredging required in undeveloped ports would be cost prohibitive and would most likely result in significant environmental impacts. Consequently, our analysis of alternative LNG terminal sites was limited to offshore or existing deepwater coastal ports that could readily accommodate LNG ships without dredging or without significantly more dredging than would be required for use of the proposed site.

3.3.2.1 Coastal Ports

As discussed previously, LNG ships can typically only access areas with depths of at least 40 feet. Throughout ports in the New England region, it is common for large ships to take advantage of rising or high tides when accessing shallow ports. This effectively increases the depth of the channel depending on the tide by several feet (typically 3 to 5 feet). In combination with some dredging, LNG ships could reasonably access ports deeper than 35 feet below MLLW. Figure 3.3.1-1 illustrates the ports in the project area that were originally considered in our analysis. The following ports were removed from further consideration since the amount of dredging required to use these ports was considered excessive and substantially more than the proposed project:

- Massachusetts: Gloucester, Beverly, Salem, Lynn, Quincy, Weymouth, Fairhaven, New Bedford;
- Rhode Island: Tiverton, Galilee/Jerusalem, Westerly; and
- Connecticut: Bridgeport.

Seven coastal ports or port areas were identified that have depths that would allow LNG ship access and that are located in areas that could provide reasonable access to the New England market. These port and port areas include: Boston Harbor, Brayton Point, Providence Harbor, Quonset Point, Coddington Cove/Melville, New London Harbor, and New Haven Harbor.

3.3.2.2 Offshore Ports

An offshore LNG import terminal would not be capable of delivering LNG by truck to LNG storage facilities throughout the region. Because an offshore LNG import terminal would not meet one of the primary objectives of the project (see section 1.3), offshore site alternatives were not considered in this analysis. However, there are several proposals to build offshore LNG import terminals in New England. The potential for one of these proposed offshore terminals to satisfy some of the other objectives of the Weaver's Cove LNG Project and the environmental issues associated with offshore LNG terminals are discussed in section 3.2.2.

[4] In New England, it is typical for deep-draft vessels to navigate channels with depths shallower than 40 feet below MLLW by transiting the channel on a rising or high tide, as is proposed for the Weaver's Cove LNG Project (see discussion in section 3.3.2.2).

3.3.3 Specific Port and Site Review

In addition to providing reasonable access to the New England market from sites with depths that would allow LNG ship access, coastal ports or port areas were evaluated for the availability of sites suitable for developing an LNG terminal. After initially considering both offshore and coastal ports, we identified seven coastal ports or port areas for further examination. To narrow the range and fully evaluate project alternatives, we developed criteria to assist in identifying and comparing specific sites for consideration as LNG terminal alternatives. The review process included the examination of required and favorable review criteria.

Required criteria included regulatory specifications regarding LNG facility layout and safety siting factors that are required to be met for the project to be feasible. If not met, the required criteria served to exclude a site from further consideration. Required criteria included:

- **Thermal Exclusion/Vapor Dispersion Zone** (49 CFR 193.2057 and 193.2059) - Thermal exclusion and vapor dispersion zones must be established in accordance with NFPA 59A. Based on the proposed project design, we have applied a thermal exclusion zone with a radius of 1,000 feet from the center of the LNG storage tank.

- **Airports** (49 CFR 193.2155(b)) - LNG storage tanks must not be located within a horizontal distance of 1 mile from the ends of the runway, or ¼ mile from the nearest point of a runway, whichever is longer. The height of LNG structures in the vicinity of an airport must also comply with Federal Aviation Administration requirements.

- **LNG Waterfront Handling Requirements** (33 CFR 127.105) - Waterfront facilities where LNG is handled must comply with Coast Guard regulations pertaining to layout and spacing of the marine transfer area. These regulations require that each LNG loading flange be located at least 985 feet from general public or railway bridges crossing navigable waterways or entrances to any tunnel under navigable waterways.

We received numerous comments from Fall River residents that the proposed LNG terminal should not be developed in an urban setting near a densely populated residential area. While we evaluated alternative LNG terminal sites, we emphasize that our responsibility under NEPA as the lead federal agency is to determine if environmentally preferable alternatives to the proposed action exist. All alternative sites were, therefore, compared to the proposed LNG terminal site. Favorable review criteria, although not absolute alternative requirements, were applied to identify those sites that would be reasonable and most likely to provide some environmental advantage over the proposed project. For example, criteria were identified that would specifically improve upon some aspects of the Weaver's Cove LNG Project such as those associated with its location to nearby population centers/residences and project dredging requirements. Favorable criteria were not intended to strictly eliminate the evaluation of certain sites. Some sites were selected for further analysis because they satisfied a majority, but not all of the favorable criteria. Given the limited availability of suitable sized parcels in areas with deepwater access, it was not possible to locate an alternative that met all of the favorable review criteria. Favorable criteria included:

- **Population Centers/Residences** - We made an effort to identify alternative LNG terminal sites in areas that are not in close proximity to population centers and/or residences. Similarly, alternative LNG terminal sites were considered preferable if the location did not require LNG ships to transit near residentially and commercially developed shorelines. In addition to avoiding potential conflicts with existing land uses,

application of this favorable criterion would ideally avoid conflicts regarding perceived safety issues related to transport and storage of LNG.

- **LNG Terminal Footprint** - Based on the proposed design and the need to contain the thermal exclusion zone, a waterfront site of about 60 acres (about the size of the southern parcel at the proposed site) would be preferable to accommodate the proposed configuration of the LNG unloading, storage and sendout facilities. Assuming the LNG storage tank is located at the waterfront, this site would have to be about 2,200 feet by 1,200 feet to contain the thermal exclusion zone that is centered on the LNG storage tank. An ideal waterfront site available for development would include an area in excess of the exclusion zone which would provide an additional buffer from development. In addition, because the federal and state resource agencies in the region prefer to avoid offshore disposal of dredged materials, any alternative LNG terminal site may also need to accommodate the reuse of dredged material onshore. However, to expand the range of potential candidate sites, we have relaxed the preferred acreage limit, recognizing that the facilities would need to be compressed and that exclusion zones may extend offshore or onto adjacent properties.

- **Dredging Required** - Few ports in the New England market area have navigation channels depths that would readily allow access to LNG ships. However, there are several ports that would accommodate LNG ships with some dredging. Given the environmental impacts associated with significant dredging projects, we considered the amount of dredging necessary to provide access to LNG ship access one of the alternative site review criteria. Areas requiring minimal dredging to develop and maintain a ship berth and a shipping channel of sufficient depth for the LNG ships were considered more favorable than those areas requiring more substantial dredging. In addition to avoiding impacts on water quality and aquatic resources, minimal dredging requirements provide the added benefit of reducing costs associated with disposal of dredged material.

- **Parcel Availability** - One of the greatest challenges of siting an LNG facility in the New England region is finding suitable property that is available for industrial development. Availability is critical since section 3 of the NGA does not provide the project proponent the authority of eminent domain in acquiring property for the LNG terminal project facilities. In some cases, a site may possess the size required for an LNG terminal but the owner is unwilling to sell or has placed unacceptable conditions on the acquisition of the site.

- **Existing Land Use** - Areas previously disturbed or cleared for industrial or commercial activities were preferable over undisturbed areas (greenfield sites) when identifying alternative LNG terminal sites. Additionally, we preferred sites where existing land use zoning, coastal zone management guidelines, or development plans were consistent with an LNG import terminal. For example, although we considered all areas with deepwater access, areas outside of designated ports were generally determined to be less preferable than areas within designated ports. Those sites in areas consistent with existing land uses were considered the most practical alternatives to the proposed site.

- **Sendout Pipeline Length** - We considered sites proximate to existing interstate pipeline systems which could accommodate the proposed volume throughput more favorable than sites further from existing pipelines. For purposes of this analysis, we assumed a pipeline should be at least 20 inches in diameter to accommodate the normal project volumes. On

top of the additional costs and environmental impacts, longer pipelines would likely directly and indirectly affect more landowners/residences.

- **Highway Access** - As discussed previously, one of the objectives of the project is to provide a new LNG import terminal with the ability to deliver LNG by truck to LNG storage facilities throughout the region.[5] To minimize traffic impacts from LNG trucks that would deliver LNG to storage facilities throughout New England, we considered sites proximate to major highways, which would avoid or minimize the transit of LNG trucks through residential neighborhoods, more favorable than sites further from major highways.

- **Navigational Suitability** - Sites that offer minimal disturbances to existing shipping and allow for good access by LNG ships were considered a favorable selection criterion. We also considered bridge transit along the navigation channel in our site analysis, since LNG ships require a vertical clearance of at least 135 feet and horizontal clearance of not less than 165 feet.

- **Environmental Justice** - As part of its NEPA analysis, the FERC is responsible for addressing the potential for a federal action to result in disproportionately high and adverse health or environmental effects on minority or low-income populations. We have not identified any significant environmental justice concerns related to the operational impacts or environmental affects of the proposal (see section 4.9.7). Nevertheless, we considered per capita income, the percentage of minorities within the population, and the percentage of the population below the poverty level as general measures of the potential for a site to have an environmental justice issue. Those sites in communities with the lowest per capita income, the highest percentage of minorities, or the highest percentage of the population below the poverty level were considered to have the highest potential to raise environmental justice issues.

- **Various Environmental Factors** - Environmental factors that were considered in our site selection included: minimizing wetland disturbance and preferring sites in uplands; identifying soil conditions with suitable foundation materials for the LNG storage tank development; avoiding areas that would conflict with recreational activities; and selecting sites where the LNG storage tank would minimally impact the viewshed from roadways and surrounding communities.

- **Special Interest Areas** - We considered favorably those sites that avoided conflicts with special interest areas such as state or national parks and marine sanctuaries (e.g., some of the islands in Boston Harbor and Narragansett Bay, the Cape Code Marine Sanctuary). When applying this criterion, we considered potential conflicts with special interest areas from either an LNG terminal or its associated sendout pipeline.

The ports, port areas, and specific sites discussed below are the most reasonable alternatives to the terminal location proposed by Weaver's Cove Energy that we identified.

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[5] We received a comment from the OCZM questioning the importance of LNG trucking as a project objective and our use of it in determining the highway access siting criteria for evaluating alternatives. We recognize that it may be possible to develop an LNG terminal in New England without the capacity to truck LNG. However, we also note that trucking of LNG is an important business component of both the existing Distrigas LNG terminal in Everett and the proposed KeySpan LNG terminal in Providence. We believe an LNG terminal facility without this capacity would not be as competitive and would be at a disadvantage.

Boston Harbor

Boston Harbor is one of the oldest and busiest ports on the East Coast that includes facilities supporting bulk and carrier cargo industries, cruise ship docking, fishing operations, shipyards, ferry services, marine research institutions, recreational marinas, and a major Coast Guard station. As discussed in section 3.2.1.1, the existing Distrigas LNG import terminal is located inland of the Boston Inner Harbor on the Mystic River. We are aware of only one site that is potentially available for development as a large industrial facility in Boston Harbor - the Mass Marine Terminal located on the south side of the main harbor channel (see figure 3.3.3-1). This site would be preferable to the proposed site in that Boston Harbor is accessible to LNG ships without the need for significant dredging. However, this site is currently being used for construction staging associated with the Central Artery Project and would not be available until at least 2007. Regardless, this site is located less than 1 mile from the end of a runway at the Logan International Airport. Because federal safety regulations prohibit locating an LNG storage tank this close to an airport runway (see *Required Siting Criteria* described above), an LNG facility at the Mass Marine Terminal is not a viable alternative to the proposed project. Table 3.3.3-1 provides a comparison of the review criteria evaluated for this site and the proposed site.

Narragansett Bay

Within Narragansett Bay, four alternative terminal sites were identified in addition to the proposed site. These were Brayton Point, Providence Harbor, Quonset Point, and the Coddington/Melville area. Other potential sites with deepwater access in Narragansett Bay were excluded because they were inconsistent with or did not satisfy multiple review criteria. For example, Prudence Island was considered as the potential site of an LNG terminal in the 1970s. However, we did not consider this a viable alternative location because a large portion of the island was designated a National Estuarine Research Reserve in 1980. In addition to requiring the development of a greenfield site in a location outside of a designated port area, an LNG terminal located on Prudence Island would not be able to meet the project objective of delivering LNG by truck to other LNG storage facilities in the New England region.

Brayton Point

During the public and agency scoping process, we received several suggestions to analyze an alternative LNG terminal site at Brayton Point in Somerset, Massachusetts. Somerset LNG also announced in 2003 that it is exploring development of an LNG import terminal at this location. Because Somerset LNG has not initiated a filing process at the FERC and there is some question as to whether an application will be forthcoming, we have considered development of a terminal at this location an alternative terminal site and not a system alternative.

The Brayton Point site is located along Mount Hope Bay less than 3 miles downstream from the site proposed by Weaver's Cove Energy (see figure 3.3.3-2). Currently, Dominion operates a coal, oil, and gas-fired 1,550 megawatt power plant at this property (Dominion recently purchased this facility from USGen). There are five fuel storage tanks and a large coal stockpile on the southern portion of this site. Natural gas is provided via a 20-inch-diameter pipeline that is connected to Algonquin's pipeline system. If gas flow were reversed, this pipeline could potentially be used to deliver about 400 MMcfd of natural gas to the Algonquin system. Table 3.3.3-1 provides a comparison of the review criteria evaluated for this site and the proposed site.

Insert Figure

3.3.3-1 Boston Harbor – LNG Terminal Site Alternative

Insert Figure

3.3.3-2 Brayton Point – LNG Terminal Site Alternative

TABLE 3.3.3-1

Environmental Comparison of the Terminal Site Alternatives to the LNG Terminal Site Proposed by Weaver's Cove Energy

	Proposed Site	Boston Harbor	Brayton Point	Providence Harbor	Quonset Point	Coddington/ Melville	New London Harbor
	Taunton River - Fall River, MA	Boston Harbor Main Channel - Boston, MA	Mount Hope Bay - Somerset, MA	Providence Harbor - East Providence, RI	Western Narragansett Bay	Rhode Island - Melville, RI	New London Harbor - Groton Heights, CT
Required Criteria							
Site Satisfies Thermal Exclusion/Vapor Dispersion Zone Requirements	Yes	Yes	Unknown	Yes	Yes	No	No
Site Satisfies Airport Setback Requirements	Yes	No	Yes	Yes	No	Yes	Yes
Site Satisfies Waterfront Handling Requirements	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Favorable Criteria							
Population Centers/ Residences	290 residential structures within ½ mile of site	0 residential structures within ½ mile of site	0 residential structures within ½ mile of site	140 residential structures within ½ mile of site	5 residential structures within ½ mile of site	3 or 4 residential structures within ½ mile of site	270 residential structures within ½ mile of site
Population Count	2,140 people within ½ mile of site	97 people within ½ mile of site	0 people within ½ mile of site	160 people within ½ mile of site	6 people within ½ mile of site	9 people within ½ mile of site	1,907 people within ½ mile of site
Site Size	73 acres	26 acres	15 acres	>100 acres	44 acres	34 acres	22 acres
Dredging Required	2.6 million cubic yards (predominately silts and clayey silts)	<100,000 cubic yards (predominately silts and clayey silts)	2.4 to 3.0 million cubic yards (predominately silts and clayey silts)	<100,000 cubic yards	3.0 million cubic yards (predominately gray clayey silt)	<100,000 cubic yards	<100,000 cubic yards
Parcel Availability a/	High	Medium (not available until 2007)	Low	Low	Medium	Medium	Medium
Existing Land Use	Former petroleum products terminal	Construction staging area for Central Artery Project	Operating power plant, fuel oil and coal storage	Petroleum products terminal	Port and Industrial Park	Former petroleum products terminal	Petroleum products terminal
Approximate Sendout Pipeline Length	<7 mile	<7 mile	0 b/	<7 mile	>40 mile	20 mile	35 mile
Highway Access	Adjacent to Route 79	1.9 miles to U.S. Interstate 93	1.6 miles to U.S. Interstate 195	2.4 to 3.3 miles to Interstate 195	2.5 miles to U.S. Hwy 1	2.6 miles to State Hwy 114	1.3 miles to Defense Hwy
Navigation Channel Transit Distance	20.9 nautical miles	2.2 nautical miles	20.0 nautical miles	24.3 nautical miles	12.8 nautical miles	11.0 nautical miles	3.3 nautical miles
Bridges (no.)	4	0	2	1	1	1	0
Per Capita Income	$16,118	$23,353	$22,420	$19,527	$25,441-29,188	$14,789	$22,239

TABLE 3.3.3-1 (cont'd)

Environmental Comparison of the Terminal Site Alternatives to the LNG Terminal Site Proposed by Weaver's Cove Energy

	Proposed Site	Boston Harbor	Brayton Point	Providence Harbor	Quonset Point	Coddington/ Melville	New London Harbor
	Taunton River - Fall River, MA	Boston Harbor Main Channel - Boston, MA	Mount Hope Bay - Somerset, MA	Providence Harbor - East Providence, RI	Western Narragansett Bay	Rhode Island - Melville, RI	New London Harbor - Groton Heights, CT
Percent Minority	8.8	45.5	1.8	13.5	12.4-20.2	21.0	22.3
Percent of Population below poverty level (all ages)	17.1	19.5	4.0	8.6	5.6-9.2	7.3	9.9
Shellfish Production Areas	Yes (closed to harvest)	Yes (closed to harvest)	Yes (closed to harvest)	Yes(closed to harvest)	Yes(closed to harvest)	Yes(closed to harvest)	Yes(closed to harvest)
Essential Fish Habitat (number of managed species)							
• Eggs	7	15	7	7	7	7	3
• Larvae	12	16	12	12	13	13	4
• Juveniles	13	21	13	13	13	14	6
• Adults	13	22	13	13	13	14	8
Special Interest Areas	None	None	None	None	None	None	None
Other Miscellaneous Environmental Factors	Site development would require the filling of a small amount of salt marsh.	--	--	Site development would require rerouting of a recreational bicycle path (recreation).	--	Site development would impact marina use (recreational/ commercial) and could potentially impact historical properties.	--

a/ High availability - the site is available for industrial use and a negotiated settlement to use the property has been reached with the current landowner.

Medium availability - the site is available for industrial use but no negotiations have taken place with the current landowner.

Low availability - the site is not available based on discussions between us or Weaver's Cove Energy with the current landowner.

b/ Existing 20-inch-diameter pipeline currently delivers natural gas to the Dominion facility. Additional sendout pipeline would likely be necessary.

Available space at the property appears to be limited. According to information in the local press provided by Somerset LNG, it would be possible to remove two or three of the existing fuel storage tanks to make room for a 15-acre site on the southern portion of Brayton Point. Depending on the specific size and containment design of the LNG storage tank, this property does not appear to be large enough for the thermal exclusion and vapor dispersion zones to be contained within the boundaries of the 15-acre site. As such, an LNG developer would be required to demonstrate control of the adjacent properties to ensure use consistent with an LNG facility.

Based on comments on the draft EIS, we more closely examined the population within 0.5 mile of the site. We originally estimated that population surrounding each of the alternative terminal sites by reviewing aerial photographs to determine the number of structures within 0.5 mile of the potential center of an LNG tank at that site. In the case of Brayton Point, we originally identified 90 structures that were near the edge of the 0.5-mile radius. By shifting the center of the tank slightly to the south and west, all of these structures are outside of the 0.5-mile radius. To further assess population in the vicinity of the alternative terminal sites, we also examined information from a U.S. Census Bureau database (see table 3.3.3-1). Based on the results of this new analysis, there would be no residences within 0.5 mile of the Brayton Point site. There would also be no need to clear forested vegetation and/or to disturb wetlands at the Brayton Point site. An additional advantage of this site would be the avoidance of the LNG ship navigation through two bridges along the Taunton River required for the proposed site (Braga and Brightman Street Bridges). A disadvantage of the Brayton Point site would be construction and LNG truck access to the terminal would be through the power plant property, potentially disrupting operation of the power station. Additionally, the closest access to a major road is Interstate 195. Specifically, traffic traveling to and from the site would need to travel on Brayton Point Road and Route 103 to access Interchange Number 4 on Interstate 195. This would require construction and operation traffic, including LNG trucks, to travel about 1.6 miles from the site to the highway and go past residential areas, a playground, and a school. Although one commentor suggested that these impacts could be avoided by constructing a new ramp onto Interstate 195, there are other disadvantages to the site that make this level of analysis unnecessary (see discussion on site ownership below).

In the draft EIS we estimated that development of an LNG terminal at the Brayton Point site would require dredging of between 2.4 and 3.0 million cubic yards. The actual dredging required would depend on the facility and pier design as well as the location of the channel and turning basin. In response to comments on the draft EIS, we have reassessed the amount of dredging needed for the Brayton Point site. It seems reasonable to assume that LNG ships en route to Brayton Point would travel the federal navigation channel through Mount Hope Bay to a point about 1 mile south of the Braga Bridge. Based on estimates for the proposed project, this segment of the ship route would require about 0.7 million cubic yards of dredging. At the top of Mount Hope Bay, the LNG ships would need to turn and proceed west to Brayton Point. For the purposes of this analysis, we have assumed the LNG ships would travel along an existing navigation channel, which leads to the power plant. Since this channel does not lead directly to the site and is too shallow and narrow for LNG ships, additional dredging would be required. We estimate that improvement of this channel would require dredging of about 0.3 million cubic yards of sediment. A turning basin would need to be developed somewhere along this channel in an area known as Borden Flats, an area that is generally 14 to 16 feet deep. To create a turning basin 41 feet deep would require dredging 25 to 27 feet of sediments. Assuming 1 foot of overdredge, we estimate this would require about 2.1 to 2.3 million cubic yards of dredging. Combined, we estimate that development of the Brayton Point site would require about 3.1 to 3.3 million cubic yards of dredging, or between 19 and 27 percent more dredging than the proposed site.

USGen indicated that there is space on the Brayton Point property to store about 500,000 cubic yards of dredged material. As such, a proponent building an LNG facility at this site would need to dispose of 2.6 to 2.8 million cubic yards of material at an offsite location. The cost of disposing of this

material would vary greatly depending on the disposal location (see section 3.6). Locating and using property away from Brayton Point for onshore dredged material disposal could be so costly as to make the project economically prohibitive.

Given our estimate of the dredging required for development of an LNG terminal at Brayton Point, we believe offshore disposal of dredged materials is the only reasonable disposal alternative (see section 3.6). Offshore disposal of the dredged material may be possible but is generally less preferred by most agencies and could have additional environmental impacts including potential short-term and/or long-term impacts on water quality, fish, benthic habitats, and local fishing industries. The costs and environmental impacts associated with dredging (and disposal) would increase significantly if the material is contaminated. To our knowledge, there has been no sampling of the sediments that would need to be dredged for a turning basin and to widen the narrow ship channel leading to Brayton Point. However, based on the sampling conducted by Weaver's Cove Energy and previous sampling done by the Massachusetts OCZM and others in the general area, there is reasonable probability that the sediments that would need to be dredged to develop an LNG terminal at the Brayton Point site would be similar in quality and texture to the sediments that would be dredged for the proposed project (see section 4.2.2). It is also reasonable to assume that the aquatic resources inhabiting the area that would be disturbed for the Brayton Point site are similar to those that would be affected by the proposed project (see section 4.6.2).

Commentors on the draft EIS suggested that siting an LNG terminal adjacent to the power plant at Brayton Point could provide beneficial operating advantages. An LNG import terminal located at Brayton Point could theoretically obtain "waste heat" from the adjacent power plant that could be used in a closed-loop system to vaporize the LNG, thus eliminating or reducing the need to burn natural gas in the vaporization process. This could provide both environmental and economic benefits to the operation of the LNG terminal (e.g., avoid/minimize need to burn 1.5 to 2.0 percent of import product thus reducing air emissions and natural gas costs). A system similar to this is currently being proposed by Ingleside Energy Center, LLC in Corpus Christi Bay, Texas (see FERC Docket No. CP05-13-000).

Additionally, the Brayton Point power plant could also benefit from having a consistent and reliable source of natural gas and a source of "waste cold" that could be used to condense the steam used to produce electricity at the facility. Although the facility is set up to burn natural gas or fuel oil, the power plant's primary source of energy is coal (see section 3.1 for a description of the environmental disadvantages of coal versus natural gas). Historically, the power plant also used water from Mount Hope Bay for the cooling process. The withdrawal of large volumes of water along with the discharge of warm water has caused or contributed to the collapse of certain fish stocks in Mount Hope Bay (EPA, 2002a). A recent NPDES permit for this facility requires that the power plant operator reduce water withdrawals and warm-water discharge. It is conceivable that an LNG terminal at this site could provide a source of cold water (or other liquid mixture) as part of a closed-loop system between the power plant and the LNG vaporizers that could help meet these permit conditions or further reduce the need to withdraw or discharge water into Mount Hope Bay.

In September 2003, Weaver's Cove Energy approached USGen regarding the availability of the property at Brayton Point. According to Weaver's Cove Energy, the President of USGen New England, indicated that the property was not for sale at that time. According to public news reports, Somerset LNG also appeared to pursue obtaining property at this site. In September 2004, Dominion (one of the largest energy producing companies in the United States) reached an agreement with USGen to purchase the existing power plant and the property at Brayton Point. Because USGen filed for bankruptcy protection early in 2003, discussions regarding the sale of the property were subject to the review and agreement of the creditor's committee in the USGen bankruptcy proceedings. On November 23, 2004 Dominion was granted approval by the U.S. Bankruptcy Court for the District of Maryland to purchase the Brayton Point facility and two other power plants. The sale of the three properties was concluded on January 1, 2005.

We recognize the potential environmental and economic advantages an LNG terminal at Brayton Point could provide. Even the disadvantages of LNG trucking or dredging at this site could conceivably be managed depending on the design of an LNG facility. For example, an LNG facility at the site could be planned so that it would not involve trucking or so that it would take shallow-draft LNG barges from other LNG terminals along the Atlantic coast (thus eliminating or reducing the need for the dredging necessary to allow deliveries from deep-draft LNG vessels). However, these design features would not allow the LNG facility to satisfy the objectives of the Weaver's Cove LNG Project. Because Dominion now owns the site and has not indicated that it intends to pursue development of an LNG facility at the site, an LNG terminal at Brayton Point can only be considered conceptually and may never be a practicable and feasible alternative to the Weaver's Cove LNG Project. For these reasons, we do not believe that an LNG terminal at the Brayton Point site is a reasonable alternative to the proposed project.

Providence Harbor

The Providence River federal navigation channel has been approved to be dredged to a depth of 40 feet below MLLW. Dredging was officially completed in December 2004; however, final bathymetric surveys and Coast Guard approval of the channel are still pending. Because the future depth of the navigational channel at this location would accommodate LNG ships without the need for significant additional dredging, we considered LNG terminal locations in Providence Harbor as alternatives to the proposed site in Fall River. The existing KeySpan LNG facility, located adjacent to the Fox Point Reach of Providence Harbor, was previously evaluated as a partial system alternative (see section 3.2.1.2). Another potentially suitable site that could be developed as an LNG terminal is one owned by ExxonMobil in East Providence (see figure 3.3.3-3). Table 3.3.3-1 provides a comparison of the review criteria evaluated for this site and the proposed site.

ExxonMobil currently operates a liquid petroleum products terminal located near the Fuller Rock Reach of the Providence River federal navigation channel. Based on a review of aerial photographs and field visits to this site, the aboveground storage tanks that were formerly present on the site have been removed. It appears that products are currently unloaded at the docking structure and sent via two pipelines to a tank farm about 0.9 mile to the east. The ExxonMobil property adjacent to the navigational channel is about 100 acres in size, and would be adequate for an LNG storage tank and the associated thermal exclusion and vapor dispersion zones. The property is bisected by the East Bay Bike Path. The 14.5-mile-long asphalt path along the upper Narragansett Bay was the first abandoned railroad corridor to be converted to recreational uses and has been described as one of Rhode Island's "recreational jewels" for cyclists, walkers, wheelchair users, and in-line skaters (URITC and RIDOT, 2003). Abutting the property to the north and east is the Silver Springs Golf Course, a small L-shaped six hole semi-private course that is open from April 1 to December 1. The area beyond the golf course to the east is used for light industrial and commercial purposes. There are about 140 residential structures within 0.5 mile of the site and Bradley Hospital, a psychiatric hospital devoted to children and adolescents, is within about 0.75 mile.

The site is about 2.3 miles from Algonquin's nearest existing natural gas pipeline system. Although we have not completed a detailed routing analysis, it appears that a natural gas sendout pipeline from an LNG terminal could be co-located with existing pipeline rights-of-way to an interconnect point with the Algonquin pipeline system east of the alternative terminal site. To accommodate the project volumes, Weaver's Cove Energy would need to construct the 2.3 miles of interconnecting pipeline and an additional 2.2 miles of pipeline (adjacent to or within an existing pipeline right-of-way) to allow a connection to the Algonquin system at a point where it has greater capacity. In either case, the sendout pipeline route would not cross any residential areas. The only obvious environmental impacts of the sendout pipeline route are that it would require the removal of vegetation and would cross the Runnins River. It also seems likely, based on the amount of exposed bedrock on the ExxonMobil property, that a

considerable amount of blasting may be necessary to bury the pipeline near the shoreline. There are also wetlands in the vicinity of the interconnect point with the Algonquin pipelines which could be affected depending on the pipeline alignment.

The primary advantage of the ExxonMobil site is that it offers deepwater access that would require less dredging than the proposed site to allow LNG ships to berth and unload (less than 100,000 cubic yards of dredging would be needed). The existing berth on the ExxonMobil property can accommodate fairly large ships (we have observed ships at the berth between 500 and 600 feet in length), but it is unclear whether it is long enough or deep enough to receive LNG ships. It is likely that some additional dredging would be needed for a berth and turning basin that would accommodate LNG ships. As an alternative to a turning basin LNG ships accessing a terminal at this site could continue north to the Fox Point Reach where the federal navigation channel is wide enough for an LNG ship to turn. During dredging for the Providence River and Harbor Maintenance Dredging Project, the portion of the Providence River Channel adjacent to the ExxonMobil site (the lower portion of the Fuller Rock Reach) did not require sequencing or timing restrictions to avoid impacts on fishery resources (COE, 2001). Although timing restrictions to minimize impacts on winter flounder or quahog spawning areas were necessary for portions of the Providence River channel both north and south of the lower portion of the Fuller Rock Reach, the fishery resources in this area did not warrant these mitigation measures. This suggests that the fishery resources in the vicinity of the ExxonMobil site may be relatively poor. So in addition to reduced volumes of dredged material compared to the proposed site, it appears the fisheries resources in the vicinity of the ExxonMobil site are not worthy of the same protection as those found in the Taunton River federal navigation channel. A potential disadvantage of this site is that a marine terminal would place the LNG vessel at the edge of the Fuller Rock Reach channel and exposed to potential allisions for vessels as they turn into this channel from the Sabin Point Reach channel en route to Providence.

One relative disadvantage of the site compared to the proposed site is its proximity to the East Bay Bike Path. Assuming the LNG tank is located close to the waterfront to maximize its distance from residences, the East Bay Bike Path would be within 200 to 300 feet of the tank. This would put recreational users of the path within the 1,600 Btu ft^2 hr thermal exclusion zone of the tank. To increase the separation of the path from the tank to 1,000 feet, it would be necessary to relocate about 1,500 feet of the path to the east further from the waterfront.

Another disadvantage of the site is its distance from the nearest divided highway. In order to access markets, LNG trucks would travel 0.4 mile east on Industrial Way and then turn north on Pawtucket Avenue. LNG trucks traveling east would proceed north on Pawtucket Avenue for 1.6 miles and then turn and proceed west for 0.4 mile on Warren Avenue, at which point they would turn right onto the east bound entrance ramp of Interstate 195. LNG trucks traveling west would proceed north on Pawtucket Avenue for 0.3 mile and then turn and proceed northwest onto Veterans Memorial Parkway for 2.6 miles, at which point they would enter the west bound ramp of Interstate 195. The result is that depending on their final destination, LNG trucks would need to travel between 2.4 and 3.3 miles on residential and commercially developed city streets to reach a divided highway.

Another issue is that the site is not available according to Weaver's Cove Energy. Weaver's Cove Energy indicated in its application that it discussed the site with ExxonMobil in late 2002 and were informed that the property in East Providence is not available for development as an LNG terminal.

Insert Figure

3.3.3-3 Providence Harbor – LNG Terminal Site Alternative

In summary, the ExxonMobil property appears to be large enough to accommodate an LNG import terminal. Additionally, compared to the proposed terminal site, an LNG terminal at the ExxonMobil property has the environmental advantage of minimal dredging requirements. This site also avoids LNG ship navigation through three bridges which are required for access to the proposed site. In other respects, the ExxonMobil site is similar or worse than the proposed site. Although the ExxonMobil property is located within 0.5 mile of about half the number of residential structures than the site at Fall River, the property is still located in an area that is relatively highly developed. Additionally, highway access is poorer than at the proposed site and LNG trucks would need to travel for several miles through residential and commercially developed city streets in order to reach the highway. The East Bay Bike Path is another issue that makes the ExxonMobil property less preferable than the proposed site. Additionally, the site seems to be unavailable. Given the current property ownership, the use of the ExxonMobil property is not an alternative that Weaver's Cove Energy appears able to reasonably pursue. While this site has several environmental advantages over the proposed site, the primary disadvantage of this alternative site is its lack of availability for potential LNG development. Therefore, we do not believe that an LNG terminal at the East Providence Harbor is a reasonable alternative that provides a clear environmental advantage over the proposed location.

Quonset Point

There is an existing marine facility with deepwater access located near Quonset Point east of Quidnessett, Rhode Island (see figure 3.3.3-4). Located in a relatively isolated portion of Narragansett Bay, this site has been previously developed to provide ship docking/unloading and was formerly used as a layup berth for large ships repossessed by the DOT Maritime Administration. At present, the Rhode Island Economic Development Corporation is developing this site as a port and commerce park. Based on discussions with the Rhode Island Economic Development Corporation, there is a 45-acre parcel available for development at the waterfront. Other lands at Quonset Point are currently under lease and are being used by other tenants of the port and commerce park. Although this alternative site is located in an area more isolated from residential development than the proposed LNG terminal site, there are several disadvantages and/or limitations associated with building an LNG terminal at this site. The available parcel is less than 0.5 mile from the end of a runway of the Quonset Point Air Station and, consequently, is inconsistent with the required LNG terminal siting criteria.

In addition to the location and small size of the parcel, the site is near the end of a ship channel that would require significant dredging to accommodate LNG ships. Based on navigation charts, it appears that this site is located on a channel that is currently dredged to about 30 feet. Dredging of the channel, turning basin, and berthing area would require dredging an estimated 3 million cubic yards of material. Because the property does not have an existing pier, additional dredging would likely be necessary for a ship docking/unloading facility. Additionally, the site is located about 35 miles from the nearest large-diameter pipeline system that could allow natural gas from the site to be distributed to the broader New England market (compared to the 6.1 miles of pipeline that would be constructed as part of the proposed project). For these reasons and because the site does not meet the safety siting requirement regarding its proximity to Quonset Point Air Station, we have not further considered a potential LNG terminal in the Quonset Point area.

Insert Figure

3.3.3-4 Quonset Point – LNG Terminal Site Alternative

Coddington Cove/Melville

There are areas north of Newport where there is deepwater access adjacent to the East Passage (see figure 3.3.3-5). Coddington Cove and the waterfront to the north are part of a U.S. Naval Reservation and are not available for LNG development. While there is deepwater access at Melville, the area is largely developed for recreational or commercial purposes. A portion of the Melville area was formerly used by the U.S. Navy as a fuel distribution terminal. Fuel terminal operations ceased in 1998 and the 34-acre property may be available for use as a marina or for use by light industry/commercial developers. The State of Rhode Island Economic Development Corporation is pursuing acquisition of this property. Table 3.3.3-1 provides a comparison of the review criteria evaluated for this site and the proposed site. Given the proximity of the deep waters of the East Passage, an LNG terminal at Melville would require much less dredging than would be necessary to develop the proposed site in Fall River. Additionally, the area within 0.5 mile of the property has few residential structures. However, because of the relatively small parcel size and the presence of marinas adjacent to the north and south side of the property, there is not adequate space available for an LNG terminal of the size proposed by Weaver's Cove Energy. Other disadvantages of the property are that development may require mitigation given the historic nature of the site (i.e., it is a district eligible for listing on the NRHP) and it is located over 20 miles away from the nearest suitable interconnect with the Algonquin pipeline system (the closest natural gas pipeline system). For these reasons and because this site does not meet the safety siting requirement regarding the thermal exclusion/vapor dispersion zone, we have not further considered a potential LNG terminal in the Coddington Cove/Melville area.

New London Harbor

The New London Harbor in Connecticut is located at the mouth of the Thames River on the north shore of Long Island Sound. The harbor offers deepwater access to a variety of commercial, industrial, recreational, and military vessels (i.e., the main navigation channel is about 40 feet below MLLW). The western side of the harbor is relatively shallow and is dominated by non-industrial developments (e.g., parks, public walkways, ferry terminals). The eastern side of the harbor is closer to the ship channel and has been developed for industrial users. Weaver's Cove Energy indicated that they considered the Hess Oil Terminal, located on the eastern side of the harbor, as a potential alternative location for an LNG facility (see figure 3.3.3-6). Table 3.3.3-1 provides a comparison of the review criteria evaluated for this site and the proposed site. Because the existing berth at the Hess Terminal is 35 to 40 feet deep, development of this property as an LNG terminal would require much less dredging than would be necessary for the proposed site. However, the property is only about 22 acres and there is an adjacent office building that would significantly constrain siting an LNG storage tank. Further disadvantages of the site include the distance to the nearest large-diameter natural gas pipeline system (about 35 miles) and the lack of ready access to a major highway for construction vehicles and LNG trucks. We are not aware of other sites in the New London Harbor area that would be suitable and/or available for development as an LNG import terminal. For these reasons and because this site does not meet the safety siting requirement regarding the thermal exclusion/vapor dispersion zone, we have not considered further a potential LNG terminal in the New London Harbor area.

Insert Figure

3.3.3-5 Coddington Cove/Melville – LNG Terminal Site Alternative

Insert Figure

3.3.3-6 New London – LNG Terminal Site Alternative

New Haven Harbor

The New Haven Harbor along the northern shore of Long Island Sound is accessible to large ships via a channel that the COE is authorized to maintain to a depth of 35 feet below MLLW. To make New Haven Harbor suitable for LNG ships, improvement dredging would be required along about 5 miles of navigation channel. Additionally, the presence of the Tweed-New Haven Airport, the public bridges across the north end of the harbor, and various conflicting land uses (e.g., East Shore Park) would limit potentially suitable sites to a relatively narrow area of waterfront that has been developed for industrial uses. We are not aware of any property in this area that would be suitable for an LNG terminal. The lack of site availability, the dredging requirements, the long distances (about 20 miles) to the nearest large-diameter pipeline system, and the developed nature of the land surrounding the harbor are all factors weighing against New Haven Harbor providing any clear environmental advantage over the proposed site. For these reasons, we have not considered further a potential LNG terminal in the New Haven Harbor area.

3.4 LNG TERMINAL LAYOUT ALTERNATIVES

To minimize potential visual impacts (see section 4.8.7.1), we examined the possibility of constructing an LNG terminal that would include two smaller LNG storage tanks with the same capacity of the single storage tank proposed by Weaver's Cove Energy. A tank with a capacity of about 100,000 m^3 would be about 145 feet high and 240 to 245 feet in diameter compared to the proposed tank which is 195 feet high and 280 feet in diameter. Because of the tank spacing requirements, the thermal exclusions zone for a second LNG tank would fall outside the site boundaries. Additionally, the construction costs for LNG storage would increase by an estimated $25 million. For these reasons, we do not believe an alternative site design of two LNG storage tanks is a reasonable alternative to the design proposed by Weaver's Cove Energy.

As described in section 4.4, construction of the LNG terminal would result in permanent impacts on a small amount of salt marsh (0.04 acre) bordering the Taunton River. These wetlands, which are dominated by smooth cordgrass, are of limited ecological value due to their small size and the disturbed nature of the surrounding industrial area. Nevertheless, to avoid or minimize these impacts, we considered whether an alternative LNG terminal layout could be used. Much of the LNG terminal layout is dictated by the location of the LNG storage tank. Due to the size of the thermal exclusion and vapor dispersion zones (see section 4.12.4) and the limited space available at this property, it is not possible to move the LNG storage tank significantly further from the current location. As such, a specialized retaining wall would need to be constructed to maintain adequate construction work zones and operational security zones between the shoreline and the LNG storage tank as well as to ensure the stability of the shoreline and the perimeter berm. The outside perimeter of the alternative layout would be highly irregular along the shoreline to avoid the salt marshes along the Taunton River. While possible, Weaver's Cove Energy indicates that the alternative layout would be significantly more expensive to design and construct compared to the proposed layout. Because security of the site is improved through the use of straight sightlines compared to sightlines interrupted by an irregular outside perimeter, the proposed site layout provides superior site security. For these reasons and because Weaver's Cove Energy would take appropriate steps to compensate for wetlands permanently impacted by construction, we do not believe an alternative site layout is a reasonable alternative to the design proposed by Weaver's Cove Energy.

As discussed in section 3.6, we evaluated alternatives to disposing the sediments dredged from the federal navigation channel and turning basin. As currently proposed, this material would be placed at the LNG terminal site and be used to elevate the grade at the LNG tank site, truck loading area, and LNG piping area. Additionally, the dredged material would be used to create a landform on the north and east side of the LNG tank. The landform, which would be vegetated and/or covered with a stabilizing material

such as crushed rock, would have a maximum height ranging between about 148 feet and 188 feet MSL and provide some visual screening of the facility from locations to the east and northeast of the site. However, the top of the LNG storage tank would still be at about 220 feet MSL and would rise over the top of this landform. If the dredged material were to be disposed of at an offsite location (e.g., offshore), Weaver's Cove Energy would still require fill material to elevate the grade at the LNG tank site, truck loading area, and LNG piping area. However, the FERC may not necessarily require the landform be a component of the project. As such, a potential alternative site layout may not include a landform or any of the associated benefits (e.g., visual screening, reduction in facility noise noticeable from adjacent areas). Visual and noise issues are further discussed in sections 4.8.7.1 and 4.11.2.

3.5 PIPELINE ALTERNATIVES

Weaver's Cove Energy proposes to deliver an average of 400 MMcfd of natural gas to the New England market, and 800 MMcfd during periods of peak demand. The Algonquin pipeline system is the only system near the proposed LNG terminal with the capacity to deliver these volumes of natural gas. The portion of the Algonquin system (referred to as Algonquin's "G" system) near the proposed LNG terminal site is made up of a series of pipeline laterals that include:

- the G-1 lateral - two parallel pipelines (10-inch-diameter and 20-inch-diameter) located east of the LNG terminal in Fall River;
- the G-4 lateral - a single pipeline (8-inch-diameter) located to the south of the LNG terminal in Fall River;
- the G-20 lateral - a single pipeline (16-inch-diameter) located north of the LNG terminal in Freetown, Massachusetts; and
- the G-22 lateral - a single pipeline (20-inch-diameter) located to the west of the LNG terminal, primarily in Somerset and Swansea, Massachusetts.

An engineering analysis conducted by FERC staff concluded that no single lateral would be able to provide sufficient capacity to deliver all of the volumes of natural gas from the LNG terminal. Each of the laterals has some capacity to transport a portion of the project volumes to the New England market. However, Algonquin would have to upgrade and/or uprate (increase the MAOP) its pipeline to accommodate additional volumes of natural gas on any of these laterals. Because of the limited capacity of any one lateral, Weaver's Cove Energy proposes interconnects with two of these laterals to provide the delivery capacity and the flexibility necessary for the project. The Northern Pipeline would interconnect with the G-20 lateral; the Western Pipeline would interconnect with the G-22 lateral. Both of these routes would minimize the length of pipeline needed to interconnect with the Algonquin system. While the primary advantage of the proposed pipeline routes is their use of existing utility corridors, both routes are in close proximity to residential areas and both routes would or could have direct or indirect impacts on the Taunton River and its associated wetlands.

In evaluating pipeline alternatives, we assessed whether it might be possible to reduce the environmental impacts associated with construction and operation of the proposed pipelines by developing an alternative pipeline route that would either interconnect with one of the other Algonquin laterals or interconnect with the Algonquin lateral as proposed while following an alternative pipeline route. Additionally, we evaluated minor variations to the proposed pipeline routes to avoid or minimize impacts on specific, localized resources such as residences, waterbodies, and wetlands. Figure 3.5-1 shows the Algonquin laterals and the alternative pipeline routes that we considered in this analysis.

Insert Figure

3.5-1 Pipeline Route Alternatives

3.5.1 G-1 Lateral Interconnect (Eastern Pipeline Alternative)

To minimize the residential impacts and impacts on the Taunton River associated with the proposed pipeline routes, we evaluated the Eastern Pipeline Alternative as an option for connecting the LNG terminal to Algonquin's G-1 lateral in Fall River. This alternative begins at the LNG terminal site and follows the same alignment as the proposed Northern Pipeline route for about 0.8 mile until it reaches Wilson Road. The alternative then deviates from the proposed route and proceeds east adjacent to Wilson Road through a residential neighborhood, across Route 79, and through another residential neighborhood. When it reaches Route 24, the alternative turns and proceeds to the northeast across the highway to an existing electric transmission line. The alternative follows the existing electric transmission line through an industrial zone for about 0.4 mile and then crosses the Freetown-Fall River State Forest, Pond Swamp, and Queen Gutter Brook, before interconnecting with Algonquin's G-1 lateral on the northeast side of Copicut Reservoir. The Eastern Pipeline Alternative is about 6.5 miles long. An environmental comparison of the Eastern Pipeline Alternative and both of the proposed routes is summarized in table 3.5.1-1.

TABLE 3.5.1-1

Environmental Comparison of the Eastern Pipeline Alternative to the Proposed Routes

Environmental Factor	Proposed Northern Pipeline Route	Proposed Western Pipeline Route	Eastern Pipeline Alternative
Total length (miles)	3.6	2.5	6.5
Length adjacent to or within existing rights-of-way (miles)	3.5	1.8	5.9
Wetland impacts (acres)	1.0	0	4.6
Forest clearing (acres)	1.2	2.6	0 a/
Number of Perennial Waterbodies Crossed	2	1	4
Number of Major Waterbodies (>100 feet wide) Crossed	0	1	0
Number of Residences within 50 feet	19	21	28
Crossing of State Forest (miles)	0	0	4.0

a/ This estimate assumes that the Eastern Pipeline Alternative could be constructed entirely within the existing transmission line corridor.

Unlike either of the proposed routes, the Eastern Pipeline Alternative route traverses about 4.0 miles of the Freetown-Fall River State Forest. Largely undeveloped, the Freetown-Fall River State Forest is part of the 14,000-acre Southeastern Massachusetts Bioreserve (SMB). The SMB was established as part of a collaborative effort to protect, restore, and enhance the biological diversity and ecological integrity of a large-scale ecosystem in the region; to permanently protect public water supplies and cultural resources; to offer interpretive and educational programs communicating the value and significance of the bioreserve; and to provide opportunities for appropriate public use and enjoyment of the natural environment. This area provides various recreational opportunities to hikers, horseback riders, dog sledders, mountain bikers, motorcyclists, snowmobilers, hunters, and anglers.

Weaver's Cove Energy did not conduct field surveys of the Eastern Pipeline Alternative. However, the portion of the route through the Freetown-Fall River State Forest traverses areas known to support both sensitive natural and cultural resources. Information provided by the Massachusetts Natural Heritage and Endangered Species Program indicates that several rare and/or protected species are known to occur in the vicinity of the alternative pipeline route including the spotted turtle (*Clemmys guttata*), marbled salamander (*Ambystoma opacum*), Plymouth gentian (*Sabatia kennedyana*), and the New

England bluet (*Enallagma laterale*). Additionally, there are several documented prehistoric sites near the Eastern Pipeline Alternative.

The Eastern Pipeline Alternative also crosses several wetland areas that amount to nearly five times the length of mapped wetlands crossed by either of the proposed routes. Additionally, five of the wetlands and streams crossed by the Eastern Pipeline Alternative are considered Outstanding Resource Waters because they feed into public water supplies including Watuppa Pond and Copicut Reservoir. Use of the Eastern Pipeline Alternative could reduce the impact on forested areas if construction activities could be confined within the existing transmission line corridors. If this would not be possible, the Eastern Pipeline Alternative could result in anywhere between about 12.1 and 48.5 acres (depending on the amount of overlap with the previously cleared corridor) of forest clearing, which would be substantially more forest clearing than would be required for either of the proposed routes.

The potential advantage of the Eastern Pipeline Alternative is that it does not cross the Taunton River. While this would reduce impacts on the river compared to the Western Pipeline route, it does not offset the relative environmental disadvantages of the Eastern Pipeline Alternative (e.g., wetland impacts, disturbances within the SMB). In addition, this alternative route is significantly longer than either of the proposed routes and thus would result in more land disturbance. We do not believe that an interconnection with the G-1 lateral provides any clear environmental advantage over either of the proposed pipeline routes, and we do not recommend further consideration of the Eastern Pipeline Alternative.

3.5.2 G-4 Lateral Interconnect (Southern Pipeline Alternative)

The Southern Pipeline Alternative was considered as a possible route for interconnecting the LNG terminal with the Algonquin G-4 lateral in Fall River (see figure 3.5-1). Although this alternative would cross fewer waterbodies than either of the proposed routes and no mapped wetlands, the alternative route would be longer and would require construction through densely populated areas in Fall River. We estimate that the alternative would require construction within 50 feet of more than five times as many homes as either of the proposed routes. Furthermore, the G-4 lateral would not have the capacity to accommodate the projected volumes delivered from the LNG terminal without substantial upgrades. Therefore, we do not recommend further consideration of the Southern Pipeline Alternative.

3.5.3 G-20 Lateral Interconnect (Northern Pipeline)

As currently proposed, Weaver's Cove Energy would interconnect with Algonquin's G-20 lateral via the Northern Pipeline. This route generally follows an existing naphtha pipeline and the CSX railroad right-of-way from the LNG terminal to an interconnect with Algonquin's system in Freetown. To avoid or minimize impacts resulting from construction and operation of the Northern Pipeline, we considered an alternative route (Northern Highway Alternative) and several minor realignments (minor route variations) to the proposed route.

Northern Highway Alternative

The Northern Highway Alternative was considered as an alternative to the proposed Northern Pipeline route in an attempt to minimize impacts on residences along the CSX railroad and to avoid the constricted work areas along the proposed route. This alternative route begins at the LNG terminal site and follows the same alignment as the proposed Northern Pipeline route for about 0.8 mile. The alternative then deviates from the proposed route and proceeds east along Wilson Road through a residential neighborhood until it reaches Route 79. At the highway, the alternative turns and proceeds northeast adjacent to the Route 79 right-of-way (which is joined by Route 24) for about 2.6 miles. The

Northern Highway Alternative terminates at a potential interconnection with the Algonquin G-20 lateral at a point where the lateral crosses Routes 24/79. In total, the Northern Highway Alternative is about 3.6 miles long, and would interconnect with the Algonquin G-20 lateral in Freetown about 2,000 feet east of the proposed interconnection.

Table 3.5.3-1 provides an environmental comparison of the proposed route and the Northern Highway Alternative. Both routes are 3.6 miles long and follow existing rights-of-way. An advantage of the alternative route is that it avoids crossing any mapped wetlands. The primary disadvantage of the alternative route would be that it would be constructed within 50 feet of six more residences.

TABLE 3.5.3-1

Environmental Comparison of the Northern Highway Alternative to the Proposed Northern Pipeline Route

Environmental Factor	Proposed Northern Pipeline Route	Northern Highway Alternative
Total length (miles)	3.6	3.6
Length adjacent to existing rights-of-way (miles)	3.5	3.4
Wetland crossings (feet)	1.0	0
Forest clearing (acres)	1.2	15.4
Number of Residences within 50 feet	19	25

One of the biggest challenges in constructing the alternative would be traversing the area between the CSX railroad and Route 24/79. Workspace in this area is limited and it is likely that Wilson Road would need to be closed to through traffic during construction of the pipeline. Construction along or in the road would also be slow and maintaining access to homes along the road would be difficult.

Another issue is that the alternative may not be able to take full advantage of the Route 24/79 right-of-way. The width of the cleared road right-of-way is narrow in spots and additional area adjacent to the cleared right-of-way may be necessary to safely and feasibly accommodate construction activities. This would require clearing forest vegetation adjacent to the highway, a portion of which would be within the Freetown-Fall River State Forest. To use the highway right-of-way, Weaver's Cove Energy would also need to obtain approval from MassHighway. Historically, this agency has discouraged lengthy utility corridors within its rights-of-way where feasible alternatives exist. If permission to use the highway right-of-way could not be obtained, the construction right-of-way would need to be located beyond the road right-of-way, which could result in up to 30.8 acres of tree clearing.

For all of these reasons we do not believe the Northern Highway Alternative provides a clear advantage over the proposed Northern Pipeline route. And most importantly, the Northern Highway Alternative would not provide any advantages over the proposed route regarding potential residential impacts. Consequently, we do not recommend further consideration of the Northern Highway Alternative.

Northern Pipeline Minor Route Variations

We examined several minor route variations to the proposed Northern Pipeline route that would avoid or minimize potential impacts on wetlands and residences.

Northern Parcel Variation

We examined a minor route variation to the segment of the proposed Northern Pipeline route between MPs 0.26 and 0.55 to minimize potential wetland impacts and increase the riparian buffer zone between the construction right-of-way and the Taunton River. Between these MPs, the proposed pipeline

route follows the existing naphtha pipeline on the west side of the CSX railroad right-of-way. This portion of the pipeline route is adjacent to the Taunton River and a narrow salt marsh (Wetland N4) that borders the river (see figure 3.5.3-1). This salt marsh provides both wildlife and fish habitats. Although most of the construction right-of-way for the proposed route appears to avoid direct impacts on the river and salt marsh, there is minimal workspace on the west side of the railroad and a steep embankment between the railroad tracks and the river. These constraints would complicate construction and potentially lead to indirect impacts on the river and salt marsh by removing adjacent vegetation and increasing the potential for stormwater runoff and associated sediments to discharge directly to the river and salt marsh during rainfall events. Additionally, the location of the extra workspace required for the proposed pipeline crossing of the railroad track near MP 0.55 would be immediately adjacent to the river.

As shown on figure 3.5.3-1, the route variation, referred to as the Northern Parcel Variation, would cross from the west to the east side of the CSX railroad tracks on the northern end of the LNG terminal property and would remain adjacent to the east side of the CSX railroad right-of-way for its entire length. The location for the crossing of the railroad tracks by the Northern Parcel Variation and the extra work space for this crossing would be in a previously disturbed upland area of the property further from the river than the crossing location and extra workspace required for the proposed route. The Northern Parcel Variation would traverse primarily upland forest and a small portion of wetland on the northern parcel of the LNG terminal site, which would be largely disturbed to construct of the administration building for the LNG terminal facilities.

The Northern Parcel Variation would be the same length and thus require the same amount of land disturbance as the corresponding segment of the proposed route but would require more clearing of upland forest (<0.1 acre along the proposed segment compared to 1.8 acres along the Northern Parcel Variation). As stated above, the upland forest clearing required for the proposed administration building diminishes the additional tree clearing along this variation. The variation would, however, increase the distance of the right-of-way from the river and avoid the potential direct or indirect impacts on the Taunton River and associated wetland habitats. For these reasons and because the Massachusetts Wetlands Protection Act protects riverfront areas and salt marshes that provide wildlife or fisheries habitats (see 310 CMR 10.32 and 10.58), we recommended in the draft EIS that Weaver's Cove Energy incorporate the Northern Parcel Variation into the proposed route. In its comments on the draft EIS, Weaver's Cove Energy agreed to incorporate the Northern Parcel Variation into the proposed route. As such, the Northern Parcel Variation is now considered an adopted segment of the proposed route.

River Street Variation

We received comments from the Massachusetts EFSB recommending that we consider an alternative alignment to avoid or minimize the loss of trees and vegetation that provide aesthetic value, shade, and/or visual screening at the residential locations between MPs 0.54 and MP 0.91 of the Northern Pipeline route.

The portion of the proposed route between MPs 0.54 and 0.68 would primarily be constructed on property owned by the New England Power Company. Because there are large transmission line towers located within this property, the area is periodically cleared of tall vegetation. Currently, there is little vegetation that provides significant shade and/or visual screening to the adjacent residences. Because there is limited space to work on the west side of the railroad right-of-way without removing vegetation that buffers the Taunton River, we do not believe an alternative alignment for this segment is environmentally preferable.

Insert Figure

3.5.3-1 Northern Parcel Variation

The portion of the route between MPs 0.68 and 0.91 would be constructed within the property of 11 landowners. There are three residences along this portion of the route that are within 50 feet of the pipeline construction right-of-way. Mature vegetation that provides aesthetic value, shade, and/or visual screening to the residences along this segment of the route would be removed during construction. A narrow intermittent stream and associated 5-foot-wide wetland would also be crossed. To avoid or minimize affecting landowners, removing vegetation, and affecting the intermittent stream and wetland, we considered the River Street Variation that would cross the railroad right-of-way at MP 0.68 and follow the west side of the railroad right-of-way until it rejoins the proposed route at MP 0.91 (see figure 3.5.3-2). Because of the steep slope adjacent to the west side of the railroad right-of-way, a route variation at this location would likely be most feasible if constructed from or within River Street, a narrow road located on top of the slope. Although this variation would increase the distance between the pipeline and the residences, use of the road for construction would interfere with traffic accessing the nearby boat marina (Captain John O'Connell Marina).

We received several comments on the draft EIS regarding the River Street Variation, including:

- the variation would include 90 degree pipe bends;
- the variation would run within 15 feet of four homes and other buildings and a 6,000 gallon gasoline tank on River Street;
- a portion of the variation along Collins Street would cross an area that consistently floods; and
- the bridge at the foot of Collins Street is scheduled to be rebuilt.

Weaver's Cove Energy examined the feasibility of this variation and agreed that by maximizing the use of Collins and River Streets, it would minimize impacts on nearby residences and mature vegetation as well as avoid a wetland on the east side of the railroad. While the construction of a pipeline would temporarily inconvenience residents along River Street, there would be no apparent long-term impacts. While the commentors suggested that four homes would be within 15 feet of the River Street Variation, we only identified two residences that would be within 50 feet of the construction workspace associated with the variation in our review (compared to three residences along the corresponding segment of the proposed route). Regardless of the bends in the pipe or the nature of area flooding, the pipeline would be installed in a manner that the pipeline's integrity would be protected. Additionally, the pipeline would be constructed and operated in compliance with DOT safety standards.

In its comments on the draft EIS, Weaver's Cove Energy agreed to incorporate the River Street Variation into the proposed route. As such, the River Street Variation is now considered as an adopted segment of the proposed route.

While we find that incorporating this variation into the proposed route would minimize landowner impacts while making use of an existing road corridor, we believe that mitigation is required to ensure that this segment of the proposed route limits construction and access disturbances on local residences and commercial facilities along the River Street corridor. Therefore, **we recommend that**:

- **Weaver's Cove Energy develop a site-specific plan for construction of the adopted River Street Variation that includes a description of any special construction techniques that would be used (e.g., stove-pipe or drag-section techniques) and other steps taken to minimize impacts on local residences and commercial facilities. This plan should be filed with the Secretary for review and approval by the Director of OEP <u>prior to construction.</u>**

Insert Figure

3.5.3-2 River Street Variation

Golf Course Variation

The Massachusetts EFSB also recommended that we consider an alternative alignment to avoid or minimize the loss of trees and vegetation that provide aesthetic value, shade and/or visual screening at the residences near MP 2.0 along the Northern Pipeline route. The portion of the Northern Pipeline route between MPs 2.00 and 2.40 is located between the railroad right-of-way and seven condominiums (multi-residential buildings). Because there are steep slopes on both sides of the railroad, it does not appear feasible to move the pipeline route closer to the railroad and within the railroad right-of-way. As currently aligned, the pipeline segment through this area would necessitate clearing most of the mature trees between the buildings and the railroad. The pipeline would also cross 155 feet of one wetland (Wetland N9) and likely require extra workspace in another wetland (Wetland N12) to accommodate the pipeline crossing of the railroad near MP 2.4. Because four of these condominiums are within 50 feet of the proposed construction right-of-way, many people could also potentially be inconvenienced by the noise and traffic associated with pipeline construction.

To avoid or minimize these impacts, we evaluated an alternative pipeline alignment between MPs 1.89 and 2.43 (referred to as the Golf Course Variation) in the draft EIS. Both Weaver's Cove Energy and the Fall River Country Club commented that this variation could affect the golf course's Number 7 tee box, fairway, and green (a hole that runs parallel to the east side of the railroad). By crossing to the west side of the railroad before reaching the Number 7 tee box, the pipeline route could avoid the need to clear vegetation adjacent to the condominiums and minimize impacts on the golf course. Based on comments from Weaver's Cove Energy and the Fall River Country Club, we have expanded the Golf Course Variation to include a new pipeline alignment between MPs 1.58 and MP 2.43. This variation is shown on figure 3.5.3-3.

The Golf Course Variation would deviate from the proposed route at MP 1.58 by crossing to the west side of the railroad right-of-way. Although this cross-over would necessitate additional workspace on the Fall River Country Club property, it would not have a direct impact on the golf course fairways east or west of the railroad (see section 4.8.6.1 for additional discussion of impacts on the Fall River Country Club). After crossing the tracks, the variation would proceed north along the railroad right-of-way until it rejoins the proposed route at MP 2.43. The primary disadvantage of the Golf Course Variation is that it would require about 3.2 acres more tree/shrub clearing than the proposed route. The removal of this vegetation may result in a minor alteration of the visual aesthetic of one of the golf course holes. However, the Golf Course Variation would avoid construction disturbance and vegetation clearing adjacent to the condominiums located near MP 2.0 of the proposed route, and eliminate one wetland crossing and the potential need for extra workspace in another wetland. For these reasons, we recommended in the draft EIS that Weaver's Cove Energy incorporate this variation into the proposed route.

In its comments on the draft EIS, Weaver's Cove Energy agreed to incorporate the Golf Course Variation (as modified to include the portion of the route between MPs 1.58 and 2.43) into the proposed route. As such, the modified Golf Course Variation is now considered as an adopted segment of the proposed route. In addition, we find that the modified variation between MPs 1.58 and 1.89 is environmentally preferable to the corresponding segment of the original route, since it reduces disturbances to the Fall River Country Club.

Insert Figure

3.5.3-3 Golf Course Variation

3.5.4 G-22 Lateral Interconnect (Western Pipeline)

As currently proposed, Weaver's Cove Energy would interconnect with Algonquin's G-22 lateral via the Western Pipeline. After crossing the Taunton River, the Western Pipeline route generally follows existing electric transmission line rights-of-way to an interconnect with Algonquin's pipeline system in Swansea. To avoid or minimize impacts on the Taunton River and upland forests and to reduce visual impacts on adjacent residences resulting from construction and operation of the Western Pipeline, we considered several minor realignments of the proposed pipeline route. Also, an alternative construction method (horizontal directional drill) was evaluated for the Taunton River crossing as a mitigative measure and is discussed in section 4.3.2

Western Pipeline Minor Route Variations

To minimize potential impacts on the Taunton River, we examined alternative crossing methods as well as minor route variations to the Western Pipeline route (Taunton River Variations) that would provide an alternative pipeline alignment around the Montaup Power Plant on the western bank of the Taunton River. We also considered route variations that would minimize impact on residences in close proximity to the proposed route's alignment with the existing electric transmission corridor (Jaffrey Street Variations), and a variation that would avoid creating a new right-of-way through a forested area near the terminus of the proposed route (Ferncroft/Dwelly Road Variation).

Taunton River Crossing Methods

To avoid impacts on the Taunton River and address agency concerns regarding an open-cut pipeline crossing of the river, we investigated the potential to install the Western Pipeline across the river using the HDD method. We also received public comments on the draft EIS that we should consider the potential for Weaver's Cove Energy to use plowing or jetting instead of dredging to install the pipeline. Plowing and jetting installation techniques are commonly used in the construction of offshore pipelines. Both techniques typically require large barges for pipeline installation, which are typically moored in place and secured by an array of large anchors. These vessels are typically 400 feet long by 120 feet wide and have a draft of approximately 20 feet. Upstream of the existing turning basin water depths are significantly less than 20 feet along most of the proposed pipeline crossing. Due to the size of the vessels and the draft requirements, which precludes their use in shallow waters, we do not believe that plowing or jetting would be feasible for pipeline installation across the Taunton River.

The HDD method involves drilling a hole under the waterbody and pulling a prefabricated segment of pipe through the hole. The first step in an HDD crossing is to drill a small-diameter pilot hole from one side of the crossing (entry side) to the other (exit side). Drilling is achieved using a hydraulic powered drill bit. The drilling fluid, commonly referred to as mud, is a mixture of water and bentonite (a naturally occurring clay mineral), which is circulated through the drill hole during the drilling process.

As the drilling of the pilot hole progresses, segments of drill pipe are inserted into the pilot hole to extend the length of the drill. When the pilot hole is completed, the hole is enlarged to accommodate the pipeline. The enlargement of the pilot hole is accomplished by attaching a reaming tool to the end of the drill on the exit side of the hole and drawing the reaming tool back through the pilot hole to the drill rig. Typically, several passes of consecutively larger reaming tools are required before the hole is sufficiently sized to accommodate the pipeline. The final hole is typically about 12 inches larger than the diameter of the pipeline segment to be installed.

The pipeline segment to be installed beneath the waterbody is fabricated and radiographically inspected and/or hydrostatically tested on the right-of-way on the exit side of the crossing during the

drilling and reaming process. When the final hole is completed, the pipeline segment is attached to the drill string on the exit side of the hole and pulled back through the drill hole toward the drill rig.

HDD techniques have become increasingly common to avoid disturbing the bed and banks of major waterbodies during pipeline installation. However, there are several factors that must be evaluated in determining the feasibility of the HDD method. For one, the substrate must be suitable for drilling. Drilled crossings are typically designed to maintain a drill path of at least 20 feet or more below the waterbody to minimize the potential for an inadvertent release of drilling mud. Certain subsurface conditions make maintenance of an open drill hole difficult. In particular, the presence of glacial till or outwash interspersed with boulders and cobbles, fractured bedrock, or non-cohesive coarse sands and gravels increase the likelihood of HDD failure due to refusal of the drill bit or collapse of the bore hole in non-cohesive, unstable substrate. Drilling through bedrock can also be problematic if the rock is fractured, which may provide conduits within the rock through which drilling mud can travel to the surface. If these fractures lead to the surface under or near the waterbody, drilling mud could “frac-out” into the water, covering benthic habitat with drilling mud and increasing suspended sediment levels and turbidity. As discussed in section 4.1.2, the proposed facilities are located in an area generally underlain by glacial till over bedrock. The glacial till consists of very dense poorly sorted sand and gravel with fine silt interbeds and some black shale and pink granite cobbles. Furthermore, the area is affected by the Beaverhead Fault Zone, which is a zone of highly broken rock, coincident with the run of the Taunton River (see section 4.1.4).

Although Weaver’s Cove Energy has not conducted specific geotechnical borings to determine the suitability of the substrate for HDD, it did collect bore samples to characterize the subsurface geology underlying the proposed LNG tank. These data suggest that at least a portion of the drill path would cross through poorly graded gravels or gravel sand mixtures with little or no fines, which may not be suitable for drilling. The data also indicate that the underlying bedrock is fractured shale and silty sandstone. Deep borings conducted approximately 1,200 feet south of the proposed river crossing document shattered bedrock. Recovered cores measured from these borings have low rock quality designations that range from 20 to 30 percent, which is indicative of poor rock quality and highly fractured rock. This information regarding the underlying geology is also supported by reports prepared by di Cervia and Taylor of the Trevicos Corporation, who was awarded the contract for installation of the drilled shafts for the Brightman Street Bridge piers. They reported that the geology of the bridge "site consists of sands and gravels over a layer of cobbles and boulders 30 feet thick above sandstone and shale bedrock." They also reported that as soon as work started on the east pier of the bridge, they "encountered large numbers of cobbles and boulders in the sand-and-gravel stratum in a percentage much greater than shown in the contract boring logs" (di Cervia and Taylor, 2003). This geotechnical information suggests that the underlying substrate in the project area is not conducive to drilling and that drilling would not be without environmental risks.

Another requirement for the HDD method is that there must be workspace on one side of the waterbody for the drill rig and workspace on the opposite side of the waterbody to fabricate the pipeline segment for the crossing. There are several general requirements for the pipe fabrication workspace. Ideally, the area should be generally level to gently sloping, equal in length to the fabrication segment, and aligned with the drill path. Steep topography or bends in the fabrication area can put additional stresses on the pipeline that can complicate the pullback operation and potentially damage the pipe. Under some circumstances, it may be possible to use less workspace for pipe fabrication by welding shorter segments of pipe together during the pull-back operation. However, this would require the pullback operation to be halted to complete the necessary welds, which is not recommended by drilling experts and greatly decreases the probability for a successful HDD crossing. For these reasons and because the substrate does not appear to be highly suitable for HDD, we do not consider halting the pullback operation to weld on additional sections of pipe practical for this project. We received a

comment from NOAA Fisheries that we should evaluate the possibility of welding the pipeline during the pullback (e.g., welding on the move) to avoid interrupting the pullback operation. We believe this would be impractical due to the length of time required for each weld, the need to radiographically inspect the weld before installing the pipeline, and the challenges of completing a suitable weld while the pipeline is in motion.

We reviewed both sides of the river upstream and downstream of the proposed crossing location to identify potential workspace locations to fabricate the pipe segment for a HDD crossing. We divided our review into two areas: areas located within one mile of the proposed crossing; and areas located more than one mile from the proposed crossing.

Since the narrowest point of the river within one mile of the proposed crossing location is about 1,400 feet across, we assumed the pipe fabrication area for any HDD crossing within one mile of the proposed crossing location would need to be at least 1,500 feet in length. Our review revealed that the riverfront on both sides of the river is well developed and that there are no unobstructed areas of this size within one mile of the proposed crossing location. Route 79, North Main Street, and the CSX railroad are all within 1,500 feet of the eastern shore of the river and Riverside Avenue and County Road are both within 1,500 feet of the western shore on the river. The fabrication of the pipeline segment on either side of the river would require the closure of roads and/or the railroad for at least several hours.

Our review of potential fabrication areas more than a mile from the proposed crossing location was limited primarily to areas north of the site. We could not find any suitable fabrication areas south of the proposed crossing location (e.g., south of the existing Brightman Street Bridge) that would not require road closures. Furthermore, any crossing of the river more than a mile south of the site would require construction of additional pipeline through highly developed areas of Fall River.

We found one area located about 4.5 miles north of the proposed crossing where there may be sufficient area on the eastern shore of the river to fabricate the pipeline segment without interrupting road or railroad traffic. However, the river is wider at this location, which would increase the length of the HDD crossing to about 4,500 feet. Crossing the river at this location would also increase the amount of pipeline that would need to be constructed on both sides of the river. The pipeline route on the west side of the river, in particular, would create a new right-of-way and pass through several residential areas. This pipeline route would also cross several perennial waterbodies (including the Cole River) and cross several thousand feet of wetland.

We also considered the possibility of a land-to-water or water-to-water HDD (techniques typically used in offshore pipeline construction). Due to the relatively narrow width of the river, we do not believe a water-to-water drill is possible or would have any advantages. Moreover, a water-to-water drill would likely release substantial drilling fluid within the river at the exit or entry point and increase the chances of a release where the drill path is within 20 feet of the river bottom. We did, however, evaluate completing an HDD crossing of the river by stationing a drill rig in the center of the river and drilling both east and west to points on the eastern and western shores of the river. This method would require installation of a drill platform in the river and driving piles or spuds into the river bed to stabilize the platform. Two drill entry pits would likely need to be excavated in the river bottom. We estimate each of these pits would be about 10 feet deep, 10 feet wide, and 30 feet long, assuming sheetpiling is used (if sheetpiling is not used, the pits would be larger). Drilling mud would be injected from the head of the drill into the underwater pilot hole. The completed pilot hole would exit onshore and would then be enlarged as described above by reaming. When the hole is sufficiently sized, a section of pipe that has been prefabricated onshore would be pulled into the exit hole and back to the drill entry pit in the center of the river. After both HDDs and pipe installations have been completed, the two sections of pipe would need to be connected underwater, most likely with a special flange.

By splitting the HDD operation into two sections, the land-to-water method would reduce the length of pipe required for each HDD and thus the amount of onshore area required for pipe prefabrication and laydown. This could potentially avoid some of the road and railroad conflicts described above and increase the number of potential prefabrication areas. However, drilling from the center of the river would also result in considerable disturbance of the riverbed and the release of drilling mud into the river. HDDs that begin or end in the Taunton River would require dredging of the river bottom to receive and/or tie in the pipeline sections and bury the pipeline beneath the river bottom. In our view, these impacts would significantly diminish the environmental advantages of the HDD. Additionally, it is questionable whether such short drill segments for 24-inch-diameter pipe are feasible. The minimum length of an HDD depends on several factors including the depth and path of the drill as well as the diameter of the pipe. Generally, larger diameter pipe requires a greater minimum drill distance. Typically, HDDs with 24-inch-diameter pipe are considerably longer than half the width of the Taunton River. As a result, we believe that a land-to-water HDD would offer no clear environmental advantage over the proposed open-cut crossing.

Even though a successful HDD crossing would avoid potential impacts on aquatic organisms in the Taunton River, the factors discussed above suggest that the subsurface conditions underlying the river may not be suitable for HDD. Additionally, the use of the HDD method would be more costly (Weaver's Cove Energy indicated that the HDD crossing would be about $2.5 million more expensive than an open-cut crossing) and would result in additional environmental impacts that would be avoided by an open-cut crossing. As discussed in section 4.6.2, we have also recommended that Weaver's Cove Energy schedule the open-cut crossing of the Taunton River to minimize adverse impacts on important aquatic resources such as winter flounder habitat. For these reasons, we do not believe a HDD crossing of the Taunton River is a practicable alternative that provides a clear environmental advantage over the open-cut crossing method that would be implemented for the Weaver's Cove LNG Project.

Taunton River Variations

We examined Taunton River Variations A and B as alternatives to the segment of the Western Pipeline between MPs 0 and 0.8 in an attempt to minimize impacts on the Taunton River and to minimize impacts on residences along Annette Avenue north of the Montaup Power Plant. As shown on figure 3.5.4-1, Taunton River Variation A begins at the same location on the LNG terminal site as the proposed route and proceeds west across the Taunton River. Taunton River Variation A reaches the west bank of the river at a point south of the Montaup Power Plant. Taunton River Variation B begins on the southern edge of the LNG terminal site approximately 2,000 feet south of the starting point for the proposed route and makes landfall on the west bank of the river at the same location as Taunton River Variation A. After coming onshore on the west bank of the river, both variations go around the southern perimeter of the power plant before turning north at Riverside Avenue. The variations continue north for about 500 feet along Riverside Avenue before turning west and following Stevens Street for about 700 feet. The variations then turn north and proceed along Route 138 (County Street) for about 1,000 feet before joining the proposed route at the intersection of Clifford M. Holland Road near MP 0.8. Both variations align the pipeline within the proposed turning basin of the river and avoid the dredging of a new area north of the turning basin, as required by the proposed route.

Insert Figure

3.5.4-1 Taunton River Variations

The Taunton River Variations A and B are about 0.2 to 0.4 mile longer, respectively, than the corresponding segment of the Western Pipeline route. In other respects, the onshore portions of the variations are similar to the proposed route, although the Taunton River Variation B crosses 260 feet of salt marsh on the east bank of the river that is avoided by the other routes. The primary difference between the variations and the proposed route is that the crossing of the Taunton River would be several hundred feet longer for the variations than for the proposed route. Additionally, since the variations cross the river in an area that would be dredged for the LNG ship turning basin (between 1,000 and 1,500 feet, or 44 to 55 percent of the crossings, would be in areas proposed to be dredged), they would require more dredging than the proposed pipeline. This is because a pipeline under the turning basin would need to be buried with 10 feet of cover for safety reasons, whereas a pipeline outside of the turning basin would require only 5 feet of cover. Thus while the variations would somewhat reduce the area disturbed by dredging, the additional depth of cover necessary for the variations would more than double the volume of dredging required for the pipeline installation when compared to the proposed route. For this reason, we do not believe either the Taunton River Variation A or Taunton River Variation B provides a clear advantage over the corresponding segment of the proposed pipeline route and do not recommend that either variation be adopted as part of the preferred route.

Clifford M. Holland Road Variation

In its comments on the draft EIS, Weaver's Cove Energy indicated that it is considering a minor route variation along Clifford M. Holland Road between approximate MPs 0.80 and 1.06 of the Western Pipeline route.[6] This minor route variation would involve shifting the pipeline centerline to the south from the edge of Clifford M. Holland Road into the center of the road and reconfiguring areas needed for temporary extra work space. The result of this minor route variation would be the preservation of existing vegetation that provides aesthetic value and/or visual screening for motorists using the road or persons using the athletic fields on the south side of the road (many of the oak trees that would be avoided by this minor route variation have diameters between 10 and 24 inches). As described, we believe this is an acceptable route variation and encourage Weaver's Cove Energy to take steps necessary to avoid or minimize the need to clear vegetation along Clifford M. Holland Road.

Jaffrey Street Variations

As shown on figure 3.5.4-2, we identified two Jaffrey Street Variations as alternatives to the segment of the Western Pipeline between MPs 1.5 and 1.9 to:

- increase the distance of the pipeline from residences along Brayton Avenue and the south side of Jaffrey Street; and
- minimize potential visual impacts associated with the clearing of vegetation for the construction right-of-way.

Weaver's Cove Energy proposed alignment in this area would be constructed entirely within the existing electric transmission line corridor using a 100-foot-wide construction right-of-way. The proposed pipeline would be about 22 feet north of the base of the northernmost transmission line towers and 35 feet south of the northern edge of the electric transmission line right-of-way. In this position, the pipeline would be about 30 feet from a residence on Brayton Avenue and between 60 feet and 80 feet of 12 residences along Jaffrey Street. Based on a field review of the area, it seems likely that the construction right-of-way for the proposed route would remove at least some of the vegetation that currently screens the transmission lines from these residences.

[6] In its comments on the draft EIS, Weaver's Cove Energy inadvertently indicated that this route variation is between MPs 0.49 and 0.54 of the Western Pipeline route.

Insert Figure

3.5.4-2 Jaffrey Street Variations

One alignment that would increase the distance of the pipeline from these homes and minimize the clearing of screening vegetation would be to put the pipeline on the opposite (south) side of the transmission line right-of-way between Brayton Avenue and Swansom Road (see figure 3.5.4-2). The variation, referred to as Jaffrey Street Variation South, would increase the distance of the pipeline from the residences on Jaffrey Street by at least 200 feet. However, construction of the pipeline on the south side of the transmission line corridor would put the pipeline on the edge of a Junior High School parking lot approximately 130 feet to 170 feet from the nearest school building. It would also increase the amount of tree clearing required. Weaver's Cove Energy has indicated that it is infeasible to construct the pipeline entirely within the electric transmission line corridor at this location due to the presence of an existing water supply line. As a result, it may be necessary to put the pipeline outside of the transmission line corridor, which could result in up to 2.6 acres of new forest clearing and the acquisition of up to 50 feet of new permanent right-of-way outside of the existing corridor.

Another alignment, referred to as Jaffrey Street Variation Center, that would increase the distance of the pipeline from residences would be to put the pipeline down the center of the transmission line corridor between the two most northern lines (see figure 3.5.4-2). There is about 50 feet of space between the towers for these two transmission lines. Locating the variation here would generally avoid the clearing of screening vegetation but maintain most of the buffer between the pipeline and the Junior High School (the distance between the variation and the nearest school building would be about 375 feet, or about 45 feet less than of the distance between the proposed pipeline alignment and the building). This alignment would provide less available workspace than the other alignments. The limited amount of space between the electric towers would require Weaver's Cove Energy to use a narrower right-of-way, which would complicate and likely slow the rate of construction. The need to work under and around multiple power lines may also increase safety concerns for workers and may require additional cathodic protection to protect the pipeline.

In response to the draft EIS, Weaver's Cove Energy indicated that it has further reviewed the Jaffrey Street Variations. The potential for AC interference or effects on the pipeline's cathodic protection system still cannot be fully addressed until Weaver's Cove Energy obtains data from National Grid concerning the existence of counterpoise wires. In the meantime, Weaver's Cove Energy made adjustments to permanent easements and temporary workspaces to mitigate potential effects on stone walls and trees that are on those properties impacted by the proposed route. Additionally, National Grid filed comments with the Commission indicating it believes the Jaffrey Street Variation Center would constrain National Grid from future (although currently not planned) modifications or reconstruction of its transmission facilities. Furthermore, National Grid believes that this variation would pose safety concerns during construction and operation of the pipeline. Because of these concerns and because of the uncertainties associated with the Jaffrey Street Variation Center, we do not believe either variation provides a reasonable alternative that offers a clear environmental advantage over the proposed route. We find that Weaver's Cove Energy would adequately minimize residential impacts along Jaffrey Street by overlapping its proposed right-of-way with the existing utility corridor and by avoiding vegetation clearing which currently screens the transmission lines. Weaver's Cove Energy's development of site-specific residential plans would include measures to minimize residential impacts along this segment.

Ferncroft/Dwelly Road Variation

We examined the Ferncroft/Dwelly Road Variation as an alternative to the segment of the Western Pipeline between MPs 1.9 and 2.5 to minimize forest land impacts near the terminus of the proposed route. As shown on figure 3.5.4-3, this variation deviates from the Western Pipeline route near MP 1.9, where the proposed route turns north and follows the northern extension of the electrical transmission line right-of-way. Rather than turning to the north, the Ferncroft/Dwelly Road Variation

proceeds west generally adjacent to Ferncroft and Dwelly Roads. The variation continues west beyond the ends of the roads and crosses a narrow forested area before interconnecting with Algonquin's G-22 lateral about 1,450 feet south of where the Western Pipeline route interconnects with the G-22 lateral.

With a length of about 2,600 feet, the Ferncroft/Dwelly Road Variation is about 425 feet shorter than the corresponding segment of the proposed route. The variation would also disturb less land, and cross about 1,675 feet less forest land than the corresponding segment of the proposed route.

A significant disadvantage of the variation is that it would involve substantially more disturbance to residential areas during construction. The construction right-of-way for the Ferncroft/Dwelly Road Variation would be within 50 feet of 23 additional homes when compared to the corresponding segment of the proposed route. Construction near these homes would increase impacts on nearby residents, which would include increased noise, dust, traffic, visual impacts associated with tree clearing, and other inconveniences. Additionally, construction and restoration costs of this route variation would be greater than for the corresponding segment of the Western Pipeline due to the need to repair and repave streets and driveways as well as to replace residential landscaping. We do not believe that the reduction in the length of forest land crossing outweighs the increased residential impacts of the Ferncroft/Dwelly Road Variation and do not recommend it be adopted as part of the proposed route.

3.6 DREDGING AND DREDGE DISPOSAL ALTERNATIVES

As discussed in section 2.4.1.3, Weaver's Cove Energy would dredge up to about 2.6 million cubic yards of sediment from the Mount Hope Bay/Taunton River federal navigation channel and a turning basin to enable LNG ships to transit, dock, and turn in the Taunton River. This volume was determined based on the minimum volumes needed to safely accommodate LNG ships. Alternatives requiring more dredging could be identified. However, alternatives requiring less dredging would not be able to safely accommodate LNG ships. As such, we did not consider it feasible to reduce the volume or extent of dredging and still satisfy the objectives of the project at the proposed site.

Dredging and related activities would be conducted in accordance with applicable federal, state, and local permit stipulations. To avoid or minimize impacts on water quality or biological resources associated with these activities, alternative dredging methods and dredge disposal alternatives were considered.

3.6.1 Alternative Dredging Methods

Large-scale dredging operations in the region typically utilize mechanical dredging equipment for maintenance and improvement dredging of the harbors and channels. Mechanical dredging involves equipment such as clamshell dredges, dipper dredges, draglines, grab buckets, and barge-mounted excavators for the removal of bottom sediments and other materials. The dredged material removed by mechanical methods is typically high in solids content and lower in mixed waters that are more common with hydraulic dredge methods. Mechanical dredging equipment involves the use of a bucket to place dredged materials in scows or on barges for transport to a disposal area. Various bucket designs are available that are able to reduce the amount of solids suspended in the water column. Two types of buckets considered for this project include the open bucket and the closed bucket (or occasionally referred to as the environmental bucket). The open bucket involves dredging material at almost in-situ concentrations. Excess material and water are allowed to spill off the top so that little excess water is dumped into the scow. The closed bucket reduces turbidity at the dredge site but entrains more water.

Insert Figure

3.5.4-3 Ferncroft / Dwelly Road Variation

Mechanical dredges are rugged, highly reliable, and capable of removing a broad range of materials. Such equipment is also able to operate in an open channel as well as confined berth spaces. Barge and scow transport of dredged material is efficient over long-haul distances, although mechanical dredging productivity is generally slow compared to hydraulic dredging operations due to the scow loading process. Additionally, such operations are subject to spillage and splashing, which allows sediments to resuspend in the water. In the draft EIS, we recommended that, in consultation with NOAA Fisheries and applicable state resource agencies, Weaver's Cove Energy identify measures (e.g., changes in dredging equipment, dredging procedures, and/or dredging schedules) to avoid or minimize potential dredging impacts on fishery resources in the project area. Subsequent to the draft EIS, Weaver's Cove Energy adopted several measures, including closed buckets in certain sediments types and restricted dredging windows and no scow overflow in certain areas, to minimize aquatic impacts (see sections 2.4.1.3 and 4.6.2).

Hydraulic dredging equipment is an alternative that could be used for this project. Hydraulic dredges operate using a centrifugal pump capable of handling solids to transport a slurry of dredged sediments and water through a pipeline. The slurry containing the dredged materials is hydraulically transported through the pipeline from the dredged area to a disposal site. For long distance transport, the slurry can also be placed in barges for removal to the disposal site. Hydraulic dredges are able to excavate a broad range of materials. An advantage of the hydraulic dredge is that it typically generates somewhat lower levels of turbidity throughout the water column at the dredge site compared to mechanical dredging methods. Turbidity is managed by controlling the cutterhead rotation speed and the swing speed of the dredge and by implementing operational controls.

There are also several disadvantages associated with the use of hydraulic dredge equipment. The hydraulic dredge typically requires a long, temporary pipeline system, which could potentially become an obstruction to navigation and or vessel movement within the harbor. Moreover, hydraulic pipeline transport of dredged materials typically requires in-line booster pumps to extend pumping distances and thus are restricted by practical and economic constraints. Hydraulic dredging also draws in significant amounts of water during the dredging process. This intake of water has the potential to entrain significant numbers of fish eggs and larvae as well as other benthic organisms. Hydraulic dredging also requires a much larger disposal area and longer drying times. If barges are used to transport the dredged material, it requires more barge movements between the dredge site and the disposal area than would be necessary if mechanical dredging were used. There are sometimes water quality issues associated with overflow off of the barge. Given these disadvantages we do not believe hydraulic dredging methods are a practical alternative to mechanical dredging equipment for this project.

Hopper dredges are another type of dredging equipment. Hopper dredges are self-propelled ships that include an integral suction pipe or several suction pipes, which are dragged along the channel bottom. The bottom materials are drawn through a suction head, pass through the suction pipe and pump, and are deposited as a slurry in a large onboard hopper. Once full, the hopper dredge can travel to an offshore or other designated dumpsite, open its bottom doors, and discharge the dredged material. Some hopper dredges also can offload the dredged material by pumping. An advantage of hopper dredges is that they have minimal interference on other vessel operations and can efficiently transport materials over short haul distances. However, the use of the hopper dredge to dispose of dredged materials requires that the dredging process be suspended while the dredged material is transported to the disposal site. Hopper dredges are also not effective in restricted areas, such as berths and docking facilities. In addition, when used to dredge very fine silts that do not readily settle, the dredge generally can carry only partial loads, with relatively high water content, to the disposal site, which generally makes it inefficient for dredging in areas with these sediment types.

All three of these dredge types were assessed in detail for the Providence River and Harbor Maintenance Dredging Project, which involved sediment conditions similar to the proposed project. The COE concluded that hydraulic and hopper dredge equipment, while physically capable of conducting the work, were not preferable because they entrain significant amounts of water and result in fairly unconsolidated material. The COE (2001) identified the following disadvantages of these dredging methods:

- both hydraulic and hopper dredges require a larger dewatering site and longer drying times;
- the hydraulic dredge requires a long pipeline system that could interfere with other vessel's navigation; and
- the hopper dredge is not suited for operating in restricted areas or long haul disposal due to long cycle times for the dredging operations.

3.6.2 Dredge Disposal Alternatives

Weaver's Cove Energy proposes to dispose of the sediments that are removed from the federal navigation channel and turning basin by reusing the dredged material as general site fill material at the LNG terminal site (see section 2.4.1.3). Other potential options that were considered for the project include offshore disposal, confined aquatic disposal, confined disposal facility, island/habitat creation, landfill disposal, and other upland disposal sites. Table 3.6.2-1 lists all of the various dredging and disposal options that have been considered and summarizes the material processing requirements and potential advantages and disadvantages of each option. For a more detailed discussion of these options see Weaver's Cove Energy's *Dredging Program Report* (C2D, 2003). An electronic copy of this report is available under the "Proposal" link on Weaver's Cove Energy's website at www.weaverscove.com.

Effects of Time-of-Year Restrictions on Dredging Plan

After additional review and consultations with state and federal agencies, we concluded that the dredging program currently proposed by Weaver's Cove Energy could negatively affect biological resources in the Taunton River (see section 4.6.2). As a result, we have recommended that Weaver's Cove Energy modify its proposed dredging program within the Taunton River to prohibit dredging activities during the winter flounder spawning period (January 15 through May 31). Based on our analysis, additional time-of-year restrictions beyond the winter flounder spawning period do not appear warranted. However, the COE is currently considering additional information regarding potential dredging impacts on anadromous fish movements and may require an even longer time-of-year restriction on dredging activities (January 15 through July 31 or January 15 through October 31). These timing restrictions would leave Weaver's Cove Energy with the following time to conduct its dredging operations:

- 228 days per year (January 15 through May 31 restriction);
- 167 days per year (January 15 through July 31 restriction); or
- 75 days per year (January 15 through October 31 restriction).

TABLE 3.6.2-1

Summary of Dredging and Disposal Alternatives

Alternative (Material Placement)	Dredging Methods	Material Processing	Considerations
On-site Upland Reuse (Proposed Action)	Mechanical	Mixing mill, spread and till, or in-barge mixing of cement for stabilization	The proposed site is available and large enough to accommodate dredged materials. Use of the site would require modification of the existing groundwater remediation system as well as resolution of MCP concerns related to the placement of sediments on the site (see section 4.2.2). General costs: $35-55 per cubic yard.
Offsite Upland Reuse	Mechanical	Mixing mill, spread and till, or in-barge mixing of cement for stabilization	Weaver's Cove Energy has not been able to obtain access to another property for upland reuse of the dredged materials. Additionally, any site in Massachusetts would have the same MCP concerns related to the placement of sediments as the proposed site. General costs: $35-55 per cubic yard (assuming site is available).
Offsite Upland Disposal (Landfill)	Mechanical	Untreated	The dredged material quantity exceeds the capacities of regional landfills. Trucking dredged materials long distances is prohibitively expensive and would result in air quality and traffic impacts. General costs: $75-100 per cubic yard.
Offsite Upland Disposal (Dewatering)	Hydraulic	Naturally dewater through settling and consolidation	An upland site that would be capable of storing the dredged material during the dewatering process is not available. Additionally, any site in Massachusetts would have the same MCP concerns related to the placement of sediments as the proposed site. General costs: $20-25 per cubic yard (assuming site is available).
Offshore Disposal	Mechanical	Untreated	Offshore disposal would result in short-term (up to 3 years) impacts on water quality, benthic habitats, and fishing industry. Some sites may be permanently impacted. Additional sediment sampling and analysis has been conducted to determine the suitability of the sediments for offshore disposal. General costs: $12-27 per cubic yard.
Confined Aquatic Disposal cell (CAD)	Mechanical	Untreated	This alternative involves underwater storage of material after additional dredging is completed. A confined aquatic disposal cell is sometimes considered for isolating contaminated sediments. This alternative requires dredging and disposal of additional materials. General costs: $40-60 per cubic yard.
Confined Disposal Facility (CDF)	Mechanical or Hydraulic	Untreated	A confined disposal facility would require the construction of a wall or berms in a nearshore area. Can result in short-term and long-term negative impacts on some resources (e.g., permanent habitat replacement, short term impacts on water quality and benthic habitats). General costs: $20-25 per cubic yard.
Island/Habitat Creation	Mechanical	Untreated	Dredged material can be used to create or enhance aquatic habitats. Can result in short-term and long-term negative impacts on some resources (e.g., permanent habitat replacement, short term impacts on water quality and benthic habitats). General costs: $45-100 per cubic yard.

As described in section 2.4.1.3, the currently proposed dredging program is closely linked to the placement operations whereby the dredged materials would be stabilized and placed on the LNG terminal site. As described, the process of the onshore placement of the stabilized volumes (i.e., stabilization using cement, rate of placement, and compaction) has more impact on the project schedule than the dredging process itself. Timing restrictions, particularly those that overlap the warmer spring and summer months when dredged material stabilization and placement rates would be the highest, would particularly impact the project schedule. Weaver's Cove Energy has estimated that dredging could take approximately 650 operational days. Accounting for expected weather and equipment (moving and maintenance) delays, Weaver's Cove Energy conservatively estimated that the entire dredging and placement program would require about 975 days. Based on our own independent analysis of equipment and cycle times as well as

down time for inclement weather and equipment movement and maintenance, these assumptions seem reasonable.[7]

In response to comments on the draft EIS that we expand the analysis of impacts of various time-of-year restrictions on the proposed project schedule, we have evaluated the effects of three different time-of-year restrictions. The first restriction would prohibit dredging between January 15 and May 31 during the winter flounder spawning period. This time-of-year restriction would permit dredging 228 days a year or 684 days over a 3-year period including the summer months, which would likely be the months when the highest production and placement rates can be achieved. The second restriction would prohibit dredging between January 15 to July 31, which encompasses both the winter flounder spawning period and the anadromous fish upstream migration period. This time-of-year restriction would permit dredging 167 days a year or 501 days over a 3-year period, but would prevent dredging during the late spring and early summer months, which are expected to be when some of the highest production and placement rates can be achieved. The third restriction would prohibit dredging between January 15 and October 31, which would encompass the winter flounder spawning period and both the anadromous fish upstream and downstream migration periods. This time-of-year restriction would permit dredging 75 days a year or 225 days over a 3-year period, but would limit dredging to the coldest months of the year, when production and placement rates would be lowest.

It seems unlikely that the dredging program could be completed in 3 years under the January 15 to May 31 time-of-year restriction unless numerous barges could be filled and moored for an indefinite period. It is more likely that this restriction would add between 1 and 2 years to the proposed schedule. The January 15 to July 31 time-of-year restriction would add between 2 and 4 years to the proposed project schedule. The January 15 to October 31 time-of-year restriction would likely add up to 6 years to the proposed project schedule. Based on these timing restrictions and the onshore placement of dredged material, we believe it is reasonable to assume that time-of-year restrictions would likely lengthen the project schedule for onshore disposal a minimum of 1 to 2 years to as long as 6 years beyond the currently proposed 3-year project schedule. The significance of the time-of-year restrictions on the project schedule is reduced based on the MassHighway's anticipated completion of the new Brightman Street Bridge and demolition of the existing bridge until some time in 2010, which may add up to 2 years to Weaver's Cove Energy's currently proposed project completion date of 2008.

Offshore Disposal Alternatives

Based on consultations with state and federal agencies, there is a general consensus among most agencies that disposal of the dredged material in an upland location is preferred and could reduce water quality impacts. The DEP, however, has expressed concerns about the regulatory feasibility of placing the dredged sediment on the proposed site without some additional testing of the existing site soils and the effects of the dredged material on the existing remediation system (see section 4.2.2). If these concerns can not be reconciled, it may not be possible to place the dredged material on the proposed site. In addition, the time-of-year restrictions described above may also unduly delay the schedule for the proposed onshore placement of the entire dredged volumes. Because other onshore disposal sites are not currently available or would be prohibitively expensive, offshore disposal of the dredged material may be an alternative method for disposing of some or all of the dredged material.

Offshore disposal of the dredged material may be possible but also may involve additional water quality impacts and new regulatory issues. Although offshore disposal is not part of its proposed

[7] We estimated that based on 1 foot of overdredge, average projected production rates, and 100 percent efficiency, dredging would take approximately 560 days. With expected delays, which we assumed could result in only 50 percent efficiency, the entire dredging and placement program would take approximately 1,120 days.

dredging plan, Weaver's Cove Energy initiated a Tier III analysis program[8] in accordance with the COE- and EPA-approved protocols to determine the suitability of the materials for offshore disposal at the Rhode Island Sound Disposal Site (RISDS) formerly referred to as Site W or Site 69b and the Massachusetts Bay Disposal Site (MBDS). The results of the Tier III testing were filed with the EPA and COE on April 12, 2005. Preliminary indications provided by Weaver's Cove Energy are that the majority of the dredged material would be suitable for offshore disposal. The EPA and COE will subsequently review the Tier III testing results and make a suitability determination for offshore disposal. As of the publication of this final EIS, the EPA and COE have not made a final determination regarding the suitability of the proposed dredged sediment for offshore disposal. If the COE and EPA concur with Weaver's Cove Energy's determination that most of the dredged material is suitable for offshore disposal, Weaver's Cove Energy would likely be able to avoid dredging during the winter flounder spawning period without adversely affecting the 3-year project schedule by using multiple dredges and disposing of the dredged material at an offshore site. Thus the offshore disposal of sediments could potentially avoid impacts on winter flounder eggs and some other sensitive aquatic organism in Mount Hope Bay and the Taunton River. Another potential advantage of offshore disposal is that it would avoid the issues raised by the DEP about the regulatory feasibility of placing the dredged sediment on the proposed site and the effects of the sediments on the existing remediation system. If the dredged material is not considered suitable for offshore disposal, however, Weaver's Cove Energy has indicated that imposing the more restrictive time-of-year windows with its proposed sediment placement plan at the LNG terminal site could impact the financial viability of the project. Although we currently do not know whether the COE and EPA will determine whether the dredged material would be suitable for offshore disposal, we have conducted the following analysis of the impacts associated with offshore disposal.

Effects of Offshore Disposal and Multiple Dredges on the Project Schedule

Offshore disposal, unlike onshore disposal, would enable Weaver's Cove Energy to potentially use multiple dredges, primarily because this disposal option does not have the constraints associated with the proposed onshore dredged material stabilization and placement process. The effect offshore disposal of sediments has on the construction schedule depends on how much of the sediment qualifies for offshore disposal and how many dredges are employed. As discussed above, a final determination regarding offshore disposal based on the Tier III tests results has not yet been made. However, it appears likely based on the results of the Tier II testing, if any sediment qualifies for offshore disposal, one of two offshore disposal scenarios are probable. One scenario would be that only the native sediments (about 0.6 million cubic yards) are determined to be suitable for offshore disposal. The other scenario would be that all (2.6 million cubic yards) of the sediments are determined to be suitable for offshore disposal. Our review indicates that the first scenario (offshore disposal of only the native sediments) would have little effect on the project schedule and costs regardless of the number of dredges used. This is because the volume of native sediments relative to non-native sediments is relatively small and the stabilization and placement of the native sediments would be easier, faster, and less expensive than the stabilization of non-native sediments. Weaver's Cove Energy has estimated that under the current onshore management plan, it would take between 90 and 120 days to excavate, stabilize, and place the native sediments on the site. Weaver's Cove Energy has suggested that it might be possible to double the dredging rate if the native sediments are disposed of offshore, which would reduce the time required to dredge and dispose of the native sediments by about 50 percent. However, the overall effect of this change would only shorten the dredging schedule by about 45 to 60 days.

We then assessed the potential impacts on the schedule assuming all of the sediments are disposed of offshore. Based on the areas to be dredged, we assumed it might be possible to use two and

[8] Tier III testing involves the assessment of contaminants in the dredged material on appropriately sensitive and benchmark organisms to determine if there is the potential for an unacceptable toxicity or bioaccumulation impact at the disposal site.

perhaps three dredges effectively if some or all of the dredged material could be placed at an offshore disposal site. We then looked at the potential of using multiple dredges to accelerate the dredging schedule if certain time-of-year restrictions are imposed. Table 3.6.2-2 shows the results of our analysis of potential effects of using multiple dredges on the proposed schedule assuming various time-of-year restrictions. Based on the results of our analysis, it appears that two dredges would minimize the impact on the proposed 3-year schedule if a January 15 to May 31 time-of-year restriction is imposed. Three dredges could effectively shorten the proposed 3-year schedule if a January 15 to May 31 time-of-year restriction is imposed or minimize the impact on the proposed schedule if a January 15 to July 31 time-of-year restriction is imposed.

TABLE 3.6.2-2

Effects of Multiple Dredges and Time-of-Year Restrictions on the Proposed Dredging Schedule a/

Number of Dredges	No Restriction	Jan 15-May 31 Restriction	Jan 15-July 31 Restriction	Jan 15- Oct 31 Restriction
1	~3 yrs	~4-5 yrs	~5-7 yrs	~11-14+ yrs
2	NA	~3-4 yrs	~4-5.5 yrs	~9-12+ yrs
3	NA	~2-2.5yrs	~2.5-3.5 yrs	~5-7+ yrs

a/ The figures above assume disposal of 2.6 million cubic yards of sediment and are based on production rates similar to those that would be achieved for the proposed project. Weaver's Cove Energy believes these production rates could be increased, and thus the effect of the timing restrictions on the overall schedule could be reduced if dredge material is disposed of offshore.

To determine the potential costs of dredging and offshore disposal, we reviewed the unit costs provided by Weaver's Cove Energy and estimates of unit costs from the Providence River and Harbor Maintenance Dredging Project and the Rhode Island Regional Long-Term Dredged Material Disposal Site Evaluation Project (adjusted for inflation). Based on these dredging cost estimates, it appears that the costs of dredging and offshore disposal of 2.6 million cubic yards could be in the range of $31 to $70 million (compared to the estimated $91 to $143 million for the upland disposal on the terminal site as proposed). We estimate that a January 15 to May 31 time-of-year restriction on dredging activities would increase these costs by at least $1 to $2 million (not including the costs of additional dredges), a January 15 to July 31 time-of-year restriction would increase costs by at least $2 to $5 million (not including the costs of additional dredges), and a January 15 to October 31 time-of-year restriction would increase the costs of dredging and offshore disposal even more.

Under any of these scenarios, Weaver's Cove Energy's proposed LNG terminal design would not change significantly. As such, the offshore disposal options would require Weaver's Cove Energy to import replacement material (soils or fill material) to support the proposed site grading plan, which includes increasing the elevation of the present site. Weaver's Cove Energy would continue to regrade the site to support the proposed LNG tank, truck loading area, and LNG piping area. In addition, Weaver's Cove Energy has indicated that replacement fill material would also be required to create the proposed landform designed to visually screen the LNG terminal from the adjacent landowners. Although the landform may provide some visual screening of the facilities at the LNG terminal from the east and northeast, the FERC would not necessarily require that this landform be a component of the project. As such, an alternative site layout would not need to include this landform (see section 3.4). The cost associated with bringing any replacement material onsite and the associated offsite trucking to transport these materials would offset some of the cost benefits of offshore disposal.

Impacts of Offshore Disposal

The MBDS Site is located 12 nautical miles southeast of Gales Point, Massachusetts in water depths of about 270 to 300 feet. Because scows/barges would have to transport dredged material from the project site in the Taunton River about 180 nautical miles to this disposal site, we believe this site is economically and logistically impractical and have not considered it further in our analysis. This determination is supported by the findings of a site screening study conducted as part of the Rhode Island Regional Long-Term Dredged Material Site Evaluation Project (Battelle and Maguire Group, Inc., 2002). Consequently, we have only considered potential environmental issues associated with disposal at the RISDS. On December 16, 2004, the EPA designated RISDS as an ocean dredged material disposal site that would provide a long-term disposal option for the COE to maintain deep-draft, international commerce and navigation through authorized federal navigation projects and to ensure safe navigation for public and private entities. Use of RISDS as a disposal site was analyzed in detail in the Providence River and Harbor Maintenance Dredging Project Final EIS (COE, 2001) and the Rhode Island Region Long-Term Dredged Material Disposal Site Evaluation Project Final EIS (EPA, 2004a). Much of the discussion below is based on these documents.

As part of our analysis of offshore disposal to RISDS, we reviewed equipment requirements and potential costs associated with offshore disposal based on using one, two, or three dredges. Our analysis indicates that offshore disposal to RISDS could be accomplished using between four and eight scows (4,000 cubic yard capacity) if one dredge is utilized, between twelve and thirteen scows if two dredges are utilized, and about seventeen scows if three dredges are utilized. These scow estimates are generally consistent with or slightly below the fifteen to twenty scows that Weaver's Cove Energy proposes to use for onshore dredge disposal. We also estimated the number of scow trips that would be required if all of the 2.6 million cubic yards of dredged material is placed at one of the offshore disposed sites. Our analysis indicates that about 1,300 round trips would be required between the dredge areas and RISDS if 4,000 cubic yard scows are used and about 868 round trips would be required if 6,000 cubic yard scows are used.

Existing Conditions

The RISDS is located approximately 13 miles (21 kilometers) south of the entrance to Narragansett Bay and approximately 37 miles from the proposed terminal site (see figure 3.6.2-1). The site is located in a topographic depression where water depths range from 120 to 130 feet. Approximately 50 percent of the RISDS is located within an existing historic disposal site (Site 69B). For the purposes of analyzing the RISDS, a majority of the data provided was compiled from existing data on Site 69B.

The surface sediment in the central and western portions of the RISDS has an unconsolidated soft bottom, consisting of very fine sand mixed with silt-clay, suggesting a depositional environment. The northern half of the disposal area is hard bottom (cobbles and gravel) and the eastern side of the site consists of fine, rippled sand.

Currents occur ten times per year or on average once every 35 to 40 days and have the potential to erode sediments. Erosion potential was based upon modeling of representative, loosely consolidated, non-cohesive sediments, which showed initiation of movement when bottom currents reached 20 to 25 cm/sec (7.9 to 9.9 in/sec). This current speed generally occurs during a significant storm surge or when wave heights exceed 10 to 12 feet (3.05 to 3.66 meters) in the 130-foot-deep disposal site. Measurements taken for a full month period showed that peak currents were generally less than 15 cm/sec in Rhode Island Sound. The one exception was when Hurricane Floyd passed over Rhode Island Sound in September 1999 causing peak currents of 34 cm/sec (1.1 ft/sec) at the RISDS.

Insert Figure

3.6.2-1 Rhode Island Sound Disposal Site (Site 69b)

The organism-sediment index for the site was +7 in June 1997 and +6 in November 1999 which indicates the site has a high overall benthic habitat quality. Species expected to occur within the site include the amphipod *Ampelisca* sp., the bivalve *Nucula* sp., and various polychaetes, such as *Nepthys incisa* and *Pholoe minuta*, among others.

The RISDS has the potential to contain several commercially important molluscan species, including ocean quahogs, Atlantic surf clams, sea scallops, whelks, northern quahogs, blue mussels, and razor clams. The most important and abundant of these is the ocean quahog. A study to determine the organisms found at four disposal areas in Rhode Island Sound (Site 16, Site 18, Site 69A, and the RISDS (69B)) was conducted in 1997 in support of the EIS for the Providence River and Harbor Maintenance Dredging Project (COE, 2001). Four tows were conducted just outside of the RISDS to the north and west. These four tows all yielded similar ocean quahog catches (0.66 to 2.28 quahogs/m2). The low ocean quahog densities in these four tows indicate that the potential value of the site as an ocean quahog resource is low.

The American lobster is an important ecological and economic resource throughout the northwest Atlantic Ocean from Labrador to North Carolina. Data from commercial fisheries and site specific surveys were used to determine the abundance of lobsters at the site. According to these data, lobster numbers are on the decline in the Rhode Island Sound. The number of lobsters reported per vessel trip has declined from greater than 800 lbs/trip in 1994 and 1995 to a low of 300 lbs/trip in 2002. Lobster pots were used to sample the lobster population at three disposal locations (Site 18, Site 69A, and the RISDS) in the Rhode Island Sound (COE, 2001). The mean catch-per-unit-effort values from this study suggested that Site 69A had significantly more lobsters (13 lobsters/trap) than either Site 18 (10.3 lobsters/trap) or the RISDS (8.6 lobsters/trap) (COE, 2001). Across all sites, the largest catches of lobsters occurred during August (14.6 lobsters/trap), and the smallest catches during November (7.3 lobsters/trap).

Information from NOAA Fisheries annual spring/fall bottom-trawl surveys was used to determine finfish composition and abundance at the disposal site. According to these data, five species of finfish (skate, sea raven, silver hake, windowpane, and winter flounder) have a high likelihood of occurrence at the RISDS (COE, 2001).

Effects of Disposal on Biological Resources

In general, the primary effects of disposal of dredged material in offshore areas are an increase in the concentrations of suspended solids and contaminants in the water column, and burial of aquatic organisms with sediment. Except for changes in bathymetry, resources impacted by offshore disposal generally recover over time.

Disposal of dredged material at RISDS would expose the material to currents, which may have the potential to erode sediments and redeposit them in the surrounding aquatic environment. Eroded material would disperse quickly with deposits no more than 0.5 inches (1.3 cm) deep at a distance of one mile from the mound formed during disposal of the dredged material. With time, the mound would become consolidated and as material erodes, the mound would eventually become self-armored. Once the mound is armored, further erosion would be minimal.

During disposal, a plume would be created containing elevated levels of suspended sediments and associated contaminants. Sediments suspended during disposal can affect aesthetics, light penetration, feeding by benthic organisms and fish, and, at very high levels, can destroy or injure fish and benthic organisms. Toxic chemicals that dissolve when the dredged material is exposed to the water column can kill or impair marine animals if they are exposed to high concentrations over a sufficiently long period of

time. However, since dredged material must meet testing guidelines (see the discussion of Tier III testing above), toxicity levels should not cause undesirable environmental effects.

Sediment losses during disposal would be minimal because the sediment falls to the bottom and dilutes rapidly. Research has shown that disposal losses typically range from 1 to 5 percent of the amount disposed (Truitt, 1986). Recent laboratory studies with material in the size range of fine silt (0.01 mm) to medium sand (0.5 mm) (Ruggaber and Adams, 2000) estimated a loss of less than 1 percent of material.

A frequently expressed concern about offshore disposal is the effect of this material on nearby benthic habitats. A 5 percent loss of sediments during disposal would result in accumulation of less than 0.4 inch (1 cm) of sediment on the bottom, assuming that these sediments all deposited within a 0.5 mile radius of the disposal location. Such a thin layer would be diluted with the ambient sediments and mixed into the bottom by the benthos, thereby minimizing its impact by reducing exposure concentrations. However, dispersion beyond these limits, as expected, would result in even greater dilution further reducing the concern.

Direct impacts to the benthic community would be realized through burial, and potentially at adjacent areas, through increased siltation and burial during the disposal process. It is expected that any newly deposited dredged material at the RISDS would be rapidly recolonized by a pioneering assemblage of benthic organisms, consisting primarily of surface-dwelling tubicolous polychaetes and amphipods. Over time, it is expected that the dredged material would experience a natural advancement of successional stages. The initial recolonization by pioneering species would gradually advance to a more stable, head down deposit-feeding community in the soft, organic rich sediments.

As filter feeders, bivalves (e.g., shellfish) are particularly susceptible to mechanical or abrasive action of suspended sediments (i.e., clogging of gills, irritation of tissues, etc.) (Carnes, 1968). However, the response of organisms to suspended sediments is difficult to determine and may not be due to the actual concentrations of suspended solids, but to the number of particles in suspension, their densities, size distribution, shape, mineralogy, sorptive properties, or presence of organic matter and its form (Sherk et al., 1972).

The potential short-term effects of offshore disposal on lobster resources include burial, exposure to increased concentrations of suspended sediments, temporary loss of refuge habitat, and temporary loss of feeding habitat (i.e., loss of bottom invertebrates, including mussels, polychaetes, and snails). It should be assumed that lobsters would be killed in the area that would be covered by greater than 12 inches (30 cm) of dredged material. Lobsters buried under less than 12 inches (30 cm) of dredged material may be able to burrow up to the surface.

Lobsters generally burrow into soft substrates, including both sand and mud. They are capable of remaining in mud burrows for extended periods of time and have been observed to remain in burrows covered in silt (Cooper and Uzmann, 1980). They exhibit high tolerance to low concentrations of oxygen (as low as 0.2 milligrams per liter (mg/L), even without acclimation (Cooper and Uzmann, 1980), suggesting that, even if increased concentrations of suspended sediments resulted in temporary coating of their gills, lobsters would not become incapacitated. Lobsters exposed to increased total suspended solids during an extended period of repeated disposal activity might move away from the immediate vicinity of the disposal site. It is predicted, however, that periods of highly elevated total suspended solid concentrations would be episodic and the location would vary with the tidal conditions.

It is reasonable to assume that the benthic community at the offshore disposal area, which would eventually provide feeding opportunities for lobsters, would recover to present conditions within about 1 year following final disposal operations. Some benthic resources would be present in the interim, but

would not represent good food resources for lobsters. Lobster feeding and use of the disposal area would be impacted for approximately 18 months of disposal operations and an additional 1 year for recovery of the benthic community on which lobsters feed.

Fisheries resources may be impacted by offshore disposal activities both directly and indirectly. Potential direct impacts from disposal operations may be incurred through exposure to high concentrations of suspended sediment (i.e., suspended solids), burial, and/or loss of habitat. Potential indirect impacts may result from the temporary loss of benthic food organisms. The impact is greatest to demersal (bottom) fish, although pelagic (open water) fish may also be affected by temporary increases in total suspended solids.

Three species of endangered whales, three species of endangered sea turtles, and one threatened sea turtle may occur at the RISDS. NOAA Fisheries' concerns regarding the threatened and endangered whales and turtles include: 1) exposure to contaminants and bioaccumulation in tissues; 2) reduced forage opportunities; 3) habitat loss or degradation; and 4) physical injury from the activities proposed during the operations. However, significant adverse effects to these species are unlikely for several reasons. The dredged material that would be disposed of in Rhode Island Sound would be "uncontaminated" (i.e., dredged material that meets all Tier III testing guidelines for toxicity and bioaccumulation to be classified as suitable for open water disposal) and would not cause environmentally significant undesirable effects through bioaccumulation. The species listed are unlikely to obtain a significant portion of their food from the potential disposal site. None of the sea turtles and whales would experience major disruptions in foraging in the vicinity of the disposal site. The whales are only occasional visitors to Rhode Island Sound and are unlikely to feed for significant periods of time in the vicinity of the disposal site. The depth of the disposal site precludes several of the sea turtles from foraging there as well. The habitat would recover after disposal operations are complete. Indirect impacts, such as alterations of zooplankton populations due to elevated levels of total suspended solids, are expected to be short-lived. Although vessel traffic would increase during the period of the project, collisions between listed species and tugs and scows/barges carrying dredged material are unlikely. Direct impacts resulting from the physical dumping of dredged material from the barge is also expected to be minimal. Whales and sea turtles in the vicinity of the RISDS would actively avoid the area while disposal is occurring.

Conclusions on Offshore Disposal Alternatives

Based on the above environmental analysis of disposing the project dredged material at the RISDS, we believe that the offshore disposal alternative would be environmentally acceptable if the Tier III testing demonstrates that a significant volume of sediments are suitable for offshore disposal. However, we have also determined that offshore disposal of suitable dredged material is not without impacts and is not clearly environmentally preferable to Weaver's Cove Energy's proposed reuse of the dredged material as general site fill at the LNG terminal site. This conclusion assumes that Weaver's Cove Energy is able to resolve the regulatory and legal disputes of its proposed sediment management plan at the LNG terminal site (see section 4.2.2 for further discussion of these potential impediments). Based on the new/existing Brightman Street Bridge construction delays, we also believe that our recommended time-of-year restriction to avoid dredging from January 15 to May 31 would not impact the in-service date of the project or necessitate offshore disposal.

4.0 ENVIRONMENTAL ANALYSIS

The environmental consequence of constructing and operating the proposed Weaver's Cove LNG Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impact generally occurs during construction with the resource returning to preconstruction condition almost immediately afterward. Short term impact could continue for up to 3 years following construction. Impact was considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the project, such as the construction of an LNG terminal. We considered an impact to be significant if it would result in a substantial adverse change in the physical environment.

In this section, we discuss the affected environment, general construction and operational impact, and proposed mitigation for each resource. Weaver's Cove Energy, as part of its proposal, agreed to implement certain measures to reduce impact. We evaluated Weaver's Cove Energy's proposed mitigation to determine whether additional measures are necessary to reduce impact. These additional measures appear as bulleted, boldfaced paragraphs in the text. We will recommend that these measures be included as specific conditions to the Certificate that may be issued to Weaver's Cove Energy for this project.

Conclusions in this EIS are based on our analysis of the environmental impact and the following assumptions:

- Weaver's Cove Energy would comply with all applicable laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 of this document; and
- Weaver's Cove Energy would implement the mitigation measures included in the application and supplemental filings to the FERC.

4.1 GEOLOGY

4.1.1 Geologic Setting and Bedrock Units

The proposed project is located within the Narragansett Basin, a regional tectonic feature associated with the Allegheny Orogeny of Pennsylvanian to Early Permian age (320 to 280 million years ago). During the Allegheny Orogeny, Narragansett Basin filled largely with sedimentary rocks which were subsequently metamorphosed to varying degrees. The proposed project is located near the contact between these sedimentary rocks to the west and much older Upper Proterozoic (900 to 540 million years ago) granites of the Fall River Pluton to the east (see figure 4.1-1). This contact extends along the Taunton River, and is locally marked by the Beaverhead, or Assonet Fault, a relict normal fault zone. Faulting and seismicity in the project area is discussed in section 4.1.4.

Bedrock beneath the proposed LNG terminal site is mapped as the Lower Pennsylvanian Pondville Conglomerate, which is composed of quartz and boulder conglomerate in an abundant sandy matrix, and arkose. The Pondville Conglomerate also underlies a portion of the proposed Northern Pipeline route, although most of this route is underlain by light gray granite of the Fall River Pluton. The proposed Western Pipeline route is underlain by Upper and Middle Pennsylvanian sedimentary rocks of the Rhode Island Formation which is composed of sandstone, greywacke, shale, and anthracite, with minor beds of meta-anthracite.

4.1.2 Physiography and Surficial Geology

The project is situated in the Seaboard Lowland Section of the New England Upland Physiographic Province, which is characterized by rolling to flat topography. Topography in the area is largely the result of Pleistocene glaciation (1.8 million years ago to 11,000 years ago) and fluvial and near shore marine processes. The proposed LNG terminal site is situated at an approximate elevation of 20 to 30 feet above MSL. Ground elevations along the 2.5-mile Western Pipeline route range from about 20 feet above MSL near the Taunton River to about 170 feet above MSL at the interconnection with the existing Algonquin G-22 lateral. Ground elevations along the proposed 3.6-mile Northern Pipeline route vary from about 20 feet above MSL near the Taunton River to about 70 feet above MSL at the interconnection with the existing Algonquin G-20 lateral.

Weaver's Cove Energy proposes to alter the surface of the LNG terminal site by placing up to 2.6 million cubic yards of dredged material on the site. As proposed, the dredged material would be dewatered, stabilized, and used to raise the overall grade of the site and to create an earthen landform for visual improvement.

Based on site-specific soil boring data and review of published geological information for the Fall River area, unconsolidated deposits at the proposed LNG terminal site are comprised of the following:

- Non-native fill - This unit is present from approximately 0 to 14 feet below ground surface (bgs) and consists of unsorted sand, silt, and gravel derived, in part, from previous dredging of the Taunton River. Fill materials have been reported in all monitoring wells and soil borings installed at the site;

- Glacial outwash - This unit ranges from approximately 14 to 72 feet bgs and generally consists of fine silty sand with interbedded sandy silt; and

Insert figure

4.1-1 Bedrock Geology in Project Area

- Glacial till - These deposits range from approximately 72 feet bgs to the top of bedrock which was encountered from 76 to 100 feet bgs. The glacial till consists of very dense, poorly sorted sand and gravel with fine silt interbeds and some black shale and pink granite cobbles.

As inferred from surficial soils (Massachusetts Geographic Information System (MassGIS), 2003), unconsolidated deposits along the proposed Western Pipeline route consist of Taunton River sediments, fill, and glacial till. Unconsolidated deposits beneath the proposed Northern Pipeline route are inferred to be fill, glacial outwash, and till (see figure 4.1-2). According to the U.S. Department of Agriculture (USDA), Soil Conservation Service soil survey maps (USDA, 1981), the depth to bedrock beneath both proposed pipeline routes is greater than 5 feet.

Construction and operation of the proposed Western and Northern Pipelines would not alter the geologic or natural topographic conditions in the project area. Although the natural topographic slope and contours would be temporarily altered along much of the pipeline route by grading and trenching activities, Weaver's Cove Energy would restore topographic contours and drainage conditions to the extent practicable to preconstruction conditions following installation of the pipelines.

Blasting is not anticipated for construction of the proposed LNG terminal or the proposed pipelines based on the known and anticipated depth to bedrock in the area. If blasting were to be necessary, it would be conducted in accordance with all applicable laws and regulations.

4.1.3 Mineral Resources

According to the Massachusetts EOEA and the U.S. Geological Survey (USGS, 2001), potentially exploitable construction sand and gravel deposits are present in the vicinity of the proposed project. However, based upon a review of historic USGS topographic maps, MassGIS land use data, and aerial photographs of the project area for 2001, there do not appear to be any active mining operations within one-quarter mile of the proposed project.

The potential for the project to impact future mining in the area is low because the Western Pipeline would be constructed through an area underlain by glacial till that does not contain exploitable sand and gravel deposits, and both the Western and Northern Pipelines would be constructed primarily along existing electric transmission, pipeline, or railroad rights-of-way, which preclude future mining operations.

Other commercially exploitable mineral resources are not known to exist in the project area.

4.1.4 Geologic Hazards

Geologic or other hazards in the project area consist of seismic-related hazards; load-bearing capacity of soils at the LNG terminal site; slope instability; and flooding. Conditions necessary for the development of other geologic hazards, including karst terrain, regional subsidence, avalanches, and volcanism, are not present in the project area.

In general, the potential for geologic hazards to significantly affect the construction or operation of the proposed project is low. The risk of damage resulting from geologic hazards would be avoided or reduced by specific engineering design criteria, ground modification, other construction techniques, and operating procedures to be implemented by Weaver's Cove Energy.

Insert figure

4.1-2 Surficial Geology in Project Area

4.1.4.1 Seismic-related Hazards

The proposed project is situated in an area with a relatively low potential for significant seismic activity. Potential seismic-related hazards that exist in the area include: earthquakes/ground shaking; surface faulting; soil liquefaction and related soil failures; and tsunamis.

Weaver's Cove Energy conducted detailed, site-specific geotechnical and geoseismic studies to evaluate the risk of seismic-induced damage to the proposed LNG terminal. The results of these studies are presented in a report entitled *Geology, Seismology and Geotechnical Engineering Site Evaluation* (Environmental Resource Management et al., 2003), which was prepared in general conformance with *Data Requirements for the Seismic Review of LNG Facilities, NBSIR 84-2833*. The results of these studies and the proposed seismic mitigation plans are summarized below.

Earthquakes/Ground Shaking

The majority of significant earthquakes around the world are associated with tectonic subduction zones, where one crustal plate is overriding another (e.g., the Japanese islands), or where plates are sliding past each other (e.g., California). Unlike these highly active tectonic regions, the East Coast of the United States is located on the "trailing edge" of the North American continental plate, which is relatively seismically quiet. Earthquakes, however, do occur in the project area, largely due to trailing edge tectonics and residual stress release from past orogenic (mountain building) events.

The project area is characterized by low magnitude events that have been recorded since the mid-16th Century. None of these events precludes the safe siting of an LNG terminal (ERM et al., 2003). According to the USGS (2003), the largest recorded earthquake in Massachusetts occurred in 1755 near Cape Ann, approximately 70 miles northeast of the project area. This earthquake is estimated to have been a magnitude 6 event which resulted in Modified Mercalli Intensity VIII damage in the Boston area. Such an event today would cause considerable damage to ordinary, substantial buildings but only slight damage to specially designed structures. The largest earthquakes in New England, other than those that have occurred near Cape Ann, have been near Ossipee, New Hampshire, approximately 200 miles north of the project area (Simmons, 1976).

The largest recorded earthquake in nearby Rhode Island was a magnitude 3.5 event that occurred in 1976 near Newport, approximately 15 miles to the southwest of the project area. The impact of this earthquake included cracked plaster, fallen tabletop lamps, and snow being shaken from rooftops. The level of shaking associated with this magnitude event is generally below the threshold of damage to well built structures.

As required by NFPA 59A (2001), Weaver's Cove Energy conducted a site-specific probabilistic seismic hazard assessment (PSHA) to develop seismic design criteria for the proposed LNG terminal. The seismic hazard analysis included input data for potential seismic sources in the region, including maximum anticipated magnitude, distance from the LNG terminal, recurrence intervals, and consideration of site-specific geologic conditions in attenuation modeling.

The results of the PSHA were used to obtain peak ground acceleration (PGA) and response spectra for the Safe Shutdown Earthquake (SSE, defined as the 5,000-year mean return earthquake) and the Operating Basis Earthquake (OBE, scaled as two-thirds of the Maximum Considered Earthquake (MCE), which is the 2,500-year mean return earthquake). The OBE represents the level of shaking through which the facility should be able to operate and continue operating after its occurrence, with perhaps a brief shutdown for a safety inspection to confirm that no damage occurred. The larger SSE

represents the level of shaking that should not damage the vital, safety-related components of the facility to the extent that they could not function.

Detailed seismic design criteria are presented in Weaver's Cove Energy's seismic report (Environmental Resource Management et al., 2003). In general, the seismic hazard analysis yielded an SSE design earthquake in the magnitude range of 6.2 to 6.4, with a ground surface horizontal peak acceleration of 0.26 gravity (g). These predicted ground motions would be incorporated into the final design of the LNG tanks and other critical structures at the LNG terminal.

Based on the evaluation conducted by Weaver's Cove Energy, the likelihood of a major earthquake occurring in the project area during the operating life of the proposed LNG terminal is low. Weaver's Cove Energy's commitment to meet or exceed the proper design standards would further reduce the potential effects associated with earthquakes to the proposed LNG terminal. Ground shaking would not be expected to affect the proposed pipelines, which would be constructed of modern steel that is capable of remaining elastic during the level of shaking that could potentially occur in the area.

Surface Faulting

As noted in section 4.1.1, the project area is underlain by the Beaverhead Fault Zone. Other faults also exist in the region. The Beaverhead Fault Zone formed approximately 280 million years ago during the later stages of development of the Narragansett Basin (Mosher, 1983), and the most recent movement along the fault zone most likely occurred during the opening of the Atlantic Ocean 65 to 146 million years ago (Environmental Resource Management et al., 2003). Field mapping within a 5-mile radius of the LNG terminal site did not identify evidence of recent surface faulting in the project area. Based on the literature search, field mapping, and generally low level of significant local seismic activity, the potential for surface faulting to occur in the project area is low.

Soil Liquefaction

Secondary seismic effects triggered by strong ground shaking are often more serious than the shaking itself. Soil liquefaction is a physical process in which saturated, noncohesive soils temporarily lose their bearing strength when subjected to strong and prolonged shaking. Soil liquefaction can also lead to other ground failures including settlement and lateral spreading.

Soil borings, cone penetration tests, geophysical surveys, and laboratory analyses were performed to determine the physical and engineering properties of existing soils at the LNG terminal site. Given the definition of the SSE and OBE from the PSHA, detailed seismic soil response and liquefaction analyses were performed using deterministic methods. These studies concluded that liquefaction would not be expected to occur in the event of the less significant MCE or OBE seismic events (Environmental Resource Management et al., 2003). However, the existing loose, silty soils at the LNG terminal site are marginally susceptible to liquefaction when subjected to the ground motions associated with the SSE (the 5,000-year earthquake). Calculated dynamic one-dimensional ground settlements due to liquefaction would be in the range of 2 to 4.5 inches.

As noted in section 4.1.2, Weaver's Cove Energy proposes to alter the surface of the LNG terminal site by placing up to 2.6 million cubic yards of dredged material on the site. The dredged material would be used to raise the grade of the site and to construct a berm and landform, but none of the dredged material would be placed beneath the LNG tank. Due to the physical properties of the stabilized dredged material and placement of the material above the existing groundwater table at the site, the dredged material would not be susceptible to liquefaction (Environmental Resource Management et al., 2003).

Six potential ground improvement alternatives were evaluated to mitigate liquefaction-susceptible soils, including deep mixing, jet grouting, permeation grouting, dynamic deep compaction, compaction grouting, and vibro-replacement (stone columns). Based on this analysis, Weaver's Cove Energy proposes that stone columns be used to reinforce soils beneath the proposed LNG tank foundation. With the installation of stone columns under the LNG tank, level soil liquefaction studies concluded that the soils under the tank would not be susceptible to liquefaction.

Full-scale field tests would be conducted at the beginning of the project to ensure that the stone column method would have the intended effect of reinforcing soils to the point where they are no longer susceptible to liquefaction during the seismic design events. It is anticipated that the stone columns would be placed beneath the LNG tank foundation in a grid pattern on 8- to 10-foot centers between columns. The columns would be constructed to the depths of potentially liquefiable soils 50 to 55 feet below existing ground surface by advancing an 18-inch diameter vibrating steel probe, which would create a borehole by laterally displacing existing soils. Once the boreholes for each column are created, they would be backfilled with compacted crushed stone.

In conclusion, detailed site-specific studies indicate that soils at the proposed LNG terminal site are marginally susceptible to liquefaction in the event of the 5,000-year earthquake. Installation of stone columns would reduce the potential effects of liquefaction at the LNG tank location and, as discussed in sections 4.1.4.2 and 4.1.4.3, would also improve the load-bearing capacity and stability of slopes in the LNG tank area.

Because the risk of a strong earthquake in the project area is low, the potential for soil liquefaction to occur along the proposed pipelines is low. Seismic activity has not disturbed existing pipelines in the project area. Liquefaction-induced settlements were not calculated for specific soils along the pipeline routes; however, the calculated settlements in the range of 2 to 4.5 inches for the proposed LNG terminal site during the 5,000-year earthquake would not pose a significant risk to the proposed pipelines due to the linear extent and ductility of the pipelines.

Tsunamis

Tsunamis are long oceanic waves generally caused by seismic activity. While a tsunami could potentially occur along the East Coast of the United States, only two Atlantic Ocean tsunamis have been recorded: a tsunami which struck Lisbon, Portugal in 1755, and one which struck eastern Canada in 1929. The probability of a significant tsunami occurring along the East Coast is very low (NOAA, 2003a). In addition, construction of the proposed LNG terminal would include raising the overall elevation of the site, constructing and/or fortifying the existing sea wall, and constructing a 15-foot-high berm around the storage tank and process area, all of which would mitigate potential impacts from tsunamis, tidal waves, or rogue waves.

4.1.4.2 Load-Bearing Capacity

The load-bearing capacity and stability of existing soils beneath the proposed LNG tank was modeled based on soil boring data from the tank area and two assumed conditions: the case of the 273-foot-diameter tank and the case of the 10-foot wide ring wall footing.

Using conservative assumptions and applying a safety factor of 3, both models result in estimated settlement due to static loading of 6 to 8 inches at the center of the tank and 3.5 to 4.5 inches at the edge of the tank, assuming that the foundation is supported with stone columns. The maximum differential settlement of 4.5 inches is less than the 6-inch differential settlement tolerance specified by the LNG tank

manufacturer. The use of stone columns also results in meeting the manufacturer's specifications for maximum allowable total differential settlement ("tilt") across the entire LNG tank of 9 inches.

Given the linear extent and ductility of modern pipelines, existing geologic materials along the proposed pipeline routes are expected to have sufficient capacity to support the pipelines.

4.1.4.3 Slope Instability

Weaver's Cove Energy conducted preliminary phase static and dynamic slope stability analyses of the proposed LNG terminal site. The analyses were based on soil profiles developed from site soil borings and assumed that dredged material would be used to raise the site grade and to create a landform. A number of factors were considered in the analyses including final site grades, various levels of filling of the LNG tank, whether or not existing soils are reinforced through stone column construction, and whether or not liquefaction occurs. Slope stability analyses results indicate the following:

- The calculated static slope stability factors of safety for trial slip surfaces that pass under or through the proposed LNG tank area are 3 and greater for the proposed site grading and tank loading;

- Based on pseudostatic analyses, ground accelerations of 50 percent gravity (0.5 g) or greater would be required to reach a calculated safety factor of 1 in the absence of liquefaction;

- A slope stability safety factor of less than 1 is calculated assuming that liquefaction accompanied with lateral spreading occurs, and assuming no ground improvement is undertaken;

- Installation of the proposed stone columns would increase the slope stability factor to greater than 3 beneath the proposed LNG tank, even if liquefaction were to develop;

- The LNG tank performance analyses did not rely on waterfront structures to provide lateral or vertical support for the LNG tank. The only heavily loaded structures that the waterfront walls would be supporting are the perimeter roadway and berms to be constructed adjacent to the river. To minimize any potential effects on slope stability, these structures would be located as far from the LNG tank as site conditions permit;

- Short-term construction phase deformation control and dynamic loading considerations could result in design and construction of limited, local foundation treatments, such as stone columns or piles, directly beneath the structures; and

- The slopes of the berms, mounds, and walls to be constructed on the site with dredged material or other materials would require appropriate design to provide sufficient stability and calculated factors of slope stability safety.

According to the USGS (1982), the project area is situated in an area of low landslide occurrence and susceptibility. In eastern Massachusetts, increased landslide susceptibility is largely related to the presence of marine clay, which is unstable on steep slopes. Neither of the proposed pipeline routes nor the proposed LNG terminal site is underlain by marine clay (USGS, 1982). The potential for landslides to occur would be further reduced through the use of appropriate erosion control measures during construction.

Based on these analyses, it appears that potential slope instability can be managed. To ensure that the issue of slope instability is adequately addressed, **we recommend that:**

- **Weaver's Cove Energy prepare final engineering design plans ensuring the stability of all site grades and the waterfront walls and file these plans with the Secretary <u>prior to construction</u>.**

4.1.4.4 Flooding

Flash Flooding

The potential for flash flooding to occur and significantly impact construction or operation of the proposed project is low. The greatest potential for flash flooding to occur in the project area is associated with tropical storms, which are usually accompanied by significant precipitation over a short period of time. The potential effects associated with high rainfall events during construction would be mitigated by implementing the FERC Plan and Procedures. After construction, the proposed LNG terminal would be stabilized with permanent erosion control measures such as berms and vegetative cover, and a stormwater management system would be constructed to manage and divert precipitation to the Taunton River without causing erosion of the site or the river bed or banks. Weaver's Cove Energy's implementation of the FERC Plan and Procedures, which include revegetation of disturbed soils, would also minimize the effects of high rainfall events during construction and operation of the proposed pipelines.

Hurricane Storm Surge

Storm surge, the abnormal rise in sea level due to the wind and pressure forces associated with hurricanes and other tropical storms, is often the most significant cause of damage to facilities and property in low lying coastal areas.

According to NOAA (2003b), 11 hurricanes made landfall in either Massachusetts or Rhode Island from 1900 through 1996. None of the storms were classified as Category IV or higher storms. However, 5 of the 11 were classified as Category III hurricanes, with maximum sustained wind speeds of 111 to 131 miles per hour (mph) and typical storm surges of 9 to 12 feet. The NOAA data also indicate that nearly all hurricanes that struck New England during the referenced time period were moving faster than 30 mph, which would tend to minimize storm surge height and duration.

The current elevation of the proposed LNG terminal site is approximately 20 to 30 feet above MSL, and the proposed construction would include raising the overall elevation of the site, fortifying the existing sea wall, and constructing a berm around the storage tank and process area. Therefore, the proposed LNG terminal site would be protected against storm surge associated with hurricanes on the order that are likely to impact the project area.

4.1.5 Paleontological Resources

The project area is underlain by sedimentary rocks that are known to contain plant fossils, but which are not protected or highly regarded (Environmental Resource Management, 2003a). Bedrock would not be encountered during construction of the proposed LNG terminal and would not be expected to be encountered during construction of the proposed pipelines. Therefore, construction and operation of the proposed project would not impact paleontological resources.

4.2 SOILS AND SEDIMENTS

4.2.1 Soil Resources

LNG Terminal

Soils at the proposed LNG terminal site include approximately 52 acres of Urban Land, 20 acres of Udorthents, and 1 acre of Paxton very stony fine sandy loam.

According to the Soil Survey of Bristol County, southern part (USDA, 1981), Urban Land in the project area consists of areas covered by structures, which include parking lots, industrial areas, and roads. Natural soils in these areas have been so severely disturbed that they can no longer be identified. Small areas of Udorthents and undisturbed natural soils comprise about 15 percent of the Urban Land map unit.

Udorthents in the project area consist of nearly level areas formed by excavating or filling for construction projects. Examples of these alterations include athletic fields, housing developments, and interstate highways. Small urbanized areas and natural soils comprise about 15 percent of the Udorthents map unit.

Based on previous soil borings on the LNG terminal site, the Urban Land map unit soils are composed of three distinct materials: old dredge fill, glacial outwash, and glacial till. From ground level to about 14 feet bgs the soils are composed of unsorted, brown sand, silt, and gravels, which were generated and placed on the site in conjunction with former dredging operations. The sediment from about 14 to 72 feet bgs consists of greenish-gray to brownish-gray silty sand and sandy silt outwash deposits. Below about 72 feet bgs, the sediment is gravelly to sandy glacial till.

Construction of the LNG terminal would include the stabilization, placement, and grading of up to 2.6 million cubic yards of sediment dredged from the federal navigation channel and turning basin. These activities would permanently affect and generally bury about 52 acres of Urban Land and about 15 acres of Udorthents and raise the grade of the site above the 100-year floodplain elevation. These activities would not have a significant environmental impact on soils at the LNG terminal site because the soils have already been severely impacted by previous dredge disposal activities and land uses.

Due to the generally level topography at the site, runoff and erosion would be minimal; however, as the grade of the site is raised, runoff potential from the edges of the berm, landform, and other raised areas would increase. Erosion and sedimentation at the site would be controlled and mitigated during construction and operation of the facility through implementation of the measures specified in the FERC Plan and in a site-specific Erosion and Sedimentation Control Plan and a Stormwater Management Plan (see section 4.3.2 for information regarding the Stormwater Management Plan). These measures would include installation of sediment filters and barriers during construction to control and prevent the flow of silt-laden water into adjacent wetlands and the Taunton River. Following construction, the site would be stabilized with permanent erosion control measures such as vegetative cover.

Pipeline Facilities

According to published soils information (USDA, 1981), the proposed pipelines would cross eight different soil series. These series include poorly to very poorly drained, sandy-textured soils with very slow to slow permeability (Ridgebury and Whitman series); moderately well drained to well drained, sandy- and loamy-textured soils with slow and very slow permeability (Newport, Pittstown, and Woodbridge series); and sandy-textured, well to somewhat excessively drained soils with moderately

rapid to rapid permeability (Hinckley and Merrimac series). All of the mapped soils exist in stony to extremely stony surface phases. The pipelines would also cross Urban Land and Udorthents, discussed above.

Pipeline construction activities such as clearing, grading, trench excavation, and backfilling, and the movement of construction equipment along the rights-of-way could impact soil resources in several ways. Clearing would remove protective cover and expose the soil to the effects of wind, sun, and precipitation, which could increase the potential for soil erosion and the movement of sediments into sensitive areas. Grading and equipment traffic could compact soil, reducing porosity and percolation rates resulting in increased runoff potential and decreased soil productivity. Trench excavation and backfilling could lead to mixing of topsoil and subsoil which could lower soil productivity. Contamination from spills or leaks of fuels, lubricants, and coolants from construction equipment could also impact soils.

The meter and regulation station at the terminus of the Northern Pipeline would be located within an area of Udorthents. Construction and operation of this facility would affect about 0.9 acre of these soils. The meter and regulation station at the terminus of the Western Pipeline would be located within an area of Paxton extremely stony fine sandy loam. Construction and operation of this facility would affect about 1.4 acres of these soils. Soils at this latter meter and regulation station would be susceptible to erosion due to the slopes at the site and would have a poor revegetation potential. Weaver's Cove Energy would minimize soil erosion and sedimentation impacts by constructing the facilities in accordance with the FERC Plan. Both meter and regulation stations would be covered with gravel pads as part of the site restoration activities. The meter and regulation station for the Western Pipeline would require construction of a permanent access road, which would follow the existing Algonquin G-22 pipeline right-of-way from Stevens Road in Swansea to the station. There would be no additional soil impacts because the access road would utilize an area already disturbed by an existing access trail and right-of-way. Access to the meter and regulation station for the Northern Pipeline would be over existing hard-surfaced roads and would have no additional impacts on soils.

Soils along the Northern and Western Pipeline routes were evaluated for characteristics that could affect construction or increase the potential for construction-related soil impacts. Table 4.2.1-1 provides a summary of significant soil characteristics along each pipeline route. Each of the soil characteristics is discussed separately below.

TABLE 4.2.1-1

Acreage of Soil Characteristics for the Proposed Pipeline Rights-of-Way a/

Facility	Total	Prime Farmland b/	Hydric Soils c/	Compaction Prone d/	Highly Erodible e/	Revegetation Concerns f/
Northern Pipeline	32.2	3.8	0.8	0.0	13.5	11.7
Western Pipeline	26.5	12.5	5.3	0.0	2.7	14.0
Pipeline Total	58.7	16.3	6.1	0.0	16.2	25.7

a/ Acreage is based on a variable-width construction right-of-way, but does not include access roads or temporary extra workspace. Values within a row do not sum to the total listed in the total column because soils may occur in more than one characteristic class, or may not occur in any class listed in the table.

b/ As designated by the Natural Resources Conservation Service (NRCS) and includes farmland of local or statewide importance.

c/ As designated by the NRCS.

d/ Includes soils in somewhat poor to very poor drainage classes with surface textures of sandy clay loam and finer.

e/ Includes soils with slopes greater than 8 percent and soils designated by NRCS as highly erodible land.

f/ Includes soils with slopes greater than 8 percent, shallow watertables, high surface stones, and dense subsoils.

Prime Farmland

The USDA defines prime farmland as "land that is best suited to food, feed, fiber, and oilseed crops" (Soil Survey Division Staff, 1993). This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops or are available for these uses. Urbanized land and open water are excluded from prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by use of artificial drainage). In addition to prime farmland, soils that are capable of producing high yields of food, feed, fiber, or forage crops when treated or managed according to acceptable farming methods, but fail to meet one or more of the criteria of prime farmland are considered to be farmlands of state or local importance.

Twenty-eight percent (16.3 acres) of the total area that would be affected by the proposed pipelines is designated prime farmland or farmland of local or state-wide importance. However, none of this land is actively cultivated. Most prime farmland along the routes is located within existing electric transmission line or pipeline rights-of-way and is unavailable for agricultural development. Consequently, there would be no impacts on prime or locally important farmland as a result of pipeline construction.

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). Soils that are artificially drained or protected from flooding (e.g., by levees) are still considered hydric if the soil in its undisturbed state would meet the definition of a hydric soil. Generally, hydric soils are those soils that are poorly and very poorly drained. About 10 percent (6.1 acres) of the proposed pipeline routes are underlain by hydric soils.

Due to extended periods of saturation, hydric soils can be prone to compaction and rutting. If construction activities, particularly the operation of heavy equipment, occur when these soils are saturated, compaction and rutting could occur. The hydric soils within the proposed construction rights-of-way are relatively coarse-textured and would not be susceptible to compaction. Weaver's Cove Energy would minimize rutting of these hydric soils by constructing the pipelines, as much as possible, during the driest portion of the year and by using construction mats where wetland soils cannot support equipment.

High groundwater levels associated with the hydric soils could create a buoyancy hazard for the pipelines. Special construction techniques such as concrete coating and other weighting methods would be used to overcome buoyancy hazards during operation of the pipelines. Dry season construction and/or trench dewatering would minimize buoyancy problems during construction.

Compaction Potential

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Construction equipment traveling over wet soils could disrupt the soil structure, reduce pore space, increase runoff potential, and cause rutting. The degree of compaction is dependent on moisture content and soil texture. Fine-textured soils with poor internal drainage that are moist or saturated are the most susceptible to compaction and rutting. Soils that would be disturbed by the pipeline construction activities do not have soil textures or drainage characteristics that would make them highly susceptible to soil compaction. Consequently, no compaction-related soil impacts would be expected.

Erosion

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors that influence the degree of erosion include soil texture, soil structure, length and percent of slope, vegetative cover, and rainfall or wind intensity. Soils most susceptible to erosion by water are typified by bare or sparse vegetative cover, noncohesive soil particles with low infiltration rates, and moderate to steep slopes. Wind erosion processes are less affected by slope angles. Clearing, grading, and equipment movement could accelerate the erosion process and, without adequate protection, result in discharge of sediment to waterbodies and wetlands. Soil loss due to erosion could also reduce soil fertility and impair revegetation.

Soils along both pipeline routes are not susceptible to wind erosion. However, about 27 percent (16.0 acres) of the proposed pipeline routes consist of highly erodible land (HEL) that is susceptible to water erosion. Most of these soils (13.3 acres) are located along the Northern Pipeline route, while the remainder (2.7 acres) is located along the Western Pipeline route. An additional 5.5 acres of soils (most along the Western Pipeline route) are designated by the NRCS as potentially highly erodible land (PHEL). PHEL consists of those soils that have the potential to be highly erodible, but cannot be designated as highly erodible land without a field determination of slope percent and length. Despite the presence of HEL and PHEL, extensive erosion would not be expected in most locations along the pipeline routes, due to the gently sloping topography in the area. Stream banks and areas with slopes greater than 8 percent (all 16.0 acres of HEL) would be most susceptible to erosion resulting from construction of the pipelines. Weaver's Cove Energy would implement the stream crossing methods outlined in the FERC Procedures and the erosion and sediment control practices specified in the FERC Plan to minimize potential impacts from erosion (see Appendices E and F). Specific erosion and sedimentation control measures that would be implemented include installation of slope breakers, on slopes greater than 5 percent, and sediment barriers, such as straw bales or silt fence, at stream crossings and at the base of slopes adjacent to wetlands and roads. Application of seed, mulch, and erosion control fabric would also be used to control erosion and stabilize the rights-of-way following construction.

Revegetation Concerns

Successful restoration and revegetation is important to maintain soil productivity and to protect the underlying soil from potential damage, such as erosion. About 44 percent (25.7 acres) of the soils that would be affected by pipeline construction activities have a poor revegetation potential (table 4.2.1-1). These soils include those with stony or rocky surface layers, shallow water tables, or dense subsoils and potentially erosive soils with slopes greater than 8 percent that would require additional stabilization to promote germination and seedling establishment. In accordance with the FERC Plan, Weaver's Cove Energy would mitigate the effects of poor revegetation potential by applying fertilizer, pH modifiers, and using mulch (where appropriate) to create a favorable environment for the re-establishment of vegetation. Weaver's Cove Energy would further enhance revegetation potential by using seed mixes recommended by local soil conservation authorities to reseed the rights-of-way.

Soil Contamination

Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils. The effects of contamination would typically be minor because of the low frequency and volumes of spills and leaks. Weaver's Cove Energy would develop an onshore SPCC Plan that specifies cleanup procedures in the event of soil contamination from spills or leaks of fuel, lubricants, coolants, or solvents.

In addition to the LNG terminal site, Weaver's Cove Energy identified two hazardous or contaminated sites along the pipeline routes (see table 4.3.1-1 in section 4.3.1). Construction of the pipelines in the vicinity of these sites could disturb contaminated soils. Additional contamination could be encountered within the existing naphtha pipeline right-of-way along the proposed Northern Pipeline route. To address potential impacts associated with encountering contaminated soils during construction, **we recommend that:**

- **Weaver's Cove Energy prepare a plan for the discovery and management of contaminated soils and groundwater. This plan should comply with applicable state and federal regulations and should provide for management of contaminants at known sites and include procedures for the identification and management of unknown contaminants in other locations. The plan should be filed with the Secretary for review and approval by the Director of the Office of Energy Projects (OEP) <u>prior to construction</u>.**

4.2.2 Sediments

As discussed in section 2.4.1.3 and the *Dredging Program Report* (C2D, 2003), Weaver's Cove Energy would dredge up to 2.6 million cubic yards of sediment from the federal navigation channel and the turning basin.[1] The dredged sediment would be stabilized with portland cement and placed as structural fill on the LNG terminal site. As part of the planning for the dredging operations, Weaver's Cove Energy included an adjustment (bulking) factor of 20 percent (or 1.2 times the *in-situ* volume of dredged material) to account for changes in bulk density that occur when dredged sediments are disturbed by excavation. Based on the estimated *in-situ* volume of dredged material, the "bulked" volume of dredged sediment would be about 3.1 million cubic yards. In its comments on the draft EIS, Weaver's Cove Energy indicated that this bulked volume of sediment was used to estimate the number of scows that would be required to manage the sediments. Weaver's Cove Energy also indicated that FERC staff had inappropriately used the bulking factor to estimate the volume of dredged material that would be placed at the site. The sediment volume estimate has been revised and no longer includes the bulking factor.

Weaver's Cove Energy would add 8 percent cement (on a mass basis) to the dredged material. Based on the *in-situ* volume of 2.6 million cubic yards of sediment and a wet density of 79 pounds per cubic foot for the untreated dredged material, we estimate that about 83,000 cubic yards of cement would be used to stabilize the dredged material. Dewatering and the placement, grading, and compaction of the sediment placed on the site would result in a smaller volume of material actually being placed on the LNG terminal site. To account for this volume reduction, Weaver's Cove Energy used a preliminary "reduction factor" of 0.86. This reduction factor includes an allowance for the volume of cement that would be added to stabilize the dredged material. Applying a reduction factor of 0.86 to the volume of sediment (with cement added) yields a volume of about 2.3 million cubic yards that would need to be accommodated on the site for 2.6 million cubic yards of *in-situ* dredged sediment. To account for the potential need to use additional cement to achieve appropriate engineering properties for the stabilized sediment, we also analyzed the volume of sediment plus cement that would result from the use of 10 percent cement. The addition of 10 percent cement would not change appreciably the amount of material after compaction (2.3 million cubic yards based on a 0.86 reduction factor) that would need to be placed on the site. In its comments on the draft EIS, Weaver's Cove Energy indicated that based on revised engineering estimates, the likely achievable reduction factor could be more than 70 percent; however, for planning purposes they have adopted a more conservative value of 80 percent reduction. Based on this

[1] This estimate includes 1 foot of overdredge, as proposed by Weaver's Cove Energy, and is the volume of dredged material that will be analyzed throughout section 4. See section 2.4.1.3 and our responses to comments on the draft EIS (Appendix L) for a discussion of the overdredge issue.

revised reduction factor, the volume of dredged sediment that would need to be accommodated at the site (assuming 8 percent cement) would be about 2.1 million cubic yards.

We believe the bulking and reduction factors assumed by Weaver's Cove Energy are reasonable based on the experiences of other regional dredging projects involving mechanical dredging of similar sediments as well as cement stabilization and upland placement (Beaudoin, 2004a). For example, the planning estimates for the Dredged Materials Management Program in Fall River Harbor conducted by OCZM in the late 1990s used a bulking factor of 20 percent. The planning estimates for the Providence River and Harbor Maintenance Dredging Project used a 30 percent bulking factor; however, field observations of sediment bulking associated with this latter project indicate that actual volume increases due to bulking were around 10 percent or less (Beaudoin, 2004a).

Weaver's Cove Energy conducted a comprehensive sediment sampling and analysis program, approved by both the COE and DEP, to characterize the sediments that would be dredged from the federal navigation channel and the turning basin. The sediment sampling and analysis program followed the tiered approach required by the COE and EPA (COE, 2003; EPA and COE, 1991, 1998; EPA-New England and COE-New England, 2002) and included Tier I and Tier II analyses. Weaver's Cove Energy submitted a draft Sediment Sampling and Analysis Plan (SAP) for the Tier III testing to the COE in January 2004. In September 2004, the COE (with concurrence from the EPA) approved the SAP with slight modifications. A summary of this approved SAP is provided below. The original COE approval memo, which includes specific details of the plan, is provided in Appendix K.

The Tier I evaluation, based on historical sediment core data and a review of regional sources of pollution, indicated the potential presence of polycyclic aromatic hydrocarbons (PAHs), trace metals, and pesticides in the near-surface sediments within the federal navigation channel and turning basin. Although point source discharges into the Taunton River were identified, as well as historical spills that could have reached the river, a review of previous sediment sampling results did not identify any discrete locations of high concentrations of pollutants.

The Tier II coring program was based on the results of the Tier I evaluation. For the Tier II program, Weaver's Cove Energy collected sediment cores from 43 locations within the proposed dredging area, exclusive of the East Channel (see figure 4.2.2-1). Dredging modifications in a portion of the East Channel were found to be necessary after the field efforts for the sediment sampling and analysis program were completed. However, data from cores within the East Channel collected during a recent coring program conducted by Massachusetts OCZM were used for initial comparison with the analytical results obtained by Weaver's Cove Energy. As part of the Tier III sampling and analysis program, additional cores were collected from the East Channel area in the Fall 2004. The analysis of these cores allowed an additional comparison of the sediment in the East Channel with sediments from the adjacent dredging segment. Further discussion of the East Channel cores is included later in this section.

The 43 cores resulted in 55 sediment samples, based on observed stratification within individual cores. The cores were not composited horizontally for analytical purposes (i.e., individual cores from separate locations were not combined before analysis), but similar strata within individual cores were mixed vertically to obtain samples for analysis. Each of the 55 samples represents a discrete stratum within an individual core. The sediment samples collected by Weaver's Cove Energy were analyzed for physical parameters, including grain size, total solids, water content, total organic carbon content, and Atterberg Limits (a series of physical measurements that partially characterize the engineering properties of sediment). The sediment samples were also analyzed for the following chemical compounds: PAHs, polychlorinated biphenyls (PCBs), pesticides, and trace metals, as specified by the COE; and extractable petroleum hydrocarbons (EPHs), volatile organic compounds (VOCs), and the toxicity characteristic leaching procedure (TCLP), as specified by the DEP.

Insert figure

4.2.2-1 Sediment Core Locations Weaver's Cove Energy's Sampling Program

sheet 1 of 4

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4.2.2-1 Sediment Core Locations Weaver's Cove Energy's Sampling Program

sheet 2 of 4

Insert figure

4.2.2-1 Sediment Core Locations Weaver's Cove Energy's Sampling Program

sheet 3 of 4

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4.2.2-1 Sediment Core Locations Weaver's Cove Energy's Sampling Program

sheet 4 of 4

The results of the sediment sampling and analysis program are summarized below. A more detailed description of the program is provided in Weaver's Cove Energy's *Dredging Program Report* (C2D, 2003). An electronic copy of this report is available under the "Proposal" link on Weaver's Cove Energy's website at www.weaverscove.com.

Weaver's Cove Energy conducted a Tier III sediment analysis in accordance with its approved SAP to assess the suitability of the proposed dredged sediments for open water disposal (see section 3.6.2 for additional information about the open water disposal alternative). Tier III testing assesses the impact of contaminants in the dredged material on appropriately sensitive and benchmark organisms to determine if there is the potential for an unacceptable toxicity or bioaccumulation impact at the open water disposal site. The data generated during the Tier III testing also provide a means of assessing project-specific impacts on aquatic organisms within the dredging footprint.

The original SAP required the collection of 47 individual cores from various parts of the proposed dredging footprint. These areas included the federal navigation channel (including the 30-foot deep East Channel), the turning basin (including proposed improvement areas), and the proposed construction access channel adjacent to the LNG terminal site. These 47 cores were to be composited into 8 cores representing sediment from each of the major segments proposed to be dredged. Depth soundings made during sediment coring operations for the Tier III sampling indicated that 10 of the 47 core locations were already essentially at the proposed dredging depth. As a result, there was not sufficient sediment to collect a sample from these locations. Consultations among Weaver's Cove Energy and the COE and EPA, resulted in a revised SAP that specified sampling at 35 core locations and compositing into seven core samples. The eighth composite core required by the original SAP consisted of native sediments from the Turning Basin. Weaver's Cove Energy was advised by EPA and COE staff that the eighth composite core could be eliminated because the volume of native sediment that could be readily distinguished from the maintenance sediment was smaller than originally expected and the grain size of the native sediment was very coarse and unsuitable for the biological analyses of the Tier III tests. The material collected to create the eighth core was archived by Weaver's Cove Energy at the request of the COE and EPA. In addition to cores from the project area, reference samples were collected for concurrent analyses from the MBDS reference location and from the reference location for the RISDS. The composited dredged area cores and the reference site cores were used to conduct 10-day bioassay tests, 28-day bioaccumulation tests, and suspended particulate bioassay tests (EPA-New England and COE-New England, 2004; EPA/COE, 1991). Additional elutriate testing and analysis of the background river water were also conducted as part of the Tier III program.

The Tier III testing of the sediments was completed and the results were submitted to the EPA and COE on April 11, 2005. Preliminary analysis of the results indicates that most of the proposed dredged sediments would be suitable for open water disposal. We note, however, that the EPA and COE have not made a final determination as to the suitability of the dredged sediments for open water disposal. Although the sediments appear suitable for offshore disposal, Weaver's Cove Energy has indicated that it currently has no plans to dispose of dredged material at an open water offshore site.

Physical Analyses

The results of the grain size analyses indicated that the sediments in the proposed dredging area generally consist of silts and clays (i.e., greater than 50 percent of the sediment passes a #200 sieve). Sediments along the federal navigation channel were dominantly silts and clayey silts, whereas sediments within the turning basin contained slightly more sand, usually found in the deeper portions of the cores. On average, cores from the federal navigation channel consisted of 16 percent clay, 76 percent silt, 5 percent fine sand, 2 percent medium-fine sand, and 1 percent medium or coarse sand. In aggregate, this

material would be classified as silt. Total solids[2] averaged 46 percent in cores from the channel. Average water content[3] was 119 percent and total organic carbon averaged 1.1 percent. The average composition of all turning basin cores was 11 percent clay, 47 percent silt, 25 percent fine sand, 13 percent medium-fine sand, 3 percent medium sand, and 1 percent coarse sand. In aggregate, this material would be classified as sandy silt. Samples from the turning basin exhibited somewhat greater intra-core stratification than cores from the federal navigation channel. Turning basin cores averaged 60 percent total solids, 76 percent water content, and 1.3 percent total organic carbon.

Chemical Analyses

The results of the chemical characterization of the proposed dredged sediments are based on a statistical analysis of the 55 individual core strata analyzed by Weaver's Cove Energy. The statistical evaluation provides a more representative composite of the chemical characteristics of the sediment than physical compositing of cores prior to laboratory testing. The average chemical results of all samples are discussed below because the dredged material would be effectively composited during the stabilization and upland reuse process proposed by Weaver's Cove Energy.

Statistical averages were compared to a number of commonly accepted, ecologically risk-based screening criteria to assess the potential hazards posed to the aquatic environment by the dredged sediment. Marine sediment values presented in the NOAA Screening Quick Reference Tables (Buchman, 1999) were used in assessing the COE-requested compounds. The following three NOAA screening criteria, listed in increasing order of the magnitude of potential impacts, were used for comparisons:

- Effects Range-Low (ERL) - a criterion representing the lower 10th percentile sediment concentration at which effects may begin to be observed in sensitive species and rarely result in adverse biological impacts;
- Probable Effects Level (PEL) - a criterion representing concentrations above which adverse biological effects are frequently expected; and
- Effects Range-Median (ERM) - a criterion representing the median (50th percentile) sediment concentration, above which effects frequently occur.

In select instances, when no values for the above three criteria were available, the statistical results were compared to the Apparent Effects Threshold (AET). Individual AETs are essentially equivalent to the concentration of a contaminant observed in the highest non-toxic sample from the studies reviewed to develop the SQUIRTS tables (Buchman, 1999). Because of this, AETs represent a screening concentration above which adverse biological effects would always be expected based on a specific test organism exposed to that single contaminant. It should be noted that AET values were developed for use in Puget Sound, Washington, and are not easily compared directly to other benchmarks (Buchman, 1999). However, the use of these criteria when no others are available provides a method of comparison where one would otherwise be lacking. Further, we have no reason to believe that the organisms in the Taunton River and Mount Hope Bay are any more or less sensitive to potential impacts from the four contaminants for which the AET criteria were used than are the aquatic organisms in Puget Sound.

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[2] The solids content is expressed as a mass per unit volume (milligrams per liter) based on a known volume of sediment and water, and sums to 100 percent.

[3] Water content is a geotechnical parameter calculated by dividing the mass of water in a sample by the mass of solids in the sample, and can, therefore, be larger than 100 percent.

PAHs

Sediment samples were analyzed for 16 distinct PAHs. The frequency of detection for all PAHs in all samples ranged from 42 to 80 percent.

Of the 16 PAHs analyzed, 12 have listed ERL, ERM, and PEL screening values. The average concentration of each of these 12 PAHs was below the ERM and PEL values. The average concentrations of four of the 12 PAHs (fluoranthene, chrysene, benzo(a)pyrene, and dibenz(a,h)anthracene) were below the ERL screening criteria. The average concentration of eight of the 12 PAHs (naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, pyrene, benzo(a)anthracene) was greater than the most conservative ERL value. Four PAHs (benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene) had no listed ERL, ERM, or PEL screening values. For these four compounds, the alternate AET screening criteria were applied. The average concentrations of these four PAHs were well below the AET values.

In all areas with average PAH concentrations above the ERL criteria, the PAHs were found only in the upper strata of sediment, except at core location turning basin core 10 (TB-10). In this core, which is located in the turning basin near the existing pier at the proposed LNG terminal site, average PAH concentrations above the ERL criteria were found in both the upper and lower levels of sediment.

Although the majority of PAHs occurred throughout much of the proposed dredging area at concentrations above the most conservative risk-based screening criteria (ERL), average PAH concentrations were below the ERM and PEL screening criteria, and well below the AET criteria. The distribution of some PAHs was relatively uniform throughout much of the dredging area; however, the concentrations of most PAHs were higher in the area between the Braga Bridge and the north end of the turning basin.

PCBs

PCBs are a general class of compounds with a variety of chemical compositions. Sediment samples were analyzed for a total of 22 distinct PCBs. Total PCB concentrations were estimated by summing the concentration of 18 of the specific compounds analyzed and multiplying by two. This method was identified in both the COE's approval of the sediment sampling and analysis program and the COE/EPA draft Regional Implementation Manual (EPA-COE, 2002). For those samples with individual PCB concentrations below detection limits, one-half of the value of the specific PCB's detection limit was used to generate the total PCB estimate.

For all samples, the frequency of detection for individual PCB compounds ranged from 0 to 31 percent, with an average frequency of detection of 8 percent. The average concentration of individual PCBs ranged from 0.70 to 3.71 parts per billion (ppb). Nine of the 22 specific PCBs analyzed were not detected in any individual sediment sample.

The average total PCB concentration exceeds the ERL screening value, but does not exceed either the ERM or PEL screening values. The vertical and horizontal distribution of samples with average PCB concentrations exceeding the ERL screening level was relatively evenly spread throughout the proposed dredging area. However, the area between the Braga Bridge and the south end of the turning basin exhibited the highest average total PCB concentrations.

Pesticides

Sediment samples were analyzed for a total of 21 pesticides. Only dichlorodiphenyldichloroethylene (DDE) was detected, in about 5 percent of the samples.

For several of the 20 pesticides that were not detected, the ERL and ERM screening values are less than the analytical detection limits. As a result, these compounds artificially appear to exceed the screening values. A data interpretation procedure commonly accepted under these circumstances is to compare the average concentration in the sediment to the analytical method detection limit because laboratory-based toxicological research can, and often does, achieve greater accuracy than can be achieved using standard methods for the analysis of environmental media. Because these 20 pesticides were undetected across the sample set, the apparent screening criteria exceedances were disregarded and these 20 pesticides were not considered contaminants of concern (COCs).

The one pesticide that was detected, DDE, had an average concentration in the bulk sediment that was below the detection limit and below the ERM and PEL thresholds. The ERL value for DDE was less than the analytical method detection limit.

Metals

Sediment samples were analyzed for eight metals, including arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc. Individual metals were detected in 82 to 100 percent of the samples. The average concentrations of seven metals exceeded the most conservative ERL screening values; cadmium was the only metal with an average concentration below the ERL screening criterion. Seven of the metals had average concentrations below both the ERM and PEL thresholds. However, average mercury concentrations exceeded the ERM and PEL values. The concentrations of metals in samples from the turning basin and the federal channel south of the Braga Bridge were relatively similar. The highest concentrations of metals occurred between the Braga Bridge and the south end of the turning basin.

Revised Dredging Analysis

Based on comments we received from the EPA and OCZM on the draft EIS, we have reassessed the chemical characteristics of the proposed dredged sediments. Statistically based concentrations of analyzed constituents are still compared to the same ecological risk screening criteria, but we have revised our analysis to consider the sediment based on the dredging segments proposed by Weaver's Cove Energy, and incorporated the EPA's suggestions regarding the statistical comparisons. We believe the use of dredging segment analysis is appropriate because the proposed upland placement of the stabilized sediment would result in only one dredge operating in a single dredging segment at any point in time. Thus the potential impacts associated with the sediment in any single dredging segment would largely be limited to that dredging segment. We have also reassessed the dredged sediments for hotspot concentrations. The three dredging segments as described in Weaver's Cove Energy's *Dredging Program Report* are:

- the federal channel downstream of the Braga Bridge;
- the federal channel upstream of the Braga Bridge; and
- the turning basin.

Federal Channel Downstream of the Braga Bridge

The level of contaminants in the sediments within the federal channel downstream of the Braga Bridge is relatively uniform. The ratio of the maximum to mean concentration provides an indication of the variability of constituents by comparing the highest concentration for an individual compound to the average concentration of the same compound. A ratio of 1.0 indicates that the average and highest concentrations are the same and thus there is no variability; as the ratio increases above 1.0, the variability

of the data increases. This ratio ranges from 1.3 to 3.1 in the dredging segment downstream of the Braga Bridge. As shown in table 4.2.2-1, 62 percent of the constituents in this dredging segment exhibit a value of less than 2.5 for this ratio, and 31 percent exhibit a value less than or equal to 2.

TABLE 4.2.2-1

Statistical Analysis of Dredged Sediment Chemical Constituents from the Federal Channel Downstream of the Braga Bridge a/

Constituent	Statistical Results						NOAA SQUIRTS Criteria			
	Min	Max	Mean	95% UCL	95th Percentile	Max/Mean	ERL	PEL	ERM	AET
PAHs (ppb)										
Naphthalene	10	230	98	129	203	2.4	160	391	2100	
Acenaphthylene	10	200	84	113	191	2.4	44	128	640	
Acenaphthene	10	47	15	20	32.6	3.1	16	89	500	
Fluorene	10	76	27	36	52.6	2.8	19	144	540	
Phenanthrene	10	470	184	248	380	2.6	240	544	1500	
Anthracene	10	260	106	142	233	2.4	85	245	1100	
Fluoranthene	10	770	321	431	644	2.4	600	1494	5100	
Pyrene	10	1600	508	708	1240	3.1	665	1398	2600	
Benzo[a]anthracene	10	500	203	271	410	2.5	261	693	1600	
Chrysene	10	600	239	322	483	2.5	384	846	2800	
Benzo[b]fluoranthene	10	740	269	368	578	2.8	NS	NS	NS	1800
Benzo[k]fluoranthene	10	930	306	427	723	3.0	NS	NS	NS	1800
Benzo[a]pyrene	10	750	297	400	597	2.5	430	763	1600	
Indeno[1,2,3-cd]pyrene	10	170	91	115	170	1.9	NS	NS	NS	600
Dibenz[a,h]anthracene	10	61	31	39	56.5	1.9	63	135	260	
Benzo[g,h,i]perylene	10	160	84	105	151	1.9	NS	NS	NS	670
Total PCB (ppb)	18	67.6	29.7	35.6	49.2	2.3	22.7	188.8	180	
Pesticides (ppb)										
4,4'-DDE	10	25	11.4	13.4	21.4	2.2	2.2	374.17	27	
Metal (ppm)										
Arsenic	8.3	15	11.3	12.1	14.1	1.3	8.2	41.6	70	
Cadmium	0.1	1.2	0.6	0.7	1.20	2.1	1.2	4.21	9.6	
Chromium (Total)	34.0	210	97.4	123	201	2.2	81	160.4	370	
Copper	11.0	120	60.1	77.0	111	2.0	34	108.2	270	
Lead	11.0	130	64.8	83.5	130	2.0	46.7	112.2	218	
Mercury	0.024	2.6	0.95	1.31	2.06	2.7	0.15	0.696	0.71	
Nickel	19	30	23.8	25.3	28.2	1.3	20.9	42.8	51.6	
Zinc	69	280	162	194	271	1.7	150	271	410	

a/ Analysis includes all cores sampled in this segment

NS = No Standard

Although the mean concentrations for each constituent are included in the tables for each dredging segment, we have adopted the use of the 95 percent upper confidence limit (UCL) of the mean, and the 95th percentile concentrations for comparisons with the risk screening criteria. The use of the 95 percent UCL for comparisons with the risk screening criteria is appropriate because of the uncertainty associated with estimating the true average (mean) concentration of contaminants in environmental media

(EPA, 1992). The 95 percent UCL of the mean provides a *conservative estimate* [emphasis in the original document] of the average concentration of a substance, but should not be confused with the 95th percentile concentration of a substance (EPA, 1992). We have included the 95th percentile concentrations of the contaminants analyzed in our comparisons, but we would like to emphasize that their use provides a highly conservative estimate of the potential impact resulting from any particular component of the sediments.

PAHs

The 95 percent UCL concentrations of PAHs in the dredging segment downstream of the Braga Bridge were below the PEL and ERM criteria (for those 12 substances with published criteria). The four compounds without PEL or ERM criteria are all below the AET values (4 to 6 times lower). The 95 percent UCL concentrations of four of the PAHs in this dredging segment are below the ERL criteria. The remaining six compounds with published ERL criteria exceed their respective screening criteria. The 95th percentile concentrations of ten of the PAHs are below the PEL and ERM criteria. Only acenaphthylene and anthracene exceed the PEL criteria, but both compounds are below their respective ERM values. The 95th percentile concentrations of the four compounds for which only AET criteria exist are still substantially below their corresponding criteria (2.5 to 4.4 times less).

Total PCBs

The 95 percent UCL and 95th percentile concentrations of total PCBs in the dredging segment downstream of the Braga Bridge are both less than the PEL and ERM criteria, but greater than the most conservative ERL criteria.

Pesticides

As indicated in the draft EIS, the only pesticide identified at greater than the method detection limits was 4,4'-DDE. The 95 percent UCL and 95th percentile concentrations of this compound are both less than the PEL and ERM criteria in this dredging segment. Further, as noted in our original discussion above, the ERL screening criteria for DDE is less than the analytical detection limit for this compound, and the 95th percentile concentration listed in table 4.2.2-1 (21.4 ppb) is only slightly higher than the analytical detection limit (20 ppb). Therefore, we do not consider DDE to be a contaminant of concern in this dredging segment.

Metals

The 95 percent UCL concentrations of seven of the eight metals analyzed are greater than the most conservative ERL criteria in the dredging segment downstream of the Braga Bridge; only the concentration of cadmium is below the ERL criterion. The 95 percent UCL concentrations of seven of the eight metals are less than the PEL and ERM screening criteria in this dredging segment. Only the 95 percent UCL concentration of mercury exceeds all three screening criteria in this dredging segment. The 95th percentile concentrations of all eight metals exceed the ERL criterion; however, five of the eight metals have 95th percentile concentrations that are less than the PEL criterion and seven of the eight metals are below the ERM criterion when using the 95th percentile concentrations. Chromium, copper, and zinc are greater than or equal to the PEL criterion in this dredging segment; chromium is about 30 percent above the PEL, copper is about 3 percent higher than the PEL criterion, and the 95th percentile concentration of zinc in this dredging segment is equal to the PEL criterion.

Federal Channel Upstream of the Braga Bridge

The level of contaminants in sediments within the federal channel upstream of the Braga Bridge is also relatively uniform. The ratio of the maximum to mean concentration ranges from 1.3 to 3.1 in this dredging segment. As shown in table 4.2.2-2, 73 percent of the constituents in this dredging segment exhibit a value of less than 2.0 for this ratio, and 50 percent exhibit a value less than or equal to 1.5.

TABLE 4.2.2-2

Statistical Analysis of Dredged Sediment Chemical Constituents from the Federal Channel Upstream of the Braga Bridge a/

Constituent	Statistical Results						NOAA SQUIRTS Criteria			
	Min	Max	Mean	95% UCL	95th Percentile	Max/Mean	ERL	PEL	ERM	AET
PAHs (ppb)										
Naphthalene	160	390	231	282	342	1.7	160	391	2100	
Acenaphthylene	96	690	224	364	526	3.1	44	128	640	
Acenaphthene	33	82	52	63	75.6	1.6	16	89	500	
Fluorene	52	100	80	91	96.8	1.3	19	144	540	
Phenanthrene	350	630	491	552	610	1.3	240	544	1500	
Anthracene	210	560	299	378	472	1.9	85	245	1100	
Fluoranthene	730	1300	922	1052	1180	1.4	600	1494	5100	
Pyrene	1100	2900	1500	1910	2340	1.9	665	1398	2600	
Benzo[a]anthracene	450	1300	609	808	1028	2.1	261	693	1600	
Chrysene	480	1500	703	938	1204	2.1	384	846	2800	
Benzo[b]fluoranthene	400	1300	671	890	1120	1.9	NS	NS	NS	1800
Benzo[k]fluoranthene	340	1700	741	1074	1420	2.3	NS	NS	NS	1800
Benzo[a]pyrene	500	1800	783	1081	1424	2.3	430	763	1600	
Indeno[1,2,3-cd]pyrene	170	330	261	309	326	1.3	NS	NS	NS	600
Dibenz[a,h]anthracene	63	120	91	108	120	1.3	63	135	260	
Benzo[g,h,i]perylene	150	360	270	330	352	1.3	NS	NS	NS	670
Total PCB (ppb)	32.4	210	82.1	122	169	2.6	22.7	188.8	180	
Pesticides (ppb)										
4,4'-DDE	10	24	11.6	15.1	18.4	2.1	2.2	374.17	27	
Metal (ppm)										
Arsenic	14.0	22	16.6	18.4	20.4	1.3	8.2	41.6	70	
Cadmium	0.7	1.7	1.1	1.3	1.50	1.5	1.2	4.21	9.6	
Chromium (Total)	130.0	420	254.4	319.2	380	1.7	81	160.4	370	
Copper	82.0	180	129.1	150.9	168	1.4	34	108.2	270	
Lead	93.0	170	142.6	158.7	162	1.2	46.7	112.2	218	
Mercury	2.0	4.3	2.80	3.38	3.98	1.5	0.15	0.696	0.71	
Nickel	25	36	30.4	32.9	34.8	1.2	20.9	42.8	51.6	
Zinc	220	330	271.1	298.2	326	1.2	150	271	410	

a/ Analysis includes all cores sampled in this segment
NS = No Standard

PAHs

The 95 percent UCL concentrations of all 12 PAHs for which ERL criteria exist are above their respective screening concentrations in the dredging segment upstream of the Braga Bridge. The four PAHs for which only AET criteria are available are all below their respective AET concentrations (all are about 2 times less). The 95 percent UCL concentrations of 5 of the 12 PAHs are below their PEL criteria in this dredging segment, but the concentrations of seven PAHs are greater than the PEL criterion. All 12 PAHs for which ERM criteria exist exhibit 95 percent UCL concentrations less than their respective ERM criteria. Similar results are obtained if the 95th percentile concentrations are compared to each screening criterion. The 95th percentile concentrations of the four PAHs that have only AET criteria are still less than their respective AET concentrations.

Total PCBs

The 95 percent UCL and 95th percentile concentrations of total PCBs in the dredging segment upstream of the Braga Bridge are both less than the PEL and ERM criteria, but greater than the most conservative ERL criteria.

Pesticides

The maximum concentration of DDE measured in this dredging segment is 24 ppb; this is only slightly higher than the analytical detection limit for this compound. The 95 percent UCL and 95th percentile concentrations of DDE in this dredging segment are all less than the analytical detection limit. We therefore do not consider DDE to be a contaminant of concern in this dredging segment.

Metals

The 95 percent UCL concentrations of all eight metals analyzed are greater than the ERL criterion in this dredging segment (the concentration of cadmium only exceeds the ERL by 0.1 parts per million (ppm)). Three of the metals analyzed (arsenic, cadmium, and nickel) have 95 percent UCL concentrations below their respective PEL criteria in this dredging segment. The remaining five metals have 95 percent UCL values greater than the PEL criterion. Seven of the eight metals in this dredging segment have 95 percent UCL concentrations below the ERM criterion; only mercury exceeds the ERM concentration. The 95th percentile concentrations of all eight metals exceed their respective ERL criteria. The 95th percentile concentrations of arsenic, cadmium and nickel are also below the PEL criterion. The remaining five metals are all above their respective PEL criteria based on their 95th percentile concentrations. Six of the eight metals in this dredging segment are below the ERM criterion based on their 95th percentile concentrations; only mercury and cadmium exceed the ERM screening values. Cadmium is only slightly above the ERM concentration (1.03 times higher) and, as noted earlier, the 95th percentile concentrations provide highly conservative estimates of potential impacts.

Turning Basin

The level of contaminants in sediments within the turning basin dredging segment is the most variable. The ratio of the maximum to mean concentration ranges from 1.8 to 18.3 when all cores analyzed are considered. If all of the cores in this dredging segment are included, 81 percent of the constituents exhibit a value greater than 3.0 for this ratio, and 23 percent exhibit a ratio greater than or equal to 5.0 (table 4.2.2-3).

The variation reflected in the ratio of the maximum to mean concentration in the turning basin dredging segment data is primarily related to a single core, TB-10. As noted in our original discussion

above, and in Weaver's Cove Energy's *Dredging Program Report*, core TB-10 (located near the existing pier at the proposed LNG terminal site) was the only core that had average PAH concentrations above the ERL screening criteria in both the upper and lower core segments. In addition, a review of the complete data set indicates that 58 percent of the maximum concentrations for all constituents occur in core TB-10. Therefore, core TB-10 should be considered a hotspot. As a result of this finding, we have included an analysis of the turning basin sediments that excludes the results from core TB-10. We also reviewed all of the cores in close proximity to core TB-10, and the concentration gradients between core TB-10 and all of its nearest neighbors decrease rapidly, indicating that this core is an isolated location of generally high contaminant concentrations. Core TB-10 and the surrounding sediment may need to be excavated separately from the rest of the sediment in the turning basin. To avoid biasing the statistical analysis of the sediment data from the turning basin dredging segment, we have excluded the analytical results of core TB-10.

When core TB-10 is excluded from the statistical analysis of sediment from the turning basin dredging segment, the ratio of the maximum to mean concentrations drops considerably; ranging from 1.9 to 5.0. As shown in table 4.2.2-3, 85 percent of the analytes still exhibit a ratio greater than 3, but only 4 percent exhibit a ratio equal to 5.

The data in table 4.2.2-3 present statistical comparisons that include core TB-10; however, our discussion of the turning basin sediments below excludes core TB-10.

PAHs

Of the 12 PAHs for which ERL criteria are available, the 95 percent UCL concentrations of three PAHs in the turning basin segment are below the ERL. The remaining nine PAH compounds are greater than the most conservative ERL screening criterion. Of these nine, two PAHs (benzo(a)pyrene and benzo(a)anthracene) are only 5 and 7 percent greater, respectively than the ERL criterion. The four PAH compounds for which only AET criteria are available are all considerably lower than their respective AET values (3.5 to 5.5 times lower). The 95 percent UCL concentrations of all 12 PAH compounds are lower than both the PEL and ERM criteria. Based on the 95th percentile concentrations, all 12 PAHs exceed their respective ERL criteria. Seven PAH compounds have 95th percentile concentrations that exceed the PEL criterion, whereas five PAHs have 95th percentile concentrations below the PEL criterion. All 12 PAHs with available ERM values have 95th percentile concentrations below the ERM criterion. The 95th percentile concentrations of the four PAHs for which only AET criteria are available are below the AET criterion.

Total PCBs

The 95 percent UCL concentrations of total PCBs in the turning basin dredging segment are greater than the most conservative ERL criterion, but lower than both the PEL and ERM criteria. The 95th percentile concentration of total PCBs in this dredging segment is greater than all three screening criteria.

Pesticides

The concentration of DDE in all cores in the turning basin dredging segment represent values that are one-half the analytical detection limit, indicating that this compound was not detected in any segment of any core in the turning basin area (including core TB-10). Therefore, as with both previous dredging segments, DDE is not a contaminant of concern in the turning basin dredging segment.

TABLE 4.2.2-3

Statistical Analysis of Dredged Sediment Chemical Constituents from the Turning Basin Area

Constituent	Statistical Results															
	Analysis Includes all Cores in Segment						Analysis does not Include Core TB-10						NOAA SQUIRTS Criteria			
	Min	Max	Mean	95% UCL	95th Percentile	Max/Mean	Min	Max	Mean	95% UCL	95th Percentile	Max/Mean	ERL	PEL	ERM	AET
PAHs (ppb)																
Naphthalene	10	5700	311	740	479	18.3	10	290	86	129	274	3.4	160	391	2100	
Acenaphthylene	10	270	82	119	237	3.3	10	230	68	102	216	3.4	44	128	640	
Acenaphthene	10	380	42	73	152	9.0	10	110	24	34	55.8	4.7	16	89	500	
Fluorene	10	410	62	98	229	6.7	10	180	40	60	118	4.5	19	144	540	
Phenanthrene	10	1300	259	398	910	5.0	10	700	188	290	688	3.7	240	544	1500	
Anthracene	10	720	162	248	646	4.4	10	520	118	182	400	4.4	85	245	1100	
Fluoranthene	10	1800	452	690	1670	4.0	10	1700	352	559	1340	4.8	600	1494	5100	
Pyrene	10	4800	715	1143	2170	6.7	10	2200	500	779	1960	4.4	665	1398	2600	
Benzo[a]anthracene	10	1500	334	506	1100	4.5	10	1100	257	398	868	4.3	261	693	1600	
Chrysene	10	1600	346	526	1100	4.6	10	1100	266	414	956	4.1	384	846	2800	
Benzo[b]fluoranthene	10	1300	310	466	971	4.2	10	980	245	379	844	4.0	NS	NS	NS	1800
Benzo[k]fluoranthene	10	1100	264	396	784	4.2	10	790	211	325	740	3.7	NS	NS	NS	1800
Benzo[a]pyrene	10	1400	363	542	1170	3.9	10	1200	292	452	960	4.1	430	763	1600	
Indeno[1,2,3-cd]pyrene	10	510	140	205	431	3.6	10	410	113	170	346	3.6	NS	NS	NS	600
Dibenz[a,h]anthracene	10	190	50	72	151	3.8	10	130	40	58	110	3.3	63	135	260	
Benzo[g,h,i]perylene	10	470	129	187	390	3.7	10	390	104	156	328	3.7	NS	NS	NS	670
Total PCB (ppb)	18	274	54.3	84.1	244	5.1	18	274	54.7	86.8	254	5.0	22.7	188.8	180	
Pesticides (ppb)																
4,4'-DDE	10	10	10	10	10	1.0	10	10	10	10	10	1.0	2.2	374.17	27	
Metal (ppm)																
Arsenic	0.8	28	11.3	14.2	21.1	2.5	0.78	22	10.4	13.0	19.0	2.1	8.2	41.6	70	
Cadmium	0.1	1.4	0.5	0.6	1.37	3.0	0.05	1.4	0.4	0.6	1.08	3.6	1.2	4.21	9.6	
Chromium (Total)	5.5	380	101.9	151.6	310	3.7	5.5	380	92.5	143.1	310	4.1	81	160.4	370	

TABLE 4.2.2-3 (cont'd)

Statistical Analysis of Dredged Sediment Chemical Constituents from the Turning Basin Area

Constituent	Statistical Results															
	Analysis Includes all Cores in Segment						Analysis does not Include Core TB-10						NOAA SQUIRTS Criteria			
	Min	Max	Mean	95% UCL	95th Percentile	Max/Mean	Min	Max	Mean	95% UCL	95th Percentile	Max/Mean	ERL	PEL	ERM	AET
Copper	4.1	150	47.2	68.4	137	3.2	4.1	140	40.6	61.0	128	3.4	34	108.2	270	
Lead	2.9	360	70.1	104.8	195	5.1	2.9	210	54.9	81.8	158	3.8	46.7	112.2	218	
Mercury	0.0	4.2	1.11	1.69	3.90	3.8	0.01	4.2	0.9	1.50	3.72	4.5	0.15	0.696	0.71	
Nickel	5.6	30	16.2	19.6	29.7	1.8	5.6	30	15.4	18.8	29.0	1.9	20.9	42.8	51.6	
Zinc	17	330	121.6	163.9	297	2.7	17	300	106.5	145.9	268	2.8	150	271	410	

NS = No Standard

Metals

Based on the 95 percent UCL concentrations of the eight metals analyzed, three metals (cadmium, nickel, and zinc) are lower than the ERL criterion. The remaining five metals have 95 percent UCL concentrations that exceed their respective ERL criteria. However, the 95 percent UCL concentrations of seven of the eight metals are lower than both the PEL and ERM criteria; only mercury exceeds all three screening criteria in this dredging segment. All eight metals have 95th percentile concentrations that exceed the most conservative ERL criterion. Four of the metals remain below the PEL criterion when compared with their 95th percentile concentrations; however, four metals (chromium, copper, lead, and mercury) exceed the PEL criterion based on their 95th percentile concentrations. Seven of the eight metals (all but mercury) are lower than the ERM criterion compared to their 95th percentile concentrations.

Summary of COE-requested Parameters

The sediment analysis by dredging segment generally supports our original analysis, based on the arithmetic means of all constituents from all dredging segments. Most PAH concentrations exceed the most conservative ERL criterion, and most PAH concentrations are generally less than the PEL and ERM criteria, even using more conservative estimates of constituent concentrations (e.g., 95 percent UCL and 95th percentiles). However, the dredging segment analysis and use of the 95 percent UCL concentrations does demonstrate that some PAH compounds in the dredging segment upstream of the Braga Bridge exceed the PEL criteria when not mediated by lower concentrations from other segments. Conversely, PAH compounds in both the dredging segment downstream of the Braga Bridge and in the turning basin are lower than the most conservative ERL criterion - a point that is obscured when all of the samples are combined.

The dredging segment-based analysis of the total PCB concentrations generally supports our initial discussion. Based on the 95 percent UCL and 95th percentile concentrations of total PCBs, the ERL criterion is exceeded in all three proposed dredging segments (as it is for the entire dredging footprint in our earlier analysis). The more conservative 95 percent UCL estimates of total PCB concentration are below both the PEL and ERM criteria in all dredging segments. The most conservative 95th percentile estimates of total PCB concentrations are generally still less than both the PEL and ERM criteria, except in the turning basin where this estimator of PCB levels is greater than all three screening criteria.

As described in our initial analysis, DDE is the only pesticide identified above the analytical detection limit in any dredging segment. This pesticide was positively identified in only three samples from the two dredging segments farthest downstream. DDE was consistently below the PEL and ERM criteria in all dredging segments. In addition, the ERL screening criterion is lower than the analytical detection level of DDE. As a result, both our initial and revised analyses regarding the concentration of DDE in the proposed dredged sediment demonstrate that it is not a contaminant of concern in any dredging segment proposed for the project.

It is significant to note that both the 95 percent UCL and 95th percentile concentrations of mercury exceed all three screening criteria in all three proposed dredging segments. This finding is consistent with our initial analysis and clearly indicates that mercury is widespread throughout the proposed dredging footprint. Furthermore, the observed concentrations likely represent a local background condition. Given that the Taunton River and upper Mount Hope Bay are directly downwind of two coal-fired power plants, the levels of mercury observed in the sediment are not unexpected. The single largest source of atmospheric mercury deposition in the United States is coal-fired power plants (EPA, 2004b).

Our original analysis of the remaining seven metals is also generally supported by the revised, dredging segment-based review. Six to seven of the remaining metal concentrations are greater than the most conservative ERL screening criterion (the original analysis indicated that six were greater than this criterion). Only the concentration of cadmium was below the ERL criterion, but only in the segment downstream of the Braga Bridge. Based on the 95 percent UCL concentrations, seven of the remaining metals are below both the PEL and ERM criteria in the segment downstream of the Braga Bridge and the turning basin segment. Overall metal concentrations are higher in the dredging segment upstream of the Braga Bridge, where five of the seven remaining metals have 95 percent UCL concentrations that exceed the PEL criterion. Comparisons of the remaining seven metals based on their 95th percentile concentrations are similar to our original analysis for the ERM criterion (6 to 7 metal concentrations are below the ERM value), but less similar with respect to the PEL criterion, with fewer metal concentrations below their respective PEL values. Given the conservative nature of the use of the 95th percentile concentrations and the NOAA SQUIRTS tables the latter finding is not unexpected.

In contrast to our original review, this revised analysis indicates the presence of a hotspot of various contaminants. Core TB-10 contains concentrations of a number of contaminants that are considerably higher than those same constituents in nearby cores. Based on our identification of this core as a hotspot for a number of contaminants, we believe that the sediment from this core and its immediate surroundings could need to be excavated separately from the remaining sediments in the turning basin, if the dredging is approved. However, because the dredging and management of contaminated sediments is largely an issue under the COE's jurisdiction, **we recommend that:**

- **Weaver's Cove Energy consult with the COE regarding the appropriate method(s) for dredging and managing the sediment from the immediate vicinity of turning basin core 10. Weaver's Cove Energy should file copies of all correspondence and any final plan for managing dredged sediment associated with core TB-10 with the Secretary for review and approval by the Director of the OEP <u>prior to dredging</u>.**

In its supplemental draft EIR, Weaver's Cove Energy indicated that additional sediment cores have been collected from the area of the proposed Western Pipeline crossing of the Taunton River. Weaver's Cove Energy is having the cores analyzed in accordance with the existing Tier II testing protocols. These data were not available as of the publication of this document. However, the estimated volume of this material is only 33,000 cubic yards, and given the location of the proposed pipeline crossing (upstream of the turning basin), we do not expect the results of this testing to alter significantly our conclusions regarding the potential impacts from dredging.

Massachusetts Contingency Plan Constituents

In addition to the constituents requested for analysis by the COE, the DEP requested the analysis of three parameters: VOCs, EPH, and TCLP. These testing procedures are often used by the DEP in the management of contamination in upland environments under the Massachusetts Contingency Plan (MCP) which is regulated under Massachusetts General Law Chapter 21E.

Weaver's Cove Energy collected fourteen sediment subsamples from the core sites identified for the COE-approved sediment sampling and analysis program and analyzed these samples for the requested MCP parameters. The core locations and samples were identified by Weaver's Cove Energy's Licensed Site Professional (LSP) prior to the field sampling effort and represent a subset of the sediments analyzed using the COE protocols.

The MCP established a series of risk-based action levels based on site use and other factors. The analytical results for each MCP parameter were compared to the corresponding MCP Method 1

concentrations (i.e., S2/GW2, S2/GW3 and S3/GW2, S3/GW3) for the Shell Oil facility where sediment placement is proposed. The MCP Method 1 concentrations are risk-based criteria developed based on a multi-faceted combination of expected soil exposure, indoor air quality, and the protection of surface water quality. Groundwater at the site is not classified as drinking water (GW1) and thus only volatilization to structures (GW2) and groundwater discharge to surface water (GW3) were the receptors of concern. The soil categories (S-1, S-2, and S-3) describe a range of potential human exposures to those soils. Category S-1 soils are associated with the highest potential for exposure and typically represent surface soils to a depth of about 3 feet. Category S-1 is also assigned to any soils for which the current or reasonably foreseeable use is fruit and/or vegetable production for human consumption. Category S-3 soils represent the lowest potential for exposure (generally below 3 feet), and S-2 soils represent an intermediate potential for human exposure. A specific volume of soil material may only have one assigned category, but soils in different parts of a particular site may be assigned different categories, depending on the potential for human exposure (see 310 CMR 40.0930 for more details).

Toxicity Characteristic Leaching Procedure

According to 314 CMR 9.07 (2)(b)6, the "TCLP analysis is to be performed when sediment is to be managed in the upland and if the total concentrations of metals or organic compounds are equal to or greater than the theoretical concentration at which TCLP criteria may be exceeded as follows:

- > 100 mg/kg arsenic
- > 20 mg/kg cadmium
- > 100 mg/kg chromium
- > 4 mg/kg mercury"

The total concentrations of TCLP-metals in the 14 MCP samples did not exceed the screening criteria listed above. However, some of the cores collected for COE-requested analyses contained metal concentrations that slightly exceeded the TCLP screening criteria. As a result, Weaver's Cove Energy performed TCLP analyses on all 14 MCP samples. The analytical results indicated that leached constituent concentrations were below appropriate thresholds. Therefore, the leaching of measurable concentrations of TCLP-specific compounds from the stabilized dredged sediment into the groundwater below the LNG terminal site would not occur in excess of TCLP thresholds. In addition, Weaver's Cove Energy would undertake TCLP analyses of stabilized dredged material samples as part of the field testing program it has proposed to support the dredging effort (C2D, 2003). As noted in the supplemental draft EIR filed by Weaver's Cove Energy, additional testing of the stabilized dredged material using the TCLP procedure is currently being conducted. Those data were not available when this final EIS was published.

Extractable Petroleum Hydrocarbons

Sediment samples were analyzed for EPHs. The EPHs were separated into C9-C18 aliphatics, C19-C36 aliphatics, C11-C22 aromatics, and unadjusted C11-C22 aromatics. Detection frequencies for these four groups of compounds ranged from 21 percent to 57 percent. The average concentration, 95 percent UCL, and maximum values for C9-C18 aliphatics, C19-C36 aliphatics, and C11-C22 aromatics were all significantly below the appropriate S2/GW2, S2/GW3 and S3/GW2, S3/GW3 thresholds by a factor of 10 or more. No MCP criteria exist for the unadjusted C11-C22 aromatics; however, based on the MCP criteria for the other three groups of EPHs, the concentration of unadjusted C11-C22 aromatics appears to be acceptable for upland disposal.

Volatile Organic Compounds

Sediment samples were analyzed for 68 individual VOCs. Of these, 63 were not detected in any sample. Of the five remaining VOCs, three are suspected as laboratory contaminants (bromomethane, acetone, and 2-butanone (methylethylketone)) because they are common laboratory chemicals and were detected at relatively equivalent concentrations in the associated method blanks. The two remaining VOCs detected (carbon disulfide and tetrahydrofuran) had a frequency of detection of 14 and 86 percent, respectively. The average concentrations, 95 percent UCL, and maximum values of these VOCs were significantly below the most conservative MCP reporting criteria.

We received a comment on the draft EIS that the appearance of possible laboratory contaminants in some VOC analyses "calls into question the quality control at the lab and the quality assurance and accuracy of all test results analyzed by this lab." We disagree with this comment. The fact that these three compounds were identified in the method blanks indicates that the quality control/quality assurance program of the lab was working as designed. The entire purpose of analyzing method blanks, matrix blanks, and other quality assurance samples is to assess the conditions of the analyses. Levels of analytes in method blanks are routinely subtracted as 'background' from the results of analyses to account for the potential occurrence of analytes of interest in reagent-grade laboratory chemicals or potential additions from unintended laboratory sources. Further, the lab that managed and performed the analyses maintains certifications from the National Environmental Laboratory Conference, the COE, DEP, DEM, and other regulatory agencies. These certifications require regular inspections and data quality monitoring procedures. Based on these standard laboratory certification procedures and our review of the data, we do not believe that additional duplicative analyses are justified.

East Channel Sediments

The East Channel has a federally authorized depth of 30 feet below MLLW, and runs alongside the main federal navigation channel. A wedge-shaped portion of this channel falls within Weaver's Cove Energy's proposed dredging area (see figure 4.2.2-2). The proposed action would deepen this portion of the East Channel to about 37 feet below MLLW.

Weaver's Cove Energy's sediment sampling and analysis program did not include the collection of sediment samples within the East Channel. When the program was developed, Weaver's Cove Energy did not know that a portion of the East Channel would require dredging to support the navigational requirements of the project. However, in the sediment sampling program carried out by the OCZM, four sediment cores were collected from within this wedge, specifically cores EC-4, -5, -6, and -7 (see figure 4.2.2-2[4]). Due to OCZM's sample compositing scheme, these four cores yielded two sediment samples: EC-A (composited from cores EC-1, EC-3, and EC-5) and EC-B (composited from cores EC-6 and EC-7). Based on a hydrographic survey conducted in 2000, the sampling depth of EC-A was estimated by Weaver's Cove Energy to be 36.1 feet below MLLW (based on core EC-4) and the sampling depth of core EC-B was estimated to be 34.5 feet below MLLW (based on core EC-7).

To determine whether the OCZM's analytical results for the East Channel sediments were within Weaver's Cove Energy's observed ranges, the data from cores EC-A and EC-B were compared with the average and maximum concentrations obtained from Weaver's Cove Energy's sediment sampling program for cores in the dredging segment upstream of the Braga Bridge. Data for the physical properties were compared to the average of all cores from the federal navigation channel because no data regarding the physical properties of the sediment were available for individual dredging segments.

[4] In response to a comment from the OCZM, we have revised figure 4.2.2-2 to include the location of cores EC-1, EC-2, and EC-3.

Insert figure

4.2.2-2 Sediment Core Locations in the East Channel Office of Coastal Zone Management's Sampling Program

Based on this comparison, the East Channel sediments were determined to be physically similar to the sediments in the main navigation channel. The average percent fines in cores EC-A and EC-B was 84 percent, and the average percent solids in these two cores was 58 percent. The average percent fines of the cores in the federal navigation channel collected by Weaver's Cove Energy was 92 percent, and the average percent solids was 46 percent.

Although it does not appear that OCZM's chemical analysis of cores from the East Channel was as extensive as Weaver's Cove Energy's sediment analysis, the two data sets share a number of analyses that are required by guidelines specified in the Ocean Testing Manual (EPA and COE, 1991). Both studies analyzed the same eight metals. OCZM also analyzed all of the PAHs, total PCBs, and 16 of the pesticides analyzed by Weaver's Cove Energy. A comparison of these data are provided in table 4.2.2-4.

The concentration of 8 of the 16 PAHs analyzed is greater in one of the two OCZM cores than the maximum concentrations of those constituents in the adjacent dredging segment. However, the highest concentrations of these eight PAH compounds are only 1.1 to 2.5 times greater than the maximum concentration within the adjacent dredging segment. Comparing the mean concentrations of PAHs in the OCZM cores with the mean concentrations in the adjacent dredging segment yields a ratio that varies between 0.5 and 2.7, with 88 percent of the samples having a ratio less than 2. Only two PAHs (indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene) exhibit ratios of the means greater than 2.

Weaver's Cove Energy reported detectable concentrations for two pesticides (4,4' DDE and toxaphene). The concentration of DDE in the OCZM cores was lower than the average concentration reported by Weaver's Cove Energy and the concentration of toxaphene was similar in both data sets. However, the data for toxaphene reported by Weaver's Cove Energy actually represent undetected concentrations, based on slightly elevated method reporting limits. The concentrations reported by OCZM and Weaver's Cove Energy for the 14 remaining pesticides were similar. Most of the reported concentrations of these 14 pesticides in both data sets represent values that are one-half the method detection limit (Weaver's Cove Energy's samples) or one-half the method reporting limit (OCZM's samples), indicating these compounds were not detected in either set of analyses.

The mean concentration of all eight metals in the dredging segment is greater than the mean concentrations in the OCZM cores. The ratio of the mean concentrations of individual metals in the adjacent dredging segment compared to the mean of the OCZM cores ranges from 1.1 to 2.9, with most of the metals having ratios of 1.5 or less. Only chromium and nickel are more than 2 times higher in the dredging segment.

Although there is a moderate degree of variability between the two data sets, we believe that the East Channel sediments are chemically similar to the sediments in the adjacent dredging segment of the federal channel.

TABLE 4.2.2-4

Comparison of Chemical Constituents in Proposed Dredged Sediments from the Dredging Segment Upstream of the Braga Bridge and Cores from the East Channel Segment Sampled by the OZCM

		Dredging Segment Sediment Data			East Channel Cores	
Constituent	Detection Limit	Minimum a/	Maximum	Mean	EC-A	EC-B
PAHs (ppb)						
Naphthalene	20	160	390	231	250	140
Acenaphthylene	20	96	690	224	230	140
Acenaphthene	20	33	82	52	110	50
Anthracene	20	210	560	299	670	300
Fluorene	20	52	100	80	150	100
Fluoranthene	20	730	1300	922	1000	710
Phenanthrene	20	350	630	491	700	560
Pyrene	20	1100	2900	1500	1400	920
Benzo[a]anthracene	20	450	1300	609	1300	900
Chrysene	20	480	1500	703	1300	840
Benzo[b]fluoranthene	20	400	1300	671	1600	1000
Benzo[k]fluoranthene	20	340	1700	741	420	270
Benzo[a]pyrene	20	500	1800	783	1500	1000
Indeno[1,2,3-cd]pyrene	20	170	330	261	820	590
Dibenz[a,h]anthracene	20	63	120	91	190	140
Benzo[g,h,i]perylene	20	150	360	270	750	503
Pesticides (ppb)						
4,4'-DDD	20	10	10	10	9.8	2.1
4,4'-DDE	20	10	24	12	9.3	1.4
4,4'-DDT	20	10	10	10	0.65	0.55
Aldrin	20	10	10	10	0.65	0.55
alpha-Chlordane	20	10	10	10	0.65	0.55
Dieldrin	20	10	10	10	4.4	0.55
Endosulfan I	20	10	10	10	0.65	0.55
Endosulfan II	20	10	10	10	0.65	0.55
Endosulfan sulfate	20	10	10	10	3.20	0.55
Endrin	20	10	10	10	0.53	0.24
gamma-Chlordane	20	10	10	10	0.4	0.55
Heptachlor	20	10	10	10	0.65	0.55
Heptachlor epoxide	20	10	10	10	16	0.55
Methoxychlor	20	10	10	10	7.0	5.4
trans-Nonachlor	20	10	10	10	4.2	1.9
Toxaphene	20	85	95	92	65	55
Total PCB (ppb)						
Sum of Cogeners x 2		32.4	210	82.1	129.8	72.8
Metals (ppm)						
Arsenic	0.5	14.0	22	16.6	14	8.4
Cadmium	0.1	0.7	1.7	1.1	0.99	1.0
Chromium	1	130	420	254	120	58

TABLE 4.2.2-4 (cont'd)

Comparison of Chemical Constituents in Proposed Dredged Sediments from the Dredging Segment Upstream of the Braga Bridge and Cores from the East Channel Segment Sampled by the OZCM

		Dredging Segment Sediment Data			East Channel Cores	
Constituent	Detection Limit	Minimum a/	Maximum	Mean	EC-A	EC-B
Copper	1	82.0	180	129	83	55
Lead	1	93.0	170	143	120	92
Mercury	0.02	2.0	4.3	2.8	2.7	1.8
Nickel	1	25.0	36.0	30.4	15	11
Zinc	1	220	330.0	271	270	180

a/ Concentrations for undetected samples are based on one-half the detection limit

As part of the Tier III sediment testing conducted by Weaver's Cove Energy, new sediment cores were collected and analyzed from the East Channel area. The analytical results from these cores allow an additional comparison of the East Channel sediment with sediment from the adjacent dredging segment. Four individual cores collected from the East Channel area were composited to create a single representative sample which was then analyzed (for details see appendix K). The recent Tier III sample also indicates that the East Channel sediments are similar to both the sediments in the adjacent dredging segment and the samples reported by OCZM. The concentration of PAHs ranged from 1.2 to 2.6 times the average values in the dredging segment upstream of the Braga Bridge, and 0.6 to 2.6 times the concentrations reported by OCZM. Metal concentrations ranged from 0.6 to 1.5 times those in the adjacent dredging segment, and 0.8 to 1.9 times those reported by OCZM. The majority (15 of 19) of pesticides analyzed were not detected; however, dichlorodiphenyltrichloroethane (DDT) and its daughter products DDE and dichlorodiphenyldichloroethane (DDD) were detected at relatively low concentrations, similar to those reported by OCZM. The Tier III analysis also identified cis-Nonachlor at very low concentration (about 2 times the detection limit). Total PCBs in the Tier III core were about 1.4 times the concentration reported by OCZM and 1.7 times the average in the adjacent dredging segment. Although the Tier III sediment analyses continue to suggest a moderate degree of variability between the sediments in the East Channel and the adjacent dredging segment, we still believe the sediments are not significantly different from the sediment in the adjacent dredging segment.

Elutriate Testing Results

Weaver's Cove Energy conducted a series of elutriate tests in accordance with the guidelines in the Ocean Testing Manual, Inland Testing Manual, Upland Testing Manual, and the Draft Regional Implementation Manual (COE, 2003; EPA and COE, 1991, 1998; EPA-New England and COE-New England, 2002). Elutriate testing simulates the potential transfer of chemicals from the dredged sediments into the water column during dredging or in-water disposal operations. There are two types of elutriate tests, the standard elutriate and the effluent elutriate. Both tests were developed by the COE and are applied in different dredged material disposal situations. In both testing protocols, a volume of dredged material is vigorously mixed with a larger volume of water. The solids are allowed to settle out and the resulting water is then chemically analyzed. If the COCs remain adsorbed (i.e., chemically attached) to the solids, they simply settle out of the water with the solids. However, if the COCs go into solution in the water, they could be transported in the water column.

The analytical results of the elutriate tests were compared to two data sets: the bulk sediment data and the appropriate water quality criteria. When compared to the bulk sediment chemistry, the elutriate results indicated that nearly all of the detected constituents were adsorbed to the sediment particles because the constituent concentrations in the elutriate water were identified at low and often undetectable levels. This implies that most of the constituents identified in the bulk sediments would be expected to remain attached to the sediment particles and would not be released into the water column during dredging operations. A comparison of the elutriate test results with the EPA National Recommended Water Quality Criteria (EPA, 2002b), yielded the following conclusions:

- All PAHs analyzed were not detected and thus were below the published Aquatic Life Criteria Maximum Concentration (AL-CMC), an acute exposure-based screening criteria, and the Aquatic Life Criterion Continuous Concentration (AL-CCC), a chronic exposure-based screening criteria;
- All PCB compounds analyzed, individually and in total, were not detected and thus were below the published AL-CMC and AL-CCC screening criteria;

- All pesticides analyzed were not detected and thus were below the published AL-CMC and AL-CCC screening criteria; and
- Of the 10 metals analyzed, eight were found to have average concentrations below the published AL-CMC and AL-CCC screening criteria. The two exceptions were copper and zinc.

Average copper concentrations for both the standard and effluent elutriates were greater than both water quality criteria (28 and 20 ppm versus water quality standards of 4.8 and 3.1 ppm for acute and chronic exposure criteria, respectively). However, river water also contained background concentrations of copper greater than both water quality criteria (37 ppm versus water quality standards of 4.8 and 3.1 ppm for acute and chronic exposure criteria, respectively).

Average zinc concentrations for both the standard and effluent elutriates were greater than both water quality criteria. The standard elutriate zinc compliance average was 1.4 times greater than the acute exposure criterion and 1.6 times greater than the chronic exposure criterion. The effluent elutriate zinc compliance average was 1.2 times the AL-CMC and 1.3 times the AL-CCC. Background levels of zinc in the river water were below both water quality criteria (23 ppm versus 90 and 81 ppm for acute and chronic exposure criteria, respectively).

Weaver's Cove Energy conducted additional elutriate testing as part of the Tier III sampling and analysis program; however, the results of this set of elutriate tests were not available when this final EIS was published.

Dredged Material Reuse and MCP Guidelines

Dredged material placed in uplands must meet the MCP requirements in 310 CMR 40.0000. Weaver's Cove Energy's plan for handling and stabilizing the dredged material is to increase the bearing capacity and simplify the handling of the sediments by dewatering the dredged material and then mixing with portland cement. The stabilized material then would be placed and compacted in lifts on the LNG terminal site.

In accordance with the MCP requirements, the sediments were comprehensively sampled and analyzed for COCs to evaluate potential risks from the reuse of the sediment on an upland site. We received a comment from the DEP indicating that they did not concur with our statement that the sediments had been comprehensively sampled and analyzed with respect to MCP reuse guidelines. Our review of the samples that were chosen for MCP-related analyses indicates that based on the complete dataset of COE-requested analysis for all 55 sediment core samples, the 14 cores chosen for MCP analyses include the complete range of contaminant concentrations and include sediments from portions of all three proposed dredging segments. As a result, we believe that the analytical results provided by Weaver's Cove Energy for the MCP upland reuse parameters provide a representative range of potential contaminant concentrations and allow an adequate evaluation of the potential impacts of upland reuse of the stabilized dredged material.

In this same comment, the DEP indicated that Weaver's Cove Energy should prepare a conceptual site model to demonstrate that adequate background review was undertaken, and sufficient understanding of the potential sources of sediment contamination exists, to justify the sediment sampling and analysis conducted by Weaver's Cove Energy pursuant to MCP dredged material reuse guidelines. Weaver's Cove Energy's SAP was developed using the tiered process required by the COE and EPA for characterizing proposed dredged sediments. The Tier I review identified the potential sources of point (e.g., direct spills or permitted discharges) and non-point (e.g., runoff from agricultural land and other open spaces) pollution. The Tier I review data were used to assist in the development of the list of

chemicals to be characterized in the sediments, as well as to direct the placement of core locations from which to collect samples. Decisions about the placement of sample cores were also informed by the extensive series of analyses conducted by OCZM. As noted above, our review of the sample locations and analytical results indicates that Weaver's Cove Energy has adequately characterized the sediments with respect to MCP upland reuse guidelines.

Nevertheless, Weaver's Cove Energy in response to comments on the draft EIS and to our data request of October 15, 2004, has indicated that it is preparing a report that will further demonstrate a sufficient understanding of the depositional environment of the Taunton River system and the general types of contaminant sources that were likely contributors of oil and or hazardous materials in the project area. The results of this report were not available as of publication of this final EIS.

Weaver's Cove Energy's LSP evaluated potential risks associated with the use of these sediments in a manner consistent with the August 2001 Method 3 Risk Characterization of the existing site conditions conducted by Shell Oil pursuant to the requirements of the MCP. Weaver's Cove Energy used the same conservative exposure assumptions utilized by Shell Oil to conduct its risk characterization of the site soils. The results of this risk characterization are provided in the *Method 3 Risk Assessment for Upland Placement of Dredged Material as Engineered Fill Report* (ERM, 2003b), which is available under the "Proposal" link on Weaver's Cove Energy's website at www.weaverscove.com.

The suite of analyses that was completed was based on a review of historical, commercial, and industrial practices within the vicinity of the LNG terminal site and upstream of the site. This review is consistent with MCP requirements for comprehensive assessment of contaminated sites in Massachusetts. The exposure pathways evaluated in the risk characterization include:

- incidental ingestion of dredged sediment;
- dermal contact with dredged sediment; and
- inhalation of dredged sediment particulates.

All of these exposure pathways were evaluated for a commercial worker, a utility worker, and a trespasser involved with disturbing the dredged sediment. Exposure of utility workers to VOCs in utility trenches was not analyzed, because no risk for this pathway was concluded from the risk assessment performed by Shell Oil, and VOC concentrations in the proposed dredged sediment were significantly lower than in existing soils on the proposed LNG terminal site (less than 1 percent of existing concentrations in soils at the site). Exposure to groundwater was not assessed because the risk to a utility worker associated with VOCs in groundwater is ten times less than the cumulative site-wide risk for this receptor, indicating the risk from inhalation of VOCs in groundwater is insignificant relative to the other exposure pathways evaluated.

Weaver's Cove Energy's LSP concluded that the concentrations of oils and hazardous material in the proposed dredged sediment would pose no significant risk to human health. The analysis indicates that the non-cancer risks for each receptor considered are less than the risk limit of 1.0 and the cancer risks are less than the risk limit of $1x10^{-5}$. In addition, none of the exposure point concentrations exceed Upper Concentration Limits.

A construction worker scenario was also evaluated using an MCP Method 1 Risk Screening for exposure to dredged sediment and soil during construction on the site. Method 1 was used for the construction worker evaluation for added conservatism and because a number of constituents in the dredged sediment were not included in Shell Oil's earlier analysis of soils on the site. All of the sediment exposure point concentrations were below Method 1 S-3 standards, which indicates that the dredged sediment would not pose a significant risk to a construction worker. However, hotspots for lead and petroleum presently exist in the soils on the proposed LNG terminal site and these would require health

and safety controls to mitigate potential risks to workers on the site (in keeping with the current deed restrictions).

A comparison of Shell Oil's previous risk evaluation with Weaver's Cove Energy's sediment risk evaluation described above indicates the following:

- The sediment does not pose a risk to any of the receptors evaluated in the Shell Oil risk assessment or to construction workers; and
- levels of some contaminants in the sediments are lower than levels of similar contaminants in the soils at the LNG terminal site (see figure 4.2.2-3).

Table 4.2.2-5 provides a comparison of the 90th-percentile concentrations of COCs in the sediment with background concentrations of PAHs and metals in soils, as determined by the DEP (2002), as well as the MCP S-1 (residential) standards for soil constituents. This comparison, which includes data from all 55 samples analyzed for PAHs, indicates that none of the 90th percentile concentrations of PAHs in the sediment exceed the most conservative MCP-defined background concentrations, and only three PAHs exhibited 90th percentile concentrations that exceed the MCP S-1 standard. Although the 90th percentile concentrations of these three PAHs (benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene) exceed the MCP S-1 standard, they are still below the most conservative background concentration.

More than half of the metals quantified in the sediment are below background concentrations, as defined by the DEP. The metal COCs in the sediment that exceed DEP-defined background levels are beryllium, total chromium, chromium (VI), mercury, selenium, and silver. Of these six metals, only beryllium was identified at higher concentrations than the MCP-defined residential standard (see table 4.2.2-5). However, beryllium may still be consistent with background conditions based on historical industrial practices upstream, atmospheric deposition, and emissions and/or discharges from nearby power plants and sewer outfalls.

We received comments from Shell Oil during both the scoping process and on the draft EIS that suggested the dredged material does not conform with current use restrictions on the site. Upland placement of stabilized dredged material at the proposed LNG terminal is controlled by both the regulatory authority of the DEP and the use restrictions specified in the Quitclaim Deed for the property.

The DEP has the regulatory authority to decide that materials may be used as a substitute for clean fill. Therefore, the DEP could approve the use of the stabilized dredged material as a substitute for clean fill on the site. However, actual use of the stabilized dredged material on the site would be governed by the additional regulatory guidelines of the MCP and the private contractual provisions of the Quitclaim Deed.

Shell Oil further indicated that the presence of arsenic and mercury in the sediment samples was a potential concern. However, the highest concentrations observed for these metals are below MCP S-1 standards (meaning soils with the same concentrations of these metals would be suitable for use in residential settings). Shell Oil also commented about the potential impact of upland placement of dredged sediments on the existing groundwater remediation system. Weaver's Cove Energy would implement modifications to the existing groundwater remediation system necessary to maintain the present site remediation program. These modifications would minimize any impacts on light non-aqueous phase liquid (LNAPL) recovery and site remediation (see section 4.3.1 for further discussion of groundwater remediation issues).

TABLE 4.2.2-5

Background Concentrations and MCP Residential Standards for PAHs and Metals Relative to the Dredged Sediment

	Dredged Sediment	DEP Background Concentrations a/		
	90th Percentile Concentrations	Natural Soil	Soils Associated with Fill	DEP S-1 Standard b/
PAHs (concentrations in ppb)				
Acenaphthene	110	500	2,000	20,000
Acenaphthylene	225	500	1,000	100,000
Anthracene	365	1,000	4,000	1,000,000
Benzo(a)anthracene	775	2,000	9,000	700
Benzo(a)pyrene	900	2,000	7,000	700
Benzo(b)fluoranthene	835	2,000	8,000	700
Benzo(g,h,i)perylene	340	1,000	3,000	100,000
Benzo(k)fluoranthene	900	1,000	4,000	7000
Chrysene	845	2,000	7,000	7000
Dibenz(a,h)anthracene	118	500	1,000	700
Fluoranthene	1050	4,000	10,000	600,000
Fluorene	113	1,000	2,000	400
Indeno(1,2,3-cd)pyrene	325	1,000	3,000	700
Naphthalene	275	500	1,000	700
Phenanthrene	655	3,000	20,000	100,000
Pyrene	1,800	4,000	20,000	500,000
Metals (concentrations in ppm)				
Antimony c/	0.3	1	7	10
Arsenic	19	20	20	30
Barium	46	50	50	1000
Beryllium	1.2	0.4	0.9	0.7
Cadmium	1.2	2	3	30
Chromium (total)	302	30	40	1000
Chromium (VI)	166	30	40	200
Copper	136	40	200	None Listed d/
Lead	150	100	600	300
Mercury	3.1	0.3	1	20
Nickel	30	20	30	300
Selenium	2.1	0.5	1	400
Silver	6.7	0.6	5	100
Thallium	0.2	0.6	5	8
Zinc	280	100	300	2500

a/ Values from DEP Technical Update: *Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil.* http://www.state.ma.us/dep/ors/files/backtu.pdf

b/ DEP standard based on S-1/GW-1 values listed in 310 CMR 40.0975(6)(a).

c/ Concentrations for metals indicated in bold-face type were calculated from the 14 MCP core samples. All other metals are based on the 55 COE-parameter core samples.

d/ DEP currently has no standard for copper.

The placement and reuse of dredged sediment at the proposed LNG terminal site could potentially improve the current site conditions by effectively isolating any soil hot spots for lead and LNAPL from potential receptors. In its comments on the draft EIS, the DEP indicated that the volume of sediment

necessary to isolate potential receptors from LNAPL and hotspots of lead contamination should be discussed along with requisite calculations.

As indicated in table 4.2.2-6, the maximum concentration of lead in the dredged materials is 360 mg/kg (62 times less than the highest lead concentration in the existing site soils). The maximum concentration in the dredged sediments is below the RCS-2 reportable concentration of 600 mg/kg and below the DEP background level of lead in soils associated with fill (table 4.2.2-6). Therefore, the risk from exposure to the stabilized dredged sediments would be significantly lower than the risk from the existing site soils.

The proposed LNG terminal site would be covered by between 5 and 25 feet of stabilized dredged material (see figure 2.4.1-1). The LNG spill containment area would be covered by about 5 feet of stabilized sediment. Because access to this area would be restricted to occasional maintenance of stormwater control and LNG spill control pumping equipment, and because excavation below the depth of emplaced fill would be minimal, the volume of stabilized fill present in this area would generally isolate any lead contamination from potential receptors. However, this thickness of fill may not be adequate to isolate potential receptors from LNAPL vapor contact. The remainder of the site would be covered by between 15 and 25 feet of stabilized fill material. This thickness of fill would isolate potential receptors from all hotspots for lead, and would likely isolate all potential receptors from LNAPL contaminants. However, because the calculations necessary to make a final determination of the potential for isolation of hotspots for lead and LNAPL must be carried out by an LSP, **we recommend that**

- **Weaver's Cove Energy provide all appropriate grading plans, cross section drawings, and risk assessments required to demonstrate the degree of isolation provided by the upland reuse of stabilized dredged materials. The required documentation should be filed with the Secretary for review and approval by the Director of the OEP <u>prior to construction</u>.**

Based on our analysis, we believe the upland placement of the dredged sediment on the LNG terminal site could be accomplished without impeding current LNAPL recovery efforts (also see section 4.3.1). However, the MCP at 310 CMR 40.0032 (3)b prohibits the disposal or reuse of soils containing oil or hazardous materials "at locations where existing concentrations of oil and/or hazardous material at the receiving site are significantly lower than levels of those oil and/or hazardous materials present in the soil being disposed or reused." This is in keeping with the statutory preference contained in Chapter 21E to maintain or achieve background levels of oil or hazardous materials at sites proposed for placement or reuse of soils or sediments from offsite sources. In order to make a final determination of compliance with the MCP, a complete comparison of all constituents identified in the dredged material and the soils at the proposed LNG terminal site needs to be completed. Based on comments we received from the DEP (DEP, 2004), we indicated in the draft EIS that additional testing of the soils at the proposed LNG terminal site was necessary to complete the comparison of the dredged sediment and existing site soils.

Weaver's Cove Energy maintains that the above provision of the MCP does not apply to sediment and, therefore, does not apply to the project. Nevertheless, in September 2004, Weaver's Cove Energy conducted sampling and analysis of soils at the proposed LNG terminal site to supplement the data previously collected by Shell Oil. Ten cores were collected from locations in the northern half of the southern parcel and one location in the southern portion of the northern parcel (figure 4.2.2-4). The cores were collected by continuous split spoon sampling from the ground surface down to the water table. All cores were field screened for contamination using visual inspection and instrumental photo-ionization detector analysis. One sample from each core was submitted for analysis of some or all of the following compounds: VOCs, PAHs, PCBs, MCP-required metals, and physiologically available cyanide.

TABLE 4.2.2-6

Comparison of Proposed Dredged Sediment with Existing Soils at the Proposed LNG Terminal Site and DEP Reportable Concentrations and Accepted Background Concentrations for Urban Fill Material

	Dredged Sediment		Site Soils		Site Soils		Massachusetts DEP	
	Tier II Data		Shell Data		September 2004 Data		Reportable Concentration RCS-2	Back-ground Fills
	Mean	Max	Mean	Max	Mean	Max		
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Volatile Organics								
2-Butanone (MEK)	0.15	0.22	NA	NA	4.1*	29*	40	NS
Acetone	0.20	0.33	2.6	55	4.1*	29*	60	NS
Benzene	0.038*	0.055*	0.7	54	0.50*	2.9*	60	NS
Bromomethane	0.05	0.12	NA	NA	0.83*	6.0*	3	NS
Carbon disulfide	0.07	0.42	NA	NA	4.1*	29*	1,000	NS
Ethyl benzene	0.038*	0.055*	7.2	430	17	160	500	NS
p/m-Xylene	0.076*	0.105*	25	527	24	250	500	NS
Methyl tert-butyl ether (MTBE)	0.038*	0.055*	0.26	0.837	0.83*	6.0*	200	NS
o-Xylene	0.038*	0.055*	6	245	0.42*	2.9*	500	NS
Tetrahydrofuran	0.09	0.14	NA	NA	8.3*	60*	5,000	NS
Toluene	0.038*	0.055*	4.51	350	0.61*	4.3*	500	NS
Total Xylenes	NA	NA	27	1700	NA	NA	500	NS
Semi-Volatile Organics								
1,2,4-Trichlorobenzene	0.12	0.22	NA	NA	2.2*	10*	500	NS
1,4 Dichlorobenzene	0.10	0.12	NA	NA	2.2*	10*	60	NS
1-Methylnaphthalene	NA	NA	1.6	55	2.2*	10*	NS	NS
2-Methylnaphthalene	0.16	0.64	7.6	597	2.2*	110	1,000	NS
4-Methylphenol	0.12	0.23	NA	NA	2.2*	10*	NS	NS
Acenaphthene	0.05	0.38	0.8	90	2.2*	10*	2,500	2
Acenaphthylene	0.12	0.69	0.3	26	2.2*	10*	1,000	1
Anthracene	0.17	0.86	0.2	15	2.2*	10*	1,000	4
Benzo[a]anthracene	0.38	3.3	0.2	7	2.2*	10*	1	9
Benzo[a]pyrene	0.44	2.5	0.2	5	2.2*	10*	0.7	7
Benzo[b]fluoranthene	0.39	2.8	0.1	3	2.2*	10*	1	8
Benzo[k]fluoranthene	0.41	2.9	0.1	2	2.2*	10*	2,500	3
Benzo[g,h,i]perylene	0.14	0.47	0.2	2	2.2*	10*	10	4
Benzoic Acid	0.11	0.17	NA	NA	2.2*	10*	10,000	NS
Biphenyl	0.10	0.12	NA	NA	2.2*	10*	100	NS
bis(2-Ethylhexyl)phthalate	0.63	1.4	NA	NA	2.2*	10*	300	NS
Carbazole	0.10	0.12	NA	NA	2.2*	10*	NS	NS
Chrysene	0.41	3.3	0.24	11	2.2*	10*	10	7
Dibenzo[a,h]anthracene	0.06	0.19	0.08	0.25	2.2*	10*	0.7	1
Dibenzofuran	0.11	0.18	NA	NA	2.2*	10*	NS	NS
Dibutyl phthalate	NA	NA	1.4	1.7	2.2*	10*	500	NS
Fluoranthene	0.51	2.7	0.3	12	2.2*	10*	1,000	10
Fluorene	0.06	0.41	1.6	121	2.5*	4.2	2,000	2
Indeno[1,2,3-cd]pyrene	0.15	0.51	0.12	1.6	2.2*	10	1	3
Naphthalene	0.23	5.7	6.66	216	6.4*	48	1,000	1

TABLE 4.2.2-6 (cont'd)

Comparison of Proposed Dredged Sediment with Existing Soils at the Proposed LNG Terminal Site and DEP Reportable Concentrations and Accepted Background Concentrations for Urban Fill Material

	Dredged Sediment		Site Soils		Site Soils		Massachusetts DEP	
	Tier II Data		Shell Data		September 2004 Data		Reportable Concentration RCS-2	Back-ground Fills
	Mean	Max	Mean	Max	Mean	Max		
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Phenanthrene	0.28	1.3	1.36	102	2.6*	2.6	100	20
Phenol	0.10	0.15	NA	NA	2.3*	10*	500	NS
Pyrene	0.84	7.1	0.54	9.8	2.2*	10*	2,000	20
Total PCBs	0.13	0.30	NA	NA	0.5	1.8	2,000	NS
Metals								
Arsenic	12	28	NA	NA	8	53	30	20
Barium	35	52	NA	NA	7	14	2,500	50
Beryllium	1.0	1.2	NA	NA	0.2	1.0	0.8	0.9
Chromium	123	420	NA	NA	5	10	2,500	40
Copper	65	180	NA	NA	11	48	10,000	200
Lead	80	360	221	22,500	138	1,300	600	600
Mercury	1.3	4.3	NA	NA	0.1	0.2	60	1
Nickel	21	36	NA	NA	7	14	700	30
Selenium	1.5	2.2	NA	NA	1.1*	1.2*	2,500	1
Silver	3.5	8.3	NA	NA	0.3	1.1	200	5
Zinc	157	330	NA	NA	23	99	2,500	300
Physiologically Available Cyanide	3	8	NA	NA	0.5	0.6	100	NS
Volatile Petroleum Hydrocarbons								
C10-C22	NA	NA	40	950	NA	NA	NS	NS
C5-C8 Aliphatics	5.6*	7.5*	205	4,820	NA	NA	500	NS
C9-C10 Aromatics	3.8*	5.0*	141	2,800	NA	NA	500	NS
C9-C12 Aliphatics	5.6*	7.5*	313	6,300	NA	NA	2,500	NS
Extractable Petroleum Hydrocarbons								NS
C9-C18 Aliphatics	7	46	999	53,800	NA	NA	2,500	NS
C19-C36 Aliphatics	39	210	386	30,800	NA	NA	5,000	NS
C11-C22 Aromatics	19	55	958	23,700	NA	NA	2,000	NS

* Value is based on one half the detection limit

NA = Not Analyzed
NS = No Standard

As shown on figure 4.2.2-3 for total VOCs, all individual VOCs in the existing site soils occur at higher concentrations than in the proposed dredged sediments. This is also true for all SVOCs except benzo(k)fluoranthene (table 4.2.2-6). The maximum concentration of benzo(k)fluoranthene in the dredged sediments is 2.9 mg/kg, whereas the maximum detectable concentration observed in the existing site soils is 2 mg/kg. Therefore, upland reuse of the stabilized dredged sediments could result in a slight increase in the concentration of benzo(k)fluoranthene in the site soils but it would not result in a reportable concentration. Also, it would be unlikely to result in a final concentration in site soils that exceeds DEP-defined background levels for this compound in soils associated with fill materials. The maximum concentrations of four SVOCs in the existing site soils currently exceed the RCS-2 reportable concentrations (table 4.2.2-6). However, the mean concentrations of these compounds are well below the RCS-2 criteria. Additionally, the maximum concentrations of these compounds are less than the DEP-defined background level, and upland reuse of the stabilized dredged sediment would not result in a reportable concentration, nor would it be likely to create new concentrations of these compounds that exceed DEP-defined background levels.

The concentrations of both volatile and extractable petroleum hydrocarbons in the existing site soils currently exceed the MCP reportable concentrations. The mean concentrations of these compounds in the proposed dredged sediments range from 0.7 percent to 10 percent of the mean concentrations in the existing site soils. In addition, the maximum concentrations of these compounds in the dredged sediments are far lower than the mean concentrations in the existing site soils (table 4.2.2-6).

The mean and maximum concentrations of total PCBs in the dredged sediments are much lower than the corresponding concentrations in the existing site soils. In addition, the maximum concentration of total PCBs in the sediment is lower than the mean concentration in the existing site soils. Both the sediments and the site soils are substantially below the RCS-2 reportable concentration of 2,000 ppm.

Upland placement of the stabilized dredged sediment would result in an increase in the concentration of most metals in the existing site soils. However, increases in the concentrations of most metals would not result in the exceedance of a reportable concentration (table 4.2.2-5). The increase in the concentration of beryllium could potentially result in the exceedance of a reportable concentration for that metal. However, it seems probable that the range of beryllium concentrations demonstrated by both the dredged sediments and the existing site soils represents a local background condition given the location of the dredging footprint and the terminal site, directly downwind of two coal-fired power plants. The principal source of atmospheric beryllium dust in the United States is smoke stack emissions from coal- and oil-fired power plants (EPA, 2004c; Agency for Toxic Substances and Disease Registry, 2004). An additional source of beryllium derives from ash waste from coal-fired power plants. The background concentration of beryllium in table 4.2.2-6 is based on published DEP values (DEP, 2002). However, that technical note indicates that the values published therein "… do not obviate the need to establish location-specific background conditions for other purposes, such as compliance with the anti-degradation provisions of the MCP" (DEP, 2002). As a result, the local background concentration of beryllium may be higher in the Fall River area than the published value of 0.9 mg/kg. Furthermore, the presence of beryllium in the existing site soils at maximum concentrations similar to those in the dredged sediment means that the proposed reuse of the stabilized sediment would not introduce a contaminant to the site that is not already present.

Insert figure

4.2.2-3 Comparisons of Average Concentrations in Sediment and Soil Samples

Weaver's Cove Energy conducted a revised Method 3 Risk Assessment using both Shell Oil's existing soil data and the data recently acquired by Weaver's Cove Energy that included the same constituents found in the proposed dredged sediments. The results of this assessment indicated that exposure to the existing site soils does not pose a risk for commercial workers, trespassers, or utility workers, but based on the additional data, the new risks from existing site soils are slightly higher than the original site risk calculated by Shell Oil. The same analysis, including Shell Oil's existing data, the new site soil data, and the data for the dredged sediment, indicates that total site risk is below the MCP carcinogenic risk criterion (1×10^{-5}), and the MCP non-carcinogenic risk criterion (i.e., less than 1). Total site risk is below these criteria for commercial workers, trespassers, and utility workers. Our analysis of the risk assessment conducted by Weaver's Cove Energy suggests that it conservatively overestimates the risk to the chosen receptors. Because the data collected in September 2004 do not represent entirely separate exposure points from those used in the original Shell Oil risk assessment, combining separately calculated risks from data collected from the same exposure points overestimates the risk to the chosen receptors, thereby producing a conservative estimate of potential site risk.

The MCP at 310 CMR 40.0032 requires that the DEP evaluate the types and extent of contamination within the proposed dredged sediment compared to the contaminant profile in the soil at the proposed reuse location to prevent the occurrence of a release condition at the site that would require remediation, or significantly increase contamination at the proposed reuse site. Our analysis indicates that except for those contaminants in the existing site soils that currently exceed reportable concentrations, upland reuse of the stabilized dredged sediment would not result in an increase in the concentration of any additional contaminants that would exceed a reportable concentration. For those contaminants that already exceed a reportable concentration, use of the stabilized dredged sediment at the site would not likely result in additional remediation requirements because the incremental increase in these substances would be minimal. Upland reuse of the dredged sediment would result in an increase in the concentration of most metals in the existing site soils; however, none of the increased concentrations would result in a release condition. It does not appear that the increased concentrations of metals would pose a significant environmental impact because all of the metals in the dredged material also occur in the existing site soils (some at higher maximum concentrations), and except for selenium and mercury, the increased metal concentrations would remain below DEP-published background levels. The published background concentration for mercury is 1 mg/kg; however, given the proximity of the site and the dredging footprint to the coal-fired Brayton Point Power Plant, it is likely that the local background level of mercury is higher than 1 mg/kg, and reuse of the sediments may not pose a significant impact on existing site soils. Information in a recent lawsuit against the Brayton Point Power Plant indicates that 240 pounds of mercury per year are emitted from the plant (Conservation Law Foundation, 2005). We note, however, that the DEP has not made a final determination on this issue.

Because the DEP has not made a final determination regarding the upland placement of sediments on the LNG terminal site with respect to either the anti-degradation provisions or potential impacts on the existing remediation system, and because upland reuse of the stabilized dredged sediment is a critical aspect of the proposed project design**, we recommend that:**

- **Weaver's Cove Energy file documentation with the Secretary <u>prior to construction</u> to verify that placement of the stabilized dredged material on the LNG terminal site is consistent with the MCP. If Weaver's Cove Energy is unable to verify the consistency of the proposed use of the sediment with the MCP, it should file a revised sediment placement plan that identifies alternative location(s) for use of the sediments. This alternative use plan, if necessary, should be developed in consultation with the relevant agencies and include a detailed assessment of the environmental impacts associated with the alternative location(s) and demonstrate that the alternative location(s) are in compliance with applicable regulations.**

Weaver's Cove Energy should file the plan, if necessary, with the Secretary for review and approval by the Director of OEP <u>prior to construction</u>.

We received a comment from the DEP indicating that the proposed upland reuse of stabilized dredged sediment is regulated under the provisions of 314 CMR 9.00 (Water Quality Certification). The DEP also indicated that to be considered a valid reuse proposal, the amount of material proposed for reuse must be "reasonable and consistent with the project's design, construction, and operation." The volume of material used should be the minimum amount necessary to accomplish the project. Any volume of material larger than the minimum necessary to accomplish the project would be "considered solid waste, if proposed to be disposed upland" and be subject to management under MGL c. 111, §150A and 150A1/2 as well as 310 CMR16.00 and 19.000.

In its comments on the draft EIS, Weaver's Cove Energy provided information regarding the volumes of stabilized sediment required to construct each of the site features. This information shows that a large portion of the fill (41 percent) would be used to bring the site grade from its present elevations (generally 20 to 25 feet above MSL) to 40 feet above MSL. This would bring the entire facility above the 100-year floodplain elevation, a required safety feature. More importantly, this volume of stabilized dredged material would allow the installation of sumps, berms, process piping, drains, and other systems necessary for site operation without disturbing the underlying contaminated site soils. An additional 5 percent of the stabilized fill material would be used to construct auxiliary facilities and the approach berms for the railroad crossing between the southern and northern parcels. The remaining volume would be used to construct a perimeter retaining wall and a landform for visual screening and noise attenuation. Our analysis indicates that the volume of stabilized dredged sediments appears reasonable and consistent with the project's design, construction, and operation. In addition, because the sediments are an environmental media that would be stabilized and reused as engineered fill, and would not be discarded or abandoned, they do not appear to meet the definition of solid waste under 310 CMR 16.00. Therefore, we do not believe that a site assignment would be required for the site.

During the scoping process, we received a comment expressing concern about the potential interaction of an intense fire with the LNAPL contamination in the existing site soils. The LNAPL at the site currently exists as a plume floating on the top of the groundwater. Current groundwater elevations at the site range from 2 to 15 feet below the existing ground surface. Upland placement of dredged sediments would cover the majority of the site with a thick layer of material that would further isolate the LNAPL contaminants from direct exposure to any fire. The use of other forms of structural fill in areas of the site not directly covered by stabilized dredged material would also result in isolation of the LNAPL contaminants. In addition, most of the heat from a fire would be directed up into the atmosphere, minimizing the risk of LNAPL-fire interaction and any potential for a release of LNAPL from the site.

Sediment Stabilization Testing

The physical characterization of the bulk sediment indicated that the dredged material is predominantly fine-grained with a highly plastic behavior. These physical characteristics are not optimal for time-efficient material handling and offloading, drying, and upland placement as structural fill. To improve the material handling and mechanical properties of the dredged material, some form of stabilization would be required.

Weaver's Cove Energy conducted a laboratory testing program to evaluate the application of several admixtures, in differing percentages and under differing conditions, to identify a soil stabilization method that could produce improved physical characteristics (additional details on the testing can be found in the *Dredging Program Report* under the "Proposal" link on Weaver's Cove Energy's website at www.weaverscove.com). The objective of the dredged material admixture testing program was to obtain

a general understanding of the behavior of typical fine-grained sediments when treated with varying percentages of lime, portland cement, and a combination of both lime and cement. This program did not evaluate the effects of admixtures on the more coarse-grained 'parent material' sediments found in distinct areas within the turning basin. It is anticipated that these coarse-grained materials would be easier to dewater and stabilize than the fine-grained materials that were tested.

Based on the results of the sediment stabilization testing program, the addition of lime, portland cement, and mixtures of lime and cement in combination improved the strength of the fine-grained dredged material. The magnitude of strength gained, however, varied significantly with respect to the type and percentage of admixture used. The addition of an 8 percent (mass basis) portland cement admixture to the fine-grained dredged material yielded the greatest short-term (1 day) and long-term (28 day) gains in material compressive strengths. The resulting product was a material with improved workability and handling characteristics and suitable for structural applications.

In addition to the mechanical properties of the stabilized dredged material, the permeability of samples from the two cement admixtures was measured to evaluate the potential movement of water, and therefore potential contaminants, through the stabilized materials after on site placement as structural fill. The results for both cement admixtures were similar. When compacted to 90 percent of maximum dry density, both 4 and 8 percent cement-stabilized sediment had a saturated permeability of 0.03 inch per day. Similarly, both 4 and 8 percent cement-stabilized sediment compacted to 95 percent of maximum dry density had saturated permeabilities of 0.02 inch per day. By comparison, a natural soil such as heavy clay, with very slow permeability (as described by the NRCS) has a saturated permeability of about 1.4 inches per day, which is nearly 50 times faster than the fastest permeability measured for the stabilized dredged material.

The saturated permeabilities measured for the stabilized dredged material represent the fastest flow rate for water moving through this material. These permeabilities assume that the entire mass of sediment is saturated and that a constant source of ponded water exists at the ground surface. Neither of these assumptions would be valid for the stabilized sediments placed at the LNG terminal site, thus our analysis is highly conservative. Rainfall reaching the surface of the LNG terminal site would run off the steeply sloping portions of the land surface and be contained in sedimentation ponds constructed for stormwater management. Much of the water standing in these ponds would be lost to evaporation before it could recharge the groundwater. Rainwater that soaked into those portions of the site with low slope gradients would largely be evapotranspired by vegetation, further limiting groundwater recharge. The limited amount of water that would be available for groundwater recharge would have to move through a minimum of 15 feet of stabilized material before reaching the preconstruction land surface. Existing groundwater at the site is generally 2 to 15 feet below that elevation. Assuming the permeabilities measured for the stabilized sediment could be realized, it would take between 16 and 25 years for water moving through the stabilized sediments to reach the preconstruction land surface. By comparison, water moving through 15 feet of low permeability natural soil (as described above) would move through that distance in 129 days.

The primary impact from construction of the LNG terminal site would result from erosion and sedimentation of stabilized dredged material during placement and grading of the sediments. The low permeability of the stabilized dredged material could result in large amounts of runoff from rainfall during construction. High runoff rates are also likely during operation of the LNG terminal due to the low permeability of the stabilized fill. To mitigate the impacts associated with erosion and sedimentation during construction and operation of the LNG terminal site, Weaver's Cove Energy would implement both a site-specific erosion and sedimentation control plan pursuant to its application for a section 401 Water Quality certification and section 404 and Massachusetts Wetland Protection Act (WPA) wetlands permits, and a stormwater management plan pursuant to EPA and DEP stormwater management policies and regulations. A summary of the measures contained in these plans is presented in section 4.3.2.

4.3 WATER RESOURCES

4.3.1 Groundwater

Regional Groundwater Quality and Quantity

Groundwater resources in the project area include unconsolidated sand and gravel aquifers underlain by crystalline bedrock aquifers. The sand and gravel aquifers are comprised primarily of ice-contact, outwash, and lake-bottom sediments, which were deposited in pre-glacial bedrock valleys and water-filled depressions. Water well depths in the sand and gravel aquifers typically range between 10 and 100 feet and yield between 10 to 400 gpm. The quality of water is adequate for most uses, but may contain high concentrations of iron and manganese (USGS, 1995). In general, groundwater within theses aquifers follows topographic contours and discharges to surface waterbodies, such as the Taunton River.

Water well depths in the crystalline bedrock aquifers range between 100 to 400 feet and yield between 1 to 20 gpm, primarily from joints, fractures, faults, and bedding planes. The groundwater quality from the crystalline bedrock is generally suitable for most uses but may cause corrosion of pipes and appliances (USGS, 1995).

There are no EPA-designated sole-source aquifers (EPA, 2003) or state or locally protected aquifers or wellhead protection areas in the project vicinity (MassGIS, 2003). Also, based on 2003 MassGIS data, review of USGS topographic maps, and field surveys, there are no springs within 200 feet of any of the proposed project facilities or work areas**.**

Public Water Supply

Information on drinking water wells registered by the DEP was collected using 2003 MassGIS data. Groundwater and surface water supply information was also compiled through personal communications with state and local agencies. This information indicates that most drinking water in the project area comes from municipal sources. The nearest community water supply well to the proposed project is located approximately 2.2 miles northeast of the proposed interconnect between the Northern Pipeline and the existing Algonquin G-20 lateral. The nearest community water supply well to the proposed LNG terminal is approximately 4 miles northwest of the site. The nearest community surface water supply to the proposed project is the Somerset Reservoir, approximately 1.4 miles northwest of MP 2.5 of the Northern Pipeline.

Hydrostatic testing of the LNG storage tank would require an estimated 32 million gallons of water to be obtained either from the municipal water system or the Taunton River (see section 4.3.2 for a discussion of the Taunton River as a potential source of test water). An estimated 760,000 gallons of municipal water or Taunton River water is proposed for hydrostatic testing of the two pipelines. Weaver's Cove Energy would coordinate with the City of Fall River to ensure that water requirements for hydrostatic testing from municipal sources would not impact public water availability.

Private Water Supply

According to MassGIS data, there are no private drinking water wells within 150 feet of the LNG terminal site or either pipeline route. The nearest DEP-registered private water well is more than 1.4 miles from any of the proposed facilities.

Groundwater Quality at the LNG Terminal Site

A petroleum product storage and distribution terminal operated on the site from the 1920s through the 1990s. Historical operations at the site resulted in contamination of soil and groundwater by petroleum products, including kerosene, xylene, gasoline, No. 2 fuel oil, No. 6 fuel oil, and jet fuel. Releases were documented from aboveground storage tanks (ASTs), underground storage tanks (USTs), loading racks, pipelines, and ship loading areas.

Contaminated sites in Massachusetts are regulated by the DEP under the MCP, 310 CMR40.0000. The MCP process involves the following five phases. According to Weaver's Cove Energy, Phases I through IV have been completed and the site is now in Phase V of the MCP process.

- Phase I - Initial site investigation (January 1989 - November 1991). During Phase I, initial investigations were performed and short-term measures were implemented to contain petroleum contamination. The site was classified as a Tier IB site, requiring the DEP to issue a permit for the responsible party (i.e., Shell Oil) to conduct response actions at the site.

- Phase II - Comprehensive site assessment (February 1997). Extensive investigations including numerous groundwater monitoring wells and soil borings were conducted to delineate the source, magnitude, and extent of contamination at the site. A site-specific risk assessment was conducted by Shell Oil in accordance with MCP protocol and concluded that a condition of significant risk existed at the site due to petroleum products and lead in the subsurface.

  A northern plume and a southern plume of LNAPL petroleum product were found floating on the groundwater table at the site. Figure 4.3-1 shows the approximate location of the two plumes on the LNG terminal site. The northern plume covers a larger area and is characterized by less viscous petroleum than the southern plume. As much as 4.9 feet of LNAPL has been reported in the northern plume, and as much as 1 foot of LNAPL has been reported in the southern plume. Contaminated soil was also documented in areas where historic aboveground petroleum storage and handling equipment existed, and near the groundwater table due, in part, to diurnal tidal-induced variation of approximately 0.5 to 1.0 foot in the groundwater elevation at the site.

  Completion of Phase II also included placement of a deed restriction on the site, with the following main elements:

  - future residential or agricultural use of the site is prohibited;
  - a cap or other barrier must be constructed prior to any permitted reuse or development;
  - a Soil and Groundwater Management Plan and a Health and Safety Plan must be prepared and implemented for soil excavation activities at the site;
  - an LSP must be used for relocation or off site shipment of contaminated soils; and
  - new occupied buildings must be constructed slab-on-grade with active sub-slab ventilation systems.

Insert Figure

4.3-1 Groundwater Plume of Light Non-Aqueous Phase Liquid Petroleum Product

- Phase III - Remedial action plan (September 1989 - August 2001). Remedial alternatives were evaluated in Phase III. The remedial action selected for the site involved groundwater gradient control, LNAPL recovery, and groundwater removal and treatment.

- Phase IV - Remedial action plan implementation (August 2001). The remedial action plan selected in Phase III was implemented in Phase IV and included installation and operation of groundwater monitoring wells, an interceptor trench, automated and manual LNAPL recovery wells, and groundwater depression wells. The groundwater depression wells were located and designed to enhance LNAPL recovery and prevent LNAPL from migrating to the Taunton River. In general, the impact of the groundwater pumping on groundwater flow is confined to the site.

  LNAPL is currently being recovered from the northern plume by automated pumping, collected in aboveground tanks, and periodically trucked off-site for disposal. LNAPL recovery wells in the southern plume are inspected on a predetermined schedule, and any accumulated LNAPL is recovered manually and disposed of off-site. Contaminated groundwater is pumped to an onsite water treatment building for processing via activated carbon before being discharged to the Taunton River under a NPDES permit. As reported to the DEP in May 2004, 1,000,000 gallons of free-phase product has been recovered from the site to date.

- Phase V - Operations and maintenance. The site entered Phase V of the MCP process after submittal of the Phase IV Final Inspection Report to the DEP in November 2002. In Phase V, the remedial systems at the site continue to be operated and modified as warranted by system performance and site monitoring. Progress reports are submitted to the DEP every 6 months, and the site will remain in Phase V until remediation is determined to be complete.

Because the placement of dredge spoils onsite and the construction of the proposed infrastructure have the potential to interfere with or exacerbate on-going response actions, the DEP has stated that any significant modifications to the existing groundwater remediation system may require a revised Phase IV, Phase V, and Remedial Operation Status submittal.

Impacts of LNG Terminal Construction and Operation on Groundwater Quality

As discussed in section 4.1.4.1, Weaver's Cove Energy proposes to install stone columns beneath the LNG tank. The purpose of the stone columns would be to improve the static load bearing capacity of site soils and to mitigate the potential effects of soil liquefaction in the unlikely event of a significant earthquake.

Utilizing stone columns would result in fewer environmental issues related to existing soil and groundwater contamination at the site than other alternatives. One advantage of stone columns is that they would not result in a significant amount of potentially contaminated spoil that may be brought to the surface during installation. Stone column construction could temporarily increase pore water pressure in subsurface soils, which could cause short-term changes in the shallow groundwater flow regime. Although no shallow groundwater contamination LNAPL was observed in any of the geotechnical soil borings installed in the LNG tank area, Weaver's Cove Energy would implement proactive measures to monitor and control groundwater levels during construction. These measures would include:

- monitoring groundwater levels in existing monitoring wells in the area and implementing methods, such as limited pumping, to maintain water levels in acceptable ranges;

- varying the stone column installation sequence so that a significant number of columns are not installed consecutively in a small area;

- if necessary, installing temporary dewatering sumps near the center of the proposed treatment area to allow for groundwater withdrawal to prevent groundwater flow out of the proposed treatment area; and

- handling any potentially contaminated soils or groundwater that is removed or handled as a result of the stone columns construction in accordance with the MCP under the direction of an LSP.

Once installed, the stone columns would have minimal or no long-term effect on the existing groundwater flow regime and would not impact any plans for groundwater remediation. Based on the physical setting of the site, surrounding major topographical elevations, and proximity to the Taunton River, vertical groundwater gradients at the LNG terminal site are most likely upward. Therefore, installation of the stone columns would not be expected to result in downward migration of shallow groundwater contamination to deeper, uncontaminated zones. Additionally, the installation of stone columns would reduce the overall permeability of fine-grained materials relative to native uniform fine sands, further reducing the potential for vertical contaminant migration at the site.

As part of the proposed LNG terminal construction, Weaver's Cove Energy has proposed to install sheet piling along the shoreline. We received comments expressing concern that installation of the sheet piling would adversely impact the operation of the existing LNAPL remediation system and that removal of the existing timber bulkhead could allow LNAPL to flow to the Taunton River. Except for a relatively small section along the northern edge of the southern parcel, Weaver's Cove Energy would not remove the existing timber bulkhead. Rather, the proposed sheet piling would be constructed upland of the old timber bulkhead, and should supplement the existing timber bulkhead as a physical barrier to LNAPL migration toward the Taunton River. Weaver's Cove Energy contends that installation of the sheet piling could potentially increase the rate of LNAPL recovery by limiting the flow of river water toward LNAPL recovery wells. In its final design phase, Weaver's Cove Energy would take steps to ensure that LNAPL does not flow to the Taunton River during or after construction of the proposed sheet piling system. These steps could involve installation of additional monitoring wells, water extraction wells, and LNAPL recovery wells, or other adjustments to the existing groundwater remediation system. Any modifications to the existing groundwater remediation system would be based on further hydrogeologic tests at the site and the development of a groundwater model that would predict how groundwater would react to changes to the system. Any such tests and changes to the remediation system would be prepared under supervision of Weaver's Cove Energy's LSP, would require approval by Shell Oil under the provisions of its Quitclaim Deed, and must comply with the MCP (M.C.L.c.21E and 310 CMR 40.000).

Other construction activities at the LNG terminal site, including grading, excavation, and construction of footings, foundations, and pilings could potentially cause minor fluctuations in shallow groundwater levels and/or increase turbidity within shallow groundwater adjacent to the construction activity. These impacts would be expected to be localized and would not significantly impact groundwater quality. Most potential impacts would be avoided or minimized by use of standard construction techniques as set forth in the FERC Plan and Procedures. 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 Weaver's Cove Energy's compliance with federal regulations related to fuel transport, handling, and spill response procedures and its implementation of a project-specific onshore SPCC Plan. These measures would ensure that:

- employees who handle fuels and other hazardous materials are properly trained;
- equipment used during construction is in good operating order and inspected on a regular basis;
- each construction crew has on hand sufficient supplies of absorbent and barrier material to allow the rapid containment and recovery of spilled materials, and knows the procedure for reporting spills;
- each construction crew has on hand sufficient tools and materials to stop leaks;
- contractors know the contact names and telephone numbers for all local, state, and federal agencies that must be notified of a spill;
- contractors follow the requirements of those agencies in cleaning up the spill and collecting and disposing of waste generated during spill cleanup;
- fuel trucks transporting fuel to on site equipment travel only on approved access roads;
- all onshore equipment is parked overnight and/or fueled at least 100 feet from wetlands and waterbodies;
- refueling and maintenance of offshore equipment is conducted in accordance with procedures designed to minimize the risk or impact of a spill; and
- hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a waterbody or wetland.

Impacts of Dredged Material Placement on Groundwater Quality and the Existing Remediation System

Weaver's Cove Energy proposes to reuse up to approximately 2.6 million cubic yards of dredged material from the Taunton River on the LNG terminal site as fill material. We received numerous comments expressing concern that placement of the dredged material could adversely affect groundwater quality and operation of the existing groundwater remediation system at the site. As described in section 4.2.2, Weaver's Cove Energy conducted detailed studies and analyses to characterize the physical and chemical nature of the dredged material and to evaluate the potential environmental and health risks associated with placing the dredged material on the site. The results of these studies are summarized in the *Dredging Program Report* (C2D, 2003) and the *Method 3 Risk Assessment for Upland Placement of Dredged Material as Engineered Fill Report* (Environmental Resource Management, 2003b), which are both available under the "Proposal" link on Weaver's Cove Energy's website (www.weaverscove.com).

As discussed in section 4.2.2, Weaver's Cove Energy determined that the COCs in the sediments are primarily select PAHs and metals, as expected in industrialized waterways like the Taunton River. In the original Method 3 risk assessment, Weaver's Cove Energy compared the results of its dredged material chemical analysis to previous Shell Oil soil analytical data and concluded that the average sediment contaminant concentrations were lower than site concentrations for all comparable classes of compounds. Weaver's Cove Energy also concluded that the concentrations of oil and hazardous materials (OHM) in dredged sediment pose no significant risk to human health, public welfare, safety, or the environment, and that the sediment would not introduce significantly higher concentrations of OHM to the site when compared to OHM concentrations currently in soil and groundwater at the site. In

September 2004, Weaver's Cove Energy sampled and analyzed additional soils from the proposed LNG terminal site. As discussed in section 4.2.2, the additional data appear to support our initial finding that use of the dredged material at the site would not pose a significant environmental impact. Therefore, upland placement of the stabilized dredged material on the site would not be expected to have an adverse effect on the chemistry of the groundwater underlying the site.

In a report entitled *LNAPL Plume Response to Upland Placement of Dredge Material* (Environmental Resource Management, 2003c), Weaver's Cove Energy's LSP evaluated the potential impacts that placement of the dredged material could have on groundwater quality and remediation efforts at the site. One potential impact that was considered was whether placement of stabilized dredged material on the site could influence the existing groundwater flow regime and LNAPL plume configuration. The analysis indicates that adding the weight of 100 feet of stabilized dredged materials would reduce the porosity in existing soils by about 1 percent. However, this reduction in porosity would not result in a substantial reduction in hydraulic conductivity, and any pore pressure increases would dissipate quickly due to the relatively high conductivity of existing materials. Therefore, although the placement of fill may result in localized pore pressure build-ups and localized LNAPL mobilization, it is not expected to substantially mobilize large portions of the LNAPL plumes at the site.

Soil moisture present in the dredged material may have more impact on site hydrology than a potential porosity reduction. Depending on the water content of the dredged material at the time it is placed, the water table under the fill may mound as water drains naturally from the dredged material. However, stabilization with Portland cement would tie up much of the free water in the dredged material which would reduce the potential for groundwater mounding to occur. The high permeability of the underlying soils should result in rapid pore pressure dissipation and thus any mounding should be short-lived.

We received a comment suggesting that the potentially high pH of leachate from the stabilized dredged material could adversely affect the existing groundwater remediation system. Our analysis indicates that the effect of the leachate on groundwater pH would not be significant and would not exceed the current NPDES permit threshold. The pH of leachate from pulverized Portland cement paste is approximately 11 (Spalding, 2000). A mixture of equal parts leachate from the cement and groundwater with a pH of 7.1 yields a solution with pH 7.4. Even a mixture of 95 percent leachate with 5 percent native groundwater with a pH of 7.1 would yield a mixture with a pH of 8.4, which would still be under the permit threshold. The optimal pH range for natural degradation of hydrocarbons is between 5.0 and 9.0; therefore, the potential increase in groundwater pH that may be associated with placement of stabilized dredged material would have minimal effect on natural degradation of hydrocarbons.

Salinity and total dissolved solids are not among the discharge criteria for the NPDES permits at the site. Shell Oil has expressed concern regarding the potential for increased salinity to occur in groundwater as a result of placing the stabilized dredged material at the site. Laboratory test results of the stabilized dredged material indicate that the material would have a very low permeability of about 10^{-7} centimeter per second (0.03 inch per day). Recharge through the fill to the groundwater should be minimal (see section 4.2.2), affording infiltration water little opportunity to carry substantial amounts of dissolved ions to the water table. In addition, any discharge of saline water from the groundwater remediation system would not have a significant impact because the Taunton River contains saline estuarine waters (salinity range of 18 to 28 parts per thousand).

In summary, based on studies completed to date, we do not expect the physical effects associated with placement of a large volume of dredged material on the proposed LNG terminal site to have a significant impact on the groundwater flow regime at the site or the configuration of existing LNAPL plumes. We agree with Weaver's Cove Energy that the placement of the dredged material at the site has

the potential to improve site conditions because it would effectively serve as a barrier, which would isolate existing soil hotspots and LNAPL from potential receptors. However, we also agree with the DEP that prior to initiation of the project, groundwater modeling of the site, incorporating the proposed construction and placement of the dredged materials, must be completed to assure that the site remains in compliance with the MCP (M.C.L.c.21E and 310 CMR 40.000).

It appears that reuse of stabilized dredged material on the proposed LNG terminal site would not degrade existing groundwater quality. Weaver's Cove Energy is conducting additional TCLP analysis of the stabilized dredged sediment to confirm this (the results of the TLCP analyses were not available when this final EIS was published). Except for temporary shut-downs that may be necessary in order to relocate, modify, or improve the existing groundwater remediation system, the system would remain in operation during and after construction, and the base remediation plan would remain substantially the same: to prevent LNAPL from migrating to the Taunton River; to remove LNAPL from the ground for proper disposal; and to comply with the MCP.

The DEP has stated that any construction at the site must be completed to maintain compliance with the MCP (M.C.L.c.21E and 310 CMR 40.000). Either the existing response action must be maintained at its current operational compliance status, or a plan must be developed that identifies an alternative remedial approach to achieve an acceptable Response Action Outcome. The DEP has also stated that if Weaver's Cove Energy conducts the response actions, they must be included on the Tier 1B Permit as a responsible party, potentially responsible party, or other party prior to undertaking response actions pursuant to the MCP. As noted in the Phase II Site Assessment, the approved response action includes institutional controls that are also reflected in Shell Oil's Quitclaim Deed for the property. We agree with the DEP that Weaver's Cove Energy would need to provide a plan to the DEP that specifies measures that would maintain response action compliance during all phases of construction at the site, and it must detail the financial assurance measures that would be in place to ensure compliance in the event of a release that results from the construction activities. Weaver's Cove Energy has stated that it plans to conduct additional hydrogeologic testing and analyses, as well as development of a groundwater model, to evaluate how groundwater would respond to changes to site modifications. Weaver's Cove Energy's LSP would ensure that any response actions taken at the site would meet the performance standards of the MCP. Weaver's Cove Energy and its LSP are in discussions with Shell Oil regarding the appropriate response actions that could be needed, including possibly the addition of more monitoring wells, water extraction wells, and LNAPL recovery wells. As stated by Weaver's Cove Energy, any required modifications to the site and the groundwater remediation system would be implemented by Weaver's Cove Energy at its sole expense.

Impacts of Pipeline Construction and Operation on Groundwater Quality

Weaver's Cove Energy searched federal and state databases to identify contaminated sites that could be encountered during construction of the proposed pipelines. Databases accessed for this review included, but were not limited to the following: National Priority List; EPA Resource Conservation and Recovery Information System; EPA Comprehensive Environmental Response, Compensation and Liability Information System; hazardous waste treatment, storage and disposal facilities; PCB generators; registered USTs; and DEP hazardous waste sites.

As indicated in table 4.3.1-1, several known and potential sources of contamination were identified within approximately 0.25 mile of the proposed pipeline routes.

TABLE 4.3.1-1

Contaminated Sites and Underground Storage Tanks Located Within 0.25 Mile of the Pipeline Facilities

Facility/Site Name	Milepost	Type of Site	Distance and Orientation from Pipeline Facility	Comments
Western Pipeline Route				
Sunoco	0.8	UST - gasoline	730 feet north	Registered UST
Sewage Pumping Station	0.8	UST - diesel	1,300 feet south	Registered UST
Northern Pipeline Route				
Lot II - Plat X3	1.3	DEP hazardous waste site	120 feet east	Petroleum contaminated soil and/or groundwater
Fall River Country Club	1.4	UST - contents unknown	425 feet east	Registered UST
Cumberland Farms 4	1.9	UST - gasoline	940 feet east	Registered UST
Polaroid Corporate Facility	3.0	DEP hazardous waste site	600 feet south	Trichloroethene, 1,1-dichloroethene and chloroethene detected in soil and/or groundwater
Borges Bros., Inc.	3.0	UST - gasoline	1,340 feet south	Registered UST
Borges Bros., Inc.	3.4	UST - diesel	160 feet east	Registered UST

Weaver's Cove Energy reviewed DEP files pertaining to the Lot II-Plat X3 Site and the Polaroid Corporate Facility to further evaluate the potential to encounter contaminated soil or groundwater during construction near these known release sites. Based on its review of the files, Weaver's Cove Energy determined that petroleum-contaminated soil and groundwater would likely be encountered during pipeline construction at the Lot II-Plat X3 Site, and groundwater, primarily contaminated with trichloroethene, could be encountered at the Polaroid site. To address the potential to encounter contaminated soil and/or groundwater, we have recommended that Weaver's Cove Energy prepare a plan for the discovery and management of contaminated soils and groundwater prior to pipeline construction (see recommendation in section 4.2.1).

According to the USDA (1981), there are no areas of near surface (less than 5 feet) bedrock along either pipeline route. Consequently, blasting and potential blasting impacts on groundwater are not anticipated for construction of either pipeline. In the unlikely event that blasting would be necessary, it would be conducted according to applicable Massachusetts regulations. Because there were no public or private water supply wells identified within 150 feet of the project, any blasting that may be required would not impact wells in the area.

Other pipeline construction activities could result in minor, temporary impacts to shallow groundwater resources in proximity to the proposed pipelines. These impacts could include increased turbidity, groundwater level fluctuations, short-term disruption of recharge, localized flow along the pipeline trench, contamination from a spill or leak of hazardous substances, and decreased water yield. There are no federal or state protected aquifers in the project area and, therefore, these potential impacts would not have a significant adverse effect on groundwater quality. Most potential impacts would be avoided or minimized by the use of standard construction methods and measures set forth in the FERC Plan and Procedures and the appropriate hazardous materials management and spill response procedures

contained in Weaver's Cove Energy's SPCC Plan. Specific methods and measures would include discharging groundwater removed during trench dewatering in the immediate vicinity of where it is removed to allow for localized resource recharge; backfilling the trench with native material to promote aquifer equilibrium and minimize preferential groundwater flow along the trench; reestablishing preconstruction surface contours and drainage; as well as measures to minimize the risk of spills and procedures to contain, clean up, and report any spills that may occur. Implementation of these measures would ensure to the extent practicable that the potential impacts to groundwater quality along the proposed pipeline routes are localized to the immediate area of the disturbance and do not have a significant impact on overall groundwater quality in the area.

4.3.2 Surface Water

Regulatory Permits

Pipeline installation, LNG terminal construction, and dredging in waters of the United States would be regulated by the COE under section 10 of the Rivers and Harbors Act and section 404 of the CWA. Section 10 of the Rivers and Harbors Act prohibits the creation of any obstruction to the navigable capacity of any waters of the United States without specific approval of the COE. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States.

In addition to the COE permitting requirements, Weaver's Cove Energy's proposed pipeline installation, LNG terminal development, and dredging activities would need to comply with section 401 of the CWA and the CZMA. Weaver's Cove Energy would be required to obtain a section 401 water quality certificate from Rhode Island and Massachusetts demonstrating that the proposed discharge of dredged material complies with each state's water quality standards. Weaver's Cove Energy would also need to certify that its project is consistent with the enforceable policies of Rhode Island's and Massachusetts' CZMPs.

Massachusetts also regulates activities located within flowed tidelands, filled tidelands, and non-tidal rivers and streams through its Chapter 91 licensing requirements. Specific activities regulated under the Chapter 91 licensing program include:

- Structures - Placement or construction of any structure, regardless of size, whether permanent or seasonal. Examples of typical structures include, but are not limited to piers, wharves, dams, seawalls, weirs, booms, breakwaters, bulkheads, ripraps, revetments, jetties, piles, lines, groins, roads, culverts, bridges, buildings, parking lots, cables, pipes, conduits, tunnels, wires, floats, etc.

- Filling - Placement of any unconsolidated materials that is confined or expected to remain in place in a waterway, except for material placed by natural processes. Such placement includes material placed for the purposes of shoreline protection, beach nourishment, or subaqueous disposal of dredged material.

- Dredging - Removal of materials, including, but not limited to, rocks, bottom sediments, debris, sand, refuse, plant or animal matter, in any excavating, cleaning, deepening, widening, or lengthening of any waters in the Commonwealth. The DEP must also know the location where the removed material would be disposed.

- Change in Use - Any use of the authorized premises or structures for a purpose unrelated to the authorized use, whether express or implied. An example of such a change in use would be the conversion of a commercial fishing establishment to an office building.

- Structural Alteration - Any change in the dimensions of a structure or fill from the specifications contained in the existing authorization.

- Demolition/Removal of Structures - Approval is required for removal of any unauthorized structure or fill that was previously not authorized or for which there is not a current and valid grant or license.

Watershed Descriptions

The LNG terminal, Northern Pipeline, and most of the Western Pipeline (between MPs 0.0 and 1.8) would be located within the Taunton River drainage basin, which drains approximately 530 square miles of southeastern Massachusetts. The remainder of the Western Pipeline, from MP 1.8 to its terminus, would be located within the Narragansett Bay and Mount Hope Bay drainage basin, which is approximately 112 square miles in size (USGS, 1992).

Waterbody Classifications

The project would require dredging of the federal navigation channel and turning basin in the Taunton River and Mount Hope Bay. The ship unloading facility would also be constructed in the Taunton River. The Northern and Western Pipelines would cross 15 waterbodies, including the Taunton River. The other 14 waterbodies crossed by the pipeline routes include 3 perennial and 11 intermittent streams. Table 4.3.2-1 lists the location (by milepost), waterbody name, flow regime, approximate crossing width, surface water classification, fishery type, and proposed crossing method for each waterbody. Descriptions of the fishery resources in the waterbodies are provided in section 4.6.2.

Outstanding Resource Waters

The Taunton River and the other waterbodies crossed by the pipeline routes are not classified as Outstanding Resource Waters (Massachusetts Surface Water Quality Standards Program, 1995).[5] However, the Taunton River is currently being evaluated by the National Park Service (NPS) for inclusion into the Wild and Scenic Rivers System (see section 4.8.6.1).

Contaminated Sediments

Based on contacts with state agencies in Massachusetts and Rhode Island and a review of existing published information (e.g., fish consumption advisories, section 305(b) and section 303(d) water quality reports), none of the waterbodies, except the Taunton River and Mount Hope Bay, are suspected of containing contaminated sediments (see section 4.2.2).

[5] The DEP defines Outstanding Resource Waters as waterbodies that exhibit outstanding socioeconomic, recreational, ecological, and/or aesthetic values.

TABLE 4.3.2-1

Waterbodies Crossed by the Northern and Western Pipeline Routes

Facility/ Milepost	Waterbody Name	Flow Regime	Crossing Width (feet)	State Water Quality Classification a/	Fishery Classification	Proposed Crossing Method
Northern Pipeline						
0.7	Steep Brook	Perennial	N/A b/	B	Warmwater	N/A
0.8	Unnamed Ditch (Tributary of Taunton River	Intermittent	3	B	Warmwater	Open Cut
1.3	Unnamed Tributary of Taunton River	Intermittent	3	B	Warmwater	Open Cut
1.5	Unnamed Tributary of Taunton River	Intermittent	6	B	Warmwater	Open Cut
1.6	Unnamed Tributary of Taunton River	Intermittent	≤ 10	B	Warmwater	Open Cut
2.3	Unnamed Tributary of Taunton River	Intermittent	3	B	Warmwater	Open Cut
2.4	Unnamed Tributary of Taunton River	Intermittent	≤ 10	B	Warmwater	Open Cut
2.8	Unnamed Tributary of Taunton River	Intermittent	4	B	Warmwater	Open Cut
3.3	Mother Brook	Perennial	12	B	Warmwater	Open Cut
3.3	Unnamed Tributary of Mother Brook	Intermittent	3	B	Warmwater	Open Cut
3.6	Unnamed Tributary of Taunton River	Intermittent	3	B	Warmwater	Open Cut
Western Pipeline						
0.1	Taunton River	Perennial	2,200	SB	Warmwater c/	Open Cut
1.2	Unnamed Tributary of Taunton River	Perennial	6	B	Warmwater	Open Cut
1.2	Unnamed Tributary of Taunton River	Intermittent	4	B	Warmwater	Open Cut
2.4	Unnamed Tributary of Lee River	Intermittent	4	B	Warmwater	Open Cut

a/ Class SB - These waters are designated as habitat for fish, other aquatic life and wildlife and for primary and secondary contact recreation. In approved areas they shall be suitable for shellfish harvesting with depuration (Restricted Shellfish Areas). These waters shall have consistently good aesthetic value.

Class B - These waters are designated as habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of public water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.

b/ Steep Brook is contained within a culvert at the proposed crossing location that is below the elevation of the proposed pipeline.

c/ The fisheries in the Taunton River include shellfish and anadromous and catadromous fish.

Mount Hope Bay and the Taunton River

The Taunton River begins at the confluence of the Matfield and Town Rivers just east of Bridgewater and flows south for approximately 36 miles before it empties into Mount Hope Bay at Fall River. The Taunton River has an average discharge of 1,050 cubic feet per second (cfs), although this flow varies seasonally with monthly mean values ranging from a low of 332 cfs in August to a high of 2,090 cfs in March (Ries, 1990). Approximately 23 miles of the Taunton River is affected by tides, and the lower 8 miles of the river is a tidal estuary (USGS, 1992).

Mount Hope Bay is a shallow estuary located in the northeast corner of Narragansett Bay. The bay is situated in both Rhode Island (to the south and west) and Massachusetts (to the north and east). Mount Hope Bay is connected to the East Passage of Narragansett Bay to the southwest and to Rhode Island Sound through the Sakonnet River to the south. The bay has a total surface area of 13.6 square miles and a total volume of 53 billion gallons at mean low water (Chinman and Nixon, 1985). The average water depth is 18.8 feet and about 70 percent of the bay is less than 20 feet deep at mean low water.

About 90 percent of the freshwater inflow into Mount Hope Bay comes from the Taunton River. In addition to the inflow from the Taunton River, water circulation in Mount Hope Bay is influenced by tidal flow and wind. Tidal currents are generally between 0.3 and 0.8 feet per second (ft/sec) within Mount Hope Bay, but can exceed 6 ft/sec in the narrows at Sakonnet. Tidal fluctuations range from 3.3 feet at neap tide to 5.5 feet at spring tide with a mean tidal range of 4.4 feet (Spaulding and White, 1990). Tides are the primary source of circulation in Mount Hope Bay with 7.9 billion gallons of water being flushed through the bay twice a day (USGen, 2001).

The state water quality classifications for the Taunton River and Mount Hope Bay are shown on figure 4.3.2-1 and described in table 4.3.2-2. Because Mount Hope Bay is located on the state boundary between Rhode Island and Massachusetts, it has a unique water quality classification in each state.

TABLE 4.3.2-2

Water Quality Classifications of Mount Hope Bay and the Lower Taunton River

Waterbody	State Water Quality Classification a/
Taunton River	
From mouth to Route 24 bridge (21.2 miles upstream)	MA-SB
Mount Hope Bay (MA)	
West of line from Brayton Point to Buoy R4	MA-SA
East of line from Brayton Point to Buoy R4	MA-SB
Mount Hope Bay (RI)	
South and west of the MA-RI border and north of a line from Borden's Wharf, Tiverton to Buoy R4 and east of a line from Buoy R4 to Brayton Point in Somerset, MA.	RI-SB1
South of a line from Borden's Wharf, Tiverton to Buoy 4 and west of a line from Buoy R4 to Brayton Point, Somerset, MA, and east of a line from the end of Gardiner's Next Road in Swansea to Buoy N2 through Buoy C3 to Common Fence Point, Portsmouth; and north of a line from Portsmouth to Tiverton at the railroad bridge at "The Hummocks" on the northeast point of Portsmouth.	RI-SB
West of the SB zone described above to the Narrows at the entrance to the Kickamuit River and east of a line from shore to shore passing through the most westerly points of the two center piers of the Mount Hope Bridge.	RI-SA

a/ Class MA-SA: These waters are designated as an excellent habitat for fish, other aquatic life and wildlife and for primary and secondary contact recreation. In approved areas they shall be suitable for shellfish harvesting without depuration (Open Shellfish Areas). These waters shall have excellent aesthetic value.

Class MA-SB: These waters are designated as a habitat for fish, other aquatic life and wildlife and for primary and secondary contact recreation. In approved areas they shall be suitable for shellfish harvesting and depuration (Restricted Shellfish Areas). These waters shall have consistently good aesthetic value.

Class RI-SA: These waters are designated for shellfish harvesting for direct human consumption, primary and secondary recreational activities, and fish and wildlife habitat. They shall be suitable for aquacultural uses, navigation and industrial cooling. These waters shall have good aesthetic value.

Class RI-SB: These waters are designated for primary and secondary contact recreational activities; shellfish harvesting for controlled relay and depuration; and fish and wildlife habitat. They shall be suitable for aquacultural uses, navigation, and industrial cooling. These waters shall have good aesthetic value.

Class RI-SB1: These waters are designated for primary and secondary contact recreational activities and fish and wildlife habitat. They shall be suitable for aquacultural uses, navigation, and industrial cooling. These waters shall have good aesthetic value. Primary contact recreational activities may be impacted due to pathogens from approved wastewater discharges. However, all class RI-SB criteria must be met.

Insert figure

4.3.2-1 Lower Taunton River / Mount Hope Bay State Surface Water Quality Classifications

Section 303(d) of the CWA requires states to identify waterbodies that are not expected to meet surface water quality standards. The Taunton River and Mount Hope Bay do not currently meet the designated water quality standards established by Massachusetts or Rhode Island. Table 4.3.2-3 provides a list of the section 303(d) waters in the project area and identifies the cause of impairment within each section of these waters. The segments are depicted on figure 4.3.2-2.

TABLE 4.3.2-3

List of 303(d) Waters in the Project Area

State/Waterbody	Segment a/	Causes of Impairment
Massachusetts		
Taunton River a/	1	Organic enrichment, low dissolved oxygen, pathogens
Taunton River b/	4	Organic enrichment, low dissolved oxygen, pathogens
Mount Hope Bay a/	2 and 3	Nutrients, organic enrichment, low dissolved oxygen, pathogens
Rhode Island		
Mount Hope Bay	5 and 6	Biodiversity impacts, thermal impacts c/ Pathogens, hypoxia, nutrients d/
Mount Hope Bay	7	Biodiversity impacts, thermal impacts c/ Hypoxia, nutrients d/

a/ Segments of waterbodies that continue to exhibit impairment of one or more uses and will require additional control measures for point- and/or non-point sources before the waterbody is expected to meet applicable standards (see figure 4.3.2-2).

b/ Segments of waterbodies or pollutants/stressors that have been listed in the past and should be targeted for monitoring or other information gathering to confirm whether they should remain on the section 303(d) list.

c/ Segments of waterbodies not meeting water quality standards where the Total Maximum Daily Load (TMDL) development is currently underway for the cause of impairment.

d/ Segments of waterbodies not meeting water quality standards where the TMDL is planned for the future for the cause of impairment.

Surface Water Resources Impacts and Mitigation

Construction of the Weaver's Cove LNG Project could adversely affect surface water quality due to activities within Mount Hope Bay and the Taunton River (i.e., dredging, pipeline installation, ship unloading facility construction, and hydrostatic test water discharge) and activities located at the LNG terminal (i.e., clearing, grading, and dredged material reuse).

Dredging Activities

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 of an 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, PCBs, pesticides, and PAHs. Surface water quality could also be adversely affected by a spill, leak, or other release of hazardous materials during construction activities. Weaver's Cove Energy would minimize potential impacts associated with spills or releases of hazardous materials by implementing both onshore and offshore SPCC Plans and complying with federal regulations related to fuel transport, handling, and spill response procedures. These measures would minimize impacts of potential spills on surface waters to the extent practicable and reduce the potential degradation of surface waters.

Insert figure

4.3.2-2 Massachusetts and Rhode Island 303(d) Listed Waters

To predict water circulation in the Taunton River and Mount Hope Bay and to determine the potential effects of dredge-induced suspended sediment, Weaver's Cove Energy conducted computer-based modeling of the dredging operations using a three-dimensional, boundary-fitted hydrodynamic (BFHYDRO) model and a Suspended Sediment Fate (SSFATE) model, respectively. The results of these models are discussed below. Weaver's Cove Energy used a Suspended Sediment Dose (SSDOSE) model to assess potential impacts on aquatic organisms that could result from exposure to suspended or deposited sediments. The results of the SSDOSE modeling are discussed in section 4.6.2. Additional details on all of these models are provided in Weaver's Cove Energy's modeling report entitled *Modeling Dredge-induced Suspended Sediment and the Environmental Effects in Mt. Hope Bay and the Taunton River for the Proposed Weaver's Cove Energy, LLC, Liquefied Natural Gas Import Terminal* (Applied Science Associates (ASA), 2003), which is available under the "Proposal" link on Weaver's Cove Energy website (www.weaverscove.com).

The area evaluated using the BFHYDRO model included the Taunton River, Mount Hope Bay, the Sakonnet River, portions of the Providence, Kickamuit, Cole, and Lee Rivers, and Narragansett Bay as far south as Newport, Rhode Island. Parameters that were incorporated into the model to characterize water circulation patterns included:

- bathymetry measurements obtained from historical digitized survey data and recent high resolution surveys;
- surface water elevation at the three entrance locations to Narragansett Bay;
- wind data obtained from the NOAA Physical Oceanographic Real-Time Systems (PORTS) data collection station located at Borden Flats; and
- river flow data from gaging stations located on the Taunton, Threemile, and Segregansett Rivers.

The BFHYDRO model was calibrated to the field measured water level and current data collected from the PORTS stations and run using three tidal conditions (spring, mean, and neap) and three river flow regimes (high, low, and mean river flow, defined further below). The modeling results indicated that the major force driving water circulation in the Taunton River and Mount Hope Bay is the astronomical tides, with the predominant flow occurring along the river channel. The results also indicated that velocities decrease from the water surface to the bottom of the water column for all tidal forcing conditions and that at a given location within the water column, spring tides result in the greatest velocities, while neap tides result in the smallest velocities.

Using the SSFATE model, Weaver's Cove Energy then simulated the distribution and deposition of suspended sediment plumes under the following river flow and tide conditions:

- mean tide with mean river flow (1050 cfs);
- spring tide with high river flow (2090 cfs); and
- spring tide with low river flow (332 cfs).

The SSFATE model was run multiple times to reflect four similarly situated reaches within the dredging limits. Each reach represents a dredging area with similar hydrodynamic conditions, physical sediment characteristics, dredge cut thickness, dredging equipment components, and resulting estimated dredge production rates. The four distinct reaches included:

- Mount Hope Bay Federal Navigation Channel - located at the Rhode Island and Massachusetts state line and characterized by shallow cuts of maintenance silts;

- Taunton River Federal Navigation Channel - located upstream of the Braga Bridge at the "S" bend and characterized as predominantly moderate cuts of maintenance silts;

- Turning Basin (Silt) - characterized as deep cuts of maintenance silts; and

- Turning Basin (Native Material) - characterized as moderate to deep cuts of glacially deposited consolidated parent sediments.

The SSFATE modeling results indicated that the maximum total suspended solids (TSS) concentration would occur near the river bottom in close proximity to the dredging operation and would decrease both upstream and downstream of the dredge operation. This suggests that suspended sediments and increased turbidity associated with dredging would be a short-term effect limited primarily to the time periods and areas when and where dredging would be conducted, which would not impair designated uses assigned under Massachusetts' and Rhode Island's respective surface water quality standards. Based on other studies completed for similar dredging projects, sediment concentrations would be expected to return to background levels within about 1,600 to 2,300 feet of the dredging operations (Bohlen et al., 1979; Bohlen et al., 1996).

We received comments from agencies that the modeling results do not take into account natural background levels of suspended sediment, particularly during peak runoff periods, and consequently may underestimate actual TSS levels during some periods of the proposed 3-year construction period. Our review of the modeling report indicates that the SSFATE modeling used to determine biological effects did take into account a background TSS concentration of 11 milligram/liter. This TSS concentration was derived from an analysis of river water collected on March 24, 2003 at three depths slightly downstream of the Braga Bridge, during slack high tide. Recognizing that data collected on a single day may not represent all background conditions, we agree that background TSS levels may be higher than predicted by the model on some days. However, based on review of monthly TSS concentration data collected within the Taunton River during a study completed between 1988 and 1990, we believe a TSS concentration of 11 mg/L is a reasonable estimate of background conditions. The mean TSS concentration for all of the stations sampled during this study period was 7.7 mg/L. Two of the stations located closest to the turning basin (approximately 5 kilometers and 7 kilometers upstream of the turning basin, respectively) reported a mean TSS concentration of 8.3 mg/L, and minimum and maximum concentrations of 2 mg/L and 19 mg/L, respectively (Boucher, 1991) While the TSS concentrations may vary over the course of the proposed dredging operations, we do not believe this alters the general conclusion that suspended sediments and increased turbidity associated with dredging would be a short-term effect limited primarily to the time periods and areas when and where dredging would be conducted.

To minimize suspended sediment concentrations and the potential impacts on water quality and aquatic species, Weaver's Cove Energy has committed to the following mitigation measures during dredging:

- allowing no significant scow overflow during all seasons and at all dredge locations;

- reducing bucket loss rates by using a closed or "environmental" bucket in areas where depositional sediments would be dredged; and

- minimizing the extent of suspended sediments across the width of the river during the anadromous fish runs by sequencing dredging operations to occur in a line parallel with the river flow (as opposed to across the river channel).

To measure the sediment plume distribution and concentration, Weaver's Cove Energy is proposing to implement a monitoring program during dredging operations. The dredge monitoring program would include:

- Collecting water samples up-current and down-current of dredging activities to quantify TSS concentrations resulting from the dredging operations. Sampling would be conducted near the surface, middle, and bottom of the water column.

- Establishing a monitoring frequency to achieve water quality objectives. The dredge monitoring program would include provisions to increase or decrease the frequency of the sampling effort depending on the specified monitoring criteria.

We received comments regarding the potential for dredging of the federal navigation channel and turning basin and construction of the marine terminal to affect water circulation and tidal flow patterns in Mount Hope Bay and the Taunton River. An analysis conducted by Weaver's Cove Energy estimated that the maintenance and improvement dredging of the turning basin would reduce the velocity of the currents in the turning basin area by up to 18 percent. This decrease in current velocity would likely increase the settling rate of suspended sediments, which could in turn necessitate more frequent maintenance dredging in the future. Similar analyses conducted for the federal navigation channel estimate that the proposed dredging would reduce current velocities in the navigation channel by approximately 0.6 percent and have little effect on water circulation. The marine terminal is also expected to have minimal impact on water circulation because it would be constructed using pile-supported structures, similar to the existing pier.

Weaver's Cove Energy completed elutriate tests on sediment samples collected from the proposed dredging area to assess the potential for pollutants to be released into the water column during dredging (see section 4.2.2). This testing was conducted by mixing the sediment samples with water obtained from the Taunton River and then analyzing the water for selected organic and inorganic compounds. A comparison of the elutriate test results with the bulk sediment analytical results indicate that:

- most pollutants identified in sediments would remain tightly adsorbed to the sediment particles and would not be released into the water column; and

- copper and zinc would be released into the river during dredging in concentrations that exceed EPA-published acute (AL-CMC) and chronic exposure-based screening criteria (AL-CCC) (EPA, 2002b).

Analytical test results of background water samples collected from the Taunton River, near the LNG terminal site indicate that the copper concentration in the river is 37 ppb, 7 times the EPA acute criterion (which is 4.8 ppb) and 12 times the EPA chronic exposure value (which is 3.1 ppb). This suggests that elevated copper levels are normal in this area of the Taunton River. Standard elutriate tests indicate that dredging could result in localized copper concentrations of 28 ppb. Analytical test results of background water samples collected from the Taunton River, near the project site indicate that zinc concentrations in the river water are currently 23 ppb, which is below the EPA acute and chronic criteria (90 ppb and 81 ppb, respectively). Standard elutriate tests for zinc indicate that dredging could result in localized zinc concentration of 127 ppb, which is approximately 1.4 times higher than the EPA acute criterion and 1.5 times higher than the EPA chronic criterion. In interpreting these results, it is important to recognize that elutriate testing simulates a greater level of sediment mixing and aeration than mechanical dredging. This is supported by a study conducted by the COE to evaluate the release of chemical constituents at the point of dredging, which found elutriate test results are a conservative

predictor of chemical concentrations within the water column (COE, 1988). Therefore, actual concentrations of copper and zinc released to the water column would be expected to be less than the elutriate test results indicate. Moreover, the effect of the elevated concentrations of zinc would be localized and diluted downstream of the dredging activities.[6] Based on a study by Tramontano and Bohlen (1984), the elevated concentrations of dissolved contaminants could be expected to return to background levels within 600 feet of the dredging operation. Weaver's Cove Energy conducted additional elutriate testing as part of the Tier III sampling and analysis program; however, the results of this elutriate testing were not available when this final EIS was published.

We received a comment regarding the potential for dredging activities to decrease dissolved oxygen (DO) levels and potentially increase the toxicity of copper and zinc on aquatic organisms. Based on a study of mechanical dredging operations completed by the COE Waterways Experiment Station in the Hudson River Estuary, near-field monitoring results indicate that dredge-induced DO reduction was minimal. Dissolved oxygen reduction was generally less than 0.1 mg/L (COE, 1989). While elutriate test results indicate that copper and zinc would be released from the sediments during dredging and would increase concentrations in the water column, the effects of a slight reduction in DO levels would not be expected to measurably increase the toxicity of copper and zinc (Rand and Petrocelli, 1985).

The DEP conducted a preliminary review of Weaver's Cove Energy's sediment modeling and elutriate test results and had the following comments. The DEP noted, as described above, that the elutriate test results indicate that copper and zinc would be released into the water column at levels exceeding the Ambient Water Quality Criteria. The DEP acknowledged that while the elutriate test results indicate that the contaminants in the sediments other than copper and zinc would not exceed Ambient Water Quality Criteria, some of these compounds would still dissolve in the water at low levels and may be of concern if hot spots are encountered during dredging. The DEP also noted that Weaver's Cove Energy's modeling did not evaluate the potential effects of chemical toxicity resulting from the deterioration of water quality during testing. As a result, the DEP indicated that barge/scow overflow is unlikely to be permitted by the state. In addition, the DEP indicated that it would require Weaver's Cove Energy to develop a water quality monitoring program to evaluate whether or not excessive amounts of sediment are suspended in the water column; determine if elevated levels of suspended sediments extend beyond the mixing zone; and ensure that Massachusetts' state surface water quality standards and criteria are met at the edge of the mixing zone. In accordance with DEP's requirements, this monitoring program must:

- describe the proposed monitoring/sampling locations and frequency;
- list the monitoring/sampling parameters;
- describe the proposed mixing zone;
- identify the conditions under which modifications to dredging operations would be made to minimize the levels of suspended sediment;
- describe what the modifications would entail; and
- demonstrate the effectiveness of the proposed modifications.

[6] A similar dilution is not expected for copper since the background concentration of copper in river water was higher than the concentration of copper in measured elutriate test results.

LNG Terminal Construction and Operation

Construction of the proposed LNG terminal would involve clearing and grading of land adjacent to the Taunton River and filling within the river to construct the shoreline stabilization structures. Stormwater runoff from the cleared and graded construction site as well as the placement of fill material directly into the river could affect water quality by increasing suspended sediment and turbidity levels in the river near the construction activities. Erosion and sedimentation at the site would be controlled and mitigated through implementation of the measures specified in the FERC Plan and in a site-specific erosion and sedimentation control plan and stormwater management plan.

The removal of the existing pier and the construction of the ship unloading facility in the Taunton River could also affect water quality. The removal of the old pilings for the pier and the installation of the new pilings for the ship unloading facility would disturb bottom sediments and could result in increased suspended sediment and turbidity levels in the river. These impacts would be temporary and would be limited to the immediate area around the existing and proposed piers.

In addition to the construction-related impacts discussed above, the Taunton River could be affected during operations of the proposed facilities. During operation of the LNG terminal, prop wash from LNG ships and tugs would temporarily increase suspended sediments and turbidity within the navigation channel and turning basin. Impacts associated with prop wash would occur more frequently than dredging since as many as 70 LNG ships may travel to and from the terminal annually. The LNG ships would also take on ballast water from the Taunton River during the offloading of LNG. Each LNG ship would withdraw up to 14 million gallons of river water for ballast. Assuming up to 70 LNG ships offload at the terminal each year, about 980 million gallons of water could be removed from the Taunton River by LNG ships annually. According to Weaver's Cove Energy, ballast water would be withdrawn over a roughly 12- to 16-hour period using intakes located approximately 25 to 30 feet below the water surface. The ballast water would be pumped at a maximum rate of about 16,000 gpm and an average rate of about 12,000 gpm. The potential impacts of prop wash and these water withdrawals on aquatic resources are discussed in section 4.6.2.

An LNG spill on the water of the river is another potential impact that could occur during operations of the terminal. Although we consider the potential for a spill of LNG on the Taunton River unlikely, if a spill were to occur on the river, the cryogenic liquid would vaporize rapidly upon contact with the warm air and water. Being less dense than water, the LNG would float on the surface before vaporizing. Because LNG is not soluble in water and the LNG would completely vaporize shortly after being spilled, there would be no liquid left that could mix with and/or contaminate the water. Therefore, water quality would not be affected by an LNG spill.

Weaver's Cove Energy would utilize several techniques to minimize erosion and sedimentation during placement of fill material as described in its Stormwater Management Report. This report was originally submitted to the DEP in May 2004 with Weaver's Cove Energy's application for a section 401 Water Quality Certification, and subsequently revised on June 28, 2004. The erosion and sedimentation control measures would include: installing the sheetpile bulkhead along the shoreline of the southern parcel prior to the placement of the dredged material; controlling the stabilization process and placement of the dredged material; constructing temporary retaining walls and earthen berms as necessary to control sediments; and using the existing berms and dikes areas to contain dredged material.

Weaver's Cove Energy would install the sheetpile bulkhead along the riverfront during the first stage of site development prior to placing the dredged material on the site. Once the sheetpiling is installed, Weaver's Cove Energy would begin dewatering and stabilizing the dredged material with cement. Weaver's Cove Energy would adjust the amount of stabilizer added to the dredged material and

the amount of time the material sits in a barge or processing pile as necessary to control erosion and achieve the desired physical properties. Water discharged during sediment dewatering would be regulated under the NPDES permitting program.

Weaver's Cove Energy would also minimize erosion and sedimentation by controlling the placement and production rates of the dredged material. During dredged material placement, temporary and existing berms and dikes would be used on the LNG site to prevent sediment-laden water from entering the Taunton River. Water that accumulates behind these structures would be pumped through temporary stormwater treatment units (STUs) to remove sediment, oil, and other floatables prior to discharge.

There are currently four permitted outfalls located on the LNG site: two stormwater outfalls, one groundwater remediation outfall, and one combined sewer outfall. To operate the terminal, Weaver's Cove Energy proposes to modify the existing site drainage system by extending or relocating three of the existing outfalls and other stormwater control devices to collect and treat stormwater runoff prior to discharge to the Taunton River, as shown on figure 4.3.2-3.

Stormwater runoff on the southern parcel would be treated using swales, deep sump catch basins, and STU's prior to discharge. Based on an impervious area of about 10.4 acres on the southern parcel, Weaver's Cove Energy determined that 10 STU's would provide effective sediment removal and sufficient capacity to treat stormwater generated on the LNG terminal site. During larger storm events, a control structure installed at the head of the inline STU system would allow larger design events to overflow the control weir. The control structure would be fitted with an internal oil baffle to prevent floatables from being discharged during an extreme storm event.

Runoff from the developed portions of the northern parcel would be directed through swales and a series of catch basins to a deep sump catch basin before being routed to a wet pond. The wet pond would be used for pretreatment prior to conveying the flow to an infiltration trench. Before entering the infiltration trench, the outflow from the pond would pass through a control structure and STU, which would direct water to one of two locations: 1) the infiltration trench located along the railroad property boundary for the purpose of groundwater recharge or 2) the existing pipe passing under the railroad property to accommodate storm events larger than the 2-year event (i.e., emergency overflow). Pretreatment through the wet pond would be required to maintain the effectiveness of the infiltration trench. Based on an impervious area of about 6.3 acres on the northern parcel, Weaver's Cove Energy estimates that the wet pond would be approximately 6 feet deep and approximately 0.25 acre in size to comply with DEP guidelines.

Weaver's Cove Energy estimates that the proposed stormwater facilities would remove at least 80 percent of the total suspended sediment from stormwater runoff during operation of the LNG facility.

Pipeline Construction and Operation

Steep Brook, one of the perennial waterbodies crossed by the Northern Pipeline, is contained within a culvert pipe at the proposed crossing location. According to Weaver's Cove Energy the pipeline would be installed above the culvert pipe and would not impact the stream. Pipeline construction across the Taunton River and the other perennial and intermittent streams using the open-cut method could adversely affect surface waters. Potential impacts from clearing and grading, in-stream trenching, trench dewatering, and backfilling could modify aquatic habitat, increase sedimentation rates and turbidity, decrease dissolved oxygen concentrations, increase water temperature, and introduce fuels and oils from accidental spills.

Insert figure

4.3.2-3 Proposed Stormwater Management System

The construction of the Western Pipeline across the Taunton River would involve dredging a trench across the river upstream of the turning basin, installing the pipe, and backfilling with native material or other suitable material. The impacts of dredging on the river are discussed above. Weaver's Cove Energy is proposing to use the coarse-grained native sediments dredged from the deeper depths of the turning basin for backfilling the trench. Because these coarse-grained sediments would settle out faster, the sediments would be resuspended for a shorter duration and the extent of the downstream sediment plume would be reduced.

We received a comment that the HDD construction technique should be considered to reduce impacts of the pipeline crossing on the Taunton River. Our analysis of the feasibility of installing the Western Pipeline using the HDD method is presented in section 3.5.4. This analysis indicates that while there appears to be sufficient space on both sides of the Taunton River for drilling equipment, neither side of the river seems to have sufficient space near the proposed terminal site to fabricate a pipestring long enough for the entire crossing. Additionally, borings conducted at the proposed LNG tank site and the experience of the contractor responsible for installing the piers for the new Brightman Street Bridge indicate that the subsurface geology may not be suitable for HDD. In weighing these factors against the potential environmental benefits of a successful HDD crossing, we concluded that an HDD crossing of the Taunton River for this project is not a practicable alternative to the open-cut crossing proposed by Weaver's Cove Energy.

The impacts of the open-cut construction method on the minor and intermediate streams located along the pipeline routes would generally be localized and short term. The degree of impact would depend, in part, on the flow volume in the streams during construction. As described above, most of the streams that would be crossed are intermittent and have minimal to no flow during drier periods of the year. If construction occurs during a dry period, most of the impacts on these streams would be avoided. If the streams are flowing during construction, clearing, grading, and trenching within and adjacent to these streams could affect water quality. Sediments would be resuspended by in-stream construction activities or by erosion of cleared stream banks and riparian areas. Turbidity resulting from the resuspended sediments could reduce light penetration and the corresponding photosynthetic oxygen production. Resuspension of deposited organic material and inorganic sediments could cause an increase in consumption of biological and chemical oxygen, decreasing available dissolved oxygen. Weaver's Cove Energy would be required by the FERC Procedures to complete most in-stream work in the minor waterbodies within 24 hours and to stabilize and restore the stream banks after construction is completed. Therefore, the impacts would be temporary and suspended sediment and turbidity levels would be expected to return to pre-construction levels soon after the stream crossing is completed.

We received a comment regarding impacts on the navigability of the 14 minor and intermediate stream crossings (i.e., those waterbodies less than 10 feet and 100 feet in width, respectively) located along the Western and Northern Pipeline routes. The 14 waterbodies vary in width from 3 feet to 12 feet and include 11 intermittent waterbodies and three perennial waterbodies (see table 4.3.2-1). Due to the narrow width and lack of baseflow for the majority of these waterbodies, it is unlikely that the waterbodies would be navigable by any vessel, including canoe, kayak, raft, or rowboat. As required by 310 CMR 9.37(4) and our Procedures, pipeline installation would require burying the pipelines below the stream bed and restoring bottom contours following installation. Therefore, pipeline construction and operation would not be expected to result in a navigational hazard in any of these waterbodies.

To minimize impacts on surface waters, Weaver's Cove Energy would adhere to the protective measures specified in the FERC Procedures and would implement its onshore and offshore SPCC Plans. Other federal, state, or local agencies may require Weaver's Cove Energy to implement additional protective measures.

Hydrostatic Testing

Weaver's Cove Energy is currently planning to obtain water from the City of Fall River for hydrostatic testing of the LNG storage tank, LNG plant piping, and the sendout pipelines. If the City denies the use of its water or otherwise is unable to provide the water, Weaver's Cove Energy indicated that hydrostatic test water would be obtained directly from the Taunton River. We received a comment from the EPA recommending that Weaver's Cove Energy be prohibited from using river water for hydrostatic testing in order to minimize impact on winter flounder (further discussed in section 4.6.2). While we agree that this recommendation could reduce impacts on aquatic resources, we do not believe a prohibition on using river water is warranted without knowing whether the use of City water would be permitted. If river water is needed for testing, we believe that impacts of water withdrawals from the river would be minimized by implementing the mitigation measures described below.

Weaver's Cove Energy indicated that approximately 32 million gallons of water would be needed to test the LNG tank, approximately 315,000 gallons would be needed to test the Western Pipeline, and approximately 445,000 gallons would be needed to test the Northern Pipeline. Appropriation rates would vary depending on whether the water is obtained from the City of Fall River or from the Taunton River. Based on current plans to obtain water from the City of Fall River, Weaver's Cove Energy estimates that filling the LNG storage tank would take between 5 to 11 days at a withdrawal rate of between 2,000 to 4,000 gpm. Due to the much smaller volume of water required to fill and test the Northern and Western Pipelines, water would be withdrawn at a rate of approximately 2,000 gpm over a period of several hours. If water is appropriated from the Taunton River to hydrostatically test the LNG storage tank, Weaver's Cove Energy would attach a temporary 12- to 14-inch-diameter pipe to the newly constructed pier. The intake pipe would be set at a depth of 5 feet below MLLW and would be fitted with a fine mesh screen to minimize potential entrainment and impingement of aquatic organisms. If water is appropriated from the Taunton River, Weaver's Cove Energy estimates that the appropriation rate would need to be increased by approximately 3,000 gpm (i.e., a withdrawal rate of between 5,000 to 7,000 gpm) to reduce the residence time in the LNG tank and the potential for microbiologically influenced corrosion, a condition that could lead to the corrosion of the tanks and piping from the presence and interaction of bacteria, fungi, and algae, if the water was not treated.

Based on these sources and withdrawal rates, the hydrostatic test water would not require pre-treatment and no chemical additives (e.g., biocides or neutralizing agents) would be mixed with the water during the test or prior to discharge. After the hydrostatic testing is completed, Weaver's Cove Energy is proposing to discharge the test water directly into the Taunton River over a period of several days. The water would be filtered prior to discharge and would be returned at a rate and location that would minimize bottom disturbance and potential impacts on aquatic resources. The discharge of hydrostatic test water would be conducted in accordance with the FERC Procedures and the NPDES permit(s) issued by the DEP and/or EPA. The discharge of water would also be controlled, as necessary, to prevent erosion or scouring of the banks or bed of the river. Weaver's Cove Energy would coordinate with the City of Fall River to ensure that water requirements for hydrostatic testing from municipal sources would not impact public water availability.

4.4 WETLANDS

Regulatory Permits

Wetlands in the project area are regulated at the federal, state, and local level. As discussed in section 4.3.2, 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. In Massachusetts, wetlands are also regulated at the state level by the DEP and the local level by the Conservation Commissions of each city and town. The DEP has authority under G.L.c. 21 and 314 CMR 9.00 to issue, condition, or deny a section 401 Water Quality Certification for the discharge of dredged or fill material, dredging, and dredge material disposal in waters of the United States within the Commonwealth. In addition to the section 401 Water Quality Certification program, wetlands in Massachusetts are also regulated under the WPA (G.L.c. 131 § 40). This law states that "no person shall remove, fill, dredge, or alter the bank riverfront area, fresh water wetland, coastal wetland, beach, dune, flat, marsh, meadow or swamp bordering on the ocean or any estuary, creek river, stream, pond, or lake, or any land under said waters or any land subject to tidal action, coastal storm flowage, or flooding without filing written notice of his intentions with the Conservation Commission or its authorized representative, including such plans as may be necessary to describe such proposed activity and its effect on the environment, and without receiving and complying with an order of conditions."

Construction within wetlands would require compliance, at a minimum, with the COE's section 404 and DEP's section 401 permit conditions. In order for the COE to determine whether practicable alternatives have been taken, Weaver's Cove Energy is required to avoid wetland impacts to the maximum extent possible. Weaver's Cove Energy must also demonstrate that it has taken appropriate and practicable steps to minimize wetland impacts in compliance with the COE's section 404(b)1 guidelines that restrict discharges of dredged or fill material where a less environmentally damaging alternative exists. When unavoidable wetland impacts are proposed, the COE and the DEP would require that all practicable actions be taken to mitigate those impacts. We believe this is consistent with the CEQ's Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (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.

Wetlands Resources at or Near the LNG Terminal Site

Weaver's Cove Energy conducted wetland delineations at the proposed LNG terminal site using the methods specified in the *1987 COE Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the DEP's *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act* (DEP, 1995). Both the COE and DEP methodologies require the identification of wetlands based on the presence of three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology.

Vegetated Wetlands on the LNG Terminal Site

A total of 4.64 acres of vegetated wetlands, comprising seven palustrine and estuarine wetland areas, were delineated within the boundaries of the LNG terminal site. Palustrine wetlands are defined as nontidal wetlands dominated by trees, shrubs, and emergent vegetation. Estuarine wetlands consist of deepwater tidal habitats and adjacent tidal wetlands that are typically semi-enclosed by land but have access to the ocean and are periodically diluted by freshwater runoff from land. Table 4.4-1 identifies the location, unique wetland identifier, Cowardin classification, size, and impact area on each wetland at the LNG terminal site. The location of each wetland on the LNG terminal site is shown on figure 4.4-1. Vegetated wetland areas permanently affected by the proposed facilities are shown on figure 4.4-2. A description of vegetation types in these wetlands is provided in section 4.5.

TABLE 4.4-1

Vegetated Wetlands Located on the LNG Terminal Site

Location/Wetland Identification	Wetland Classification a/	Size (acres)	Construction and Operation Impact Area (acres)
Northern Parcel			
Flag Series 2 b/	PEM	0.3	0.3
Flag Series 3 b/	PEM/PSS	1.6	1.6
Subtotal		1.9	1.9
Southern Parcel c/			
Flag Series 1	PEM/E2EM	2.3	0.0
Flag Series 4	PEM/E2EM	0.4	0.0
Salt Marsh A	E2EM	0.03	0.03
Salt Marsh B	E2EM	0.01	0.01
Salt Marsh C	E2EM	< 0.01	< 0.01
Subtotal		2.74	0.04
Project Total		4.64	1.94

a/ Cowardin Classification System:
PEM Palustrine Emergent
PSS Palustrine Scrub-shrub
E2EM Estuarine Intertidal Emergent

b/ The COE has determined that these wetlands are isolated wetlands and are not subject to the COE's jurisdiction. However, these wetlands are under the FERC's jurisdiction and would be subject to the mitigation measures contained in the FERC's Procedures.

c/ PEM and E2EM wetlands located on the southern parcel would be regulated under the Massachusetts Wetlands Protection Act as Bordering Vegetated Wetland and Salt Marsh, respectively.

Intertidal and Subtidal Habitats Bordering the LNG Terminal Site

In addition to the vegetated wetlands described above, the project would also affect intertidal and subtidal areas. The most common intertidal habitats bordering the terminal site are beaches, consisting of coarse sands; rocky shoreline, consisting of naturally rocky areas; and structured shorelines such as rip-rap, sheet pile, and bulkhead. Mudflats, which consist of finer grain material than beaches, are also present along a portion of the shoreline of the terminal site. Subtidal areas occupy the permanently flooded areas seaward of the intertidal habitats. The proposed shoreline modifications (sheet pile, rip rap, and fill, and the pile-supported ship unloading facility) would permanently fill 0.94 acre of intertidal habitat and 0.19 acre of subtidal habitat. Another 0.23 acre of intertidal habitat and about 191 acres of subtidal habitat would be impacted by the proposed dredging for the construction access channel, turning basin, and federal navigation channel.[7]

[7] Acreage of permanently filled intertidal and subtidal habitats was derived from Weaver's Cove Energy's COE application.

Insert figure

4.4-1 Field-Delineated Wetlands and Other State Wetland Resource Areas

Insert figure

4.4-2 Vegetated Wetland Areas Affected by the Proposed LNG Terminal

Other State Wetland Resource Areas at or Near the LNG Terminal Site

In addition to the vegetated wetlands and intertidal and subtidal habitats described above, the following state-designated wetland resource areas located on the southern parcel are regulated under 310 CMR 10 of Massachusetts' WPA:

- designated port area (DPA);
- coastal beach (including tidal flats);
- coastal dune;
- coastal bank;
- land containing shellfish;
- 25-foot riverfront area;
- land under the ocean;
- land subject to coastal storm flowage; and
- banks of or land under the ocean, ponds, streams, rivers, lakes, or creeks that underlie an anadromous/catadromous fish run.

The locations of these resource areas in the vicinity of the LNG terminal site are shown on figure 4.4-1. The boundaries of the resources are not necessarily mutually exclusive from each other or from the subtidal and intertidal habitats described above. In many cases the boundaries overlap. Each of these state wetland resource areas is discussed below.

Designated Port Area - There are currently 11 DPAs in Massachusetts, which were established to promote marine industrial development in port areas with key industrial attributes, such as deepwater channels, established rail and transportation links, and public utility services conducive to industry. The Fall River/Mount Hope Bay DPA encompasses the federal navigation channel, existing turning basin, and about 47 acres of the land-based portion of the proposed LNG terminal site.

Coastal Beach (including Tidal Flats) - Coastal beach is defined in the WPA regulations (310 CMR 10.27) as "unconsolidated sediment subject to wave, tidal and coastal storm action that forms the gently sloping shore of a body of salt water and includes tidal flats. Coastal beaches extend from the mean low water line landward to the dune line, bank line or the seaward edge of an existing man-made structure." Coastal beaches include areas designated as tidal flats, which are situated in intertidal areas (between mean high water and mean low water) with a gradual slope composed of coarse-grained marine sediments.

An area of coastal beach, including tidal flats, is located in the embayment behind the existing pier adjacent to the City of Fall River combined sewer outfall location. Weaver's Cove Energy has indicated that, including salt marsh, about 1.1 acres of coastal beach area would be permanently filled as a result of the proposed shoreline modifications and fill for the LNG terminal.

Coastal Dune – Coastal Dune is defined under the WPA regulations (310 CMR 10.28) as any natural hill, mound, or ridge of sediment landward of a coastal beach deposited by wind action or storm overwash. Coastal dunes can also include artificially deposited sediment that functions as storm damage prevention or flood control.

Coastal dune habitat is located on the northern end of the southern parcel. Weaver's Cove Energy has modified its proposed shoreline stabilization measures in this area to avoid impacting the coastal dune. While no permanent impacts on the coastal dune are anticipated, installation of the Western Pipeline across the Taunton River would temporarily affect approximately 0.05 acre of the dune.

Coastal Bank - Coastal bank is defined under the WPA regulations (310 CMR 10.30) as "the seaward face or side of any elevated landform, other than a coastal dune, which lies at the landward edge of a coastal beach, land subject to tidal action, or other wetland." A particular coastal bank may serve both as a sediment source and as a vertical buffer to storm waters, or it may serve only one role.

We estimate that approximately 3,935 feet of shoreline along the proposed LNG terminal site would be classified as coastal bank. This coastal bank currently consists primarily of rip rap and/or earthen berms. Development of the facility and the proposed shoreline modifications would alter the location of the coastal bank but would not appreciably change its length.

Land Containing Shellfish - Land containing shellfish is defined under the WPA regulations (310 CMR 10.34) as "land under the ocean, tidal flats, rocky intertidal shores, salt marshes and land under salt ponds when any such land contains shellfish."

The proposed dredging and the construction of the ship unloading facility would occur within areas designated as land containing shellfish. Maintenance and improvement dredging would not preclude the reestablishment of shellfish, but the filling associated with shoreline stabilization and the ship unloading facility would permanently impact about 0.19 acre[8] of land containing shellfish.

25-Foot Riverfront Area - Riverfront area is defined in the WPA Regulations (310 CMR 10.58) as "the area of land between a river's mean annual high water line and a parallel line 200 feet away measured horizontally outward from and parallel to the river except that the parallel line is located 25-feet away in Chelsea, Everett, Fall River...." The riverfront area may include or overlap other resource areas or their buffer zones. About 1.4 acres of the proposed LNG terminal site are designated as riverfront area. The proposed site development would not appreciably alter the size of the riverfront area but could alter the elevation of some riverfront areas.

Land Under the Ocean - Land under the ocean is defined in the WPA regulations (310 CMR 10.25) as "land extending from the mean low water line seaward to the boundary of the municipality's jurisdiction, including land under estuaries. The nearshore LUO [land under ocean] designation includes areas closest to the shore that do not exceed a depth of 80 feet at MLW."

The proposed dredging and the construction of the ship unloading facility and Western Pipeline crossing would be located within areas designated as land under the ocean. About 158 acres of land under the ocean would be directly affected by construction of the proposed project. The proposed shoreline stabilization measures and ship unloading facility would permanently impact about 0.19 acre[9] of land under the ocean.

Land Subject to Coastal Storm Flowage - The DEP uses the 100-year coastal flooding event as defined and mapped on Flood Insurance Rate Maps prepared by the Federal Emergency Management Agency, National Flood Insurance Program, as the maximum flood elevation associated with land subject to coastal storm flowage, unless recorded storm data reveal a higher flood elevation (which is the storm of

[8] Acreage of land containing shellfish was assumed to be equal to the amount of subtidal habitat impacts reported in Weaver's Cove Energy's COE application.

[9] Acreage of land under the ocean was assumed to be equal to the amount of subtidal habitat impacts reported in Weaver's Cove Energy's COE application.

record). About 14.1 acres of the proposed LNG terminal site meet the criteria for land subject to coastal storm flowage. This land would be permanently affected by site development activities to raise the site above the elevation of a 100-year coastal flooding event.

Banks of or Land Under the Ocean, Ponds, Streams, Rivers, Lakes, or Creeks that Underlie an Anadromous/Catadromous Fish Run (Fish Run) - Fish Run area is defined under the WPA Regulations (310 CMR 10.35) as "that area within estuaries, ponds, streams, creeks, rivers, lakes or coastal waters, which is a spawning or feeding ground or passageway for anadromous or catadromous fish and which is identified by DMF or has been mapped on the Coastal Atlas of the Coastal Zone Management Program."

The dredging activities and the construction of the ship unloading facility and Western Pipeline crossing would occur within an area of the Taunton River designated as Fish Run. Construction of the proposed project would affect about 158 acres of area designated as Fish Run. The proposed shoreline stabilization measures and ship unloading facility would result in the permanent loss of about 1.1 acres[10] of Fish Run area.

Summary of Wetland Impacts at or Near the LNG Terminal Site

Shoreline stabilization and construction of the trestles for the ship unloading facility would result in the filling of about 0.04 acre of salt marsh,[11] 0.94 acre of intertidal habitat and 0.19 acre of subtidal habitat. These activities would also impact several other state-designated wetland resource areas. Dredging would impact another 191 acres of subtidal habitat and about 0.23 acre of intertidal habitat (see sections 4.3.2 and 4.6.2 for a discussion of dredging impacts on surface waters and aquatic resources, respectively). Construction activities would also alter the location of the coastal bank and reduce the area of land subject to coastal storm flowage. The filling of these resource areas would reduce the amount of habitat available to aquatic resources, decrease the amount of sediment available for the replenishment of coastal beaches, and alter sediment transport processes. However, the sheet pile used to armor the shoreline would also provide certain benefits, such as protecting the upland areas from storm damage and flooding.

The placement of stabilized dredged material for site fill and construction of the administrative building, parking lot, and stormwater management system on the northern parcel would affect 1.9 acres of palustrine emergent/scrub-shrub wetlands identified as Wetland Flag Series 2 (0.3 acre) and Wetland Flag Series 3 (1.6 acres). In the draft EIS, we requested that Weaver's Cove Energy provide a revised site plan for the facilities on the northern parcel to avoid impacting these wetlands or provide an analysis demonstrating that alternative layouts to avoid wetland impacts are not practicable or feasible. Based on current plans, Weaver's Cove Energy indicates that avoiding the two wetlands would not be practicable due to the space required to place dredged material, stage equipment, store material, and construct the administrative facilities and stormwater management system. While certain activities could be moved further north to minimize impacts on these two wetlands, doing so would require additional tree clearing along the perimeter of the northern parcel and would decrease the separation distance of project activities from residences located adjacent to the northern boundary of the site. The COE has determined that these two wetlands are not waters of the United States and, therefore, not subject to regulation under section 404 of the CWA. In addition, Weaver's Cove Energy contends that these areas are also not regulated as wetland resources under the WPA because they are isolated (i.e., they are not located adjacent to a stream, creek, pond, or lake) and do not meet the definition of isolated land subject to flooding. Even though Wetland Flag Series 2 and 3 may not be jurisdictional wetlands, Weaver's Cove Energy indicated in its

[10] Acreage of fish run was assumed to be equal to the amount of permanent subtidal and intertidal impacts reported in Weaver's Cove Energy's COE application.

[11] We received a comment from the EPA requesting that alternative LNG terminal designs be considered to avoid impacts on these estuarine wetlands. A discussion of alternative terminal layouts that would avoid these wetlands is presented in section 3.4.

Wetland Mitigation Plan (see discussion below and Appendix L) that it would mitigate for impacts on these wetlands.

The EPA expressed particular concern about the filling of the three small salt marshes bordering the southern shore of the southern parcel (see section 3.4 for an evaluation of potential alternative LNG terminal layouts to avoid these salt marsh wetlands). Weaver's Cove Energy conducted a functional assessment of these salt marsh areas using the procedures described in *The Highway Methodology Workbook* (COE, 1993) and *The Highway Methodology Workbook Supplement* (COE, 1999). The assessment evaluated the following functions and values: groundwater recharge/discharge, floodwater alteration, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, wildlife habitat, recreation, education/scientific value, uniqueness/heritage, visual quality aesthetics, and endangered species habitat. The assessment also evaluated whether any of the functions and values of the wetlands could be deemed principal functions and values. To be considered a principal function or value, the function or value must be deemed an important component of the wetland ecosystem and/or considered of special value to society from a local, regional, and/or national perspective. The assessment concluded that these salt marshes do not provide any of these values but do provide groundwater recharge/discharge, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, and wildlife habitat functions. However, due primarily to the small size and disturbed nature of the wetlands as well as the surrounding industrial environment and the location of the wetlands in a DPA, none of these seven functions are principal functions.

The DEP indicated that altering salt marshes is not allowed except where the DEP determines that the salt marshes do not contribute to the protected interests identified in the WPA. Because the salt marshes are located within a DPA, they are presumed significant to the protection of wildlife habitat and prevention of pollution and are likely to be significant to groundwater supply. Weaver's Cove Energy evaluated the salt marshes with respect to these interests and concluded that they do not contribute to these three interests for the following reasons:

- The WPA defines wildlife habitat as those areas, which due to their plant community composition and structure, hydrologic regime or other characteristics, provide important food, shelter, migratory or overwintering areas, or breeding areas for wildlife. The three areas of salt marsh consist of narrow bands of *Spartina alterniflora* growing on a substrate of cobble and rip rap. Because the plant composition and distribution are so limited, narrow, and fragmented, these areas do not provide important food, shelter, or migratory, over-wintering, or breeding areas for wildlife. In addition, due to their location within an existing industrial site, freshwater exchange via groundwater and surface water is limited.

- Prevention of pollution is defined as the prevention or reduction of contamination of surface or groundwater. The characteristics that contribute to the prevention of pollution include the growth, composition, and distribution of salt marsh vegetation; the flow and level of tidal and freshwater; and the presence and depth of peat. Salt marsh vegetation and the underlying substrate can be effective at removing sediments and pollutants from the water. However, the three areas of salt marsh are underlain by cobbles and rip rap and are relatively small in size, and thus do not play a significant role in preventing pollution.

- Groundwater supply is defined as the water below the earth's surface in the zone of saturation. The presence and depth of peat is considered a characteristic necessary for the protection of groundwater. As described previously, the salt marshes are underlain by

primarily cobble and rip rap and, as a result, would not be expected to contribute to the protection of groundwater supply.

Wetlands Along the Pipeline Routes

Weaver's Cove Energy conducted wetland delineations along the Northern and Western Pipeline routes where access could be obtained using the methods specified in the *1987 COE Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the DEP's *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act* (DEP, 1995). Where field access was denied, wetlands were identified through a review of MassGIS data, National Wetland Inventory (NWI) maps, and aerial photography. Table 4.4-2 identifies the location (by milepost), wetland identifier, wetland classification, crossing length, and acreage of each wetland that would be affected by construction and operation of the Northern and Western Pipelines.

Based on field delineations and other available wetland resource data, construction of the Northern Pipeline would result in the temporary alteration of about 2.14 acres of scrub-shrub and emergent wetland vegetation. Construction along the Western Pipeline would result in temporary alteration of about 0.68 acre of mostly scrub-shrub and emergent wetland vegetation. Construction of the two pipelines would affect a total of about 0.1 acre of forested wetland. Clearing, trenching, and other activities in wetlands could also affect wetland hydrology and water quality. Operating heavy equipment could compact wetland soils, create ruts, and result in increased sedimentation and turbidity. In addition, the pipeline trench could act as a conduit for subsurface water flow which could impact wetland hydrology. These effects would be greatest during and immediately following construction. The impact on emergent wetlands would be relatively brief, and herbaceous vegetation would likely regenerate within one or two growing seasons following restoration of the right-of-way. The impact on forested wetlands would be of longer duration due to the longer period of time required for the reestablishment of woody vegetation.

Following construction, Weaver's Cove Energy would maintain a portion of the vegetation on the permanent right-of-way to operate the pipeline. The Procedures allow Weaver's Cove Energy to maintain a 10-foot-wide herbaceous strip centered over the pipeline and periodically remove from the right-of-way trees greater than 15 feet in height that are growing within 15 feet of the pipeline centerline. These practices would result in the permanent alteration of about 0.32 acre of scrub-shrub wetland vegetation along the Northern Pipeline and the permanent alteration about 0.15 acre of wetland vegetation, less than a third of which consists of forested wetland, along the Western Pipeline.

In addition to wetlands identified within the proposed construction right-of-way, Weaver's Cove Energy has proposed to use an existing access road located at the terminus of the Western Pipeline route. This access road currently crosses portions of three wetlands identified in Weaver's Cove Energy's COE permit application (i.e., Wetlands W3, W8, and W9). The FERC Procedures currently allow the use of existing access roads that cross wetlands, provided that appropriate erosion and sedimentation controls are installed and maintained. However, Weaver's Cove Energy could not make improvements to any existing access road that would impact a wetland without first requesting and receiving FERC's approval for a site-specific variance from the Procedures.

TABLE 4.4-2

Wetland Crossings Along the Pipeline Routes

Beginning Milepost	Wetland Identifier	Wetland Classification a/	Wetland Crossing Length (feet)	Acreage Affected by Construction (acres) b/	Acreage Affected by Operation (acres)
Northern Pipeline					
0.3	Flag Series 3	PEM/PSS	265	0.00 c/	0.00
0.4	N4 d/	E2EM/E2BB d/	0	0,.00	0.00
0.8	N11 e/	PEM	0	0.00	0.00
1.2	N5/N6	PEM/PSS/POW	450	0.69	0.10
1.5	N7	PSS	85	0.09	0.02
1.6	N8 f/	PSS	0	0.00	0.00
2.3	N9 f/	PSS	0	0.00	0.00
2.3	N9A g/	PSS	27	0.05	< 0.01
2.4	N12 h/	PSS	12	0.02	<0.01
2.8	N13	PSS	23	0.06	<0.01
3.2	N2/N14	PSS	733	1.23	0.17
Subtotal			1,595	2.14	0.32
Western Pipeline					
0.0	W10	E2BB	6	0.01	<0.01
0.5	W11 d/	E2EM/E2BB	14	0.03	<0.01
1.2	W5/W6/W7	PSS/PEM	249	0.33	0.06
1.5	W4	PSS/PEM	140	0.16	0.03
1.9	W1A	PSS/PEM	0	0.05	0.00
2.0	W1	PSS/PEM	0	0.00	0.00
2.4	W2	PFO	62	0.10	0.04
NA i/	W8	PEM	0	0.00	0.00
NA i/	W3 j/	PFO/PSS/PEM	0	0.00	0.00
NA i/	W9	PSS/PEM	0	0.00	0.00
Subtotal			471	0.68	0.15
Total			2,066	2.82	0.47

a/ Cowardin Classification System:
- PEM Palustrine Emergent
- PSS Palustrine Scrub-shrub
- PFO Palustrine Forested
- E2EM Estuarine Intertidal Emergent

b/ Acreage based on GIS calculations of the intersection of the wetland polygon with the proposed construction right-of-way. A 75-foot-wide construction right-of-way would generally be used in wetlands.

c/ The Northern Parcel Variation, which was adopted by Weaver's Cove Energy after publication of the draft EIS, crosses this wetland. Impacts on this wetland are not included in this table because they have been accounted for in the summary of wetland impacts on the LNG terminal site (see table 4.4-1).

d/ Weaver's Cove Energy adopted the Northern Parcel Variation after the draft EIS to increase the distance between the pipeline and this salt marsh, which borders the Taunton River

e/ Weaver's Cove Energy adopted the River Street Variation after the draft EIS, which avoids this wetland.

f/ Weaver's Cove Energy adopted the Golf Course Variation after the draft EIS, which avoids this wetlands.

g/ The Golf Course Variation, which was adopted by Weaver's Cove Energy after publication of the draft EIS, crosses this wetland but reduces overall wetland impacts by 0.11 acre.

h/ Weaver's Cove Energy was unable to gain access the properties containing these wetland areas and, therefore, could not verify the wetland boundaries. In accordance with the Procedures, Weaver's Cove Energy must field delineate the boundaries of these wetlands prior to construction.

i/ These wetlands are adjacent to an existing access road that Weaver's Cove Energy proposes to use to construct and operate the meter and regulation station at the terminus of the Western Pipeline.

j/ Wetland W3 is hydrologically connected to Wetland W2 but was delineated separately.

Measures to Avoid, Minimize, Rectify, Reduce, or Compensate for Wetland Impacts

During the development of the proposed project, Weaver's Cove Energy examined alternative terminal locations that would avoid or minimize wetland impacts but determined that none of these sites were practicable or feasible. Weaver's Cove Energy then took steps to avoid wetland impacts during the development of the LNG terminal design and the selection of the pipeline routes. For example, the LNG terminal facilities and dredge disposal areas were configured to avoid several wetlands bordering the Taunton River on the southern parcel of the terminal site. In addition, Weaver's Cove Energy revised shoreline stabilization measures on the north end of the southern parcel to avoid permanently impacting an area of coastal dune. Weaver's Cove Energy originally proposed to install a rip rap revetment that would have permanently impacted 0.25 acre of coastal dune but now proposes to install a sheetpile bulkhead on the landward side of the dune in lieu of the rip rap revetment. In its comments on the draft EIS, Weaver's Cove Energy also agreed to adopt our recommended Northern Parcel Variation for the Northern Pipeline (see section 3.5.3), which would result in the realignment of a portion of the Northern Pipeline route to increase the distance between the construction right-of-way and the Taunton River. This route variation would avoid indirect impacts on the wetlands bordering the river.

Weaver's Cove Energy would construct and operate the project in accordance with the FERC Procedures, which specify mitigation to be implemented during the construction of pipelines and aboveground facilities in or adjacent to wetlands and waterbodies to minimize impacts or restore wetlands to pre-construction conditions. Specific measures of the Procedures relevant to wetlands include the following:

- limiting the construction equipment operating in the wetland to that necessary to complete construction;
- facilitating revegetation by leaving existing root systems in place except over the trench and where safety considerations require their removal;
- segregating topsoil from the trench in unsaturated wetland soils;
- installing and maintaining sediment barriers across the entire construction right-of-way and along the edges of the right-of-way as necessary to prevent sediment from entering wetlands;
- installing trench breakers as necessary to prevent the draining of wetlands; and
- limiting 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 in height that are located within 15 feet of the pipeline centerline.

In addition to these measures, OCZM recommended that Weaver's Cove Energy be required to avoid construction during seasonally wet periods. We do not believe such a restriction is needed, particularly because, as discussed in section 4.2.1, the soils that would be disturbed by pipeline construction do not have soil textures or drainage characteristics that would make them highly susceptible to compaction. Additionally, the FERC Procedures already contain measures to minimize the impact of construction on saturated wetland soils, including operating equipment on construction mats or using low ground weight equipment in saturated wetlands to minimize the rutting and compaction of wetland soils.

Weaver's Cove Energy developed and would implement a Wetland Mitigation Plan to mitigate for the filling of 0.04 acre of salt marsh on the southern parcel and the 1.9 acres of permanent impacts on

the freshwater wetlands (i.e., palustrine emergent/scrub-shrub wetlands) on the northern parcel. The Plan was submitted to the COE and other agencies on March 4, 2005. The Wetland Mitigation Plan is attached in Appendix L and includes the following mitigative measures:

- About 0.74 acre of salt marsh would be created and restored within the limits of Wetland Flag Series 1 (see figure 4.4-3), including the restoration of about 0.29 acre of degraded salt marsh dominated by common reed (*Phragmites australis*) and the creation of about 0.35 acre of salt marsh in early successional uplands. About 0.13 acre of tidal creek would be constructed in the restored and created salt marsh to connect this area with the Taunton River. The mitigation area would be excavated to a lower elevation, covered with 100 percent biodegradable erosion control blanket, and planted with *Spartina alterniflora* plugs.

- About 0.18 acre of freshwater wetland would be created in an upland area adjacent to Wetland Flag Series 4 (see figure 4.4-3). The mitigation area would be excavated to a lower elevation and then planted with wetland shrubs and tree saplings to create a palustrine scrub-shrub wetland.

- Both wetland mitigation areas would be maintained and monitored in accordance with procedures specified in the Plan.

Because this Wetland Mitigation Plan does not include mitigation for the loss of intertidal and subtidal habitats (see section 4.6.2) and the COE has not approved this Wetland Mitigation Plan, **we recommend that:**

- **Weaver's Cove Energy consult with the COE and NOAA Fisheries regarding mitigation of wetlands as well as intertidal and subtidal habitats and file with the Secretary the results of these consultations and the COE-approved Wetland Mitigation Plan <u>prior to construction</u>.**

Insert Figure

4.4-3 Proposed Wetland Mitigation Areas

4.5 VEGETATION

LNG Terminal

The proposed LNG terminal site includes a 55-acre southern parcel and an 18-acre northern parcel. The vast majority of the southern parcel consists of industrial/commercial land which is generally devoid of vegetation. The vegetated areas of the southern parcel include both terrestrial and aquatic types. The terrestrial vegetation includes a small area of forest land bordered by open land at the northern end of the parcel and isolated pockets of open land along the southern boundary of the parcel adjacent to the Taunton River. The aquatic vegetation on the southern parcel consists of a variety of intertidal communities including coastal beaches and salt marsh. In contrast to the southern parcel, most of the northern parcel is vegetated with forest land and open land vegetation.

Forest land on the LNG terminal site covers about 3.0 acres of the southern parcel and 8.7 acres of the northern parcel. The forest land on the southern parcel is dominated by oak and maple trees with an understory of shrubs such as smooth sumac and honey locust. The forest land on the northern parcel is dominated by oak, maple, black cherry, and aspen trees. Herbs and grasses are common beneath the trees in both areas.

Open lands (including non-forested wetlands) cover about 3.7 acres of the southern parcel and 5.8 acres of the northern parcel. The vegetated open land on the southern parcel includes terrestrial upland dominated by multiflora rose, grasses, and woody saplings on the north end; various intertidal aquatic communities vegetated by beach rose, seaside goldenrod, ragweed, and a variety of algal species along the edge of the river; and five wetlands. Four of these five wetlands are located along the southern edge of the parcel. These include: 1) three small isolated salt marsh areas (Salt Marshes A, B, and C), which are dominated by cord grass; and 2) a larger wetland area (Wetland Flag Series 1) consisting of a fringe of salt marsh dominated by cord grass along the edge of the river and a scrub-shrub wetland dominated by common reed, buckthorn, and willow further up the bank. The fifth wetland (Wetland Flag Series 4) on the southern parcel is located along the edge of the river at the north end of the parcel. This wetland consists of a fringe of salt marsh dominated by cord grass along the edge of the river and a mixture of woody and herbaceous vegetation including common reed, black grass, switch grass, honey locust, and swamp dock further up the bank.

The open land located on the northern parcel includes terrestrial uplands covered by multiflora rose, woody saplings, grasses, and forbs, and two wetlands (Wetland Flag Series 2 and 3). The smaller of these two wetlands (Wetland Flag Series 2) is dominated by common reed; the other (Wetland Flag Series 3) is dominated by soft rush, tussock sedge, wool-grass, tall goldenrod, poison ivy, and a variety of shrub species.

Construction of the proposed LNG terminal would permanently disturb most of the existing vegetation on the LNG terminal site. Table 4.5-1 summarizes the vegetation types that would be affected by construction of the LNG terminal facilities. A more detailed discussion of wetland and intertidal community impacts and a map showing the locations of the wetlands (figure 4.4-1) are included in section 4.4.

TABLE 4.5-1

Acreage of Vegetative Communities Affected by Construction of the Proposed LNG Terminal

Facility Component	Open Land	Forest Land
Northern Parcel	4.1	7.7
Southern Parcel	1.0	3.0
Total	5.1	10.7

Following construction, portions of the southern and northern parcels that are not covered by buildings, roads, gravel, or other hard surfaces would be restored according to a site-specific landscaping plan. This plan would include grass and ornamental shrub plantings to minimize visual impacts and to enhance the aesthetic appearance of the site.

Pipeline Facilities

The vegetation communities crossed by the Northern and Western Pipeline routes primarily include forest lands and a mix of open fields and shrub lands.

Upland forest comprises about 1.2 acres of the land that would be cleared for the Northern Pipeline facilities and 4.2 acres of the land that would be cleared for the Western Pipeline facilities. The forest land along the Northern Pipeline route is dominated by black locust, white ash, birch, and maple species with an understory of witch hazel, alternate-leaved dogwood, and mountain laurel. The forest land along the Western Pipeline route consists of red oak, American beech, red maple, and white pine with an understory of witch hazel, sweet pepperbush, black huckleberry, lowbush blueberry, ferns, and princess pine.

Upland shrub lands and open areas, including upland fields, existing utility rights-of-ways, and landscaped residential areas are located along the proposed pipeline routes. About 39.6 acres of upland shrub lands and 6.6 acres of open upland areas would be affected by construction of the Northern and Western Pipelines. A pipe storage yard, approximately 4 acres in size, is proposed near the Northern Pipeline interconnect in an open area characterized by an upland field with scattered shrubs. Vegetation typical of these shrub lands and open areas includes gray birch, red cedar, common juniper, asters, goldenrod, poison ivy, bracken fern, multiflora rose, and various forbs and woody saplings.

The majority of the wetlands crossed by the Northern and Western Pipeline routes are narrow riparian areas bordering streams. Wetland W2, the only forested wetland that would be crossed, is dominated by red maple and tupelo with an understory of highbush blueberry and cinnamon fern. Dominant woody vegetation in the scrub-shrub wetlands includes red maple, highbush blueberry, willows, winterberry holly, silky dogwood, sweet pepperbush, arrow-wood, multiflora rose, and Asiatic bittersweet. Dominant herbaceous species in the wetlands along the pipeline routes include common reed, cattail, sedges, and rushes. Cordgrass is the dominant vegetation in the salt marshes bordering the Taunton River.

Table 4.5-2 summarizes the temporary and permanent impacts on each vegetation community as the result of pipeline construction and operations.

During construction, the existing vegetation would be temporarily removed from within the construction rights-of-way, pipe storage yard, and other necessary workspaces to facilitate the installation of the pipelines. Trees and other vegetation on the meter and regulation station sites would be permanently removed. The impact of clearing and the amount of time required for complete recovery of vegetation to pre-disturbance levels would depend on the size and age of the pre-existing vegetation. In general, impacts would be greatest in forest lands because they are more structurally complex than other vegetation types and take longer (perhaps 30 to 40 years) than other vegetation types to become reestablished to preconstruction conditions. In addition, as discussed below, trees would be prevented from growing on the permanent rights-of-way by pipeline maintenance activities.

TABLE 4.5-2

Acreage of Vegetative Communities Affected by Construction of the Proposed Pipeline Facilities

Facility	Upland Forest Lands		Upland Shrub Lands		Wetland a/		Upland Open Field		Landscaped Lawn		Totals	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
Northern Pipeline												
Pipeline Right-of-way	1.2	0.8	23.3	16.8	2.1	0.3	1.1	0.8	2.2	1.4	29.9	20.1
Pipe Storage Yard	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	4.0	0.0
Aboveground Facilities	0.0	0.0	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Northern Pipeline Subtotal	1.2	0.8	24.2	17.7	2.1	0.3	5.1	0.8	2.2	1.4	34.8	21.0
Western Pipeline												
Pipeline Right-of-way	2.5	1.7	15.2	8.0	0.7	0.2	1.5	1.2	0.0	0.0	19.9	11.1
Temporary Extra Workspace	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Aboveground Facilities	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.4
Access Road	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0
Western Pipeline Subtotal	4.2	3.1	15.4	8.0	0.7	0.2	1.5	1.2	0.0	0.0	21.8	12.5
Pipeline Facilities Total	5.4	3.9	39.6	25.7	2.8	0.5	6.6	2.0	2.2	1.4	56.6	33.5

a/ Includes forested, scrub-shrub, and emergent wetlands.
Const. Construction
Oper. Operation
Note: The totals shown in this table may not equal the sum of addends due to rounding.

The loss of vegetation could also have secondary impacts, including forest fragmentation and the loss of wildlife habitat (see section 4.6.1) and the loss of visual screening between residences and existing utility and railroad rights-of-ways (see section 4.8.7.2). Other secondary impacts could include increased erosion and solar radiation, which could dry the soil and stimulate the growth of adjacent vegetation. The removal of trees on the rights-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 rights-of-way. The portions of the construction rights-of-way that are not maintained during pipeline operations (i.e., the temporary right-of-way, extra workspaces, temporary access road, and the pipe storage yard) would be allowed to revert to their previous preconstruction conditions through natural succession or would be restored in accordance with site-specific landscape plans.

Operation and maintenance of the proposed pipeline facilities would have additional effects on vegetation after site clearing and rights-of-way restoration are completed. The pipeline rights-of-way would be maintained in accordance with the FERC Plan and Procedures. These plans only allow annual maintenance of a 10-foot-wide strip centered over the pipeline. Other than that, routine vegetation maintenance across the entire the permanent rights-of-way could 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 centerlines.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Wildlife Resources

Most of the project area is developed and provides limited wildlife habitat. Wildlife species in the project area are typical for the predominantly urban landscape. Remnant habitats in this landscape include forest lands and open lands, including wetlands. Because the project area is a mosaic of these habitat types, the species in the project area are typically habitat generalists.

The forested areas on the LNG terminal site and along the pipeline routes include primarily hardwoods with an understory of grasses, legumes, and herbaceous plants. Wildlife attracted to forested areas include white-tailed deer, raccoon, opossum, gray squirrel, eastern chipmunk, bats, pine vole, wood thrush, summer tanager, red-eyed vireo, blue-gray gnatcatcher, and woodpeckers. Common raptors include barred owl, great-horned owl, and red-shouldered and broad-winged hawks. Characteristic reptiles include the box turtle, garter snake, and timber rattlesnake.

The open land habitat consists primarily of commercial/industrial land on the southern parcel of the proposed LNG terminal site, old fields and wetlands on portions of the southern and northern parcels of the site, and maintained lawns or rights-of-way along the pipeline routes. Typical wildlife attracted to open land habitat include cottontail rabbit, coyote, red fox, raccoon, opossum, common crow, pigeon, European starling, common grackle, field sparrow, Carolina wren, brown-headed cowbird, red-tailed hawks, and many species of rodents. With the exception of the salt marsh and intertidal habitats, the wetlands that would be affected by the project consist primarily of vegetated areas with emergent wetland plants and without standing water during most of the growing season. These types of wetlands typically provide habitat for ducks, geese, herons, shore birds, muskrat, mink, beaver, bullfrog, snapping turtle, painted turtle, and salamanders during times when standing water is present.

The proposed project area also includes the salt marsh, intertidal, and open water habitats of the Taunton River and Mount Hope Bay. Game and commercial finfish and shellfish known to inhabit the river are described in section 4.6.2. Common mammals using the open water or coastal habitats of the river include muskrat, mink, and raccoon. The shoreline habitats associated with the river also support a diverse assemblage of avian species including shorebirds, wading birds, and waterfowl. Osprey use the area and were observed nesting on a utility pole within the LNG terminal site in 2003. Some of these bird species are year-round residents, but most are migratory and spend only a portion of the year in the area.

In addition to the common terrestrial mammal species in the project area, six marine mammal species may occur in Narragansett Bay or Mount Hope Bay. These include the harbor porpoise, harbor seal, gray seal, harp seal, hooded seal, and ring seal. The Marine Mammal Protection Act of 1972 (Amended 1994; MMPA) established a moratorium on taking marine mammals. The MMPA prohibits harassing, hunting, capturing, or killing, or attempting to harass, hunt, capture, or kill marine mammals. The MMPA provides that the moratorium on taking may be waived, however, when the affected species or population stock is within its optimum sustainable population range and will not be disadvantaged by the authorized taking.

The harbor seal is the only MMPA-protected species that may occur regularly within the project area. These seals are found in the waters off of northern North America, Russia, and Asia. In Narragansett Bay, harbor seals are present most frequently from October through April. Individuals may also enter Mount Hope Bay during this period. The major causes of harbor seal mortality can be attributed to human-related incidents, either intentional (e.g., hunting) or by disturbance (e.g., habitat loss) (Ronald et al., 1982).

Wildlife Resources Impacts and Mitigation

Construction and operation of the proposed LNG terminal and pipeline facilities would result in both short-term and permanent alteration of wildlife habitat, directly impacting wildlife through disturbance, displacement, and mortality.

Vegetation clearing would reduce cover, nesting, and foraging habitat for some wildlife; however, because most of the project area is highly developed and fragmented, the area is not likely to support abundant wildlife populations. The forest land at the western end of the Western Pipeline route likely contains the most diverse and abundant terrestrial wildlife populations. Construction and operation of the pipeline in this forest would result in short- and long-term impacts on wildlife habitat.

Of the wildlife species present in the project area, more mobile species would be temporarily displaced from the construction areas to similar adjacent habitats, where available. The developed nature of the project area limits the habitat value both within the construction area of the proposed project and adjacent to the project area. Some wildlife displaced by construction would return to the newly disturbed areas and adjacent, undisturbed habitats soon after completion of construction. Less mobile species, such as small mammals, reptiles, and amphibians, as well as nesting birds located in the construction areas, could be killed or injured by construction activities.

Construction of the LNG terminal and pipelines would require the clearing of trees and other forest vegetation, which would result in a permanent change of forested wildlife habitats to commercial/industrial, herbaceous, and shrub cover types. About 10.7 acres of forest land would be lost as the result of constructing the LNG terminal facilities. Because forested areas at the LNG terminal site are relatively small and isolated from larger forest stands, they are unlikely to support substantial wildlife populations. As such, we do not expect the loss of this forest habitat to have long-term or population level effects on wildlife in the area. Forest habitat within the permanent pipeline rights-of-way (about 3.9 acres) would also be lost and permanently converted to herbaceous and shrub covered habitats. Forest habitat on the temporary construction rights-of-way and extra workspaces for the pipelines (about 1.6 acres) would be allowed to reestablish to preconstruction conditions following construction. However, it could take several years to regenerate tree saplings and many decades to develop mature trees on the restored rights-of-way.

Generally, forest clearing can contribute to fragmentation, which has been shown to have an adverse impact on forest interior species. Due to the small amount of forest land that would be affected by the proposed project and the large amount of forest fragmentation already in the project area, we consider there to be only a small potential for this impact to occur as a result of the project.

Non-forested habitats that would be affected by construction and operation of the proposed facilities include wetlands, open land, and open water. The impact of the proposed project on most of these habitats and associated wildlife species would generally be relatively minor and short-term. Some non-forested habitat would be permanently lost on the LNG terminal site to accommodate buildings, roads, and other facilities, although the majority of the permanently affected area is currently devoid of vegetation and provides only marginal habitat. The temporary disturbance of areas that would not be occupied by buildings, road, or other facilities would not have a significant or permanent impact on wildlife because non-forested habitat would be reestablished as part of the site landscaping plan.

Impacts of the proposed project on birds and mammals using the shoreline and open water habitats of the Taunton River and Mount Hope Bay are expected to be minor and temporary. Although some shoreline habitat, including small areas of salt marsh, would be filled, Weaver's Cove Energy would consult with all applicable resource agencies to develop a plan to mitigate for these impacts. Birds would

be expected to avoid the project area during construction and return after site restoration. The osprey nest on the site, which was occupied in 2003, would be removed while unoccupied, and no longer available for nesting osprey. No other known nesting areas would be disturbed.

Substrate disturbance, especially in nearshore areas, may temporarily reduce the availability of prey for many bird species. Weaver's Cove Energy's suspended sediment modeling indicated that sediments would return to a quasi-steady state after about four tide cycles or two days. Following sediment settling, we expect that the affected areas would eventually be recolonized and return to a preconstruction state. Also, although an increase in localized turbidity would occur because of dredging in the Taunton River and Mount Hope Bay, this increase is not expected to have adverse impacts on marine mammals as these species have the ability to disperse and vacate areas undergoing disturbance.

Long-term impacts on wildlife resources along the pipeline routes would be minimized by Weaver's Cove Energy's adherence to the FERC Plan and Procedures. As discussed in section 4.5, these plans only allow annual maintenance of a 10-foot-wide strip centered over the pipeline. Other than that, routine vegetation maintenance across the entire the permanent right-of-way could 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, the FERC Plan and Procedures specify that routine vegetation maintenance should be conducted between August 1 and April 15, which is outside of the typical nesting season for most bird species.

4.6.2 Aquatic Resources

Taunton River and Mount Hope Bay

The Taunton River and Mount Hope Bay provide habitat for a diverse community of shellfish and finfish. These species either provide forage for other predatory fish or are directly sought by recreational and commercial fishermen in the project area.

Shellfish - The Massachusetts DMF has characterized the area of the Taunton River that would be affected by the project as a "Significant Shellfish Habitat" which provides productive habitat for quahogs, American oysters, and soft shelled clams (DMF, 2003).

Northern quahog live in waters up to 15 meters deep and are distributed in deeper subtidal habitat throughout the lower Taunton River as well as near the mouth of the Taunton River in Mount Hope Bay. DMF (1997) surveys show quahog occurring in the Taunton River north and south of the proposed LNG terminal site. Since 1997, the DMF has contracted with shell fishermen to harvest quahogs from biologically contaminated areas in Mount Hope Bay and the Taunton River. Harvested quahogs are then offered to other coastal towns for relocation, or "relay," to clean sites where they remain for a suitable depuration period before they are harvested for consumption. Although not comprising a significant portion of the relay harvest, quahogs are consistently harvested from the channel edges and shoal areas in the project area. Quahogs are generally not harvested from the main navigation channel in the Taunton River because the fine-grain mud in the channel is not suitable quahog habitat.

Soft-shelled clam beds are present in limited areas of the Taunton River near the project area. These beds are generally located in shallow intertidal and nearshore subtidal flats along the shore of the river. The closest soft-shelled clam habitat is in the small cove south of the LNG terminal site.

Oyster shells were found near the proposed terminal site during recent surveys (Vine Associates, 2002 unpublished), but viable eastern oyster populations are restricted to areas located approximately 1

mile upstream of the site. Higher turbidity and salinity levels limit the suitability of the area near the terminal site for oysters.

Blue crabs, lady crabs, green crabs, and spider crabs have also been identified near the LNG terminal site (Vine Associates, 2002 unpublished). Blue crab and lady crab are harvested as a recreational fishery in the project area while green crab is an exotic invasive species from Europe that has established populations throughout the coastal waters in North America.

Finfish - Numerous fish species use the various habitats found within the river, turning basin, and Mount Hope Bay at different times throughout their life cycles. Many of the species that use estuarine wetlands along the river system begin their life cycles in the open water of the Atlantic Ocean as demersal or pelagic eggs and/or larvae. Larvae and post-larvae are then transported by wave currents into the estuaries where they occupy muddy bottoms or find food and protection from predators amongst the vegetation of the brackish marshes. The Taunton River also serves as a migratory pathway for anadromous species such as alewife, rainbow smelt, striped bass, and blueback herring. NOAA Fisheries (2003) also reported that the catadromous American eel grows to maturity within the Taunton River before migrating to a marine environment to spawn.

Marine Research, Inc. (MRI) conducts annual surveys in Mount Hope Bay and the lower Taunton River to determine finfish species and life stage occurrence in the area as required under permit stipulations for the Brayton Point Power Plant. The eggs and/or larvae of several fish species have been collected in Mount Hope Bay and the Taunton River during these surveys, including winter flounder, windowpane flounder, scup, Atlantic silverside, bay anchovy, tautog, cunner, weakfish, menhaden, and butterfish.

Based on 1998 survey data (MRI, 1999), 31 finfish species were recorded in the standard otter trawl. Winter flounder, windowpane flounder, bay anchovy, butterfish, and alewife comprised the five most commonly collected species. Thirty-nine species were collected using the Wilcox trawl with bay anchovy, winter flounder, butterfish, scup, and alewife as the five most commonly collected species. The nearshore seine sampling effort collected 19 species. Atlantic silverside was the most commonly collected of the 19 species by a wide margin, but striped killifish, mummichogs, and bluefish were also relatively abundant (MRI, 1999).

Other Waterbodies

The other 10 waterbodies that would be crossed by the proposed pipelines are narrow freshwater streams. Although all of these streams have the potential to contain warmwater fisheries (i.e., waters unsuitable for the propagation of trout and not capable of supporting a stocked trout population), the majority are intermittent and thus are incapable of supporting a year round fishery and none support commercial fisheries. Fish species potentially present in these waterbodies include largemouth bass, chain pickerel, and yellow perch. The Massachusetts Division of Fish and Wildlife (DFW) also reported that the American eel could also be found in these waterbodies (DFW, 2003c).

Aquatic Resources Impacts and Mitigation

Dredging Activities

Dredging of the federal navigation channel and turning basin may adversely affect fish and fish habitat. Potential adverse effects on fish and fish habitat include impairment of water quality, destruction of benthic habitat, and direct and indirect effects on fish and their prey species. The extent of these

effects depends on project timing and duration, sediment texture and composition, and fish life stage and behavior.

The water quality of the Taunton River and Mount Hope Bay is currently degraded by upstream discharges and runoff. The proposed dredging would contribute to further degradation of water quality through increases in turbidity, releases of chemical and nutrient pollutants from sediments, and introduction of chemical contaminants, such as fuel and lubricants from the dredge vessels. Turbidity resulting from the resuspension of sediments would reduce light penetration and the corresponding primary production of aquatic plants, algae, and phytoplankton. Additionally, resuspension 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 a temporary displacement of motile organisms and may stress or kill sessile benthic organisms within the affected area (see section 4.3.2 for more discussion of dissolved oxygen impacts).

Although specific information regarding the condition of the benthic communities in the federal navigation channel and turning basin has not been collected, such communities may be well established because the channel has not been dredged since the 1970s. These benthic invertebrates provide a food source for demersal species of finfish during part or all of their life cycles. Direct alteration of the benthic substrate via dredging would remove the existing benthic community and may adversely affect prey species, suitable cover, settlement structure, and/or nursery and spawning areas. Pioneering benthic invertebrates would likely recolonize the dredged area soon after completion of dredging. The character of this recolonizing community would depend on the nature of the available substrate (e.g., grain size distribution and hardness) and resident species in adjacent areas.

Based on DMF data (DMF, 1997), the dredging of the federal navigation channel and turning basin could directly impact up to 84 acres of quahog habitat. Although as previously stated, much of this 84-acre area comprises the existing navigation channel and turning basin, which have bottoms consisting of fine-grained muds that are not suitable for quahog. Taking this into account, we estimated that about 21 acres of the area to be dredged for the turning basin should be considered suitable quahog habitat that would be directly affected during construction of the project. The impact on some and perhaps all of this 21-acre area would be permanent because LNG ships would continue to disturb the benthic substrate which in turn would preclude the reestablishment of quahogs. Dredging could also have indirect impacts on quahogs. NOAA Fisheries reported that quahogs redirect residual and newly acquired food energy towards producing reproductive products prior to initiating spawning, which begins in May. NOAA Fisheries expressed concern that constant stress, including processing and discarding unusual levels of suspended sediment, can prevent quahogs from beginning the energy transfer to reproduction or cause them to reverse the process if already begun. Thus, quahogs in the vicinity of dredging activities during the pre-reproductive through post-spawning periods would be at risk for reduced productivity. To mitigate impacts on quahogs and other shellfish from the development of the turning basin, Weaver's Cove Energy has indicated that it would:

- coordinate with federal and state resource agencies to harvest and relay quahogs from the proposed dredging footprint prior to commencement of dredging activities; and

- coordinate with federal and state resource agencies to develop and fund a plan to reseed quahogs in those areas where quahogs were harvested prior to commencement of dredging activities.

We received several comments on the draft EIS regarding the appropriateness of Weaver's Cove Energy's proposed quahog mitigation measures. NOAA Fisheries, however, indicated that the proposed mitigation measures could adequately offset permanent impacts on quahogs. Thus in accordance with

NOAA Fisheries comments and to ensure that potential impacts are accounted for in the mitigation plans, **we recommend that:**

- **Weaver's Cove Energy complete the coordination with applicable federal and state resource agencies regarding development and funding of mitigation measures to offset impacts on quahogs resulting from the expansion of the turning basin and provide the results of that coordination, including copies of agency approval, to the Secretary prior to dredging.**

Dredging also has the potential to re-introduce deleterious compounds currently in the bottom sediments into the water column. In addition to behavioral responses by fish to exposure to resuspended sediments, certain chemical contaminants could cause various acute and chronic growth and physiological effects. To evaluate these risks, Weaver's Cove Energy performed elutriate tests and undertook a sediment characterization study that analyzed a number of organic and inorganic chemicals associated with the potential dredged sediments. As discussed in section 4.2.2, these chemical analyses of sediments included PAHs, PCBs, pesticides, and metals. To assess the potential hazards posed to the aquatic environment by the dredged sediment, statistically based average concentrations of the various organic and inorganic compounds detected in the sediments were compared to commonly accepted, ecological risk-based screening criteria. These analyses, which are described in more detail in section 4.2.2, indicated that:

- The 95 percent UCL concentrations of most PAHs are less than the PEL and ERM criteria; however, some PAH compounds in the area between the Braga Bridge and the lower end of the turning basin exceed the PEL criterion, but are less than the ERM criterion.

- The 95 percent UCL concentrations of total PCBs are less than the PEL and ERM criteria in all portions of the dredging footprint.

- Only one pesticide, DDE, was detected. DDE was identified in only three samples from the entire dredging footprint; the concentration of DDE was low and is not a contaminant of concern in any part of the dredging footprint.

- Mercury concentrations exceed all three screening criteria in all portions of the dredging footprint.

- The 95 percent UCL concentrations of the other metals are below both the PEL and ERM criteria, except in the area between the Braga Bridge and the lower end of the turning basin. In this portion of the river, five of the seven metals exceed the PEL criterion.

Elutriate tests conducted to determine if deleterious compounds in the sediments could be released into the water indicated that most of the tested chemicals and metals would remain tightly adsorbed to the sediments. However, the results of the elutriate tests indicated that copper and zinc would be released from the sediments into the water in concentrations that exceed published EPA water quality criteria (see discussion of elutriate test results in section 4.2.2). Uptake of these chemicals by aquatic organisms could alter behavior affecting foraging success and increasing susceptibility to predation, could lower reproduction, or could have physiological responses that result in predisposition to disease and other forms of stress (Peterle, 1991). However, the potential for these effects is limited. As discussed in sections 4.2.2 and 4.3.2, the concentration of copper in the river water is greater than EPA-recommended water quality criteria. Moreover, a study by Tramontano and Bohlen (1984) indicated that elevated concentrations of dissolved contaminants resulting from dredging activities would be expected to return

to background levels within about 600 feet of the dredging operation. Therefore, the effect of these metals being released into the water would be localized and quickly diluted.

We also do not expect that there would be a long-term impact on the health of fish and shellfish after completion of the dredging operations. Bottom fish and shellfish are currently exposed to contaminated sediments in the Taunton River on a continuous basis. This constant exposure is part of the reason shellfish harvesting is banned in the Taunton River and quahogs are relocated for depuration prior to harvest in other less contaminated areas. Moreover, studies have demonstrated that impacts resulting from dredging-induced sediment resuspension are generally small relative to naturally occurring, storm-induced sedimentation (Bohlen et al., 1979; Bohlen et al., 1996). These studies suggest that the exposure of organisms to chemicals in the sediments resuspended due to dredging may be less than the exposure to these chemicals regularly experienced by the organisms in the river from resuspension due to natural causes.

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 Taunton River and Mount Hope Bay. Direct impacts could result from the exposure to sediment particles and indirect impacts could result from habitat alteration caused by sediment deposition.

SSDOSE Modeling Conducted and Mitigation Proposed by Weaver's Cove Energy

To assess the potential for direct and indirect impacts that could result from exposure to suspended or deposited sediments, Weaver's Cove Energy investigated potential impacts on different life history stages of aquatic species inhabiting the project area and conducted computer simulation modeling using the SSDOSE model. Additional details on this model are provided in Weaver's Cove Energy's modeling report entitled *Modeling Dredge-induced Suspended Sediment and the Environmental Effects in Mt. Hope Bay and the Taunton River for the Proposed Weaver's Cove Energy, LLC, Liquefied Natural Gas Import Terminal* (ASA, 2003), which is available under the "Proposal" link on Weaver's Cove Energy's website (www.weaverscove.com).

Weaver's Cove Energy's modeling focused on the direct effects of dredging such as the excavation and transport of sediments through the water column and did not specifically address effects associated with related operations such as the placement and removal of spuds required to stabilize the dredging platform. We received a comment from the DMF that we should consider the potential effects on marine organisms of anchor strike and spud movements associated with dredging. Our review, which is based on consultations with COE staff who have been involved in the recent dredging of the Providence River (O'Donnell, 2004), indicates there would be little or no effect resulting from anchor strikes if the dredging equipment utilizes spuds for barge stabilization. Further, spud placement during dredging and the direct effects on benthic habitat would be limited to the dredging footprint. Given the availability of laser surveying equipment and the use of differential GPS positioning, as well as high-resolution fathometric sensors, it should be possible to accurately set the spuds within the navigation channel. The need to set spuds outside the navigation channel would be infrequent and should have minimal impact on benthic habitat outside of the channel.

For perspective, the average footprint of a spud used to stabilize the barges would be approximately 16 square feet (ft^2) (Beaudoin, 2004b). Additional disturbance during penetration and extraction of the spud would occur around each spud in an area that would depend on the type and consolidation of the sediment. During extraction of the spuds, some resuspension of sediment would likely occur; however, the amount of resuspension would be much less than that resulting from the dredging operation itself. The deck barge used as a dredging platform would be fitted with between two to four spuds depending on the size of the barge. Assuming that the barge would be repositioned 2 to 6

times per day and the barge would need at least three spuds (48 ft^2 total) to maximize dredge stability, between 6 and 18 spud penetrations/extractions would occur per day. This would result in potential direct impacts on the benthic habitat of between 288 ft^2 and 864 ft^2 per day, most of which would be limited to the navigation channel and turning basin. Even if it were assumed that 25 percent of the spud placements and removals were to occur outside the dredging footprint (which we believe is high), the potential impact of spuds on areas outside the dredging footprint would be small, ranging from 1 to 3 percent of the total project dredge footprint (based on a total dredged area of about 8.3 million ft^2 and a 3-year dredging schedule).

Secondary effects (i.e., increased turbidity due to resuspended sediment) from spud removal and repositioning would likely be limited to the dredging footprint. Although the potential effects of spud barge operations were not included as inputs to Weaver's Cove Energy's sediment transport modeling, we believe that impacts associated with spud placement, removal, and repositioning would not significantly increase the duration or severity of impacts on aquatic resources above the levels that would result from excavation-related dredging activities.

Organisms and species that were considered in Weaver's Cove Energy's suspended sediment analysis included winter flounder, shad, alewife and blueback herring, white perch, sturgeon, striped bass, summer flounder, windowpane flounder, scup, Atlantic silverside, bay anchovy, tautog, cunner, weakfish, menhaden, bluefish, butterfish, American eel, northern quahog, blue crab, soft shell clam, eastern oysters, amphipods, polychaete worms, and zooplankton. The sediment deposition analysis considered winter flounder, Atlantic silverside, bay anchovy, and eastern oyster. A key element in assessing potential effects of suspended sediment was to determine thresholds of concern for each species, which involved the following steps:

- development of a list of species and life stages of concern present in the project area;
- a review of the life history of each stage (i.e., eggs, larvae, juvenile, and adult) for each species;
- a determination of the seasonal presence (by month) of each species (by life stage); and
- a determination of the duration of potential exposure to dredging activities during each life stage of each species.

Published literature was reviewed to determine the minimum suspended sediment concentration and minimum deposited sediment thickness (as appropriate for the organism) that has been shown to have either a lethal or sublethal effect for any exposure duration for each life stage of each species. A screening analysis was performed on each dredging scenario and location to determine if the minimum effects threshold would be exceeded for any duration of exposure (short or long) for each species and life stage. Where suspended sediment concentrations in the water or sediment layer thickness on the bottom exceeded the minimum threshold for a species life stage over any time period, the effect of duration and degree of exposure were evaluated using the SSDOSE model.

Weaver's Cove Energy's modeling results, which are consistent with the results of field studies conducted by Bohlen et al. (1979, 1996), indicate that the sediment plume resulting from dredging would be temporary, linear in nature, and confined primarily to the dredged area. The modeling results also indicate that the concentration of suspended sediments in the water column would be below the minimum threshold concentrations that would result in sublethal or lethal effects on fish, shellfish, or other marine organisms in the project area. These results suggest that no species or lifestage would be exposed to sublethal or lethal suspended sediment concentrations during dredging regardless of time of year or tidal

conditions. The results also suggest that organisms inhabiting the water column, including anadromous fishes and the American eel migrating through the area, would not be adversely affected by suspended sediments during the proposed dredging operations.

NOAA Fisheries commented on Weaver's Cove Energy's methods for determining the minimum effect threshold for certain fish species, noting that these data are not available for many species. NOAA Fisheries suggested that it would be more appropriate to evaluate behavioral response thresholds such as avoidance and increased swimming activity than sublethal thresholds, and specifically cited studies by Wildish and Power (1985) and Chiasson (1993). Wildish and Power conducted laboratory experiments with smelt to determine if smelt are capable of avoiding suspended sediments. They found that smelt exhibited an avoidance response to suspended sediment levels above 20 mg/L. Chiasson's study investigated the potential for suspended sediments (concentrations ranging from 0 to 40 mg/L) to modify natural movements or migration patterns of rainbow smelt in a laboratory. The results of this study indicated that:

- fish did not attempt to flee at higher concentrations of suspended sediment;
- fish were not fatigued by increases in the amount of suspended sediment; and
- the effects of inert suspended sediment on smelt are probably sublethal.

However, the results of the study also indicated that rainbow smelt were more active at higher levels of suspended sediment. Chiasson (1993) interpreted this as an "alarm reaction" but noted that the fish showed no preference for direction of flight. Chiasson (1993) concluded that smelt may not use the current gradient to determine a specific direction of flight in the presence of above normal concentrations of suspended sediments. However, movement downstream or upstream from a point source of suspended sediment are two possible strategies that would enable fish to reduce or eliminate this source of stress. These studies, while conducted under laboratory conditions, suggest that fish may respond in their natural environment to suspended sediment concentrations that are well below sublethal concentrations through behavioral responses such as avoidance or increased swimming activity.

Some agencies questioned the validity of the modeling results and recommended that a timing restriction be required to avoid silt-producing activities during upstream (between March 1 and July 31) and/or downstream (between June 15 and October 31) fish migrations. Weaver's Cove Energy's revised modeling of the proposed dredging segments using an open bucket indicated that in any single hour, dredging would induce a suspended sediment plume with a concentration of 15 to 66 mg/l above background if scow overflow is allowed and a concentration of 9 to 33 mg/l above background if scow overflow is not allowed.[12] If a closed bucket is used, the resulting concentration of the dredging induced sediment plume would likely be lower than 20 mg/l. The modeling also indicates that the plume would only extend over 25 percent of the width of the river. Additionally, even though instream activities could cause migrating fish to avoid the navigation channel, other portions of the Taunton River would continue to be available for passage. Therefore, we do not believe that restricting dredging to avoid impacts on anadromous fish is necessary. Nonetheless, the COE could require an anadromous fish timing restriction as a condition of Weaver's Cove Energy's section 404 permit, if issued. We note, however, that requiring Weaver's Cove Energy to adhere to a timing restriction prohibiting instream work during fish migration periods would have considerable implications on the proposed dredging schedule (see section 3.6.2).

[12] As discussed in section 4.3.2, Weaver's Cove Energy assumed the background TSS concentration in the Taunton River is about 11 mg/L. We believe this is reasonable based on review of monthly TSS concentration data collected within the Taunton River during a study completed between 1988 and 1990.

In regards to the effects of sediment deposition, the results of the SSDOSE modeling indicated that no life history stage of any species except winter flounder eggs would be exposed to the minimum effects threshold during dredging regardless of time of year or tidal conditions.

The preliminary SSDOSE model results were based on published literature which suggested that winter flounder spawn between January and April, primarily in water depths of less than 5 meters, and the minimum effects threshold for winter flounder eggs would be an accumulation of 1 millimeter of sediment deposition over a period of 21 days or less (the average duration of the incubation period). After reviewing preliminary results of the suspended sediment model, including the input values and assumptions, NOAA Fisheries recommended Weaver's Cove Energy revise the model parameters that were used for winter flounder. Specifically, NOAA Fisheries recommended that Weaver's Cove Energy rerun the model using the following assumptions: winter flounder may use depths up to 8 meters as suitable spawning habitat in the Taunton River and Mount Hope Bay; lethal effects on winter flounder eggs may result from as little as 0.5 millimeter of sediment deposition; and winter flounder egg development could take as long as 40 days. NOAA Fisheries also requested that Weaver's Cove Energy use an assumed bucket loss rate (of sediment during dredging) of 2 percent.

Based on our review of literature and research being conducted in the project area, we conclude that NOAA Fisheries' recommendations are conservative and tend to overestimate potential impacts. For example, although Bigelow and Schroeder (1953; as cited in Pereira et al., 1999) reported that winter flounder spawn in waters as deep as 45 to 73 meters, Pereira et al. (1999) reported that the spawning at these greater depths occurs in stocks on Georges Banks, and most probably, on Nantucket Shoals. According to Pereira et al. (1999) the winter flounder on Georges Bank tend to grow larger and at a faster rate, have different fin ray counts, and different movement patterns than those residing inshore. Moreover, most of the fish tagged on Georges Bank stay on the Bank and almost no fish moved away from coastal areas to Georges Bank (Lux et al., 1970). Lux et al. (1970) indicated that the fish from Georges Bank are clearly separate from those in inshore areas but were unable to determine whether these differences could be attributed to temperature or other factors. Regardless, we believe this research suggests that the spawning depths of the winter flounder on Georges Bank differ from the spawning depths of winter flounder in inshore areas, where winter flounder spawning appears to generally occur in waters less than 6 meters deep. Thus we believe modeling results based on an 8 meter spawning depth are overly conservative.

With respect to egg development, several researchers and NOAA Fisheries have noted an inverse relationship between winter flounder egg incubation time and water temperature. NOAA Fisheries also commented that hatching can be protracted for up to 40 days in a laboratory setting. Williams (1975) indicated that the hatching of winter flounder eggs can be protracted by cold water temperatures and reported that on average winter flounder eggs hatch or die in 38.6 days when held at 0° C. However based on our review of studies by Pereira et al. (1999) and Rogers (1976) and consultations with Grace Klein-MacPhee, who has studied winter flounder egg development in the Providence River, it appears that winter flounder eggs typically develop in less than 25 days and perhaps less than 21 days even at cold temperatures. Grace Klein-MacPhee indicated that incubation of winter flounder eggs only extends to as much as 30 days when water temperatures are less than 0° Celsius (C) for an extended period of time, which generally does not occur in the project area (Klein-MacPhee, 2004). The premise that prolonged water temperatures at or below 0° C is rare in the project area is also supported by our review of water temperature data collected at Fall River and in the Providence River (NOAA, 2004c). Based on data collected at a depth of 2.05 meters below MSL from the south end of the State Pier in Fall River between October 1999 and December 2004 and at a depth of 1.5 meters below MSL in the Providence River from September 1995 to December 2004, temperatures at or below 0° C occurred only three times during the recording period. In 2000, the average daily water temperature was at or below 0° C for 9 days at Fall River and 2 days in the upper Providence River. In 2003 and 2004, the average water temperatures were

at or below 0° C for 10 days and 23 days, respectively, in Fall River and 2 days and 7 days, respectively, in the Providence River. These data indicate that the coldest temperatures that have been shown to prolong incubation periods upwards to 40 days are typically limited to relatively short periods during late January and early February. Additionally, given that water temperatures increase through late winter and early spring (March through May) and the incubation period progressively decreases, we believe NOAA Fisheries position that the modeling should assume winter flounder development takes 40 days in the project area is overly conservative.

The potential for resuspended sediment to impact fish eggs and larvae depends upon the species, the concentration of particles, and the duration of exposure. Demersal eggs such as those of the winter flounder may be partially or completely covered by fine particles that settle back to the bottom. Buried eggs may result in a slower exchange of oxygen between the water and egg and thus slow development or cause eggs to experience higher mortality rates (Wilbur and Clarke, 2001). Recent studies in the Providence River suggest that winter flounder eggs and larvae exposed to increased levels of sediment adjacent to dredging operations survived at statistically similar rates to controls (Klein-MacPhee et al., 2005). In related studies, winter flounder eggs were buried at various depths ranging from 0.5 to 6 egg diameters in fine-grained clean and contaminated sediment (Berry et al., 2005). Hatching success decreased and incubation period increased with increasing burial depth in clean sediment. The results with contaminated sediment were complicated by low control survival but eggs buried to 0.5 diameter had survival rates similar to the controls. Overall, the results indicated that winter flounder eggs may be more resistant to sediment burial than previously thought.

The bucket loss rate assumed in Weaver's Cove Energy's original modeling (0.66 percent) was based on data reported from a study conducted in Boston Harbor. The dredged sediments from the Boston Harbor Navigation Improvement Project consisted of 2 feet of maintenance silts and 1 foot of overdredge material composed of relatively stiff clays (Hayes et al., 2000). The majority of materials dredged during the study period consisted of maintenance silts (Hayes, 2004a) with physical properties similar to the sediments that would be dredged for the Weaver's Cove LNG Project. As noted in Weaver's Cove Energy's modeling report (ASA, 2003), 10 of the 12 maintenance silt sampling stations analyzed for the Boston Harbor Navigation Improvement Project contained sediments that were composed of 69 to 95 percent fines (silt plus clay). In comparison, grain-size data for the Weaver's Cove LNG Project ranged from 67 to 93 percent fines. Further, since scow overflow was not allowed during dredging for the Boston Harbor Navigation Improvement Project, the only source of additional suspended solids was the open or closed buckets that were used for the dredging.

Additionally, the suspended sediment monitoring conducted by Hayes et al. (2000) occurred within 5 to 20 meters of the bucket, so measured turbidity and TSS values had not been diluted to any significant degree. The modeling originally conducted by Weaver's Cove Energy included a scenario that used a bucket loss rate of 1.32 percent (or twice the bucket loss rate of 0.66 percent). This value was used to: 1) account for "unknown factors such as operator control and debris problems," and 2) estimate the potential affect of scow overflow on suspended solids concentrations. As described in the modeling report and confirmed by Hayes (2004a), the use of suspended solids concentrations that are double the bucket loss rate is an acceptable means of obtaining an initial estimate of the potential effects of scow overflow. Accordingly, we believe that Weaver's Cove Energy's original bucket loss rate is a reasonable estimate and the use of a 2 percent loss rate in the model runs as recommended by NOAA Fisheries is overly conservative.

Taking into account the conservative nature of NOAA Fisheries' comments, Weaver's Cove Energy reran the suspended sediment model and reassessed the model results based on NOAA Fisheries' recommendations (i.e., all areas up to 8 meters deep could be winter flounder spawning habitat, the potential for impacts on winter flounder eggs could result from the deposition of 0.5 millimeter of

sediment, and a loss rate of 2 percent[13]). Based on the results of the sediment characterization study and the revised modeling of suspended sediment, we reported the following potential impacts of dredging on aquatic organisms and habitats in the draft EIS:

- Mobile species and life stages would burrow out of any accumulation that results from the redeposition of sediments;
- The deposition of sediments would be below the threshold for sublethal effects of windowpane, black sea bass, scup, and summer flounder;
- The deposition of sediments could impact winter flounder eggs depending on the equipment used and the time of year dredging is conducted;
- If a 26 cubic yard open bucket is used for dredging during the spawning period and the scows are allowed to overflow when being filled with the dredged material, up to 144 acres of winter flounder egg habitat could be affected;
- If a 26 cubic yard open bucket is used for dredging during the spawning period and the scows are not allowed to overflow when being filled with the dredged material, approximately 29 acres of winter flounder egg habitat could be affected; and
- If a 26 cubic yard closed bucket is used for dredging during the spawning period and the scows are not allowed to overflow when being filled with the dredged material, no winter flounder egg habitat would be affected. We note, however, there is some potential for sediment release when using a closed bucket due to entrainment of large debris that can interfere with bucket closure.

After reviewing the revised modeling results, NOAA Fisheries, DMF, EPA, and other resource agencies continued to express concern about the potential impacts of the project on winter flounder spawning habitat within Mount Hope Bay and the Taunton River. According to the agencies, winter flounder impacts are of particular concern since existing winter flounder populations are stressed and substantially below historic levels, despite extensive agency efforts to improve winter flounder population size. As a result, these agencies recommended that Weaver's Cove Energy implement additional mitigative measures to avoid or minimize impacts on aquatic resources. To address these concerns, Weaver's Cove Energy revised its proposed dredging program to include the following:

- use of a 15 cubic yard open bucket to dredge the stiffer and coarser grained native material from the turning basin;
- use of a closed or "environmental" bucket to dredge depositional sediments (i.e., for dredging all areas except the native sediments in the turning basin);
- dredging would be conducted by working in a line parallel to the river flow during the upstream anadromous fish run;
- a time-of-year restriction would be implemented to prohibit dredging in the turning basin during February, March, and April; and
- no significant scow overflow would be allowed in any area or during any season.

[13] Initially, Weaver's Cove Energy did not rerun the model assuming a 40 day winter flounder egg development period, as requested by NOAA Fisheries.

Weaver's Cove Energy's modeling results indicate that the above mitigative measures would eliminate the majority of indirect winter flounder impacts associated with dredging. Only the 15 cubic yard open bucket proposed for dredging native sediments in the turning basin would result in deposition of greater than 0.5 mm of sediment over winter flounder eggs. The area of suitable habitat in water depths up to 8 meters that would be affected by this deposition over a 21-day period (assuming a sediment loss rate of 0.66 percent using an open bucket and no scow overflow and a sediment loss rate of 0.22 percent using a closed bucket and no scow overflow) would be about 6.2 acres.[14]

In addition to the potential for indirect impacts on winter flounder egg habitat, dredging would also have a direct impact on winter flounder egg habitat as the result of expanding the turning basin. The existing turning basin would be expanded from 33 acres to 54 acres and deepened to a depth of 41 feet to accommodate the maneuvering of LNG ships. Of the 21-acre expansion area, approximately 11 acres are currently less than 25 feet (8 meters) deep and could potentially provide suitable winter flounder spawning habitat. Dredging of these areas in May during the spawning period would likely injure or kill winter flounder eggs in the turning basin expansion area. Dredging of the trench for the pipeline across the Taunton River could also damage or destroy any winter flounder eggs that are present during the dredging operations.

NOAA Fisheries and other agencies have acknowledged that the recent mitigation proposed by Weaver's Cove Energy would reduce impacts on winter flounder habitat. However, these agencies continue to have concerns regarding the modeling results. In particular, some agencies maintain that the revised modeling underestimates impacts on winter flounder. Although we disagree, we also recognize that winter flounder is a valuable and highly stressed resource within the project area. We also acknowledge that while the proposed mitigation substantially reduces impacts, it does not eliminate all potential effects of dredging on winter flounder. We also note that the COE, as the lead regulatory agency over dredging and other riverbed disturbing activities, has indicated that it will likely require additional mitigative measures to avoid or minimize impacts on winter flounder within the Taunton River and Mount Hope Bay as a condition on any section 404 permit issued for the project. For these reasons and because NOAA Fisheries has submitted EFH conservation recommendations that additional mitigation is needed to reduce the impact of dredging on winter flounder, **we recommend that:**

- **Weaver's Cove Energy modify its proposed dredging program and pipeline construction plans within the Taunton River to prohibit any silt-disturbing construction activities during the winter flounder spawning period (January 15 through May 31). In addition, Weaver's Cove Energy should continue to consult with federal and state agencies and develop a mitigation plan to offset permanent loss of winter flounder spawning and juvenile development habitat resulting from expansion of the turning basin. The revised dredging plan and the winter flounder habitat mitigation plan should be submitted to the FERC prior to dredging.**

We received comments on the draft EIS indicating that the Massachusetts Waterway Act (310 CMR 9.40(2)(a)) prohibits dredging activity between March 15 and June 15 except upon determination by the DMF that a project would not have adverse effects on aquatic resources. We believe that our above recommendation in conjunction with Weaver's Cove Energy's proposed mitigative measures would adequately meet the intent of this law and would sufficiently protect the aquatic resources, including anadromous species, in the Taunton River and Mount Hope Bay.

[14] The use of a 21-day developmental window as a modeling parameter seems appropriate when discussing impacts since Weaver's Cove Energy would not dredge in the turning basin between February and April, which constitutes most of the winter flounder spawning period.

Implementation of timing restrictions to avoid the winter flounder spawning period and/or other sensitive fish periods could affect the proposed 3-year construction schedule for the project. Any restrictions that reduce the amount of dredging days or the rate of dredging could potentially prolong the construction schedule beyond 3 years. Weaver's Cove Energy has indicated that a timing restriction to avoid dredging during the winter flounder spawning period (January 15 to May 31) would make it highly unlikely that the necessary dredging would be completed within a 3-year period. Prolonging the construction schedule could have additional environmental impacts such as noise, air emissions, traffic, and visual impacts related to the construction activities. Section 3.6.2 provides additional discussion of implications of timing restrictions on Weaver's Cove Energy's proposed schedule.

LNG Terminal Construction and Operation

LNG Terminal Construction Activities

As discussed in section 4.3.2, stormwater runoff from the construction site and placement of fill into the Taunton River could increase suspended sediment and turbidity levels near the site. Disturbance near the water's edge by construction equipment and the resulting temporary increase in turbidity could lower fish usage in the immediate vicinity of the site. However, the shoreline along the proposed site has been previously disturbed and man-made shoreline is abundant along the river near the site. Thus, fish affected by construction would likely utilize similar habitats upstream and downstream of the proposed site.

The removal of the existing pier structure and replacement by a new ship unloading facility could also result in increased turbidity in the water column and temporarily reduce fish usage of the area. Additionally, piles driven into the riverbed to support the new ship unloading facility would permanently affect about 800 square feet of benthic habitat. However, piers and other structures are present upstream and downstream of the proposed site and fish disturbed by construction activities at the site would likely use the nearby structures for habitat. Also, although there would be a temporary loss of structural habitat during the period between removal of the existing structure and completion of the new unloading facility; the habitat lost from removal of the existing pier would likely be replaced and perhaps supplemented with development of the new facility. Fish using the benthic habitat in the area would likely relocate to similar nearby areas and fish requiring structural habitats may become more abundant following construction of the new unloading facility.

Direct spills of petroleum products into the Taunton River from dredging or other construction equipment could be toxic to fish. To reduce the potential for direct surface water contamination during construction and dredging, Weaver's Cove Energy would implement both onshore and offshore SPCC Plans. These plans would include provisions that prohibit the storage of fuel and other potentially toxic materials within specified distances of waterbodies and procedures for refueling equipment designed to minimize potential spills. These plans would also outline procedures for containing, cleaning up, and reporting spills.

Hydrostatic Testing

Weaver's Cove Energy has indicated that its preference is to obtain hydrostatic test water from the City of Fall River. If the City does not allow Weaver's Cove Energy to use its water, Weaver's Cove Energy may withdraw up to about 33 million gallons of water from the Taunton River to hydrostatically test the LNG storage tank and pipelines. If water is appropriated from the Taunton River to hydrostatically test the LNG storage tank, Weaver's Cove Energy would attach a temporary 12- to 14-inch-diameter pipe to the newly constructed pier. The intake pipe would be set at a depth of 5 feet below MLLW and would be fitted with a fine mesh screen to minimize potential entrainment and impingement

of aquatic organisms. Weaver's Cove Energy estimates that the appropriation rate would be between 5,000 to 7,000 gpm. The withdrawal of river water for hydrostatic testing would not likely entrain adult fish since the water intakes would be screened as required by the FERC Procedures. However, the screens would not necessarily prevent the entrainment and/or impingement of larvae and eggs, particularly if the withdrawal hose is positioned in the water column where a preponderance of larvae or eggs are present (e.g., at the bottom of the waterbody when demersal eggs are present). Hydrostatic test water withdrawals would be conducted in accordance with the FERC Procedures and applicable state permits, which would take into account timing and position of the intake. As such, impacts on aquatic resources within the Taunton River would be minimized.

The hydrostatic test water would not require pre-treatment and no chemical additives (e.g., biocides or neutralizing agents) would be mixed with the water during the test or prior to discharge. After the hydrostatic testing is completed, Weaver's Cove Energy is proposing to discharge the test water directly into the Taunton River over a period of several days. The water would be filtered prior to discharge and would be returned at a rate and location that would minimize bottom disturbance and potential impacts on aquatic resources.

LNG Ship Ballast Water

The entrainment or impingement of larvae and eggs could also occur during operation of the LNG terminal when ballast water would be withdrawn from the river by ships during offloading of LNG. Weaver's Cove Energy has estimated that up to 70 ships would offload LNG at the proposed facility annually. The ballast water would be pumped at a maximum rate of about 16,000 gpm and an average rate of about 12,000 gpm over a 12- to 16-hour period. The intake aperture on the ships would be about 25 to 30 feet below the water surface. Assuming a maximum water withdrawal of about 14 million gallons per ship, a total of about 980 million gallons of water could be withdrawn each year from the river for ship ballast. These withdrawals could entrain and/or impinge larvae and eggs, particularly if the withdrawals occur where a preponderance of larvae or eggs are present. Impacts attributable to impingement mortality and entrainment include losses of early life stages of fish and shellfish, reductions in forage species, and decreased recreational and commercial landings (EPA, 2004d).

To estimate of the numbers of eggs and larvae that could be entrained through ballast water intake associated with LNG ships offloading at the proposed LNG terminal, we reviewed ichthyoplankton data collected over several years by MRI in Mount Hope Bay and the Taunton River that studied the effects of the Brayton Point Power Plant. As shown in table 4.6.2-1, the ichthyoplankton intake rates were translated to age-1 equivalents by multiplying by survival rate to the end of the first year. Estimates of survival rates for eggs and larvae were adopted from the 316(b) Case Studies, Part F Brayton Point, Appendix F1 (EPA, 2002c). Expressing impingement mortality and entrainment losses as age-1 equivalents is an accepted method for converting losses of all life stages into individuals of an equivalent age, accounting for the fact that most eggs and larvae do not normally survive, and providing a standard metric for comparing losses among species and years (EPA, 2004d). However, it is also important to recognize that precise quantification of the nature and extent of impacts to populations and ecosystems is difficult and that ichthyoplankton densities are difficult to interpret because natural mortality rates are high and few eggs or larvae typically survive to adulthood in nature.

TABLE 4.6.2-1

Estimated Annual Ichthyoplankton Numbers Potentially Entrained by Ballast Water Intakes from LNG Ships on the Taunton River a/

Species	Eggs	Larvae	Age-1 Equivalents
Atlantic Silverside	2,620	46,200	20
Bay Anchovy	5,770,000	0	269
Butterfish	29,600	8,420	5
Scup	16,200	12,900	12
Tautog	6,440,000	448,000	65
Weakfish	7,650	7,430	< 1
Windowpane Flounder	70,600	79,800	9
Winter Flounder	13,300	1,297,250	2,855
Total:	12,349,970	1,900,000	3,325

a/ The estimates assume that 70 ships would offload at the facility annually and each ship would take on about 14 million gallons of ballast water during the unloading operations.

The above estimates indicate that annual ballast water withdrawals could result in the loss of up to 3,325 age-1 equivalent fish per year, of which about 86 percent would be winter flounder. The percentage of winter flounder age-1 equivalents estimated to be entrained in the LNG ship ballast water is similar to the percentage estimated to be entrained in cooling water at Brayton Point Power Plant in Mount Hope Bay (82 percent). However, as discussed in section 4.13, water withdrawals at the power plant result in substantially more loss of fish eggs and larvae on an annual basis than ship ballasting. While these estimates provide some indication of potential impacts associated with withdrawals for ship ballasting, it is important to note that the potential for entrainment or impingement of ichthyoplankton during withdrawals for ship ballast would depend on a variety of factors, including but not limited to the time of year and the distribution of the ichthyoplankton within the water column relative to the intakes for the ballast water.

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.

Weaver's Cove Energy has indicated that the LNG ships would not discharge ballast water into the Taunton River or Mount Hope Bay. However, LNG ships calling from international ports could still 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 no LNG ship ballast water would be discharged in the proposed project area, the potential to spread invasive aquatic species is significantly reduced. 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, Fall River is not a new port and ships of all types originating from different ports have and will continue to visit Narragansett Bay and enter Mount Hope Bay and the Taunton River.

Considerable effort and resources are being applied to minimize the movement of non-indigenous species around the globe by the marine industry. In February 2004, a new international convention to prevent the potentially devastating effects of the spread of harmful aquatic organisms carried by ship ballast water was adopted by the IMO, the United Nations agency responsible for the safety and security of shipping and the prevention of marine pollution from ships. The convention requires all ships to

implement a Ballast Water and Sediments Management Plan. All new ships will have to possess a Ballast Water Record Book and will be required to carry out ballast water management procedures to a given standard. Existing ships will be required to do the same, but after a phase-in period. With the adoption of this convention, the IMO has made global provisions to control and manage ballast water and thus prevent, minimize, and eliminate the transfer of harmful aquatic organisms and pathogens.

The Coast Guard has developed responses to exotic invasive organisms associated with foreign vessels. The Coast Guard Office of Operating and Environmental Standards developed Mandatory Practices for All Vessels with Ballast Tanks on All Waters of the United States. The mandatory practices include requirements to:

- rinse anchors and anchor chains during retrieval to remove organisms and sediments at their place of origin;
- remove fouling organisms from hull, piping, and tanks on a regular basis;
- and dispose of any removed substances in accordance with local, state, and federal regulations.

The Coast Guard has also implemented a Shipboard Technology Evaluation Program to encourage ship owners and operators along with technology developers to develop prototype treatment systems. To support investment in new technology, experimental treatment systems that function as designed may be deemed to meet future ballast water standards for up to the life of the treatment system or the life of the ship.

The Northeast Aquatic Nuisance Species Panel with its Ballast Water Committee is a regional committee of the Federal Aquatic Nuisance Species Task Force. The task force is an intergovernmental organization dedicated to preventing and controlling the introduction and spread of aquatic nuisance species by implementing the Non-indigenous Aquatic Nuisance Species Prevention and Control Act of 1990, which was amended in 1996 as the National Invasive Species Act.

In February 2005, the Ballast Water Management Act of 2005 was introduced to Congress to amend the Non-indigenous Aquatic Nuisance Prevention and Control Act to establish vessel ballast water management requirements. All ships entering U.S. ports would be required to have on board an aquatic species management plan outlining actions to minimize the transfer and introduction of invasive species. The Act details ballast water exchange requirements and subject to an implementation schedule ships will be required to treat ballast water prior to discharge in U.S. waters. Treated ballast water will be required to achieve minimum concentrations of planktonic organisms and indicator microbes.

We believe the measures and efforts described above would minimize the potential for the introduction of non-indigenous attached organisms via LNG ship hulls or the potential to introduce planktonic and nektonic organisms via ballast water into the Taunton River, Mount Hope Bay, or Narragansett Bay.

LNG Ship and Tug Prop Wash

During operation of the LNG terminal, prop wash and other hydraulic effects from LNG ships and tugs could also temporarily increase suspended sediments and turbidity within the navigation channel and turning basin. 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 resuspend sediments resulting

in impacts similar to those for dredging plumes and the subsequent deposition of those sediments described elsewhere in this section.

Impacts associated with prop wash would occur more frequently than dredging because as many as 70 ships may berth at the terminal annually. Prop wash could affect the substrate within and adjacent to the navigation channel and could limit the recolonization of benthic species in those areas. Potential indirect effects of vessel movement through the waterway could include disturbances preventing fish from nest guarding (Mueller, 1980; cited in Wolter and Arlinghaus, 2003) or feeding (Barrett et al., 1992; cited in Wolter and Arlinghaus, 2003) and dislodgement of eggs and redistribution of eggs and larvae in less suitable habitats (Hofbauer, 1965; Jude et al., 1998; cited in Wolter and Arlinghaus, 2003). Dislodgement and redistribution of eggs into less suitable habitats could lower the reproductive success of affected fish species. Weaver's Cove Energy has not proposed any mitigative measures to avoid or minimize impacts as the result of prop wash.

Modeling was conducted for the Boston Harbor Navigation Improvement Project to assess the effect of ship passage on the resuspension of surficial sediments in the federal ship channels (COE, 1995). The modeling was developed based on the post-dredging dimensions of the channel and information collected during interviews with pilots regarding the operation of various types of vessels. The analysis modeled the effects of a number of vessels including an LNG ship, a container ship, a 41,000-displacement-weight tanker, an ocean tug, and a harbor tug. The modeling assumed a channel depth of 45 feet and varying vessel drafts from 12 to 42 feet. The study concluded that silt, the predominant grain-size of the surficial sediments assessed in the model, can be resuspended by currents as slow as 0.65 ft/sec. The study also found that bottom velocities generated by cargo vessels passing at slow speeds through the harbor can exceed this value up to 1,312 feet astern of the vessel and that tugs can generate bottom velocities above this value up to 656 feet astern of the vessel. Turning areas were found to be particularly susceptible to resuspension of sediments as the result of ship passage. The results indicated that the surficial sediments in the federal ship channels and berth areas are subject to resuspension during virtually every ship passage.[15] However, the results also indicated that ship-induced bottom velocities dissipate rapidly following the passage of the ship and that sediments resuspended by these currents settle back to the substrate after being transported relatively short distances (COE, 1995).

Following completion of the Boston Harbor Navigation Improvement Project, the COE conducted additional studies to monitor the effect of deep-draft vessel movement on the resuspension of bottom sediments (Science Applications International Corporation (SAIC), 2000, 2001). These studies used static and mobile monitoring techniques to evaluate the impact of the passage of an LNG ship (*Matthew*) on bottom sediment resuspension from the confined aquatic disposal (CAD) cells along a portion of the Mystic River downstream of the Distrigas LNG facility as well as material resuspended from other parts of the channel. CAD cell M8-11 was not capped with coarse-grained sediment during these monitoring studies. Therefore, the data for the area surrounding this cell should provide reasonable estimates of the potential resuspension of the fine-grained sediments along the Taunton River, although prop wash and other hydrologic effects associated with the Weaver's Cove LNG Project could be somewhat greater because, due to the depth of the channel and the drafts of the various sized LNG ships, the LNG ships calling on the proposed LNG terminal could have less clearance between the hull and the river bottom than was the case in the COE study. The COE also observed near-bottom sediment plumes and conducted TSS monitoring at two other locations within the Mystic River navigation channel south of the Inner Confluence.

[15] Once suspended, fine-grained sediments may be more susceptible to resuspension as other ships pass through the channel (Schoellhamer, 1996).

Depending on the monitoring location and the speed of the LNG ship as it passed the monitoring location, the near-bottom plume widths ranged from about 33 to 164 feet. Near the CAD cell, TSS levels extending up to about 7 feet above the channel bottom ranged from 350 mg/l as measured along the channel bottom at the time of ship passage to 40 mg/l about 3 minutes after ship passage as measured along transects perpendicular to the channel within the plume area. At the Inner Confluence, suspended sediment concentrations in the plumes ranged from 18 to 24 mg/l, almost one-half the levels observed near the uncapped CAD cell. The elevated TSS concentrations returned to near-background levels within about 7 minutes after the ship passed the static monitoring equipment at the bottom of the channel, and were found to have returned to background levels 1 hour after ship passage as measured by the mobile monitoring technique (SAIC, 2000 and 2001).

Based on observed TSS levels in the vicinity of CAD cell M8-11, the authors conservatively estimated that as much as 2.6 cubic yards of sediment could have been mobilized by passage of the LNG ship. Due to the generally slow near-bottom currents (about 0.16 ft/sec) in the Mystic River study area, the authors further estimated that the suspended sediments could have been moved a distance of about 590 feet in 1 hour (SAIC, 2000). These studies demonstrate that sediment resuspension due to passage of deep-draft vessels can mobilize bottom sediments, but the volume of sediment resuspended is relatively small and the sediments are not transported far from their original locations. Ship movements within a navigation channel result in short-term water quality effects that generally dissipate within 1 hour of the vessel passing any particular point along the channel.

The potential for resuspended sediment to impact fish eggs and larvae depends upon the species, the concentration of particles, and the duration of exposure. Demersal eggs such as those of winter flounder may be partially or completely covered by fine-grained sediments as they settle back to the bottom. This may slow the exchange of oxygen between the water and egg and, therefore, slow development or cause eggs to experience higher mortality rates (Wilbur and Clarke, 2001). Exposure to high levels of TSS (between 200 and 500 mg/L) for durations of less than 24 hours has been shown to reduce feeding rates in some fish larvae (Breitburg, 1988). In general, however, exposure to increased turbidity for periods of less than 1 day appears to have little measurable effect on pelagic fish eggs and larvae (Kiorboe et al., 1981; Wilbur and Clarke, 2001).

Based on the results of the Boston Harbor studies, the increased TSS levels resulting from LNG ship passage could result in reduced feeding rates for some fish larvae along the Taunton River navigation channel. However, we expect there would be minimal impact from elevated TSS levels on most pelagic fish eggs and larvae because TSS concentrations should return to background conditions within 1 hour or less of ship passage. The measured widths of the resuspended sediment plumes in the Boston Harbor studies (33 to 164 feet wide at 7 feet above the channel bottom) suggest that the plumes would generally remain within the Taunton River navigation channel, which ranges from about 400 to 800 feet in width. Based on the initial monitoring in the Mystic River, the sediment plume did not rise above mid-water elevations (i.e., the plume was not observed at the water surface, and monitoring equipment indicated a maximum water column elevation of about 20 feet above the channel bottom). The dimensions of the monitored plumes in Boston Harbor suggest that impacts to demersal fish eggs and larvae outside the channel by remobilized sediments in the Taunton River and Mount Hope Bay would likely be limited.

Pipeline Construction and Operation

Weaver's Cove Energy proposes to cross all waterbodies along the proposed pipeline routes using the open-cut construction method. In general, pipeline construction results in temporary impacts on streams and rivers, and there are no long-term effects on water temperature, pH, dissolved oxygen, benthic invertebrate populations, or fish populations (Vinkour and Shubert, 1987; Blais and Simpson, 1997). Some potential impacts on fishery resources, such as sedimentation and turbidity, destruction of

stream bank cover, introduction of water pollutants, or entrainment of fish could result from construction activities. Overall, the impact of construction on fish and other aquatic organisms is expected to be localized and short term. To minimize these potential impacts, Weaver's Cove Energy would adhere to the protective measures outlined in the FERC Procedures. Other federal, state, or local agencies may require Weaver's Cove Energy to implement additional protective measures. Impacts on the Taunton River from activities associated with installing the Western Pipeline across the river (i.e., dredging a trench, installing the pipe, and backfilling the trench) would be similar to the effects of dredging as previously described for the LNG terminal.

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.

Standard open-cut crossing techniques as proposed for this project could elevate the concentration of suspended solids, but the elevated levels would be high for relatively short periods and short distances downstream of the stream crossing. In addition, 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. Weaver's Cove Energy would be required by the FERC Procedures to complete most in-stream work 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.

Impacts on fisheries from construction-induced sedimentation and turbidity would be reduced to short-term, temporary disturbances if the measures contained in the FERC Procedures are followed. For the 10 waterbodies less than 50 feet wide, trench spoils would be stored on or above the stream banks. 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, in accordance with the FERC Procedures, 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 reduces the loss of riparian vegetation and minimizes 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. Some in-stream and shoreline 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, the FERC Procedures 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 pipelines 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 rights-of-way. Vegetation control would be conducted solely by mechanical means. No herbicides, which could run off into 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 relocation or disrupted migration would significantly affect diadromous fish populations because construction activities are short term and waterbodies that would be affected by the project are through developed areas and contain limited fish resources.

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, Weaver's Cove Energy would implement the procedures in its SPCC Plan, including restrictions on refueling equipment and storing fuel and other potentially toxic materials at least 100 feet from waterbodies.

Essential Fish Habitat

The MSA (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. EFH is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Federal agencies which authorize, fund, or undertake activities that may adversely impact EFH must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as the NEPA, Fish and Wildlife Coordination Act, ESA, or the Federal Power Act (50 CFR 600.920(e)) 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 EIS, section 10 permit, 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, NOAA Fisheries 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 NOAA Fisheries recommendations, the action agency must respond to NOAA Fisheries. 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 NOAA Fisheries for not following the recommendation.

We consolidated EFH consultations for the Weaver's Cove LNG 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 COE, EPA, NOAA Fisheries, and Coast Guard are cooperating federal agencies (see section 1.4). As such, the FERC requested that NOAA Fisheries consider the draft EIS notification of initiation of EFH consultation. NOAA Fisheries provided comments and conservation recommendations to the draft EIS and the EFH Assessment. Those comments and recommendations are responded to herein.

Managed Fish Species

NOAA Fisheries Northeast Regional Office (National Marine Fisheries Service (NMFS), 2003) EFH designations tables identify potential EFH within the project area for 14 fish species. NOAA Fisheries subsequently reported that 3 of the 14 species (American plaice, Atlantic mackerel, and cobia) are not likely to occur in the project area, while two additional species (little skate and winter skate) should be added to the EFH analysis. None of these managed stocks are endangered or threatened under the ESA. Table 4.6.2-2 summarizes the EFH required by these species by life history stage. This information was primarily obtained from NOAA Fisheries' *Essential Fish Habitat Source Documents* prepared for individual species. The primary categories of EFH for these species include water column, benthic habitats, and man-made structures. Prey for managed fish species comprise a critical component of EFH. Potential effects of the proposed project on these habitats and prey species are discussed below.

TABLE 4.6.2-2

Major EFH Categories for Managed Species in the Project Area

Species/ Life Stage	EFH Characteristics a/	Seasonal Occurrence in Project Area
Windowpane Flounder		
Eggs:	Pelagic; surface waters; < 70 m	April - September
Larvae:	Pelagic; < 70 m	May - September
Juveniles:	Demersal; nearshore bays and estuaries; < 75 m; fine sandy sediment	January - October, December
Adults:	Demersal; nearshore bays and estuaries; < 75 m; fine sandy sediment	Year round
Haddock		
Eggs:	None b/	None
Larvae:	Pelagic; surface waters; 30 - 90 m; 34 - 36 ppt	March - November
Juveniles:	None	None
Adults:	None	April - June
Red Hake		
Eggs:	None	May - September
Larvae:	Pelagic; surface waters; < 200 m; > 0.5 ppt	May - October
Juvenile:	Demersal; < 100 m; 31 - 33 ppt; shell fragments	April - February
Adults:	Demersal; 10 - 130 m; 33 - 34 ppt; sand, mud	Year round
Winter Flounder		
Eggs:	Demersal; 10 - 32 ppt; < 6 m; mud to sand or gravel	January - April
Larvae:	Demersal; 3.2 - 30 ppt; 1- 4.5 m; fine sand, gravel	February - May
Young of Year:	Demersal; 23 - 33 ppt; 0.5 - 12 m; mud to sand with shell or leaf litter	Year round
Juveniles:	Demersal; 19 - 21 ppt; 18 - 27 m; mud, shell	Year round
Adults:	Demersal; 15 - 33 ppt; 1 - 30 m; mud, sand, cobble, rocks, boulders	Year round
Black Sea Bass		
Eggs:	Pelagic; 0 – 200 m	May - October
Larvae:	Demersal; structured inshore habitats	May - November
Juveniles:	Mostly offshore; < 24 m; shell patches, shallow hard bottoms with structure	April - August
Adults:	Demersal; 25 - 30 ppt; 6 - 38 m; rocks, sand, and shell substrates	May - October
Atlantic Sea Herring		
Eggs:	None	October - December
Larvae:	Pelagic; 50 - 90 m; 32 ppt	March - April
Juveniles:	Pelagic and demersal; 15 - 135 m; 26 - 32 ppt	Year round
Adults:	Pelagic and demersal; 20 - 130 m; > 28 ppt; gravel, sand, cobble	Year round
Bluefish		
Eggs:	None	None
Larvae:	None	May - August
Juveniles:	Pelagic; 23 - 33 ppt; 6 - 15 m; shorelines, sand, mud, silt, clay	April - August
Adults:	Pelagic; ocean salinities; not common in bays or larger estuaries	April - September
Scup		
Eggs:	Planktonic; < 50 m; > 15 ppt	April - June
Larvae:	Pelagic; < 50 m; > 15 ppt	May - August
Juveniles:	Demersal; > 38 m; sand, silty sand, mud; > 15 ppt	April - September
Adults:	Demersal; < 30 m; fine to silty sand, mud, mussel beds, rock, other structures; > 15 ppt	April - September
Summer Flounder		
Eggs:	None	None
Larvae:	Pelagic; tidal creeks and creek mouths; 10 - 70 m; 23 - 33 ppt	September - February
Juveniles:	Demersal; lower estuary; flats, channels, salt marsh; 22 - 35 ppt; sandy substrate; mud bottom, shell hash	May - October

TABLE 4.6.2-2 (cont'd)

Major EFH Categories for Managed Species in the Project Area

Species/ Life Stage	EFH Characteristics a/	Seasonal Occurrence in Project Area
Adults:	Demersal; sand; < 25 m; 18 - 35 ppt	May - October
Little Skate		
Eggs:	Demersal; mud, sand, or gravel; < 27 m	June - January
Juveniles:	Demersal; 1 - 65 m; 15 - 35 ppt	April - May, September – November
Adults:	Demersal; 1 - 75 m; 18 - 35 ppt	April - May, September – November
Winter Skate		
Eggs:	Demersal; mud, sand, or gravel	June - January
Juveniles:	Demersal; 1 - 75 m; 15 - 35 ppt	April - May, September - November
Adults:	Demersal; 1 - 75 m; 20 - 33	April - May, September - November
Coastal Migratory Pelagics		
King Mackerel		
Sandy shoals of capes and offshore bars; high profile rocky bottom; coastal inlets; > 30 ppt		
Spanish Mackerel		
Sandy shoals of capes and offshore bars; high profile rocky bottom; coastal inlets; > 30 ppt		

a/ Values presented describe general physical and chemical habitat requirements for the associated life stage. Preferred salinity and depth ranges are in parts per thousand (ppt) and meters (m), respectively.

b/ None - Denotes life stages or species that do not have EFH designated in the project area.

Potential Effects on EFH

The majority of potential impacts of the proposed project on EFH would be similar to those impacts previously described in this section and in section 4.3.2. However, a discussion of those impacts directly related to designated EFH is included below. A summary of the impacts on managed fish species is included in table 4.6.2-3.

TABLE 4.6.2-3

Summary of Potential Impacts on Specific Life Stages of Federally Managed Fish Species

Species/Group	Potential Impacts During Dredging and Trenching			LNG Ship Traffic During Operation
	Suspended Sediments/Turbidity in Water Column	Sediment Deposition a/	Benthic Habitat Alteration	
Windowpane flounder	Eggs, larvae		Juveniles, adults	Eggs, larvae
Haddock	Larvae			Larvae
Red hake	Larvae		Juveniles, adults	Larvae
Winter flounder		Eggs, larvae	Eggs, larvae, juveniles, adults	Eggs, larvae
Black sea bass			Adults	
Atlantic sea herring	Larvae, juveniles, adults		Juveniles, adults	Larvae
Bluefish	Juveniles, adults			
Scup	Eggs, larvae		Juveniles, adults	Eggs, larvae
Summer flounder	Larvae		Juveniles, adults	Larvae
Little skate		Eggs	Eggs, juveniles, adults	Eggs, juveniles, adults
Winter skate		Eggs	Eggs, juveniles, adults	Eggs, juveniles, adults
King mackerel			X b/	
Spanish mackerel			X	
Anadromous Fish (prey)	X		X	X
Shellfish (prey)	X	X	X	X

a/ Juveniles and adults are expected to be physically able to avoid impacts of sediment deposition.
b/ "X" denotes that impacts on species or group are likely to occur, but specific life stages are not designated.

Water Column

The water column in the vicinity of the proposed LNG terminal serves as EFH for various life stages of several species and their prey by providing habitat for spawning, breeding, feeding, growth, and shelter. The managed species that use water column habitats include windowpane flounder, haddock, red hake, Atlantic sea herring, bluefish, scup, and summer flounder. Additionally, prey species for many of these species also occur within the water column. Weaver's Cove Energy's proposal to dredge up to approximately 2.6 million cubic yards of sediments from the federal navigation channel, turning basin, and the pipeline crossing in the Taunton River and Mount Hope Bay would increase the level of suspended sediments and the turbidity of the water. These activities would also potentially release contaminants contained within the sediments into the water column, and reduce dissolved oxygen concentrations by releasing oxygen-demanding materials (decomposing organic materials contained within the sediments).

As previously discussed, the results of Weaver's Cove Energy's sediment sampling indicate that mercury levels exceed ERL, PEL, and ERM criteria in all dredging areas. The 95 percent UCL concentrations of all other compounds are lower than ERM criteria and generally lower than PEL criteria, although the 95 percent UCL concentrations of some PAHs and some metals are higher than PEL criteria between the Braga Bridge and the lower end of the turning basin. Elutriate tests performed on sediment samples collected from the project area indicate that with the exception of zinc and copper, chemicals would remain tightly adsorbed to sediments during dredging, would be below published EPA AL-CMC and AL-CCC levels, and would not be released into the water column in high concentrations.

Seasonal migrations by managed fish species and their prey occur within the Taunton River and Mount Hope Bay. Generally, migratory fish populations can be impacted by increased concentrations of suspended sediments if dredging activities occur during migratory periods. High concentrations of suspended sediment may delay or divert migratory passage and in some instances could cause total avoidance of an area by fish. These potential effects could be exacerbated if the migrating fish are in generally poor condition and under stress by other factors. Disturbance of migratory fish patterns, including disturbance of pelagic prey species migrations, could also adversely affect fish and their ability to find food resources. Decreased foraging success could have physiological effects on fish, including lowered reproductive rates, decreased competitive fitness, and increased risk of mortality.

However, we do not believe that the increased turbidity that would result from this project would significantly disrupt managed migratory fish or their prey. These fish generally ascend rivers when flows (and consequently, turbidity levels) are high. Thus these fish are quite tolerant of high turbidity conditions. Additionally, as Weaver's Cove Energy's modeling indicates, the TSS levels associated with suspended sediment plumes are expected to be far below the levels migrating fish can tolerate. Moreover, the sediment plumes are not expected to encompass the width of the entire river, thus migrating fish could and likely would avoid the plumes to reach undisturbed spawning areas upstream of the construction activities.

Benthic Habitats

Benthic habitats may consist of intertidal mudflats (inundated during high tides) and subtidal substrates (permanently covered by water). Intertidal mudflats serve as important nursery and feeding areas for many bird, fish, and invertebrate species. Subtidal substrates are important feeding habitats for fish and benthic species that feed on polychaete worms and mollusks inhabiting these areas. Managed species that use benthic habitats for spawning or foraging are windowpane flounder, red hake, winter flounder, black sea bass, scup, summer flounder, little skate, winter skate, and coastal migratory pelagics. Dredging in these habitats would result in the displacement or mortality of the marine organisms that inhabit the immediate area of disturbance. Dredging would also increase the turbidity and sedimentation in adjacent communities, release contaminants and oxygen-consuming substances, and alter hydrologic regimes and physical habitats. Similar to potential effects of increased suspended sediments on prey species within the water column, displacement or mortality of demersal organisms near the project could reduce the availability of prey species inhabiting benthic communities. The subsequent potential reduction in foraging success could also affect managed fish species similar to impacts for the water column impacts discussed above.

Based on the results of sediment sampling in the proposed dredging area, the deposition of sediments is not anticipated to significantly change the concentration of any pollutant in the area or have an adverse effect on benthic communities. The results of SSFATE modeling indicate that the deposition of suspended sediments would be localized and confined largely to the dredged area. Mobile species and life stages adjacent to the dredging footprint would likely burrow out of any accumulation of redeposited sediments. However, the results of the SSDOSE modeling indicate that the deposition of suspended

sediments resulting from the current project design could affect winter flounder eggs. Dredging of the turning basin would directly affect winter flounder spawning habitat. Potential impacts on winter flounder spawning habitat and eggs were discussed previously in this section.

Man-Made Structures

Man-made structures built in aquatic environments often provide habitat for fish and other aquatic organisms. Man-made structures currently within the project area include an existing wooden pier and mooring dolphins offshore of the LNG terminal site. Of the managed species potentially occurring within the project area, only adult scup are likely to use man-made structures regularly. The existing structure would be removed and replaced with a new ship unloading facility consisting of a concrete structure supported on steel piles and connected to shore by two trestles. Additionally, two breasting dolphins and four mooring dolphins would be constructed. Although there would be a temporary loss of habitat during the period between removal of the existing structure until completion of the new unloading facility, the habitat lost from removal of the existing pier would likely be replaced and perhaps supplemented with development of the new structure.

Cumulative Impact Analysis

Cumulative impact results when impact associated with a proposed project is superimposed on or added to impact associated with past, present, or reasonably foreseeable future projects within the area affected by the proposed project. Although the individual impacts of the separate projects might be minor, the additive effects from all the projects could be significant.

Existing environmental conditions in the project area reflect extensive changes based on past projects and activities. For example, substantial impacts have occurred and continue to occur because of water quality degradation from point and non-point source pollution along the Taunton River. Residential, commercial, and industrial developments are directly impacting EFH by dredging or by affecting the watershed. Point source discharges from industry, wastewater treatment plants, and the Brayton Point and Montaup Power Plants, combined with septic tank leachates, stormwater runoff, and oil and chemical spills contribute to lower water quality and degraded fishery habitats.

The final EIS provides a detailed environmental analysis of the effects of construction and operation of the Weaver's Cove LNG Project and our recommendations to mitigate environmental impact. Construction of the Weaver's Cove LNG Project would adversely affect surface water quality and biological resources associated with Mount Hope Bay and the Taunton River. Specific project activities such as dredging, dredge disposal, pipeline installation, hydrostatic testing, and upland clearing/grading could result in a variety of impacts related to aquatic resources that include:

- increased water turbidity and resuspension of sediments;
- surface runoff/erosion;
- loss of wetland or upland vegetation;
- disturbance to benthic substrates (e.g., quahog habitats);
- entrainment and impingement of aquatic organisms; and
- potential spills of hazardous substances.

Although mitigation would lessen these impacts, gradual and cumulative impacts that could result from the construction and operation of the proposed project and other projects in the area and within the near future would result in some unavoidable adverse effects on the existing environment. However, the cumulative impact of dredging, pipe installation, and other damage to benthic habitats, when conducted in

accordance with Weaver's Cove Energy's proposed plans and our recommendations, would be relatively minor and short term in comparison to available habitats in the Taunton River and Mount Hope Bay.

Conservation Measures

The placement of dredged material in an upland area is an important measure proposed by Weaver's Cove Energy to minimize potential impacts on federally managed fish species and EFH. As previously discussed, Weaver's Cove Energy would use the material dredged from the navigation channel and turning basin on the proposed LNG terminal for structural fill. Use of the material in an upland area would avoid the need for offshore disposal and reintroduction of the dredged material into an aquatic environment that may include EFH.

Implementation of additional conservation measures proposed by Weaver's Cove Energy in response to agency concerns or required by the FERC or resource agencies would also avoid or minimize impacts on EFH, including implementing the measures in the FERC Plan and Procedures to minimize impacts on wetlands and waterbodies. As previously mentioned, we recommended that Weaver's Cove Energy prohibit silt-disturbing construction activities in the Taunton River between January 15 and May 31 to avoid impacts on winter flounder eggs. This restriction is in addition to the other mitigative measures Weaver's Cove Energy has proposed to minimize impacts on aquatic resources as described previously in this section.

NOAA Fisheries commented on the draft EIS and expressed concern that potential impacts on aquatic resources were underestimated in the EIS. Based on its review of the draft EIS, NOAA Fisheries also provided conservation recommendations to further avoid, minimize, and mitigate adverse effects on EFH, including:

- prohibiting in-water silt-producing activities between January 15 and May 31 of any year to protect winter flounder spawning and juvenile development;
- requiring mitigation to offset permanent loss of winter flounder spawning and juvenile development habitat resulting from expansion of the turning basin; and
- requiring mitigation to offset the placement of fill within intertidal, salt marsh, and subtidal areas during site development.

We have reviewed these recommendations and agree that implementation of the measures would further reduce potential impacts on EFH and managed species occurring in the project area. Weaver's Cove Energy has prepared a Wetland Mitigation Plan that provides mitigation for impacts on salt marsh and freshwater wetlands (see section 4.4). We have recommended in section 4.4 that Weaver's Cove Energy consult with the COE and NOAA Fisheries regarding the mitigation of wetlands as well as intertidal and subtidal areas and file a COE-approved Wetland Mitigation Plan with the Commission prior to construction. Additionally, we have recommended in this final EIS that Weaver's Cove Energy avoid silt-disturbing construction activities in the Taunton River during the winter flounder spawning period (i.e., January 15 through May 31) and prepare a mitigation plan to offset permanent loss of winter flounder habitat in the turning basin.

Conclusions of the EFH Assessment

Dredging associated with the proposed project could affect water column, benthic substrate, and man-made structure EFH in the project area. Activities within the Taunton River and Mount Hope Bay also have the potential to affect anadromous fish and shellfish resources, two primary prey groups for

managed fish species. The temporary resuspension of sediments during dredging could temporarily affect use of the water column by managed species in the area. Deepening of the navigation channel and expansion of the turning basin would result in temporary destruction and permanent alteration of existing benthic habitat within the dredging footprint as well as affect existing benthic habitat outside of the footprint through deposition of suspended sediments. Most notably, without additional revisions to the current proposed dredging program, the modeling conducted by Weaver's Cove Energy has indicated that impacts on managed species as a result of benthic habitat destruction and alteration could include temporary loss of up to 6.2 acres of winter flounder spawning habitat (assuming suitable habitat occurs to a depth of 8 meters) during the flounder spawning period. In addition, a maximum of about 11 acres of winter flounder spawning habitat (also assuming suitable habitat occurs to a depth of 8 meters) would be permanently lost as the result of widening the turning basin. However, implementation of the conservation measures discussed above would likely avoid or minimize impacts on managed fish species and designated EFH.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Federal agencies are required by section 7 of the ESA Act (Title 19 USC 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 action agency (i.e., the FERC) is required to consult with the FWS and/or NOAA Fisheries to determine whether federally listed endangered or threatened species or designated critical habitat are found in the vicinity of the proposed project, and to determine the proposed action's potential effects on those species or critical habitats. For actions involving major construction activities with the potential to affect listed species or designated critical habitat, the federal agency must prepare a BA for those species that may be affected. The action agency must submit its BA to the FWS and/or NOAA Fisheries and, if it is determined that the action may adversely affect a listed species, the federal agency must submit a request for formal consultation to comply with section 7 of the ESA. In response, the FWS or NOAA Fisheries 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, the FERC requests that the FWS and NOAA Fisheries consider this final EIS as the BA for the Weaver's Cove LNG Project.

For purposes of this environmental analysis, special status species of plants and animals include:

- species that are listed by the federal government as endangered or threatened; and
- species listed by Massachusetts and Rhode Island as endangered, threatened, or species of concern.

With assistance from Weaver's Cove Energy, we informally consulted with the FWS, NOAA Fisheries, DFW, DMF, and the Natural Heritage and Endangered Species Programs of the DEM and DEP to assess impacts on special status species. These agency consultations resulted in the identification of five federal[16] and three state special status species (one of which is also a candidate for federal protection) that might occur in the project area. In addition to the species identified during informal agencies consultations specific to the Weaver's Cove LNG Project, NOAA Fisheries identified in its comments on the KeySpan LNG Facility Upgrade Project that federally listed whales, in particular the North Atlantic right whale, have a potential to occur in the offshore waters that would be transited by LNG ships. These nine species are listed in table 4.7-1.

The FWS stated that one federally listed species, the bald eagle, could only occur in the project area as a transient. Thus bald eagles would not be expected to regularly occur in the area. If present as transients, eagles could use but would not be dependent on the resources found in the project area. Consequently, bald eagles would not be disturbed by construction or operation activities and the proposed project would have no effect on bald eagles. Therefore, this species does not require consideration in this NEPA analysis.

4.7.1 Federally Listed Threatened and Endangered Species

Sea Turtles

Four sea turtle species were identified by NOAA Fisheries as having the potential to occur near the project area. The leatherback and Kemp's ridley sea turtles are federally listed (and state-listed) as

[16] All five of the federally listed species are also state-listed in Massachusetts as either endangered or threatened.

endangered. The green and loggerhead sea turtles are federally listed (and state-listed) as threatened. None of these species are known to nest in the project area.

Green turtles 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 primary green turtle nesting area within the United States is limited to a six-county area in east central and southeast Florida. Common adult foraging habitats are pastures of seagrasses and/or algae, but small green turtles can also be found over coral reefs, worm reefs, and rocky bottoms (NMFS and FWS, 1991a). Coastal development threatens nesting habitat and populations while commercial fisheries and pollution pose significant threats to the marine environment.

TABLE 4.7-1

Special Status Species Potentially Occurring in the Vicinity of the Weaver's Cove LNG Project

Species	Federal Status a/	State Status a/	Comments
Birds			
American oystercatcher *Harmatopus palliates*	None	SC	Nesting and foraging would not be affected by proposed project.
Bald Eagle *Haliaeetus leucocephalus*	FT	SE	Transient individuals only; no known nesting sites or habitat; proposed project would have no effect on bald eagles.
Least Tern *Sterna antillarum*	None	ST	Nesting and foraging would not be affected by proposed project.
Fish			
Atlantic Sturgeon *Acipenser oxyrhynchus*	FC	SE	Possible migrant in Taunton River.
Reptiles			
Green Sea Turtle *Chelonia mydas*	FT	ST	Possible migrant in Mount Hope Bay.
Kemp's Ridley Sea Turtle *Lepidochelys kempi*	FE	SE	Possible migrant in Mount Hope Bay.
Leatherback Sea Turtle *Dermochelys coriacea*	FE	SE	Possible migrant in Mount Hope Bay.
Loggerhead Sea Turtle *Caretta caretta*	FT	ST	Possible migrant in Mount Hope Bay.
Mammals			
North Atlantic Right Whale *Eubalaena glacialis*	E	None	Not likely to occur in the project area, but could be affected by increased ship traffic and LNG ships entering Narragansett Bay while in transit to the proposed LNG terminal

a/ FE Federally Endangered
FT Federally Threatened
FC Candidate for Federal Protection
SC State Species of Concern
ST State Threatened
SE State Endangered

The major nesting beach where Kemp's ridley turtles emerge in any concentration to lay eggs is on the northeastern coast of Mexico, although additional nesting has been reported from Texas, Florida, and South Carolina. Juveniles frequent bays, coastal lagoons, and river mouths. Adults of the species are usually confined to the Gulf of Mexico, although individuals are sometimes found on the eastern seaboard of the northwestern Atlantic Ocean. Members of this genus are usually found in water with low salinity, high turbidity, high organic content, and where shrimp are abundant. Major threats to this species include incidental mortality in commercial shrimping, marine pollution, and dredging activities.

Leatherback turtle nesting occurs primarily in southeastern Florida, Culebra, Puerto Rico, and Sandy Point National Wildlife Refuge, St. Croix. Virtually nothing is known of the pelagic distribution of hatchling or juvenile leatherback turtles. Leatherbacks stranded on United States shores are generally of adult or near adult size, demonstrating the importance of pelagic habitat to turtles breeding in tropical

and subtropical latitudes (NMFS and FWS, 1992). Nesting trends appear stable but populations face significant threats in the marine environment from plastic wastes and commercial fisheries.

Loggerhead turtle nesting in the United States occurs primarily on the beaches of Florida but has also been reported from North Carolina, South Carolina, and Georgia (NMFS and FWS, 1991b). 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 the marine environment.

NOAA Fisheries (2003) reported that in the project area, sea turtles are known to inhabit shallow harbors and embayments. NOAA Fisheries (2003) also reported that the general trend for these species is to migrate to the project region in early summer (June) and return south when water temperatures decrease in the fall (October). Sea turtles can be affected by increases in vessel traffic, including interactions that could result in injury or death of individuals. The majority of injurious vessel strikes are caused by small, fast vessels that have planing hulls. No vessels with planing hulls are proposed to be used during construction or operation of the proposed LNG terminal. Large, deep draft vessels, similar to LNG ships, push a considerable bow wave because of their bulbous hull design and large displacement tonnage. This bow wave configuration displaces water upward and ahead of the hull region, thereby reducing the magnitude of both the pressure and suction fields. Therefore, small objects at the surface (e.g., sea turtles) are pushed away from such vessels. As the proposed project would utilize only large LNG ships, the potential effects on sea turtles as a result of vessel traffic would be insignificant; therefore, the project is not likely to adversely affect sea turtles.

North Atlantic Right Whale

Listed whale species have the potential to occur in offshore waters that would be crossed by LNG ships. Of specific concern is the North Atlantic right whale, a federally endangered species most likely to be encountered by marine vessels entering Narragansett Bay through the eastern end of Long Island Sound. The North Atlantic right whale population was historically depleted by commercial whaling and has not recovered despite protection from commercial harvest. The current population is thought to be about 325 to 350 individuals and thus is considered one of the most critically endangered large whales in the world (Associated Press, 2005; NOAA, 2004d). According to the New England Aquarium, the 2004-2005 calving season resulted in the second highest number of births in a given season since scientists began tracking births in the early 1990s; however, the aquarium also noted that the newborns still need to survive their migration to summer habitat and that juvenile whales have a 25 percent mortality rate (Associated Press, 2005). The mid-Atlantic region of the United States is a principal migratory corridor for right whales that travel between the calving and nursery areas in the southeastern United States to the feeding grounds in the northeastern United States and Canada.

The two most significant human-caused threats to right whales are entanglement in fishing gear and collisions with ships. Because right whales are known to occur in or adjacent to many major shipping corridors along the eastern United States and collisions are known to account for over 50 percent of human-induced mortality in right whales, NOAA Fisheries established a right whale ship strike reduction program. Despite the measures implemented as part of that program (e.g., aerial surveys to notify mariners of whale locations, supporting shipping industry liaisons, mandatory reporting programs, etc.), right whales continue to be killed by vessel strikes. In response to this continuing problem, NOAA Fisheries developed a Strategy to Reduce Ship Strikes of Right Whales (Strategy), which is intended to minimize the overlap between ships and whales and reduce the likelihood of ship strikes to the extent practicable (NOAA, 2004d).

Although NOAA's Strategy is not yet finalized, the primary regulatory measure proposed to reduce ship strikes in the mid-Atlantic region is the establishment of uniform speed restrictions within 20 to 30 miles of the approaches of specific ports and areas, including an area south and east of Block Island Sound that would be traversed by LNG carriers visiting the proposed LNG terminal (NOAA, 2004d). NOAA (2004d) indicated that proposed speed restrictions may be in the range of 10 to 14 knots. For the area near Block Island Sound, these speed restrictions would be enforced from March through April and from September through October. We note that the Coast Guard has been coordinating with NOAA Fisheries in ongoing efforts to reduce vessel strikes by issuing periodic notices to mariners regarding ship strikes. The Coast Guard is also a partner with NOAA Fisheries in the Mandatory Ship Reporting System which requires large ships to report course and speed such that potential intersections with known whale locations can be avoided. Additionally, the Coast Guard is currently conducting a Port Access Route Study to analyze potential vessel routing measures and consider adjusting existing vessel routing measures in order to reduce vessels strikes of right whales.

Assuming that up to 70 LNG ships could unload cargo at the proposed terminal each year, about 23 of those ships would be expected to unload at the terminal during the total 4 months from March to April and from September to October. These 23 vessels approaching and entering the area near Block Island Sound would be in addition to the existing ship traffic entering the bay and visiting various ports along the Long Island Sound and Narragansett Bay. The additional ship traffic likely increases the potential risk of a right whale ship strike. However, adherence of LNG ships to NOAA Fisheries' proposed speed restrictions during the applicable time periods, in addition to other currently required measures, would be expected to effectively minimize the potential for strikes, consistent with NOAA Fisheries' goals of the Strategy. We believe that these measures are important for the protection of right whales from ship strikes, but because the proposed rule has not yet become finalized or implemented, **we recommend that:**

- **Weaver's Cove Energy coordinate with NOAA Fisheries to determine appropriate speed and seasonal restrictions, or other applicable measures, to avoid or minimize impacts on right whales. Results of the coordination, including a discussion of restrictions to be implemented, should be filed with the Secretary, prior to commencing operation of the LNG terminal.**

Although LNG ships servicing the proposed terminal have the potential to strike right whales in the vicinity of Block Island Sound, adherence to restrictions developed through coordination with NOAA Fisheries would minimize the potential for strikes such that the proposed project is not likely to adversely affect North Atlantic right whales. Such protective measures may also facilitate avoidance and/or minimization of effects on other federally protected marine animals (i.e., other whale species and sea turtles) with the potential to occur in the general vicinity of the proposed project.

We are awaiting concurrence from NOAA Fisheries on our effects determination. Weaver's Cove Energy would not be authorized to begin construction until we complete all of our section 7 obligations.

4.7.2 State-listed Species

Massachusetts has an endangered species law that prohibits the taking of listed wildlife and plants. The DFW (2003a, 2003b) reported that no state-listed threatened, endangered, or special concern species are known to occur in the vicinity of the proposed LNG terminal or pipelines. The DMF (2003) identified one species, Atlantic sturgeon, as potentially occurring in the vicinity of the proposed project.

The Atlantic sturgeon is a state-endangered species in Massachusetts and is considered a candidate species for federal protection. Atlantic sturgeon are anadromous and use estuarine or coastal marine habitats for much of their adult life stage but spawn in fast-flowing, rocky areas of large freshwater rivers. The Atlantic sturgeon is typically a benthic feeder, searching bottom sediments for organisms such as mollusks, insects, and crustaceans. Atlantic sturgeon occur from Quebec to the Gulf of Mexico and move into freshwater rivers in April and May. Females return to estuarine and coastal marine habitats following spawning, but males may depart much later, coinciding with a temperature drop in the fall.

Although no known occurrences of Atlantic sturgeon have been recorded in the immediate vicinity of the proposed terminal site, the DMF (2003) stated that this species uses the Taunton River for passage, spawning, nursery, and forage habitat. Surveys conducted elsewhere in 1991 and 1992 in the Taunton River identified only subadult (not sexually mature) sturgeon. Additionally, no other sturgeons have been recorded in Mount Hope Bay and the Taunton River despite fairly extensive surveys associated with the Brayton Point Power Plant. The lack of juvenile sturgeon likely indicates that a spawning population of this species does not occur in this river; however, the river is still potentially used as a nursery area and potentially for foraging habitat by Atlantic sturgeon.

Impacts on Atlantic sturgeon using Mount Hope Bay or the Taunton River would be similar to potential impacts on other species using these waterbodies, which are discussed in section 4.6.2. Based on suspended sediment modeling completed by Weaver's Cove Energy for in-water activities, impacts from the project on fish passage are unlikely. Therefore, the proposed project is not likely to have adverse effects on Atlantic sturgeon.

The DEM Natural Heritage Program reported that Spar Island in Mount Hope Bay has been adopted as a nesting site by American oystercatcher (species of concern) and least tern (state threatened). However, Spar Island is approximately 3,000 feet north of the proposed dredging area and would not be affected by construction activities. Also, based on suspended sediment modeling, it appears that the sediment plume associated with dredging would not extend to Spar Island during dredging activities and thus is unlikely to affect foraging habits of the birds nesting on the island.

4.8 LAND USE, RECREATION, AND VISUAL RESOURCES

4.8.1 Land Use

4.8.1.1 LNG Terminal

The proposed LNG terminal is located on a privately owned brownfield site on the east side of the Taunton River in Fall River. The 73-acre site is comprised of a 55-acre southern parcel and an 18-acre northern parcel divided by an existing CSX railroad corridor. Weaver's Cove Energy currently has an option to purchase the entire site from Fall River Marine, L.L.C., who is the current landowner.

The 55-acre southern parcel has a history of use by the oil products industry. From the 1920s to the 1990s, the site was used as a petroleum products storage and distribution facility. The southern parcel is currently used as a construction staging area for the Brightman Street Bridge project. The site currently includes eight storage tanks, a wooden pier, an office building, and miscellaneous structures. About 52.3 acres of the southern parcel would be used during construction and operation of the LNG terminal (i.e., LNG storage tank, process area, spill impoundment sumps, and ancillary buildings), the dredged material reuse areas/landform, and access roads.

The 18-acre northern parcel is currently vacant but previously housed a garage structure, of which only the concrete floor pad remains. Approximately half of the northern parcel is in an open, disturbed condition and still contains remnants of past development. The northernmost portion of this parcel is predominately forested. About 17 acres of the 18-acre northern parcel would be used during construction for parking, a construction laydown area, and access roads. After construction, use of the northern parcel would be limited to about 2.0 acres for an administrative building, associated parking, and access roads, and a small area for the stormwater drainage system.

Because the site is contaminated, there are "controls" on the use of the property. These include deed restrictions that specify no residential or agricultural use and the incorporation of a cap or exposure barrier to prevent contact with soils on the site.

Table 4.8.1-1 summarizes the acres of each land use that would be affected by construction and operation of the proposed LNG terminal.

TABLE 4.8.1-1

Land Area Affected by the Construction and Operation of the Proposed LNG Terminal

Description	Industrial/Developed (acres)	Open (acres)	Forest (acres)	Vegetated Wetland (acres)	Total (acres)
Existing Site Conditions					
Northern Parcel	3.5	3.9	8.7	1.9	18.0
Southern Parcel	48.3	1.0	3.0	2.7	55.0
Total	51.8	4.9	11.7	4.6	73.0
Proposed Site Conditions - Construction					
Northern Parcel	17.0	0.0	1.0	0.0	18.0
Southern Parcel	52.3	0.0	0.0	2.7 a/	55.0
Total	69.3	0.0	1.0	2.7	73.0
Proposed Site Conditions - Operation					
Northern Parcel	2.0	15.0	1.0	0.0	18.0
Southern Parcel	52.3	0.0	0.0	2.7 a/	55.0
Total	54.3	15.0	1.0	2.7	73.0

a/ About 0.04 acre of salt marsh would be disturbed and permanently filled during construction of the facility (see section 4.4)

Existing land uses surrounding the proposed LNG terminal site include a mixture of industrial, transportation corridor, commercial, open space, and residential uses. Along the Taunton River, land uses consist of industrial, residential, open space, and commercial areas. Operation of the LNG terminal as a marine industrial facility would be consistent with the zoning and designated uses of the site (see section 4.8.2).

The completed ship unloading facilities associated with the LNG terminal (i.e., unloading platform, service platform, trestles, breasting dolphins, mooring dolphins, and connecting walkways) would occupy an area about 150 feet wide and 1,080 feet long and would replace the existing pier.

The dredging of the federal navigation channel and turning basin would disturb a total of about 191 acres of river bottom in Mount Hope Bay and the Taunton River. Weaver's Cove Energy would dredge the existing federal navigation channel to a depth of 37 feet (plus 1 foot allowance for overdredge). More than half of the channel is already at a depth of 37 feet or greater so no additional dredging would be necessary in these areas. In total, about 136 acres of the federal navigation channel would be dredged. The existing 33-acre turning basin would be dredged to a depth of 41 feet (plus a 1 foot allowance for overdredge) and expanded to the east and north to accommodate the berth area and turning of LNG ships. The expanded and deepened turning basin would affect about 54 acres of river bottom. Another 1.3 acres of disturbance would be associated with dredging of a temporary construction access channel and installation of the pipeline across the river. Additional information on the dredging activities associated with the project is presented in section 2.4.1.3.

4.8.1.2 Pipeline Facilities

The Weaver's Cove LNG Project would involve construction of two 24-inch-diameter pipelines that would connect the LNG terminal with the existing Algonquin pipeline system. The Northern Pipeline would consist of about 3.6 miles of 24-inch-diameter pipeline in Fall River (2.7 miles) and Freetown (0.9 mile), Massachusetts. The Western Pipeline would consist of about 2.5 miles of 24-inch-diameter pipeline in Fall River (0.3 mile), Somerset (1.3 miles), and Swansea (0.9 mile), Massachusetts. Table 4.8.1-2 summarizes the land uses crossed by the proposed pipeline routes.

Of the 3.6 miles of the Northern Pipeline route, about 3.5 miles (97 percent) would be constructed within an existing utility right-of-way, specifically the existing Shell Oil easement that includes two pipelines (a 6-inch-diameter former products pipeline and a 20-inch-diameter former naphtha pipeline) (2.2 miles), or adjacent to a transportation (i.e., road or railroad) right-of-way (1.3 miles). The remaining 0.1 mile (3 percent) would be constructed on newly created right-of-way located at the northern end of the pipeline route. The Northern Pipeline, as well as the existing utility right-of-way, are adjacent to a single-track CSX railroad for about 2.8 miles. The predominant land use that would be crossed is open land, comprising about 3.2 miles (89 percent) of the pipeline route. Industrial/commercial land and forest land comprise about 0.3 mile (8 percent) and 0.1 mile (3 percent) of the pipeline route, respectively. The construction right-of-way associated with the Northern Pipeline route would also be located within 50 feet of several residences (see section 4.8.3.2).

Of the 2.5 miles of the Western Pipeline route, about 1.8 miles (72 percent) would be constructed adjacent to or within existing utility rights-of-way. The remaining 0.7 mile (28 percent) would be constructed on newly created right-of-way. The 0.7 mile of newly created right-of-way consists of 0.4 mile across the Taunton River and 0.3 mile at the western end of the pipeline route. The predominant land use that would be crossed is open land, comprising about 1.6 miles (64 percent) of the pipeline route. Open water associated with the Taunton River crossing is the second most prevalent land use, comprising 0.4 mile (16 percent) of the proposed pipeline route. Forest and industrial/commercial land comprise about 0.3 mile (12 percent) and 0.2 mile (8 percent) of the proposed pipeline route, respectively. The

construction right-of-way associated with the Western Pipeline route would also be located within 50 feet of several residences (see section 4.8.3.2).

TABLE 4.8.1-2

Land Uses Crossed by the Proposed Pipeline Facilities

Facility/Community	Open Land a/ (miles)	Open Water b/ (miles)	Forest Land c/ (miles)	Industrial/Commercial Land d/ (miles)	Total (miles)
Northern Pipeline					
Fall River	2.4	0.0	0.0	0.3	2.7
Freetown	0.8	0.0	0.1	0.0	0.9
Subtotal	3.2 (89%)	0.0 (0%)	0.1 (3%)	0.3 (8%)	3.6 (100%)
Western Pipeline					
Fall River	0.0	0.2	0.0	0.1	0.3
Somerset	1.0	0.2	0.0	0.1	1.3
Swansea	0.6	0.0	0.3	0.0	0.9
Subtotal	1.6 (64%)	0.4 (16%)	0.3 (12%)	0.2 (8%)	2.5 (100%)
Project Total	4.8 (78%)	0.4 (7%)	0.4 (7%)	0.5 (8%)	6.1 (100%)

a/ Open land consists of non-forested lands, shrublands, scrub-shrub wetlands, emergent wetlands, and open riparian wetlands.
b/ Open water includes water crossings greater than 100 feet (i.e., the Taunton River crossing).
c/ Forest land includes tracts of wooded upland or forested wetlands.
d/ Industrial/commercial land includes electric power or natural gas utility facilities, manufacturing or industrial plants, roads, and commercial or retail facilities.
Note: The totals shown in this table may not equal the sum of addends due to rounding.

Land use impacts associated with the pipelines would include the disturbance of existing land uses within the construction rights-of-way during construction and retention of new permanent rights-of-way for operation of the pipelines. Weaver's Cove Energy proposes to use a maximum 75-foot-wide construction right-of-way for the majority (89 percent) of the Northern Pipeline route. About 10 percent of the Northern Pipeline route would be constructed using a 50-foot-wide construction right-of-way to avoid buildings or structures or to stay within the existing Shell Oil easement. The remaining 1 percent of the route would be located across roads where the right-of-way would be as permitted by the local agencies.

The majority of the Western Pipeline route (71 percent) would be constructed using a maximum of a 100-foot-wide construction right-of-way. About 24 percent of the Western Pipeline route would be constructed using a reduced construction right-of-way that would vary from 50 to 80 feet wide to avoid powerlines and other structures. The remaining 5 percent of the route would be located across roads where the right-of-way would be as permitted by the local agencies. For both the Northern and Western Pipeline routes, a 50-foot-wide permanent right-of-way would be maintained for operation and maintenance of the pipelines in all areas except at road crossings where the permanent right-of-way width would be as permitted by the local agencies. The typical right-of-way cross sections that Weaver's Cove Energy would use for the Northern and Western Pipeline routes are provided in Appendix D.

In addition to the construction right-of-way, Weaver's Cove Energy has identified two temporary extra workspaces that would be required along the Western Pipeline route. The first temporary extra workspace would be located at about MP 0.5 and is needed to facilitate the crossing of the Taunton River. This temporary extra workspace would require 0.2 acre of open land. The second temporary extra

workspace would be located at about MP 2.2 and is needed to install an underground AC mitigation structure. This temporary extra workspace would require 0.2 acre of forested land. Weaver's Cove Energy has not yet identified temporary extra workspace requirements along the Northern Pipeline route.

To support construction of the Northern and Western Pipelines, Weaver's Cove Energy proposes to use one pipe storage yard located near the end of the Northern Pipeline route within the Riverfront Business Park. The yard would require about 4.0 acres of open land that was previously used as a pipe/contractor yard.

Weaver's Cove Energy proposes to construct two meter and regulation stations, one at the end of the Northern Pipeline (MP 3.6) and one at the end of the Western Pipeline (MP 2.5) where each interconnects with the Algonquin pipeline system. A portion of each meter and regulation station site would be fenced and would include metering and regulation facilities; pig launcher and receiver facilities; a data acquisition building that would house communication and other electronic equipment; an area reserved for future regulators, heaters, and filters; a light pole; and a paved driveway and parking area. The meter and regulation station at the end of the Northern Pipeline route would require 0.9 acre of forested land within the Riverfront Business Park for construction and operation. The meter and regulation station at the end of the Western Pipeline route would require 1.4 acres of forested land for construction and operation. About 1.0 acre of this area would be fenced and would be located adjacent to the existing Algonquin pipeline right-of-way. The remaining 0.4 acre would consist of a cleared area around the perimeter of the fence.

Construction of the pipeline facilities would disturb a total of about 65.5 acres of land, including the pipeline construction rights-of-way, temporary extra workspace, a pipe storage yard, aboveground facilities, and access roads. Of this total, 58.7 acres would be disturbed by the pipeline construction rights-of-way, 0.4 acre would be disturbed by temporary extra workspace, 4.0 acres would be disturbed by a pipe storage yard, 2.3 acres would be disturbed by aboveground facilities, and less than 0.1 acre would be disturbed by access roads. Table 4.8.1-3 summarizes the acres of each land use that would be affected by construction and operation of the proposed pipeline facilities.

Open land would be the primary land use affected by construction of the pipeline facilities totaling about 51.5 acres (79 percent). The remaining land uses that would be disturbed consist of 5.5 acres (8 percent) of forest land, 5.1 acres (8 percent) of open water, and 3.4 acres (5 percent) of industrial/commercial land.

Of the 65.5 acres of land affected by construction of the pipeline facilities, about 36.0 acres would be retained as permanent right-of-way for the pipelines and 2.3 acres would be retained for aboveground facilities. Most of the land required for the permanent pipeline right-of-way is currently within an existing utility easement. The land retained for the meter and regulation stations would be fenced and off limits to any future development. The land that is retained as permanent right-of-way for the pipelines would be allowed to revert to former use with certain restrictions. Activities such as the construction of aboveground structures, including houses, house additions, garages, patios, pools, or any other object not easily removable, or the planting and cultivating of trees or orchards, would be prohibited within the permanent right-of-way. The remaining 27.2 acres that are used for construction would be allowed to revert to prior uses following construction with no restrictions.

All of the pipeline facilities would be located on privately owned lands with the exception of those portions of the pipelines within public road rights-of-way. To minimize impacts on residential areas, Weaver's Cove Energy would align a majority of its proposed pipeline within or adjacent to existing utility or transportation rights-of-way (97 percent for the Northern Pipeline route and 72 percent for the Western Pipeline route). The 2.2 miles of existing Shell Oil right-of-way along the Northern

Pipeline route is comprised of easements. About half of the 1.8 miles of existing right-of-way along the Western Pipeline route is comprised of parcels owned in fee by the powerline company. The remaining 0.9 mile is comprised of easements (0.7 mile), public road rights-of-way (0.1 mile), and land within the proposed LNG terminal site (0.1 mile). Weaver's Cove Energy would need to acquire new easements or property to construct and operate the proposed facilities. The easement would convey both temporary (for construction) and permanent rights-of-way to Weaver's Cove Energy and would give Weaver's Cove Energy the right to construct, operate, and maintain the pipeline facilities. Weaver's Cove Energy would negotiate a one-time payment for each easement. An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way after construction.

TABLE 4.8.1-3

Acres of Land Affected by Construction and Operation of the Pipeline Facilities for the Weaver's Cove LNG Project

Facility	Open Land		Open Water		Forest Land		Industrial/ Commercial Land		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
Northern Pipeline										
Pipeline Right-of-Way a/	28.7	19.3	0.0	0.0	1.2	0.8	2.3	1.6	32.2	21.7
Temporary Extra Workspace b/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pipe Storage Yard	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
Aboveground Facilities	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northern Pipeline Subtotal	33.6	20.2	0.0	0.0	1.2	0.8	2.3	1.6	37.1	22.6
Western Pipeline										
Pipeline Right-of-Way c/	17.7	9.2	5.1	2.7	2.6	1.7	1.1	0.7	26.5	14.3
Temporary Extra Workspace	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.4	0.0
Pipe Storage Yard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aboveground Facilities	0.0	0.0	0.0	0.0	1.4	1.4	0.0	0.0	1.4	1.4
Access Roads	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	<0.1	0.0
Western Pipeline Subtotal	17.9	9.2	5.1	2.7	4.3	3.1	1.1	0.7	28.4	15.7
Pipeline Facilities Subtotal										
Pipeline Right-of-Way	46.4	28.5	5.1	2.7	3.8	2.5	3.4	2.3	58.7	36.0
Temporary Extra Workspace	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.4	0.0
Pipe Storage Yard	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
Aboveground Facilities	0.9	0.9	0.0	0.0	1.4	1.4	0.0	0.0	2.3	2.3
Access Roads	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	<0.1	0.0
Pipeline Facilities Total	51.5	29.4	5.1	2.7	5.5	3.9	3.4	2.3	65.5	38.3

a/ Based on a maximum of a 75-foot-wide construction right-of-way. Some areas would have a reduced construction right-of-way to avoid buildings or structures or to stay within an existing right-of-way. Operation acreage is based on a 50-foot-wide permanent right-of-way in all areas except at road crossings where the right-of-way width would likely be less based on local agency permits (assumed to be about 15 feet).

b/ Weaver's Cove Energy has not yet identified temporary extra workspace requirements for the Northern Pipeline route.

c/ Based on a maximum of a 100-foot-wide construction right-of-way. Some areas would have a reduced construction right-of-way to avoid powerlines and other structures. Operation acreage is based on a 50-foot-wide permanent right-of-way in all areas except at road crossings where the right-of-way width would likely be less based on the local agencies permits (assumed to be about 15 feet).

Const. Construction
Oper. Operation
Note: The totals shown in this table may not equal the sum of addends due to rounding.

If an easement cannot be negotiated with a landowner and the project has been certificated by the FERC, the company may use the right of eminent domain granted to it under section 7(h) of the NGA and the procedures set forth under the Federal Rules of Civic Procedure (Rule 71A) to obtain the right-of-way and extra workspace areas. The company would still be required to compensate the landowner for the right-of-way and damages incurred during construction. However, the level of compensation would be determined by a court according to state or federal law. In either case, Weaver's Cove Energy would compensate landowners for use of the land.

4.8.2 Consistency with Existing Land Use Plans, Policies, Designations, and Guidelines

There are several existing plans, polices, designations, and guidelines that have been established for land use development in the project area by state, regional, and local entities. Overall, our analysis indicates that the proposed project appears to be consistent with the existing plans and guidelines that have been established for land use development in the project area by various entities. However, we received several comments on the draft EIS suggesting that the Weaver's Cove LNG Project is inconsistent with local land use plans and policies and that the City of Fall River has identified the site of the proposed LNG terminal as a prime location for a hotel and conference center or anchor office park. Our determination was based on what is stated in existing planning documents. We cannot interpret the intent of planned uses for the proposed LNG terminal site beyond those described in these existing documents. Consistency of the Weaver's Cove LNG Project with these plans, policies, designations, and guidelines is discussed below. Consistency with coastal zone management policies is discussed in section 4.8.4.

State

Fall River - Mount Hope Bay Designated Port Area - The southern parcel of the LNG terminal site, where most of the proposed facilities would be located, is within the Fall River - Mount Hope Bay DPA. DPAs are designated by the state for the purposes of promoting and protecting marine industrial activities and supporting uses. Projects proposed within DPAs must be maritime industrial uses or supporting uses. Among other things, water-dependent industrial uses include marine terminals and related facilities for transfer and storage of goods transported by marine vessels and manufacturing facilities relying on goods shipped by waterborne transportation (The Cecil Group, Inc., 2002).

The proposed LNG terminal is consistent with the uses of a DPA because it qualifies as a marine-dependent industrial facility. Currently, the only feasible method of importing large volumes of LNG from overseas is by ship. Additional discussion of DPAs and consistency with Massachusetts coastal zone management policies is presented in section 4.8.4.

Massachusetts Contingency Program - The LNG terminal site is now in Phase V of the MCP process. As discussed in section 4.2.2, the placement of the sediments on the site would not have a significant environmental impact. The placement and reuse of dredged sediment at the proposed LNG terminal site could potentially improve the current site conditions by effectively isolating soil hot spots for lead and LNAPL from potential receptors. In addition, the upland placement of the dredged sediment on the LNG terminal site would not impede current LNAPL recovery efforts. The MCP, however, in 310 CMR 40.0032 (3)b prohibits the disposal or reuse of soils containing oil or hazardous materials "at locations where existing concentrations of oil and/or hazardous material at the receiving site are significantly lower than levels of those oil and/or hazardous materials present in the soil being disposed or reused." This is in keeping with the statutory preference contained in Chapter 21E to maintain or achieve background levels of oil or hazardous materials at sites proposed for placement or reuse of soils or sediments from offsite sources. Based on sampling and analysis of soils at the proposed LNG terminal site conducted by Weaver's Cove Energy in September 2004, it appears that upland reuse of the stabilized

dredged sediment may be in compliance with the MCP. We note, however, that the DEP has not made a final decision about this issue.

Redevelopment Within Previously Developed Riverfront Areas (310 CMR 10.58(5)) - We received a comment from the DEP stating that the project appears to fall within the provisions of 310 CMR 10.58(5). A discussion of the project relative to these provisions is provided in section 4.4.

Regional

Vision 2020: A Partnership for Southeastern Massachusetts - The Southeastern Regional Planning and Economic Development District (SRPEDD), Old Colony Planning Council (OCPC), and the Metropolitan Area Planning Council (MAPC) initiated a regional growth management project called Vision 2020: A Partnership for Southeastern Massachusetts. Southeastern Massachusetts includes 52 cities and towns in Bristol, Plymouth, and Norfolk Counties and is geographically defined by Massachusetts Bay, Buzzards Bay, and the Taunton River Watershed and its location relative to Boston, Rhode Island, and Cape Cod.

The mission of the Vision 2020 project is to "make recommendations to improve the management of land use, protect the natural environment, and foster sustainable economic growth and development in southeastern Massachusetts so that such management results in growth consistent with the region's unique character, natural and historic resources, and quality of life for the benefit of future generations" (Partnership for Southeastern Massachusetts, 2003). The project aims to refocus a larger share of regional growth on central cities, urbanized areas, inner suburbs, and areas that are already served by infrastructure. This type of development is considered "smart growth" and is in contrast to most current development practices that result in sprawl and the construction of new or expanded infrastructure. The following Smart Growth Principles were defined in Vision 2020:

- encourage growth in areas with existing and underutilized infrastructure;
- mix compatible land uses;
- build compactly;
- provide a range of housing opportunities;
- present a strong sense of place;
- coordinate public investment, and find a fair and broad-based way to fund infrastructure and municipal services;
- preserve open space, critical environmental areas, farmland, and places of natural beauty; and
- make development decisions predictable, fair, and cost effective.

In addition to Smart Growth Principles, Vision 2020 recommended in its Agenda for the Future (1999) that action strategies be prepared for open space, natural resources, economic development, urban reinvestment, land use, housing, and infrastructure. It was recommended that coordinated actions be taken to protect open space and to concentrate development within established town centers and urban areas. One of the action strategies for land use management was the creation of priority development

areas (see discussion below). Action strategies for economic development include supporting redevelopment of urban sites and promoting marine-related business.

The proposed Weaver's Cove LNG Project is consistent with both the Smart Growth Principles and the visions outlined in the Agenda for the Future in the following ways:

- the project would redevelop an existing brownfield site without impacting open spaces, critical environmental areas, or farmland;
- the LNG terminal would be located in an area that is well served by existing infrastructure;
- the project would redevelop an urban site; and
- the project would promote marine-related business.

The Agenda for the Future also stated that "in Fall River, the industrial use of the waterfront has declined; this part of the city has new potential to provide regional public amenities through the development of parks, visitor attractions and retail space" (Partnership for Southeastern Massachusetts, 1999). The areas intended for development of these facilities does not extend to the LNG terminal site. Consistency of the project with local land use plans and policies is provided below.

Priority Development and Protection Areas - To manage growth in southeastern Massachusetts, the SRPEDD prepared *Regional Land Use: Priority Development Areas and Priority Protection Areas in Southeastern Massachusetts*. The SRPEDD developed a list of preservation and development priority sites throughout southeastern Massachusetts' cities and towns to stimulate local and regional discussion, assist with the protection of the preservation priority sites, and assist with the development/redevelopment of priority development sites.

The priority development areas and redevelopment areas were nominated where infrastructure, zoning, and access made the areas most suitable for development. There are seven development priority areas in Fall River. The waterfront area of Fall River was nominated as a development priority site but does not extend northward to include the proposed LNG terminal site. The proposed dredging of the federal navigation channel in the Taunton River by Weaver's Cove Energy could promote the development of the Fall River priority development area by allowing access by deep-draft vessels to the area.

Priority protection areas were proposed where growth should be discouraged and protection and preservation encouraged in areas that are not already protected through some other means. These areas included farms, woodlands, vistas, ponds, shorelines, and other areas where excessive development would be incompatible with preservation goals. There are no priority preservation sites within a 1-mile radius of the LNG terminal site or crossed by the pipeline routes.

Comprehensive Economic Development Strategy - In 2003, the SRPEDD released its *Comprehensive Economic Development Strategy (CEDS): Toward a More Competitive Southeastern Massachusetts*. The report identifies the SRPEDD's economic strategy for the region in terms of goals, objectives, and development strategies. One of the goals is to promote the cleanup and redevelopment of existing brownfield sites for economic development (Goal G). The redevelopment of the proposed LNG terminal site would be consistent with this goal and would assist in attaining the identified objective of reducing the number of brownfield sites in the region by up to 20 percent over the next 5 years. In a letter dated August 7, 2003, the SRPEDD confirmed that the proposed LNG terminal at the former Shell Oil site would be consistent with regional land use goals and economic development strategies because it

would redevelop a brownfield site in an urban area (SRPEDD, 2003a). The SRPEDD also indicated that the continued use of the site as an industrial sea port is what was anticipated when the Coast Guard required a 200-foot-wide horizontal clearance of the bridge opening for the new Brightman Street Bridge currently under construction over the Taunton River.

The CEDS also contains a list of regional economic development and public works projects that are currently or would support the goals and objectives identified in the report. One of the projects listed is the dredging of the Taunton River/Fall River Harbor. It states that the funding source would be state bonds or other bonds and that the status of the action is unknown. The dredging proposed as part of the Weaver's Cove LNG Project would complete the majority of this project and would do so with private funds.

Narragansett Bay Estuary Program - The Rhode Island DEM runs the Narragansett Bay Estuary Program. The mission of the program is to "protect and preserve Narragansett Bay through partnerships that conserve and restore natural resources, enhance water quality and promote community involvement" (Narragansett Bay Estuary Program, 2003). One of the priorities for the program is to coordinate and oversee implementation of the Narragansett Bay Comprehensive Conservation and Management Plan (CCMP). The CCMP was completed in 1993 in compliance with section 320 of the CWA. The CCMP is based on the following overall goals (Narragansett Bay Estuary Program, 2003):

- to prevent further degradation and incrementally improve water quality in developing coastal areas with deteriorating water quality;
- to protect diminishing high quality resource areas throughout the bay watershed;
- to more effectively manage commercially, recreationally, and ecologically important estuarine-dependent living resources;
- to rehabilitate degraded waters in the bay watershed and restore water quality-dependent uses of Narragansett Bay; and
- to establish necessary interstate and interagency agreements and mechanisms to coordinate and oversee implementation of the Narragansett Bay CCMP.

Dredging activities in Mount Hope Bay and the Taunton River could potentially impact water quality and aquatic resources within Narragansett Bay. Impacts on water quality and aquatic resources and proposed mitigation measures to minimize impacts are discussed in sections 4.3.2 and 4.6.2, respectively.

Local

Fall River Zoning District Designations - Both the northern and southern parcels of the proposed LNG terminal site are zoned IND - industrial district. In an industrial district, "buildings and structures may be constructed, altered, enlarged or reconstructed and used and land may be used for manufacturing, assembling, packaging, industrial research and development, biotechnology, processing, fabrication, warehousing, wholesaling, trucking, including terminal facilities and uses customarily accessory to such uses" (City of Fall River, 1999). Requirements for industrial districts are as follows:

- Dust, smoke, fumes, gas, glare, noxious odors, noise, and vibrations shall be limited so as not to be injurious to the public health or to the use of neighboring property as provided by the laws of the commonwealth;

- All buildings and outdoor storage or work areas shall be set back at least 20 feet from any street line and property line;
- Adequate provision shall be made for the off-street accommodation of all vehicles, including those of employers, employees, customers, and visitors;
- Flashing, moving, or intermittent illumination of buildings or signs shall not be permitted;
- Off-site signs are permitted, subject to the provisions set forth by the City of Fall River; and
- Minimum lot frontage is 100 feet and minimum lot area is 10,000 square feet.

The proposed LNG terminal would conform to the uses of an industrial district and would adhere to the requirements for the area. Details on how Weaver's Cove Energy would control dust and other emissions and noise are presented in sections 4.11.1 and 4.11.2, respectively. Impacts on nearby residential and commercial areas and measures to reduce these impacts are discussed in section 4.8.3. Section 4.8.7 describes impacts on visual resources, including lighting and glare associated with the proposed facility.

Comprehensive Master Plan for Fall River - The Comprehensive Master Plan for Fall River (Master Plan) outlines goals for the City of Fall River in the areas of land utilization, existing and future development, residential development, transportation, and primary services. The Master Plan provides a description of waterfront activities and outlines a strategy to encourage revitalization of the waterfront as a major New England public attraction. There are three separate areas identified for waterfront revitalization, all of which are south of the current Brightman Street Bridge. The three areas include: 1) Christina's Marina, Steamship Cove, Point Gloria, and Coca-cola; 2) Heritage State Park and the Central Waterfront Revitalization area; and 3) Kennedy Park-Olmstead Revitalization, Kennedy Park Beach, and Borden Light Marina. The proposed LNG terminal site is not located in and would not conflict with the proposed plans for these areas.

Fall River Harbor and Downtown Economic Development Plan - The Fall River Harbor and Downtown Economic Development Plan (Harbor Plan) is a plan for the revitalization of the Fall River harbor, waterfront, and downtown areas. The purpose of the Harbor Plan "is to increase the economic diversity of the community through the expanded use and revitalization of the harbor, the harbor front, and nearby areas within the downtown. The Harbor Plan seeks to establish a clear vision for these areas and to create a pragmatic strategy for accomplishing that vision" (The Cecil Group, Inc., 2002). Two planning areas were identified in the plan, the harbor planning area and the study area. The harbor planning area encompasses about 290 acres of land and includes four sub-areas: 1) the Central DPA; 2) downtown Fall River; 3) the Central Waterfront; and 4) the South Waterfront (see figure 4.8.2-1). The study area includes the harbor planning area and additional portions of the waterfront and downtown, including the proposed LNG terminal site (referred to as the Shell Oil Terminal tank farm). Economic development recommendations, land use recommendations, and plan actions and phases related to the proposed LNG terminal site are described below. A discussion of the planned developments included in the Harbor Plan and the potential impact on these developments associated with the Weaver's Cove LNG Project is provided in section 4.8.3.1.

Insert figure

4.8.2-1 Planning Areas as Shown in the 2002 Municipal Harbor Plan

The Harbor Plan provides a summary of key economic development recommendations to implement a vision of a diversified economic base for the City of Fall River. One of the 10 recommendations for economic development is to redevelop the former Shell Oil site for new industrial development. The Harbor Plan recognizes that given the probability that some portion of the site is contaminated, it is unlikely that it can be used for residential purposes, but that the site could be used for marine industrial, light industrial, distribution, and even some office space. It also suggests that the city acquire and redevelop the site. The Harbor Plan also recommends dredging of the federal navigation channel to facilitate the proposed revitalization of the area. The cost for the proposed dredging is estimated to be $4.7 million, which would be publicly funded.

The Weaver's Cove LNG Project appears to be consistent with the economic recommendation to redevelop the former Shell Oil site for a marine industrial use. In addition, the cleanup and redevelopment of the site would be privately funded and would not require city funds. Weaver's Cove Energy would also conduct the dredging of the federal navigation channel recommended in the Harbor Plan. The initial and maintenance dredging would be financed by Weaver's Cove Energy and would not require any public funds. Information on the anticipated amount of tax revenue the City of Fall River could expect to receive as part of the Weaver's Cove LNG Project is provided in section 4.9.6.

The Harbor Plan provides additional recommendations for land use. Most of the recommendations aim to create tourism along the waterfront through conversion of underutilized industrial and vacant uses. New uses include public amenities and access throughout the waterfront, a new mixed use facility at State Pier, a performing arts center, a hotel, a marina at City Pier, and commuter rail stations. One of the recommendations, however, deals with the promotion of industrial use. The recommendation is to "support redevelopment of the Shell Oil site as an industrial area" (The Cecil Group, Inc., 2002). The Harbor Plan identifies the former petroleum products distribution site as one of only two industrial development areas proposed along the Fall River waterfront. The recommendation calls for development of industrial space and a general cargo handling facility. The Harbor Plan underscores that investigations of existing building conditions and possible site contamination need to be undertaken and that dredging would be necessary before development.

The Weaver's Cove LNG Project would involve redeveloping the Shell Oil site to a marine-industrial use. Weaver's Cove Energy is coordinating with the previous owner of the site and the DEP to ensure that development of the site is consistent with ongoing remediation efforts (see section 4.3.1). In addition, Weaver's Cove Energy would conduct the dredging needed to achieve adequate water depths for larger ships (e.g., cruise ships) traveling to the Fall River area. This work would be privately funded and would not require any financial support from the City of Fall River. As a result, the proposed project appears to be consistent with the Harbor Plan's land use recommendation for industrial use of the site and the dredging conducted by Weaver's Cove Energy would help implement a portion of the Harbor Plan without financial cost to the city.

As previously discussed, we received several comments on the draft EIS suggesting that the City of Fall River has identified the site of the proposed LNG terminal as a prime location for a hotel and conference center or anchor office park. We did not find a reference in the Harbor Plan regarding the use of the Shell Oil site for non-industrial purposes. The site is located within a DPA and currently zoned as an industrial district. Projects within DPAs must be maritime industrial uses or supporting uses. The Harbor Plan is, in part, a master plan for the DPA and "must preserve and enhance the capacity of the entire DPA to accommodate water-dependent industrial use, and must prevent substantial exclusion of such use by any other use eligible for licensing in a DPA pursuant to 310 CMR 9.32" (The Cecil Group, Inc., 2002). In addition, according to the Harbor Plan, industrial districts do not allow for hotels, marinas, boat building, and similar waterfront activities. As a result, it does not appear that use of the site for non-

industrial purposes (e.g., hotel, conference center) would be consistent with the current zoning of the site or the use of the area as a DPA and thus would require changes in these classifications.

Fall River Open Space and Recreation Plan - The Fall River Open Space and Recreation Plan (1997) aims to protect the city's natural resources, restore degraded natural areas, maintain existing public open space, and improve public access and connections to natural areas. The plan identifies the Taunton River as a driving force in the economic development of the city but recognizes that its role as a potential recreational resource has been overshadowed until recently. The plan outlines six goals:

- increase protection of North Watuppa and Copicut water supply and East Fall River watershed lands;
- expand outdoor recreational opportunities for Fall River residents;
- protect natural resources and create new greenways in urban Fall River;
- enhance the quality and appeal of Fall River's streetscapes;
- restore Fall River's park system; and
- develop implementation and funding mechanisms to support open space and recreation needs.

The Weaver's Cove LNG Project would not conflict with the Fall River Open Space and Recreation Plan because facilities associated with the project would not be located on land proposed for recreational use. In addition, the LNG terminal would be located on an industrially-zoned site that is currently contaminated and unusable for recreational purposes. The proposed project would, however, affect some recreational uses of the Taunton River as described in section 4.8.6.

Healthy City Fall River Action Plan 2004-2009 – We received comments on the draft EIS indicating that the City of Fall River, Department of Health and Human Services is involved in an initiative to define Fall River as a *Healthy City*. The Healthy City Fall River project is an effort to involve the community in a process that promotes deliberate actions designed to improve health and overall well being of those who live or work in Fall River. The five priority areas identified as part of the plan include: safety and substance abuse (increased community policing and personal safety, a drug-free community, and reduction of gangs); environment and recreation (cleaner streets and parks, increased and improved recreational opportunities for youth and adults, and measures to ensure cleaner air and water); health education; adult education, job training, and employment; and community planning and housing. As previously discussed, the proposed LNG terminal is consistent with the current zoning and DPA designation of the former Shell Oil site. The site is currently contaminated and unusable for recreational purposes. We do not anticipate that the Weaver's Cove LNG Project would interfere with the initiative to define Fall River as *Healthy City*. Impacts associated with the facility on water resources, air, and safety are discussed in sections 4.3, 4.11.1, and 4.12, respectively.

4.8.3 Existing Residences and Planned Developments

4.8.3.1 LNG Terminal

Existing Residences

Based on information contained in the LandView® Census 2000 Population Estimator produced by the EPA, NOAA Fisheries, Coast Guard, and U.S. Census Bureau, approximately 12,000 people living in 5,100 housing units are located within 1 mile of the proposed LNG storage tank. Of these 5,100

housing units, approximately 1,200 units are located within 0.5 mile of the proposed LNG storage tank. Weaver's Cove Energy inventoried and conducted an analysis of the properties that are located closest to the LNG terminal site and would be most affected by project-related activities. The analysis was conducted on two discrete blocks, Block A and Block B.

Block A includes the properties between the railroad tracks abutting the eastern edge of the proposed LNG terminal site and North Main Street. The block is made up of 25 lots that are all zoned for industrial use. Included on this block are a diesel engine/truck repair business, a commercial laundry, a storefront property, a vacant parcel comprised of four lots, 10 single-family homes, 2 two-family homes, and 1 three-family home. The closest single-family residence to the LNG storage tank (1,170 feet) is located within this block, on the west side of North Main Street and south of Alton Street. Weaver's Cove Energy has offered property owners in Block A a real estate buy-out/easement package to compensate for potential temporary inconveniences during the construction of the facility. Additional details on the real estate buy-out/easement package are provided in section 4.9.5.

Block B includes the area between North Main Street and Route 79 up to but not including 2585 North Main Street. Block B is made up of 22 lots zoned "general residence", including 2 vacant parcels consisting of five lots, a lot with a two-car oversized garage, 11 single-family homes, and a two-family home. The 13 property owners holding 15 parcels in this block have also been offered a real estate buy-out/easement package (see section 4.9.5).

Medium density single-family and multi-family residential neighborhoods lie beyond Route 79 toward the east. The Pleasant View Apartments, which consist of over 30 state-funded affordable low income family housing buildings, are located between approximately 1,850 feet and 2,950 feet east of the LNG storage tank. Industrial and commercial uses dominate the area south of the site beyond Route 79. A complex of mills south of Route 79 historically supported the textile industry has now been converted to a mixed use. One of the mills, Border City Mills, has been renovated for residential use and now supports 107 apartment units. The apartment complex is located about 1,100 feet south of the proposed LNG storage tank. The closest U.S. Department of Housing and Urban Development (HUD) housing consists of 100 units of elderly apartments located about 3,200 feet southwest of the LNG storage tank.

In addition to residences, there are several churches, schools, and health care-related facilities located within 1 mile of the LNG terminal site. Table 4.8.3-1 summarizes the location of these facilities relative to the proposed LNG storage tank. There are no hospitals located within 1 mile of the LNG terminal site.

TABLE 4.8.3-1

Churches, Schools, and Health Care-Related Facilities Located within 1 Mile of the Proposed LNG Terminal

Facility	Location	Distance and Direction from Proposed LNG Storage Tank
Artificial Kidney Center of Fall River	North side of Weaver Street	1,340 feet south
William J. Wiley Elementary School a/	Corner of North Main Street and Canedy Street	1,830 feet northeast
The Highlander Rehabilitation and Nursing Center	Highland Avenue	2,000 feet east
Seventh Day Adventist Church	Corner of North Main Street and Haskell Street	2,230 feet northeast
St. Michaels School and Church	Essex Street	3,300 feet southwest
Sunbridge Care and Rehabilitation - Rosewood	Highland Avenue	3,740 feet northeast
Somerset High School	Corner of Grandview Avenue and County Street	4,030 feet northwest
St. Joseph's School and Church	North Main Street	4,950 feet southwest
Tansey School	Ray Street	5,200 feet southeast

a/ This school has been closed.

During construction of the LNG terminal, short-term impacts on neighboring residential and commercial areas could include increased construction-related traffic on local roads, dust generated during dredged material placement and site construction, and noise from construction equipment. In general, as the distance to the construction site increases, the impacts on these areas decrease. Additional information on measures Weaver's Cove Energy would implement to reduce impacts associated with increased traffic, dust, and noise is presented in sections 4.9.4, 4.11.1, and 4.11.2, respectively.

Potential impacts on nearby residential and commercial areas during operation of the LNG terminal include increased visibility of aboveground structures associated with the facility, increased traffic, changes in air quality, and safety hazards. These impacts and applicable mitigation measures are discussed in sections 4.8.7.1, 4.9.4, 4.11.1, and 4.12 respectively.

Planned Developments

There are no planned residential developments near the proposed LNG terminal site; however, there are several commercial and industrial developments and transportation projects proposed in the general area as described below. There is also a development proposed as an alternative to the LNG terminal at the former Shell Oil site. In addition, the City of Fall River has indicated that the site of the proposed LNG terminal is a prime location for a hotel and conference center or anchor office park. Additional information on the City of Fall River's plans for the site as well as consistency with other local and regional plans is discussed in section 4.8.2.

Green Futures Development – Green Futures, a local environmental group based in Fall River, has proposed an alternative development to Weaver's Cove Energy's LNG terminal at the former Shell Oil site. The development proposed by Green Futures includes a marina and boathouse, hotel/conference center or marina condominiums, four soccer fields, four baseball fields, two football fields, four basketball courts, a concession and equipment building, a waterfront public garden, a waterfront promenade, outdoor cafes, a bandstand for summer concerts, an arboretum, a walking and jogging path around the site, a picnic area overlooking the Taunton River, a commuter rail station, and a site for a beach. Green Futures estimates the cost for the proposed development would be around $32 million and would include both public and private funds.

The Weaver's Cove LNG Project would conflict with and preclude the Green Futures development because they are both proposed for the same site. However, the Green Futures development does not appear to be consistent with the use of the site as a DPA, local zoning ordinances, or the specific recommendations for the site contained in the Harbor Plan. As discussed in section 4.8.2, projects proposed within DPAs must be maritime industrial uses or supporting uses. Unlike the proposed LNG terminal, the Green Futures development would not be a maritime industrial use and would not be a consistent use within a DPA. The Green Futures development would also be inconsistent with the current industrial zoning designation of the site and the Harbor Plan's recommendation to redevelop the former Shell Oil site for new industrial development. In addition, the Harbor Plan indicates that because of possible contamination at the site, it is unlikely it can be used for residential purposes. Another difference between the two proposed projects is that the development associated with the Weaver's Cove LNG Project would be privately funded whereas the Green Futures development would require some public funds. Additional details regarding the consistency of the Weaver's Cove LNG Project with local and regional plans is provided in section 4.8.2.

Harbor Plan Developments - As discussed in section 4.8.2, the Harbor Plan is a plan for the revitalization of Fall River's harbor, waterfront, and downtown areas. It includes several potential developments to assist in the revitalization of the area. These developments are described below.

- *City Pier* - The Harbor Plan recommends the construction of a 150- to 200-room waterfront hotel at the site of the former City Pier area. Design and construction of the hotel is slated for implementation during years 4 and 5 of the final Harbor Plan (published in 2002). The purpose of the hotel would be to anchor the waterfront and provide a connection between tourist attractions and business-related functions. The City Pier is located about 1.2 miles southwest of the proposed LNG terminal site.

- *State Pier and Battleship Cove* - The Harbor Plan describes the State Pier and Battleship Cove areas as suited for expanded cultural uses and new attractions, including a performing arts center and provisions for recreational boating, ferries, excursion boats, and cruise ships. The City of Fall River is currently securing funding to implement this vision for State Pier. In April 2002, the Seaport Advisory Council approved Fall River's request for $50,000 to conduct a cost-benefit analysis for the State Pier facilities and $10,000 for a parking analysis. State Pier and Battleship Cove are located about 2 miles southwest of the proposed LNG terminal site.

- *Waterfront Walkway/Bikeway* - The Harbor Plan calls for a 3,900-foot waterfront walkway and bikeway connecting Bicentennial Park to Heritage State Park. The proposed bikeway is intended to eventually link recreation areas in Fall River. The funding for the project is from a state grant under the 1996 Seaport Bond Bill, which encourages port cities to restore their waterfronts. Construction of the walkway and bikeway is currently underway. Bicentennial Park, the closer of the two parks to the proposed LNG terminal, is located about 1.3 miles southwest of the site.

- *Heritage State Park* - The Harbor Plan recommends new attractions that would improve attendance at the park. Potential improvements could include replacement of the existing historic display, a children's museum, or a panoramic screen theater. Heritage State Park is located about 1.8 miles southwest of the proposed LNG terminal site.

- *Redevelopment of the Crab Pond Site* - The Harbor Plan describes plans for this site as a place to "jump start" activity in the underutilized area along Water Street. A Massachusetts Bay Transportation Authority (MBTA) rail platform is currently being developed at the site. The platform is expected to allow improved access to the waterfront and the nearby downtown area. The site is located about 2.2 miles from the proposed LNG terminal site.

- *Other Development Plans* - The Harbor Plan also provides recommendations and steps for development of retail/restaurant space, expansion of the marine museum, and office development. The majority of this development is planned for areas south of Interstate 195, which is about 2.2 miles south of the proposed LNG terminal site.

The Harbor Plan is in various stages of implementation so the exact construction date for some of these projects is unknown. However, because of the distance between these planned developments and the proposed LNG terminal site, the project is not expected to conflict with these development plans and would not constrain other waterfront developments south of the site. In addition, the LNG terminal site appears to be consistent with the proposed marine-industrial use of the site (see section 4.8.2). The dredging of the federal navigation channel associated with the Weaver's Cove LNG Project may assist in the development of the area because it would allow larger ships (e.g., cruise ships) to navigate the channel and access the Fall River area. Potential impacts on recreational boating associated with the proposed project are described in section 4.8.6.2.

We received comments expressing concern that the proposed LNG terminal and associated LNG shipping would threaten these future waterfront development plans. We do not believe that this would be the case. As part of its development plans for the KeySpan LNG Facility Upgrade Project, KeySpan LNG commissioned a market analysis of Charlestown, Massachusetts, which borders the transit route of LNG ships supplying the Distrigas LNG terminal in Everett (KTR Newmark, 2005). Under the Boston Redevelopment Authority (BRA), Charlestown has been undergoing urban redevelopment. One major waterfront redevelopment project associated with the overall redevelopment of Charlestown is known as the Navy Yard. The 135-acre Navy Yard site was formerly one of six naval yards established to build warships for the United States in the 1800s. When the Charlestown Navy Yard closed in 1974, 3 years after the Distrigas LNG terminal began its operations, 98 acres of the Navy Yard site were conveyed to the BRA for redevelopment of a mixed-use project consisting of both new and old construction and the rehabilitation of existing buildings. The market analysis concluded that the Charlestown Navy Yard redevelopment has attracted millions of dollars for revitalization projects in the area and has added approximately 1,100 housing units to the neighborhood. In addition, another approximately 500 housing units are in various stages of redevelopment. Overall, the housing units developed in the Navy Yard range in selling price from the low $200,000 range to above $2 million. Recreational space, marinas, and commercial, retail, and light industrial uses have also been incorporated into the redevelopment plan. Perhaps most importantly, the redevelopment was planned, constructed, and executed directly on a waterway that has been used by ships transporting LNG since the 1970s. Based on this study, the presence of an LNG terminal and LNG shipping activity does not appear to have had an adverse impact on redevelopment efforts in Charlestown. We believe that the proposed LNG terminal and associated LNG shipping would not threaten the future waterfront development plans.

Realignment of Route 79 - There is a proposal for a new waterfront boulevard in Fall River. The new boulevard would be built by combining Route 79 and Davol Street between Heritage State Park and the Brightman Street Bridge. The project would make additional land available for development. Proposed improvements consist of changing Route 79 from a limited access highway to an urban arterial and lowering the highway for approximately 3,000 feet between the existing southern Davol Street turn around ramps and a point about 650 feet north of President Avenue. A portion of Route 79, Davol Street North, and Davol Street South would be combined into a four-lane urban boulevard with a large landscaped median separating the northbound lanes from the southbound lanes (The Cecil Group, Inc., 2002). The new waterfront boulevard would be located about 1 mile southwest of the proposed LNG terminal site and would not be affected by construction or operation of the project. Traffic impacts associated with construction and operation of the Weaver's Cove LNG Project are discussed in section 4.9.4.

Fall River Industrial Park - The Fall River Industrial Park provides over 700 acres of manufacturing, laboratory, research and development, and office space. The park is located adjacent to Route 24 on the north end of Fall River about 1 mile from the proposed LNG terminal site. In June 2003, Hatch Technology, L.L.C., a robotic equipment maker, announced plans to expand into a new 12,000 square foot terminal at the industrial park. The proposed Weaver's Cove LNG Project would not inhibit the continued use or future development of the industrial park because of the distance from the development and the ample and unconstrained transportation infrastructure that serves the area (see section 4.9.4).

Fall River Executive Park - In exchange for a 4,300-acre conservation easement for the SMB, the City of Fall River received monetary compensation and 300 acres of forested land near Route 24 for development purposes. The city plans to use this land for the Fall River Executive Park, which is expected to spur economic development along Route 24 and generate up to 2,200 new jobs. The land transfer is expected to be completed in 2004. The proposed LNG terminal is located about 1.5 miles south of the planned Fall River Executive Park and would not affect its development or operation.

Stop & Shop Regional Distribution Terminal - A 1.3 million square foot distribution center is currently under construction in the adjoining municipality of Freetown, immediately north of the Fall River-Freetown municipal boundary. The terminal's location was selected to take advantage of the ample and unconstrained transportation infrastructure associated with Route 79. The proposed LNG terminal would not inhibit the development or operation of the distribution terminal because of the distance between the facilities and the ample and unconstrained transportation infrastructure that serves the area (see section 4.9.4).

MBTA Commuter Rail Project - The MBTA has proposed an extension of its Stoughton Line commuter rail service from South Station and Back Bay Station to New Bedford and Fall River. The proposed extension includes new construction of track, bridges, grade crossings, intersection improvements, and eight new commuter rail stations as well as two train layover facilities. The project would provide 16 daily roundtrips (8 round trips to New Bedford and 8 round trips to Fall River) and serve about 4,300 new daily inbound riders. Two stations are proposed for Fall River. The Fall River Station would be located at the intersection of Pearce Street and North Davol Street, about 1.2 miles southwest of the proposed LNG terminal site. The Battleship Cove Station would be located off Water Street near Anawan Street about 2.2 miles southwest of the proposed LNG terminal site.

The extension of the commuter rail line would use existing CSX railroad tracks through the east side of Taunton to Myricks Junction in Berkley. From Myricks Junction, the line continues southwest through Freetown to Fall River. The Fall River line would remain single-tracked with the addition of passing sidings to facilitate train movement. Work required on the Fall River segment includes reconstruction of the existing active freight tracks, signals, crossings, and bridges. The extension of the commuter line through Fall River would use the existing CSX railroad tracks that bisect the northern and southern parcels of the proposed LNG terminal site.

A final Environmental Impact Report was filed for the project in April 2002; however, actual implementation of the proposed extension of the MBTA commuter rail service is uncertain at this time. According to the MBTA, the project is on hold indefinitely due to lack of funding (DeRoma, 2004). As a result, construction of the commuter rail line extension is not expected to occur at the same time as construction of the proposed Weaver's Cove LNG Project. Therefore, no construction-related impacts are anticipated. Weaver's Cove Energy contends that if the MBTA Commuter Rail Project were to be constructed, it would not be affected by operation of the Weaver's Cove LNG Project. However, if the rail project were to go forward, Weaver's Cove Energy would consult with the MBTA and adhere to all safety stipulations agreed to by the parties.

4.8.3.2 Pipeline Facilities

Existing Residences

Weaver's Cove Energy's proposed construction work area for the pipeline facilities (i.e., construction right-of-way and temporary extra workspaces) would be located within 50 feet of 35 residential dwellings (i.e., homes or condominium units). Of the 35 residences, 14 are located along the Northern Pipeline route and 21 are located along the Western Pipeline route. Table 4.8.3-2 lists these residences by milepost and indicates the distance and orientation of each from the proposed construction work area. No residences are located within 50 feet of the associated aboveground facilities.

TABLE 4.8.3-2

Residences Located Within 50 Feet of the Construction Work Area for the Pipeline Facilities Associated With the Weaver's Cove LNG Project

Facility/Community	Milepost	Description	Distance from Construction Work Area (feet)	Distance from Pipeline Centerline (feet)	Orientation from the Construction Work Area
Northern Pipeline					
Fall River	0.55	House	40	60	East
	0.77 a/	House	Not Applicable (NA)	NA	East
	0.77 b/	House	8	21	West
	0.79 a/	House	NA	NA	East
	0.83 b/	House	5	10	West
	0.86 a/	House	NA	NA	East
	0.95	House	50	100	East
	0.97	House	30	85	East
	1.00	House	35	100	East
	1.03	House	10	80	East
	1.03	House	20	95	East
	1.05	House	40	120	East
	1.17	Condos	40	100	East
	1.19	Condos	25	55	East
	1.20	Condos	15	40	East
	1.37	Condos	20	40	East
	1.41	House	50	90	East
	2.04 c/	Condos	NA	NA	East
	2.10 c/	Condos	NA	NA	East
	2.17 c/	Condos	NA	NA	Southeast
	2.34 c/	Condos	NA	NA	East
Western Pipeline					
Somerset	0.51	House	50	90	North
	0.52	House	50	90	North
	0.53	House	40	75	North
	0.54	House	35	75	North
	0.55	House	0	60	East
	0.64	House	30	65	West
	1.10	House	35	35	North
	1.11	House	0	15	North
	1.51	House	20	30	North
	1.55	House	40	75	North
Swansea	1.59	House	35	70	North
	1.61	House	35	75	North
	1.64	House	45	75	North
	1.66	House	40	80	North
	1.68	House	40	75	North
	1.70	House	30	65	North
	1.72	House	40	75	North
	1.74	House	50	80	North
	1.76	House	25	60	North
	1.78	House	40	70	North
	1.81	House	20	60	North

a/ The distance to these residences would be increased to over 50 feet from the construction work area with the incorporation of the River Street Variation into the proposed route (see section 3.5.3).

b/ The River Street Variation, which Weaver's Cove Energy agreed to incorporate into the proposed route, would be located within 50 feet of this residence.

c/ The distance to these residences would be increased to over 50 feet from the construction work area with the incorporation of the Golf Course Variation (see section 3.5.3).

In residential areas, the two most significant impacts associated with construction and operation of a pipeline 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 the construction work area would be most likely to experience the effects of construction and operation of the project. In general, as the distance to the construction work area increases, the impacts on residences decrease.

Temporary construction impacts on residential areas could include inconvenience caused by noise and dust generated by construction equipment, personnel, and trenching of 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; and removal of aboveground structures, such as sheds or trailers, from within the right-of-way.

Weaver's Cove Energy would implement the following general measures to minimize construction-related impacts on residences and other structures located within 50 feet of the construction right-of-way:

- notify landowners of the construction schedule and duration before commencement of construction;
- access construction areas from existing roads;
- catalogue and verify with the landowner before construction all landscaping and ornamental shrubbery within the construction work area;
- provide to each landowner for approval as part of the easement negotiations a plan for the replacement of all such landscaping or ornamental shrubbery or compensation for these items;
- eliminate hazards associated with open ditches (e.g., use of the stove pipe construction method and installation of safety fencing);
- restrict the hours of construction and install appropriate muffling devices on the construction equipment to minimize noise; and
- implement measures to control dust (e.g., use of water trucks to apply water to dusty areas).

In addition, Weaver's Cove Energy would prepare site-specific residential construction mitigation plans to minimize disruption and maintain access to the residences located within 50 feet of the construction work area. The plans would be developed in consultation with the affected landowners and would show the pipeline centerline; the limits of the construction work area; each residence and other structures; existing pipelines and powerlines; waterbodies, roads, driveways, fences, trees or other landscaping, and private wells; and the location of safety fencing that would be installed during construction. Potential site-specific mitigation measures that Weaver's Cove Energy would implement for residences within 50 feet of the construction right-of-way include:

- preservation of mature trees or landscaping along the edge of the proposed construction work area;
- restoration of lawns immediately after backfilling the trench; and

- installing and maintaining safety fencing along the edge of the construction work area for a distance of 100 feet on either side of the residence.

Ten residences would be located within 25 feet of the construction work area, six along the Northern Pipeline route and four along the Western Pipeline route. In addition to the measures listed above, Weaver's Cove Energy would not construct near these homes until the pipe is ready for installation. This would reduce the amount of time the residence would experience the impacts associated with construction of the pipeline. Residential properties encumbered by pipeline easements would sustain long-term impacts associated with the permanent right-of-way; however, as previously discussed, the majority of both pipeline routes would be located within existing utility rights-of-way that are already held in fee or in easements. Like the existing easements, the new easements would prohibit certain types of use, such as the construction of aboveground structures, including house additions, garages, patios, pools, or any other object not easily removable, or the planting and cultivating of trees or orchards.

We received comments from the Massachusetts EFSB regarding the close proximity of the pipeline construction rights-of-way to four residential areas and the potential loss of trees that provide aesthetic value, shade, and/or visual screening for these residences. Two of these areas are along the Northern Pipeline route (MPs 0.54 to 0.91 and around MP 2.0). The other two areas are located along the Western Pipeline route (MPs 0.49 to 0.54 and MPs 1.51 to 1.82). Several of the residences in these four areas would be located within 50 feet of the construction right-of-way and would be included in the preparation of site-specific residential construction mitigation plans as described above. Additional discussion of these areas and the potential impacts on visual resources is presented in section 4.8.7.2.

Also, in sections 3.5.3 and 3.5.4 we evaluated several route variations in the vicinity of these residences to avoid potential impacts and recommended the Golf Course Variation near MP 2.0. The Golf Course Variation would minimize impacts on residences by avoiding construction disturbance and vegetation clearing adjacent to several condominium buildings (see section 3.5.3). In the draft EIS, we also requested that Weaver's Cove Energy investigate the feasibility of the River Street Variation between MPs 0.68 and 0.91 to avoid impacts on additional residences (see section 3.5.3). In its comments on the draft EIS, Weaver's Cove Energy agreed to incorporate both the Golf Course Variation and River Street Variation into the proposed route. The River Street Variation reduces impacts on three residences that were previously identified as being within 50 feet of the construction work area; however, this variation would be within 50 feet of two newly affected residences where the route is aligned within the existing River Street corridor. The Gulf Course Variation avoids impacts on four condominiums that were previously identified as being within 50 feet of the construction work area. Table 4.8.3-2 reflects the reduced residential impacts associated with the incorporation of both the River Street and Gulf Course Variations.

Planned Developments

There are two planned developments along both the Northern and Western Pipeline routes. Consistency with local and regional plans is discussed in section 4.8.2.

Planning for the Riverfront Business Park located at the end of the Northern Pipeline route is underway. At this time the Riverfront Business Park is not expected to include any residential development. The proposed meter and regulation station at the end of the Northern Pipeline route would be located within the Riverfront Business Park in an area that currently consists of an Algonquin pipeline easement and meter and regulation station. The area was formerly used as a synthetic natural gas facility. The Northern Pipeline would also be located adjacent to the existing CSX railroad tracks that the MBTA has proposed for its Stoughton Line commuter rail service (see section 4.8.3.1).

New residential development is planned along the Western Pipeline in two locations. The first is between MPs 1.23 and 1.50 and consists of approximately 10 single family lots. These subdivided lots are vacant with no current plans for development (Hamblin, 2004). The pipeline would be located within an existing powerline easement through this area, which would minimize potential impacts on any future development of this area. A second proposed residential subdivision is located between MPs 2.18 and 2.45 of the Western Pipeline. According to town officials, the subdivision has not been approved and there are no current plans for development (Ramos, 2004). However, we received a letter from a landowner working on the development expressing concern over the placement of the pipeline in this area. The majority of the pipeline on this landowner's parcel would be located within an existing powerline easement and would not further preclude development in this area. At MP 2.18, the pipeline would leave the powerline corridor and would create new right-of-way through a forested area. With the exception of about 200 feet, the pipeline would be located along property boundaries and would not bisect the parcels, which would minimize potential conflicts with future development. We also analyzed a route variation in this area to minimize impacts on forest land that would also avoid this proposed residential development; however, it was not found to be environmentally preferable to the proposed route (see section 3.5.4).

4.8.4 Coastal Zone Management

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 coastal zone management program, a state is required to prepare a program management plan for approval by the National Oceanic and Atmospheric Administration, 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 can take place (OCZM, 2002).

The Weaver's Cove LNG Project is subject to a Federal Coastal Zone Consistency Review because it would 1) involve activities within the coastal zones of Massachusetts and Rhode Island as described in sections 4.8.4.1 and 4.8.4.2, respectively; and 2) require several federal permits and approvals (see table 1.4-1). Both Massachusetts and Rhode Island have approved coastal zone management programs administered by the Massachusetts OCZM and the Rhode Island CRMC, respectively. A description of each state's program, the applicable project activities, and information provided by Weaver's Cove Energy in its FERC section 7(c) application regarding consistency of the project with state policies is provided below.

4.8.4.1 Massachusetts

The Massachusetts CZMP Plan was approved by the OCZM in 1978. The mission of the Massachusetts program is "to balance the impact of human activities with the protection of coastal and marine resources" (OCZM, 2002). According to the CZMP Plan, the coastal zone of Massachusetts

includes the lands and waters within an area defined by the seaward limit of the state's territorial sea (generally 3 miles from shore), extending from the Massachusetts/New Hampshire border south to the Massachusetts/Rhode Island border, and landward to 100 feet inland of specified major roads, rail lines, or other visible rights-of-way. Other areas within the coastal zone include islands; transitional and intertidal areas; coastal wetlands and beaches; tidal rivers and adjacent uplands, at a minimum, to the extent of vegetation affected by saline water; anadromous fish runs to the fresh water breeding area, if the area is within a coastal town; and areas 100 feet inland of the 100-year floodplain along tidal rivers and fish runs.

The activities associated with the Weaver's Cove LNG Project within the coastal zone of Massachusetts and subject to the policies of the CZMP Plan include the:

- maintenance and improvement dredging of the federal navigation channel and other sections of the Taunton River within the jurisdictional boundaries of the Commonwealth of Massachusetts;
- LNG terminal; and
- pipeline facilities, specifically:
    - the entire Northern Pipeline route (MPs 0.0 to 3.6) and the associated aboveground facility; and
    - the first 0.8 mile of the Western Pipeline route (MPs 0.0 to 0.8).

A summary of the regulatory policies under the Massachusetts program and information provided by Weaver's Cove Energy in its FERC section 7(c) application regarding the project's consistency with these policies is presented in table 4.8.4-1. However, this is not a consistency certification. Weaver's Cove Energy filed a draft federal consistency certification with the OCZM in July 2004, which indicates that the project would be in full compliance with the Massachusetts CZMP Plan; however, Weaver's Cove Energy has not received concurrence from the OCZM regarding the project's consistency with the Massachusetts CZMP Plan. Pursuant to 310 CMR 23.00, OCZM cannot begin its federal consistency review until the final MEPA Certificate is issued and cannot issue concurrence until all other state environmental permits and licenses have been obtained for the project. If the Weaver's Cove LNG Project is approved by the Commission, concurrence from the OCZM that the project is consistent with the Massachusetts CZMP Plan must be received prior to any issuance of a Notice to Proceed with construction from the Secretary of the FERC. Therefore, **we recommend that:**

- **Weaver's Cove Energy file documentation of concurrence from the OCZM that the project is consistent with the Massachusetts CZMP Plan with the Secretary <u>prior to construction</u>.**

TABLE 4.8.4-1

Draft Outline of Coastal Consistency Issues Related to Massachusetts Office of Coastal Zone Management Policies

Subject Matter/ Policy or Principle	Policy Guidelines	Applicable Project Activity or Facility			Comments
		Dredging	LNG Terminal	Pipeline Facilities	
Energy					
Policy #1	For coastally dependent energy facilities, assess siting in alternative coastal locations. For non-coastally dependent energy facilities, assess siting in areas outside of the coastal zone. Weigh the environmental and safety impacts of locating proposed energy facilities at alternative sites.		X	X	The proposed LNG terminal is a coastally dependent energy facility because it would rely on cryogenic pipelines to transfer gas from ships to shore-side storage. The Western and Northern Pipelines are coastally dependent energy facilities because they would involve the transportation of energy from the coastal zone (i.e., the LNG terminal) to inland and/or coastal delivery points. Several alternative coastal locations and other alternatives have been evaluated (see section 3.0).
Management Principle #1	Encourage energy conservation and the use of alternative sources such as solar and wind power in order to assist in meeting the energy needs of the Commonwealth.				This management principle does not apply because energy conservation programs and alternative energy sources by themselves will not meet the increasing energy demand in New England and new supplies of natural gas will be needed. .
Water Quality					
Policy #1	Ensure that point-source discharges in or affecting the coastal zone are consistent with federally- approved state effluent limitations and water quality standards.	X	X	X	Weaver's Cove Energy would comply with all federal and state effluent limitations and water quality standards, including those specified in its section 401 Water Quality Certification and National Pollutant Discharge Elimination System permit. Additional information on water quality issues is provided in section 4.3.2.
Policy #2	Ensure that nonpoint pollution controls promote the attainment of state surface water quality standards in the coastal zone.	X	X	X	Weaver's Cove Energy would implement pollution controls that would promote the attainment of state surface water quality standards. Additional information on water quality issues is provided in section 4.3.2.
Policy #3	Ensure that activities in or affecting the coastal zone conform to applicable state and federal requirements governing subsurface waste discharges.				This policy does not apply because the project would not involve subsurface waste discharges.

TABLE 4.8.4-1(cont'd)

Draft Outline of Coastal Consistency Issues Related to Massachusetts Office of Coastal Zone Management Policies

Subject Matter/ Policy or Principle	Policy Guidelines	Applicable Project Activity or Facility			Comments
		Dredging	LNG Terminal	Pipeline Facilities	
Habitat					
Policy #1	Protect coastal resource areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and fresh water wetlands for their important role as natural habitats.	X	X	X	The waterside improvements associated with the LNG terminal would permanently or temporarily affect salt marsh, land under the ocean, coastal beach, and land containing shellfish. These resources could also be affected by dredging activities associated with the deepening and/or enlargement of the turning basin and federal navigation channel and the installation the Western Pipeline. Weaver's Cove Energy proposes to implement the mitigation measures discussed in sections 4.4 and 4.6 and to implement the Wetland Mitigation Plan attached in Appendix M to compensate for the impacts on these areas. In addition, we have recommended that Weaver's Cove Energy modify its proposed dredging program and pipeline construction plans within the Taunton River to prohibit any silt-disturbing construction activities during the winter flounder spawning period (see section 4.6.2).
Policy #2	Restore degraded or former wetland resources in coastal areas and ensure that activities in coastal areas do not further wetland degradation but instead take advantage of opportunities to engage in wetland restoration.		X		Weaver's Cove Energy would implement the Wetland Mitigation Plan attached in Appendix M to compensate for the permanent loss of salt marsh (see section 4.4).
Protected Areas					
Policy #1	Preserve, restore, and enhance complexes of coastal resources of regional or statewide significance through the Areas of Critical Environmental Concern (ACEC) Program.				This policy does not apply because the project facilities would not be located in an ACEC.
Policy #2	Protect state and locally designated scenic rivers and state-classified scenic rivers in the coastal zone.				This policy does not apply because the project facilities would not cross state or locally designated scenic rivers or state-classified scenic rivers. However, the portion of the Taunton River affected by the proposed project is currently included in a study area for inclusion in the federally-administered Wild and Scenic River Program (see section 4.8.6.1).

TABLE 4.8.4-1(cont'd)

Draft Outline of Coastal Consistency Issues Related to Massachusetts Office of Coastal Zone Management Policies

Subject Matter/ Policy or Principle	Policy Guidelines	Applicable Project Activity or Facility			Comments
		Dredging	LNG Terminal	Pipeline Facilities	
Policy #3	Ensure that proposed developments in or near designated or registered historic districts or sites respect the preservation intent of the designation and that potential adverse effects are minimized.	X	X	X	Weaver's Cove Energy has conducted archaeological reconnaissance surveys and consulted with the Massachusetts SHPO and Massachusetts Board of Underwater Archeology to identify and assess potential impacts on historic districts and sites within the Area of Potential Effect of the project (see section 4.10). Weaver's Cove Energy would develop avoidance plans or treatment plans acceptable to appropriate agencies as necessary so as to minimize adverse effects on any designated status of these resources.
Coastal Hazards					
Policy #1	Preserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as dunes, beaches, barrier beaches, coastal banks, land subject to coastal storm flowage, salt marshes, and land under the ocean.		X		The proposed LNG terminal site is located on a former industrial site that is largely void of natural coastal landforms due to historical operations. Weaver's Cove Energy would develop a wetland mitigation plan to compensate for permanent wetland loss and would develop the site to provide protection from coastal storms, flooding, erosion, and sea level rise.
Policy #2	Ensure construction in waterbodies and contiguous land areas will minimize interference with water circulation and sediment transport. Approve permits for flood or erosion control projects only when it has been determined that there will be no significant adverse effects on the project site or adjacent or down coast areas.	X	X	X	The dredging of the turning basin and federal navigation channel and other proposed waterside improvement activities would suspend and transport sediments and change circulatory patterns within the Taunton River. The proposed onshore activities would also disturb soils and increase the potential for soil erosion and runoff. The majority of these effects would be temporary and limited to the period of construction. Weaver's Cove Energy would minimize these impacts by implementing the erosion and sediment control measures discussed in sections 4.2, 4.4, and 4.6. The primary impacts during operation of the LNG terminal would include the resuspension of sediments along the ship channel during the transit of LNG ships to the terminal and a local reduction in the flow velocity of the river within the turning basin.

TABLE 4.8.4-1(cont'd)

Draft Outline of Coastal Consistency Issues Related to Massachusetts Office of Coastal Zone Management Policies

Subject Matter/ Policy or Principle	Policy Guidelines	Applicable Project Activity or Facility			Comments
		Dredging	LNG Terminal	Pipeline Facilities	
Policy #3	Ensure that state and federally funded public works projects proposed for location within the coastal zone will: not exacerbate existing hazards or damage natural buffers or other natural resources; be reasonably safe from flood and erosion related damage; not promote growth and development in hazard-prone or buffer areas; especially in Velocity Zones and ACECs; and not be used on Coastal Barrier Resource Units for new or substantial reconstruction of structures in a manner inconsistent with the Coastal Barrier Resource/Improvements Acts.				This policy does not apply because the Weaver's Cove LNG Project is not a state or federally funded public works project and activities would not be conducted in a Velocity Zone, ACEC, or Coastal Barrier Resource Unit.
Policy #4	Prioritize hazard mitigation funds for acquisition of hazardous coastal areas for conservation or recreation use, and relocation of structures out of coastal high hazard areas, giving due consideration to the effects of coastal hazards at the location to the use and manageability of the area.				This policy does not apply because the project facilities are not located in a coastal high hazard area.
Port and Harbor Infrastructure					
Policy #1	Ensure that dredging and disposal of dredged material minimize adverse effects on water quality, physical processes, marine productivity, and public health.	X	X	X	Weaver's Cove Energy would implement several mitigation measures to ensure that dredging and disposal of dredged material avoid or minimize adverse effects on water quality, physical processes, marine productivity, and public health (see sections 4.2.2, 4.3.2, 4.6.2, and 4.11.1).
Policy #2	Obtain the widest possible public benefit from channel dredging, ensuring that designated ports and developed harbors are given highest priority in the allocation of federal and state dredging funds. Ensure that dredging is consistent with marine environmental policies.	X			The dredging activities associated with the Weaver's Cove LNG Project would be privately funded and would not require the allocation of federal or state funds. The dredging would occur within a federal navigation channel to a designated port area (DPA) in Fall River. The dredging of the federal navigation channel by Weaver's Cove Energy could enhance the use of other DPAs along the Taunton River.

TABLE 4.8.4-1(cont'd)

Draft Outline of Coastal Consistency Issues Related to Massachusetts Office of Coastal Zone Management Policies

Subject Matter/ Policy or Principle	Policy Guidelines	Applicable Project Activity or Facility			Comments
		Dredging	LNG Terminal	Pipeline Facilities	
Policy #3	Preserve and enhance the capacity of DPAs to accommodate water-dependent industrial uses, and prevent the exclusion of such uses from tidelands and any other DPA lands over which a state agency exerts control by virtue of ownership, regulatory authority, or other legal jurisdiction.	X	X		The LNG terminal is a water-dependent, industrial facility that would be located within a DPA. The dredging of the federal navigation channel by Weaver's Cove Energy could enhance the use of other DPAs along the Taunton River.
Management Principle #1	Encourage, through technical and financial assistance, expansion of water dependent uses in designated ports and developed harbors, redevelopment of urban waterfronts, and expansion of visual access.	X	X		The LNG terminal is a water-dependent, industrial facility that would be located within a DPA.
Public Access					
Policy #1	Ensure that the adverse impacts of developments proposed near existing public recreation sites are minimized.	X		X	There are no public recreation sites immediately surrounding the LNG terminal site. Dredging, construction of the Western Pipeline across the Taunton River, and the transit of LNG ships to and from the terminal site could temporarily affect recreational use of the waterway. Weaver's Cove Energy would prepare and implement a Navigation Work Plan to minimize impacts on recreational use of the Taunton River (see section 4.8.6.2).
Management Principle #1	Improve public access to coastal recreation facilities and alleviate auto traffic and parking problems through improvements in public transportation. Link existing coastal recreation sites to each other or to nearby coastal inland facilities via trails for bicyclists, hikers, and equestrians, and via rivers for boaters.				This management principle does not apply because the project would not involve a coastal recreational facility.
Management Principle #2	Increase capacity of existing recreation areas by facilitating multiple use and by improving management, maintenance and public support facilities. Resolve conflicting uses whenever possible through improved management rather than through exclusion of uses.				This management principle does not apply because the project would not involve an existing recreation area.

TABLE 4.8.4-1(cont'd)

Draft Outline of Coastal Consistency Issues Related to Massachusetts Office of Coastal Zone Management Policies

Subject Matter/ Policy or Principle	Policy Guidelines	Applicable Project Activity or Facility			Comments
		Dredging	LNG Terminal	Pipeline Facilities	
Management Principle #3	Provide technical assistance to developers of private recreational facilities and sites that increase public access to the shoreline.				This management principle does not apply because the project would not involve development of a private recreational facility.
Management Principle #4	Expand existing recreation facilities and acquire and develop new public areas for coastal recreational activities. Give highest priority to expansions or new acquisitions in regions of high need or limited site availability. Assure that both transportation access and the recreational facilities are compatible with social and environmental characteristics of surrounding communities.				This management principle does not apply because the project would not involve an existing recreation facility or the development of new public areas for coastal recreational activities.
Ocean Resources					
Policy #1	Support the development of environmentally sustainable aquaculture, both for commercial and enhancement (public shellfish stocking) purposes. Ensure that the review process regulating aquaculture facility sites (and access routes to those areas) protects ecologically significant resources (salt marshes, dunes, beaches, barrier beaches, and salt ponds) and minimizes adverse impacts upon the coastal and marine environment.				This policy does not apply because the project would not involve aquaculture.
Policy #2	Extraction of marine minerals (other than sand and gravel) will be considered in areas of state jurisdiction, except where prohibited by the Massachusetts Ocean Sanctuaries Act, where and when the protection of fisheries, air and marine water quality, marine resources, navigation and recreation can be assured.				This policy does not apply because the project would not involve the extraction of marine minerals.

TABLE 4.8.4-1(cont'd)

Draft Outline of Coastal Consistency Issues Related to Massachusetts Office of Coastal Zone Management Policies

Subject Matter/ Policy or Principle	Policy Guidelines	Applicable Project Activity or Facility			Comments
		Dredging	LNG Terminal	Pipeline Facilities	
Policy #3	Accommodate offshore sand and gravel mining needs in areas and in ways that will not adversely affect shoreline areas due to alteration of wave direction and dynamics, marine resources and navigation. Mining of sand and gravel, when and where permitted, will be primarily for the purpose of beach nourishment.				This policy does not apply because the project would not involve the mining of sand or gravel.
Growth Management					
Principle #1	Encourage, through technical assistance and review of publicly funded development, compatibility of proposed development with local community character.				This management principle does not apply because the project is not publicly funded.
Principle #2	Ensure that state and federally funded infrastructure projects primarily serve existing developed areas, assigning highest priority to projects that meet the needs of urban and community development centers.				This management principle does not apply because the project is not state or federally funded.
Principle #3	Encourage the revitalization and enhancement of existing development centers in the coastal zone through technical assistance and federal and state financial support for residential, commercial and industrial development.	X	X	X	The dredging associated with the project would be conducted within an existing federal navigation channel. The LNG terminal would redevelop an existing contaminated site in a developed area slated for industrial use. The pipelines would be located primarily within existing rights-of-way in previously developed areas.

4.8.4.2 Rhode Island

The agency responsible for implementing Rhode Island's coastal zone management program is the CRMC. The CRMC adopted the Rhode Island Coastal Resources Management Program (RICRMP) in 1976 and received its federal program approval pursuant to the CZMA in 1978 (CRMC, 2003). The RICRMP is structured as a strategic plan for the state's coastal areas and is regulatory in nature. It is based on six CRMC water types. There are specific polices and prohibitions that apply to each water type. The six water types are:

- Type 1 - Conservation Areas;
- Type 2 - Low Intensity Use;
- Type 3 - High Intensity Boating;
- Type 4 - Multipurpose Waters;
- Type 5 - Commercial and Recreational Harbors; and
- Type 6 - Industrial Waterfronts and Commercial Navigation Channels.

The seaward extent of Rhode Island's coastal zone boundary is the 3 mile outer limit (CRMC, 2003). The CRMC's jurisdiction includes all tidal waters within the state boundaries. The activities associated with the Weaver's Cove LNG Project within the coastal zone of Rhode Island and subject to the polices and performance standards of the RICRMP include the maintenance and improvement dredging of the federal navigation channel within Mount Hope Bay (that portion within the jurisdictional boundaries of the State of Rhode Island). These activities would occur in Type 6 waters. The section of the RICRMP applicable to the Weaver's Cove LNG Project is 300.9, Dredging and Dredged Materials Disposal. A summary of the policies and performance standards for section 300.9 and information provided by Weaver's Cove Energy in its FERC section 7(c) application regarding the project's consistency with these standards is presented in table 4.8.4-2. However, this is not a consistency certification. Weaver's Cove Energy filed a draft federal consistency certification with the CRMC in July 2004, which indicates that the project is expected to be in full compliance with the RICRMP; however, Weaver's Cove Energy has not received concurrence from the CRMC regarding the project's consistency with the RICRMP. If the Weaver's Cove LNG Project is approved by the Commission, concurrence from the CRMC that the project is consistent with the RICRMP must be received prior to any issuance of a Notice to Proceed with construction from the Secretary of the FERC. Therefore, **we recommend that:**

- **Weaver's Cove Energy file documentation of concurrence from the CRMC that the project is consistent with the RICRMP with the Secretary <u>prior to construction</u>.**

TABLE 4.8.4-2

Draft Outline of Coastal Consistency Issues Related to Rhode Island Coastal Resources Management Policies

Section & Subject Matter/Policy or Principle	Performance Standard	Comments
Section 300.9, Dredging and Dredged Materials Disposal		
Policy #1	The CRMC shall support necessary maintenance dredging activities in Type 2, 3, 4, 5, and 6 waters, provided environmentally sound disposal locations and procedures are identified.	The maintenance and improvement dredging in Rhode Island associated with the Weaver's Cove LNG Project would occur in Type 6 waters. Weaver's Cove Energy proposes to use the dredged material at the LNG terminal site in Fall River, Massachusetts. Weaver's Cove Energy would obtain all the necessary permits and approvals for the use of the dredged material at the LNG terminal site and would implement measures to ensure that the activities are conducted in an environmentally sound manner (see sections 4.2.2, 4.3.2, and 4.6.2).
Policy #2	The CRMC favors offshore open-water disposal for large volumes of dredged materials, providing that environmental impacts are minimized.	Weaver's Cove Energy proposes to beneficially use dredged material in an upland area at the LNG terminal site in Fall River, Massachusetts. The proposed upland reuse of the material would minimize impacts on waters. Open water disposal is not considered an environmentally preferable alternative (see section 3.6). In addition, the Rhode Island Department of Environmental Management (DEM) has indicated that the proposed upland reuse of the dredged materials is preferable to other disposal options.
Policy #3	The CRMC encourages the use of innovative nearshore methods of dredged materials disposal, particularly when small volumes of material must be disposed. These options include creation of wetlands, shellfish habitat, and beach nourishment in suitable areas.	The amount of dredged material associated with the Weaver's Cove LNG Project needing to be disposed is up to 2.6 million cubic yards, making it infeasible to use for these types of activities. In addition, the DEM has indicated that the proposed upland reuse of the dredged materials is preferable to other disposal options.
Policy #4	For disposal of dredged material resulting from maintenance dredging operations, a Category A Review may be permitted provided the Executive Director determines 1) that the disposal is conducted consistent with the DEM's classification of the dredged material sediments; 2) the disposal volume is not greater than 2,000 cubic yards; 3) the area of disposal is not greater than one (1) acre in size; 4) the proposal complies with all applicable local zoning ordinances; 5) applicable soil erosion and sediment controls are employed; and 6) the proposal meets the standards of section 110.1 (Applications for Category A and Category B Council Assents).	This policy does not apply because the amount of dredged materials would be over 2,000 cubic yards.
Policy #5	For beach replenishment, a Category A review may be permitted for the placement of clean sands provided the Executive Director determines that the placement of the materials shall be beach replenishment only, and the proposal meets the standards of section 110.1 and 300.9 as applicable.	This policy does not apply because the project does not involve beach replenishment.

TABLE 4.8.4-2 (cont'd)

Draft Outline of Coastal Consistency Issues Related to Rhode Island Coastal Resources Management Policies

Section & Subject Matter/Policy or Principle	Performance Standard	Comments
Prerequisites		
Prerequisite #1	Permits for maintenance and improvement dredging and disposal projects for navigational purposes must be obtained from the COE as well as the CRMC. CRMC and COE requirements are designed to complement one another; applicants should consider the requirements of both agencies when preparing to begin the permit process and may apply for CRMC and COE permits concurrently.	Weaver's Cove Energy is in the process of obtaining all applicable permits for the dredging and disposal activities, including authorizations from the COE. Section 1.4 provides details on the permits, approvals, and consultations needed for the Weaver's Cove LNG Project.
Prerequisite #2	Except for federal consistency reviews, applicants for dredging or open water disposal of dredged materials shall be required to obtain a section 401 (Clean Water Act) Water Quality Certification from the DEM before the CRMC can consider granting approval for the project.	The Weaver's Cove LNG Project is subject to a federal consistency review. Weaver's Cove Energy will also be obtaining a section 401 Water Quality Certification from the DEM (see table 1.4-1).
Prerequisite #3	All materials to be dredged for either open water disposal or upland disposal must be classified by the DEM based upon an approved analysis process prior to the CRMC acting on an application of either dredging or dredged materials disposal.	Weaver's Cove Energy is not pursuing open water disposal or upland disposal in the State of Rhode Island. Disposal in Massachusetts would be in compliance with all applicable state and federal regulations.
Prerequisite #4	Any application for open water disposal of dredged materials shall have all requisite COE and U.S. EPA approvals.	Weaver's Cove Energy does not propose open water disposal of dredged materials; however, Weaver's Cove Energy would obtain all the necessary permits for the disposal of dredged material (see table 1.4-1).
Prerequisite #5	All applicable requirements of the Freshwater Wetlands Act have or will have been met.	Requirements of the Freshwater Wetlands Act do not apply to the Weaver's Cove LNG Project because no freshwater wetlands would be affected in Rhode Island.
Prerequisite #6	Upland disposal of dredged materials must comply with all applicable local zoning ordinances.	Weaver's Cove Energy is not proposing to dispose any dredged material in Rhode Island; however, Weaver's Cove Energy would comply with all applicable local zoning ordinances in Massachusetts.
Prohibitions		
Prohibition #1	The disposal of dredged materials on or adjacent to coastal wetlands in Type 1 and 2 waters is prohibited unless associated with a CRMC-approved program of wetland building or rehabilitation. The disposal of dredged materials is also prohibited on coastal wetlands designated for preservation in Type 3, 4, 5, and 6 waters.	Weaver's Cove Energy is not proposing to dispose any dredged materials on or adjacent to coastal wetlands In Rhode Island.
Prohibition #2	No dredging for navigational purposes is permitted in Type 1 waters, and only maintenance dredging may be permitted in Type 2 waters.	The dredging associated with the Weaver's Cove Energy project would be conducted within Type 6 waters.

TABLE 4.8.4-2 (cont'd)

Draft Outline of Coastal Consistency Issues Related to Rhode Island Coastal Resources Management Policies

Section & Subject Matter/Policy or Principle	Performance Standard	Comments
Additional Category B Requirements		
Requirement #1	Applicants for all dredging projects shall provide accurate soundings in the area of the proposed dredging operation.	Weaver's Cove Energy obtained recent bathymetric data from the COE and NOAA to determine the amount of dredging required and would provide accurate soundings to the CRMC for the area proposed to be dredged (see section 4.3.2).
Requirement #2	Applicants shall describe any temporary or permanent disturbance to a coastal feature which is required or anticipated in order to gain access for heavy equipment to the dredging or disposal site.	Access to dredging areas would be via existing boat ramps or the proposed LNG terminal site. The disposal site would be accessed via existing roads to the LNG terminal site. Therefore, no coastal features would be disturbed.
Requirement #3	When fine-grained sediments are to be removed, the applicant shall install siltation curtains to control the transport of materials placed in suspension by dredging unless the applicant demonstrates to the CRMC on the basis of competent professional analysis that such transport will not be significant or will be controlled by other measures.	Weaver's Cove Energy has not committed to install siltation curtains or other mitigative measures to control the transport of materials placed in suspension by the dredging activities. Weaver's Cove Energy conducted sediment fate and transport modeling to demonstrate that the resuspended sediments would have minimal impacts on aquatic resources. This modeling is discussed in sections 4.2.2 and 4.3.2.
Requirement #4	The applicant shall limit dredging and disposal to specific times of the year in order to minimize odors and/or impacts on fish and shellfish unless the applicant demonstrates to the Council on the basis of competent professional analysis that such odors or impacts will not be significant or will be controlled by other measures.	Weaver's Cove Energy would develop a modified dredging plan in consultation with the CRMC and the OCZM and other applicable agencies to minimize impacts on fisheries. We have recommended that Weaver's Cove Energy not conduct silt-disturbing activities in the Taunton River during the winter flounder spawning season (see section 4.6.2).
Requirement #5	Applicants for improvement dredging projects shall describe, on the basis of competent professional analysis, anticipated siltation rates, sediment sources, and anticipated maintenance dredging needs.	Weaver's Cove Energy performed field studies to characterize the sediments and conducted modeling to determine the fate and transport of sediments in the water column and on the bed of the bay and river. These studies are discussed in sections 4.2.2 and 4.3.2.
Requirement #6	When dredged materials are removed from a marine to an upland environment for disposal, the applicant shall demonstrate that the release of pollutants present in the materials shall not cause significant threats to groundwater or cause other environmental degradation.	Weaver's Cove Energy does not propose to dispose of any dredged material in Rhode Island; however, reuse of dredged material at the LNG terminal site in Fall River, Massachusetts would be in accordance with Massachusetts regulations and would not cause significant threats to groundwater or cause other environmental degradation (see sections 4.2.2 and 4.3.1.)
Requirement #7	Applicants proposing dredging operations associated with residential boating facilities must demonstrate that the purpose is to restore channels and basins to dimensions that support and maintain existing levels of use, and must submit clear and convincing evidence documenting a diminished use of a facility or navigational fairway by natural shoaling or accretion, not merely a need for additional water depth.	The Weaver's Cove LNG Project would not involve dredging associated with residential boating facilities.

TABLE 4.8.4-2 (cont'd)

Draft Outline of Coastal Consistency Issues Related to Rhode Island Coastal Resources Management Policies

Section & Subject Matter/Policy or Principle	Performance Standard	Comments
Standards		
Standard #1	For dredging: a) bottoms of dredged areas shall slope downward into the waterway so as to maximize tidal flushing; b) bottom slopes at the edges of dredged areas shall have a maximum slope of 50 percent; c) dredging shall be planned so as to avoid undermining adjacent shoreline protection facilities and/or coastal features; and d) shellfish dredged from waters classified SB or lower shall not be made available for human consumption or bait.	Details on the dredging operation associated with the Weaver's Cove LNG Project are presented in section 2.4.1.3. The Weaver's Cove LNG Project would not involve harvesting shellfish for human consumption or bait.
Standard #2	For dredged materials disposed in open water: a) dredged materials may not be placed in areas determined by the CRMC to be prime fishing grounds; b) measures must be employed and described to ensure that all dredged materials will be dumped solely within the confines of an approved site; c) hydrographic conditions at the approved disposal site must be such that the disposed dredged materials will remain within the disposal area and that resuspension of bottom sediments will be minimal; d) following disposal operations involving polluted materials, clean coarse-grained materials must be deposited to cap the spoil mound and minimize the release of any potential contaminants to the water column. The cap shall have minimum thickness of 6 inches; and e) the applicant shall provide for an environmental monitoring program designed to detail physical conditions and biological activity at and near the site for a period of at least 1 year. The results of such programs shall be made public. However, if the monitoring of the disposal of dredged materials at a site is to be performed by, and/or in conjunction with, a state or federally-sponsored monitoring program, then the applicant shall adhere to the requirements of such state- or federally-sponsored program.	Weaver's Cove Energy currently does not propose to dispose of dredged material in open water areas.
Standard #3	For dredged materials disposal in the creation of wetlands, aquatic habitat, or island: a) disposal sites must be sheltered environments which are approved by the Council for such purposes and are not prone to extensive wave or current energies yet subject to sufficient tidal action to provide adequate flushing; b) dredged materials must be pumped or placed into a containment area that will permit sediment consolidation and prevent erosion; c) the applicant must provide for an environmental monitoring program designed to detail physical conditions and biological activity at and near the site for a period of at least 1 year. The results of such a program shall be made public; and d) all applicable requirements of section 300.2 (Filling, Removing, or Grading of Shoreline Features) shall be met.	Weaver's Cove Energy does not propose to use dredged material for creation of wetlands or aquatic habitat.

TABLE 4.8.4-2 (cont'd)

Draft Outline of Coastal Consistency Issues Related to Rhode Island Coastal Resources Management Policies

Section & Subject Matter/Policy or Principle	Performance Standard	Comments
Standard #4	For upland disposal: a) dewatering of dredged materials shall occur behind a berm or bulkhead of sufficient height to contain the material; b) after dewatering, dredged materials placed on uplands adjacent to tidal waters shall be vegetated or otherwise permanently stabilized. Surface slopes of the disposal area shall be graded so as to prevent surface ponding; c) where dredged materials are placed behind a wall or bulkhead the structure shall be suitably engineered to resist the pressures of the dredged material, the material, including fines, shall be prevented from seeping through the wall or bulkhead by the placement of an adequate filtering device, and all applicable standards listed for shoreline protection facilities shall be met; and d) all applicable requirements of section 300.2 shall be met.	Weaver's Cove Energy does not propose to dispose of dredged material in Rhode Island; however, the disposal of dredged material at the LNG terminal site in Fall River, Massachusetts would be in compliance with all applicable permits and regulations.
Standard #5	For disposal for beach nourishment: a) the placement of dredged materials on a beach is a preferred disposal alternative, providing that the materials in question are predominantly clean sands possessing grain size and such other characteristics to make them compatible with the naturally occurring beach material; b) in areas where the processes of littoral drift would result in significant reentry of dredged sediments into a navigable waterway, dredged materials must be placed on the downdrift side of the inlet; and c) all applicable requirements of section 300.2 shall be met.	Weaver's Cove Energy does not propose to use dredged materials to create wetlands, aquatic habitat, or islands.

4.8.5 Hazardous Waste Sites

The southern parcel of the LNG terminal site was used as a petroleum product storage and distribution terminal between the 1920s and 1990s. Historical operations at the site resulted in contamination of soil and groundwater by petroleum products. Releases were documented from ASTs, USTs, loading racks, pipelines, and ship loading areas. Additional information on contamination within the LNG terminal site is provided in section 4.3.1.

The proposed pipeline facilities would cross two hazardous waste or contaminated sites and would be located within 0.25 mile of several others (see table 4.3.1-1). Most of the sites are registered USTs that contain either gasoline or diesel, but there are two sites that the DEP considers hazardous waste sites. Construction of the pipelines in the vicinity of these sites could disturb contaminated soils. To address potential impacts associated with encountering contaminated soils during construction, we have recommended that Weaver's Cove Energy develop a Discovery and Management of Contaminated Soils and Groundwater Plan. This plan would provide for management of contaminants at known sites and include procedures for the identification and management of unknown contaminants in other locations (see section 4.2.1).

4.8.6 Recreation, Public Interest, and Special Use Areas

The Weaver's Cove LNG Project would not affect any state forest land, national or state parks, or Indian reservations. The project would be located on private property that does not provide public access to the Taunton River and would not involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth of Massachusetts; however, the Northern Pipeline would be located within 0.25 mile of the SMB as discussed below. There are several other designated recreation and public interest areas located near the proposed facilities. Areas for general recreational activities, including motor boating, sailing, fishing, and further down Narragansett Bay yachting regattas, are also located in the project area and/or along the proposed ship route.

4.8.6.1 Designated Recreation and Public Interest Areas

Fall River

Fall River Country Club - The Northern Pipeline route would cross an access road and golf course associated with the Fall River Country Club between MPs 1.7 and 1.9. Additionally, we have recommended and Weaver's Cove Energy has agreed to incorporate a minor route variation through the golf course property between MPs 1.6 and 2.4 (see section 3.5.3). The golf course is a private, 18-hole course that is open for play during the spring, summer, and fall. The Northern Pipeline route, with the incorporation of the Golf Course Variation, would not have a direct impact on the golf course fairways; however, disruption and noise during construction could temporarily affect the activities of golfers. The degree of these impacts would depend on the timing of construction. Construction of the pipeline during the summer months when golfing activities are at their peak would cause more of a disruption than construction during the off-peak, winter months. Some of the construction-related impacts would be unavoidable including the crossing of the club access road; however, the duration of the impacts would be short-term, lasting several days to several weeks until the right-of-way and affected golf course areas are restored in accordance with the requirements specified in the easement agreement between the country club and Weaver's Cove Energy. Operation of the pipeline would not affect long-term golfing activities because the construction and permanent right-of-way would be allowed to revert to former use; however, certain activities such as the construction of aboveground structures or the planting of trees would be prohibited within the permanent right-of-way.

Southeastern Massachusetts Bioreserve - The SMB would be located within 0.25 mile of the end of the Northern Pipeline route and over 1 mile from the LNG terminal site. The SMB was dedicated by the Massachusetts EOEA in October 2002. The SMB's 13,600 acres of land extends across the eastern half of Fall River, much of southern Freetown, and parts of North Dartmouth. The SMB comprises 5,500 acres of Freetown-Fall River State Forest; 3,800 acres of private land purchased by the Massachusetts DFW, the Massachusetts DEP, and The Trustees of Reservations; and 4,300 acres of forest land from the City of Fall River.

The mission of the SMB is to "protect, restore, and enhance the biological diversity and ecological integrity of a large-scale ecosystem with diverse natural communities representative of the region; to permanently protect public water supplies and cultural resources; to offer interpretive and educational programs communicating the value and significance of the bioreserve; and to provide opportunities for appropriate public use and enjoyment of this natural environment" (The Trustees of Reservations, 2001).

Because of its distance and location within an existing pipeline right-of-way, the Northern Pipeline route would not affect the SMB. In addition, the LNG terminal would not affect this area because it is located in an industrially-zoned area over 1 mile from the SMB.

Fall River Heritage State Park - The Fall River Heritage State Park consists of 8.5 acres on the Taunton River overlooking Battleship Cove and is located about 1.5 miles southwest of the proposed LNG terminal site. The park features a visitor's center with local historical exhibits, a carousel, and a community boathouse offering sailing instructions. Battleship Cove is an exhibit of historic naval ships and related memorabilia, offering educational tours; overnight camping for youth groups; and facilities for reunions, memorial services, and banquets. The site is presently home to the USS Massachusetts, the World War II Balao-class submarine USS Lionfish, the destroyer Joseph P. Kennedy, Jr., and two PT boats. All of these were designated by the U.S. Department of the Interior and the NPS as National Historic Landmarks for their national significance in commemorating the history of the country.

The LNG terminal site is located northwest of the Fall River Heritage State Park in an area designated for industrial use and would not affect the park. The dredging associated with the project may have some temporary impacts on the park and its recreational uses. These include increased turbidity and noise (see sections 4.3.2 and 4.11.2, respectively) and conflicts with recreational boating. The arrival and departure of ships associated with operation of the LNG terminal may also affect recreational boating near the park, including the sailing programs. Potential impacts on recreational boating associated with the proposed project are described in section 4.8.6.2.

Fall River Harbor Plan Walkway/Bikeway - The Harbor Plan calls for a 3,900-foot waterfront walkway and bikeway connecting Bicentennial Park to Heritage State Park. The proposed bikeway is intended to eventually link recreation areas in Fall River. Construction of the walkway and bikeway is currently underway. The project is not expected to affect the walkway/bikeway because Bicentennial Park, the closer of the two parks to the proposed LNG terminal, is located about 1.3 miles southwest of the site.

Other Fall River Parks and Playgrounds - Fall River's parks and recreation areas are under the jurisdiction of the Department of Recreational Facilities, Cemeteries, and Trees. According to the Fall River Open Space and Recreation Plan, the city maintains 12 main parks, 14 playgrounds, 11 green spaces, and various landscaped areas covering a total of 213 acres in the city. The closest of these parks, North Park, is located over 1 mile from the LNG terminal site. North Park provides ball fields, a playground, basketball and tennis courts, and an ice skating rink. Bicentennial Park is located about 1.3 miles southwest of the LNG terminal site and includes a public boat ramp.

Construction and operation of the project would not affect recreational activities at the city parks. The dredging associated with the project may have some temporary impacts on Bicentennial Park and its boat ramp. These include increased turbidity and noise (see sections 4.3.2 and 4.11.2, respectively) and conflicts with recreational boating. The arrival and departure of ships associated with operation of the LNG terminal may also affect recreational boating near the park. Potential impacts on recreational boating associated with the proposed project are described in section 4.8.6.2.

Somerset

Chace Preserve - Chace Preserve is a municipally-owned protected or recreational open space located in Somerset adjacent to the northern edge of the construction work area of the Western Pipeline route between MPs 0.8 and 1.1. The pipeline would be located within an existing powerline easement through this area. The preserve consists of 5 acres of woodland trails open during daylight hours and is overseen by the Somerset Conservation Commission. Because the Western Pipeline would be located within an existing powerline easement and would not cross the preserve, the designated use or purpose of the areas would not be affected by pipeline construction or operation.

Other Somerset Parks and Playgrounds - The Somerset High School playing fields are located within 1 mile of the LNG terminal and adjacent to the Western Pipeline at about MP 0.8. The town's Junior High School and Elementary School playing fields are also located near the Western Pipeline route near MP 1.5. Because of the distance and location across the Taunton River, the LNG terminal would not affect the recreational use of the Somerset High School playing fields. Construction-induced effects associated with the pipeline, such as traffic, noise, and dust may affect the quality of some users' recreational experiences, but any effects would be temporary, relatively minor, and limited to the period of construction.

Taunton River

Taunton Heritage River Program - The SRPEDD administers the Taunton Heritage River Program, which aims to support the use of unique resources associated with the Taunton River and encourage tourism by local residents. The Taunton River was named the first Massachusetts Heritage River for its prominent role in the history, culture, recreation, and economy of the communities along the river.

Under this program, Green Futures, an environmental organization based in Fall River, received a grant to conduct an educational program to raise the awareness of the Taunton River for residents in communities from Fall River north to Taunton. The education program will include a narrated riverboat tour and walking tours that provide information on the cultural and natural resources of the Taunton River. Boat tours would likely start at Heritage State Park and proceed north up the Taunton River to Weir Park in Taunton and then circle back to the start of the route.

Construction of the LNG terminal would reactivate a site historically used for industrial activities and would be a consistent use for the site. The dredging associated with the project may have some temporary impacts on the boat tours associated with the program. The arrival and departure of ships associated with operation of the LNG terminal may also affect recreational boating tours. Potential impacts on recreational boating associated with the proposed project are described in section 4.8.6.2.

Wild and Scenic River Program - The NPS administers a program to identify and designate certain rivers in the United States as "Wild and Scenic River Corridors." Since the passage of the Wild and Scenic Rivers Act (WSR Act) in 1968, 163 river segments in the United States have been formally designated as having either exceptional scenic or recreational values. There are two river segments in

Massachusetts that have been formally designated as Wild and Scenic. These include a 43.3-mile segment of the Westfield River (noted as providing some of the northeast's finest whitewater canoeing and kayaking, and for traversing one of the largest tracts of roadless wilderness in Massachusetts) and 29 miles of the Sudbury-Assabet-Concord river system, portions of which traverse the Great Meadows National Wildlife Refuge.

There are no areas within or in the vicinity of the proposed project that are currently included in the NPS's Wild and Scenic River Program. However, the upper Taunton River has been designated a "study area" for inclusion in the program. The 22.5-mile-long study area stretches from Bridgewater at the confluence of the Town and Matfield Rivers to near the Taunton and Raynham town line where the Forge River meets the Taunton River. After Fall River, Somerset, and other towns along the lower Taunton River petitioned the NPS to be included in the study area, the NPS expanded the study area to include the lower Taunton River, with the southern terminus at Mount Hope Bay.

To be designated a Wild and Scenic River, a river must be free-flowing and have one outstandingly remarkable value such as history, fish and wildlife, culture, scenery, geology, archaeology, or recreation. If designated a Wild and Scenic River, development of any new federal dams or water resource projects that would adversely affect the free-flow of the river or otherwise impair the values for which it was designated (e.g., fisheries, exceptional recreational, or scenic resources) would be impeded. According to the NPS, the WSR Act does not generally impose restrictions on a river like a wilderness designation. The intent of the WSR Act is not to stop development and use of a river but to preserve the character of a river. Development that does not damage the outstanding resources of a designated river, or curtail its free flow, is usually allowed (NPS, 2004).

In a comment letter on the draft EIS, the U.S. Department of the Interior stated that based on preliminary findings of the study, the Taunton River appears to support natural and cultural resource values that would qualify it for national designation. The 40-mile-long main stem of the Taunton River is one of the few significant rivers in the region that is free of dams and does not have a history of damming, obstruction, channelization, or other significant alteration. This natural, free-flowing condition supports significant fish, wildlife, cultural, and recreational values ranging from shipbuilding/maritime history to one of the most significant anadromous fish resources of the state and region. Specifically, the fisheries resources of the Taunton River are considered to be one of the most significant contributors to the river's potential eligibility as a National Wild and Scenic River.

A final decision on including the Taunton River in the Wild and Scenic River program has not yet been made. However, protections of the Wild and Scenic River Program are in effect on an interim basis during the study period and for up to 3 years afterward. The NPS expects to complete its study of the Taunton River in 2005. If the NPS recommends the inclusion of the Taunton River in the Wild and Scenic River Program, Congress would then have to approve the designation.

The Weaver's Cove LNG Project would not adversely affect the free-flow of the river. The proposed LNG terminal would be consistent with the historical industrial use of the site and would not impair the values of the river to any greater extent than the other facilities currently located along the lower Taunton River. These include the remnants of the former Shell Oil facility at the proposed site, the Montaup Power Plant, the old and new Brightman Street Bridges, and the existing overhead transmission lines and towers located on either side of the river.

The dredging and construction activities associated with the marine terminal and the arrival and departure of ships during operation of the LNG terminal could affect recreational boating and fishing (see section 4.7.8.2). The Western Pipeline would be installed in the river bed and could also affect recreational use of the river during construction. These impacts would be temporary, lasting only during

the period of active construction. Operation of the pipeline would not impede recreational use of the river. Additional information about impacts associated with the Weaver's Cove LNG Project on visual and historic resources is provided in sections 4.8.7 and 4.10, respectively.

As previously discussed, the fisheries resources of the Taunton River are considered to be one of the most significant contributors to the river's potential eligibility as a National Wild and Scenic River. The dredging and construction activities associated with the LNG terminal and Western Pipeline and the arrival and departure of LNG ships increases the potential for turbidity and sedimentation in the river, which could potentially affect water quality and aquatic resources (see sections 4.3.2 and 4.6.2). To minimize impacts on fisheries resources, we have recommended that Weaver's Cove Energy modify its proposed dredging program and pipeline construction plans within the Taunton River to prohibit any silt-disturbing construction activities during the winter flounder spawning period (January 15 through May 31) (see section 4.6.2). The disturbance associated with the arrival and departure of LNG ships would be unavoidable; however, the ships would use an existing federal navigation channel to access an existing DPA and an area that currently and historically has accommodated commercial shipping.

For the reasons stated above, we do not believe that construction or operation of the proposed project would have a substantial adverse affect on the Taunton River's potential designation as a Wild and Scenic River. However, final determination on whether the Weaver's Cove LNG Project would have a substantial adverse affect on the Taunton River's potential designation as a Wild and Scenic River would be made by the U.S. Department of the Interior. In addition, the COE would provide a draft of its permits pursuant to section 10 of the Rivers and Harbors Act and section 404 of the CWA to the NPS for review. If the NPS objects to the permit under the provision of the WSR Act, the COE would not issue the permits. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Weaver's Cove Energy file with the Secretary documentation of concurrence from the U.S. Department of the Interior that the project would not have a substantial adverse affect on the Taunton River's potential designation as a Wild and Scenic River and that the project would be consistent with the WSR Act if the Taunton River were designated a Wild and Scenic River.**

4.8.6.2 General Recreation and Special Uses

Recreational Boating and Fishing

Narragansett Bay, Mount Hope Bay, and the Taunton River provide ample opportunities for recreational boating and fishing. These activities generally occur during the six warmest months of the year, but are particularly concentrated during the summer months between late June and September when an estimated 60,000 recreational boats use the bays and river.

The DEM (2000) reported that in 1999 there were 35,891 registered boats in Rhode Island. According to data cited in Colt et al. (2000) here were about 7,700 slips and 5,000 moorings in Narragansett Bay in 1988. These data also indicated that another 4,500 boats may also be kept at private docks and moorings within the bay. The Rhode Island Attorney General indicated in his comments on the draft EIS that there are proposals that would significantly increase the existing number of boat slips along the East Passage of Narragansett Bay. By evaluating permit applications submitted to the COE between May 2003 and March 2005, as well as the East Bay Newspapers online edition, we were able to determine that there are proposals for an additional approximately 2,056 boat slips within the entire Narragansett Bay area (COE, 2005; East Bay Newspapers, 2005). Most of these slips are associated with a single project, the Weaver Cove Marina in Portsmouth, which was approved in the mid 1990s. Based on a newspaper report, this proposed marina would be the largest marina on the East Coast; however, no

actual docks are yet in place for the project and the marina's eventual size may be smaller than originally proposed (East Bay Newspapers, 2005). Regardless, the data indicate that the number of boat slips on the bay is likely to continue to increase at least in the short term.

During the summer months yachting regattas are held within Narragansett Bay. Smaller yachts tend to race closer to Newport while larger yachts race further from shore. Several races are scheduled throughout the summer months and about 20 to 30 marine event permits are issued annually. The largest events are focused at Quonset (air show), Newport (Americas Cup), Breton Reef, north of Conamicut and Barrington Points, Greenwich Bay, and the Wickford and Bristol Bay racing series. Weekend volumes tend to be twice that of weekday volumes.

Fall River's recreational boating opportunities are provided primarily by private marinas. The only public boating facility in Fall River is a boat ramp located in Bicentennial Park, about 1 mile southwest of the LNG terminal site. The Harbor Plan identifies four marinas with a total of 215 slips and 49 designated moorings within its study area. These include the King Philip Boat Club, Borden Light Marina, Battleship Yacht Club, Heritage State Park, and Regatta Marina. Additional marinas beyond the Harbor Plan study area include Point Gloria Marina and Captain John O'Connell Marina. Point Gloria Marina is located just south of Bicentennial Park and provides 10 slips. The Captain John O'Connell Marina includes approximately 25 slips and is located north of the LNG terminal site along River Street.

The City of Fall River does not provide specific areas for recreational fishing in any of its parks or recreational areas; however, Heritage State Park located about 1.5 miles south of the LNG terminal site allows fishing south of its boathouse. Some fishing also occurs along bridges in the area, particularly from the Brightman Street Bridge. In 2002, 82 percent of the Brightman Street Bridge openings were for pleasure and fishing boats with 89 percent of the openings occurring between May and October.

There are also several opportunities for recreational boating and fishing in Somerset. Many private residences along the Taunton River in Somerset have their own dock or boat ramp. There are also several private marinas. Public recreational boating facilities include a boat ramp located at Brayton Point and the Somerset Village Waterfront Park, which includes a boat ramp and other docking and launching facilities.

Weaver's Cove Energy conducted a recreational boating traffic study focused on recreational traffic passing through the Brightman Street Bridge and under the Mount Hope Bridge during a peak summer weekend and the following Monday (see section 4.12.5 for further discussion of this study). The traffic estimates suggested that the heaviest use of the waterways for recreational purposes occur between the hours of 8 AM and sunset on Saturday and Sunday. Traffic levels fell off dramatically on the following Monday.

Several construction-related activities could impact recreational boating and fishing within the Taunton River. These include the dredging of the federal navigation channel and turning basin near the LNG terminal site, construction activities associated with the marine terminal, and construction of the Western Pipeline across the river.

Weaver's Cove Energy would schedule the dredging activities in coordination with the COE, NOAA Fisheries, the Massachusetts DMF, and other regulatory agencies to minimize disruption and conflicts with other uses of the river. Weaver's Cove Energy would also develop a Navigation Work Plan in consultation with the COE, Coast Guard, local harbor masters, and the Northeast Marine Pilots Association. The Navigation Work Plan would include measures to ensure the safe passage of waterborne transportation and recreational use of the waterway during construction activities. The dredging that would be conducted by Weaver's Cove Energy could also have a beneficial impact on the

economy because it would facilitate the achievement of adequate water depths for larger ships (i.e., cruise ships) to travel to the Fall River area. Impacts on fisheries, including shellfish, associated with these activities are discussed in section 4.6.2.

Operation of the project facilities would impact recreational boating and fishing during the arrival, and departure of the LNG ships. Weaver's Cove Energy estimates that about 50 to 70 ships per year would pass through Narragansett Bay and enter Mount Hope Bay and the Taunton River to deliver its cargo to the LNG terminal. Weaver's Cove Energy also estimates that the total travel time of a 145,000 m^3 LNG ship would be about 4 hours from the time the ship enters Narragansett Bay to being moored at the ship unloading facility.

Weaver's Cove Energy would be in regular contact with the Coast Guard and other waterway users to ensure that the arrivals of the LNG ships are coordinated with other ship traffic to minimize disruption on waterway users. As discussed in section 4.12.5.2, the Coast Guard would routinely provide Notice to Mariners prior to the arrival and departure of LNG ships as the Coast Guard currently does for Liquefied Petroleum Gas (LPG) vessels and for other activities such as the Tall Ship parades. The notification system includes broadcasts on radio frequencies used by mariners. Picket boats would also precede the LNG ship to inform vessels of the approaching security zones.

The LNG ships would use an existing federal navigation channel used by other commercial traffic, which would minimize the overall impacts on recreational traffic. In addition, Weaver's Cove Energy has indicated that it would be willing to consider limiting LNG ship transits during peak weekend hours and using early morning periods, subject to tidal conditions. With the agreement of the Coast Guard and pilots, Weaver's Cove Energy would also explore the possibility of eventually using nighttime transits for the LNG ships to minimize impacts on recreational boating.

Docks in Fall River currently accommodate both industrial and commercial ships and industrial ships have historically used the facilities at the proposed LNG terminal site. As a result, marine traffic associated with the project would not introduce any significant new type of impacts on recreational boating or fishing. However, the moving safety and security zone enforced around each LNG vessel (generally 2 miles ahead, 1 mile astern, and 1,500 feet on either side of the LNG vessel) and around the ship unloading facility while a ship is docked would widen the area restricted to boaters. This could cause additional impacts on recreational boating and fishing but the impacts would be temporary while the boat is in transit or moored at the ship unloading facility.

Because the safety and security zone would be a moving zone around the ship, the impacts would be of short duration at any given point along the shipping route. Many recreational boats should be able to go around the LNG ships at points in the river that are sufficiently wide for them to be outside of the security zone. In locations were the waterway is narrow, a recreational craft attempting to travel in the opposite direction of an LNG ship traveling at 10 knots may need to wait up to 18 minutes for the LNG ship to pass before proceeding on its way. The delay would increase to up to 36 minutes when the LNG ship is traveling at 5 knots and up to 60 minutes when the LNG ship is traveling at 3 knots. For boaters near or upstream of the facility, an additional 60 minute delay may be experienced while the LNG ship is berthed or turned. The Coast Guard has not defined the size of the safety and security zone around a docked LNG ship but has stated that it would make every effort to minimize disruption to other water way users. Moreover, the Coast Guard security zones would not be treated as absolute exclusion zones that would preclude all other vessel movements. Rather, other vessels may be allowed to transit through the security zone with the permission of the Captain of the Port. Additional information on marine traffic and the safety and security exclusion zone is presented in sections 4.9.4 and 4.12.5.

The extent of the impact on recreational boaters would depend on the number of boats in the project area during the days of the year that LNG ships would call on the LNG terminal. These impacts would be greatest during the peak recreational boating season between about May and September. As discussed above, the Coast Guard would most likely use a program of announcements to give advance notice of each safety and security zone schedule.

Operation of the LNG terminal would not affect public access to the city's waterfront, which is a requirement under Chapter 91 regulations, because the existing industrial site is privately owned and does not currently provide public access to the waterfront. Public access is also not a consistent use of any site designated as a DPA. Chapter 91 regulations support offsite mitigation to provide riverfront access in the vicinity of a proposed project. Weaver's Cove Energy would address this issue with the DEP as part of the Chapter 91 permit review process and has indicated that appropriate mitigation such as improved public access or enjoyment of a riverfront area in the vicinity of the proposed LNG terminal site would be discussed with the DEP.

Commercial Fisheries

Shellfish resources in the vicinity of the proposed LNG terminal site include northern quahog. As described in section 4.6.2, since 1997, the Massachusetts DMF has contracted with shell fishermen to harvest quahogs from biologically contaminated areas in Mount Hope Bay and the Taunton River. Harvested quahogs are then offered to other coastal towns for relocation, or "relay," to clean sites where they remain for a suitable depuration period before harvested for consumption. Weaver's Cove Energy reported that over the 6-year period of the program, an average of 7,940 bushels of quahogs has been collected in the lower Taunton River. Shell fishermen harvesting quahogs for relay in the lower Taunton River would be required to temporarily avoid or vacate the areas affected by the moving security zone during the transit of an LNG ship.

The Rhode Island shellfish industry is also dominated by the northern quahog. Shellfish resources are managed by the DEM through designated management areas and a rotational transplant/harvest system. Stock assessments based on fishery landings, fishery effort, and independent survey data indicate that quahog stock biomass is at a relatively low level and below that needed for maximum sustainable yield. However, the steady decline that occurred between the mid 1980s and mid 1990s has leveled off as the result of water quality improvements in Greenwich Bay and the DEM's rotational harvest/transplant program in the Pottowomut and High Banks Spawner sanctuaries.

Most of Upper Narragansett Bay and Mount Hope Bay in Rhode Island are permanently closed to shellfishing due to poor water and sediment quality. Other closed areas along the proposed LNG ship route include: the vicinity of Melville east of a line from Coggshall Point; Carr Point to buoy "GrC" located at Fiske Rock; the area east of Jamestown; the East Passage and Newport Harbor east; and Castle Hill Cove. In areas where shellfishing occurs, the passage of LNG vessels may inconvenience the commercial harvesting of shellfish as a result of the moving safety and security zone around transiting LNG ships. However, assuming a maximum operating depth range of 26 feet for quahog harvesting by bull rake (Desbonnet and Lee, 1991), there are few areas encompassed by the moving safety and security zone that would be within effective depth ranges harvested by shell fishermen. The few areas that could be affected include the area northeast of Prudence Island and a small area south of Dyer Island. Shell fishermen in these areas would be required to temporarily avoid or vacate the areas affected by the moving security zone during the transit of an LNG ship. Aside from these areas, a majority of the East Passage that would fall within the security zone is not prime shellfishing areas due to either permanent closure or depths below 26 feet (i.e., the maximum permitted depth for harvesting shellfish by hydraulic dredge and the maximum depth for effectively harvesting by bull rake).

Salinity levels and a lack of suitable rocky habitat generally limit American lobsters to Narragansett Bay. The Rhode Island inshore fishery for lobster has declined sharply in recent years and both fishery landings and abundance have dropped to low levels. In spite of this decline, fishing for lobster continues to occur year round in Narragansett Bay. The deep and rocky areas of the bay contain the most abundant populations and provide the best lobster fishing. The most heavily fished areas are the southern coast and the East Passage of the bay. The northern limit of the fishery is around Ohio Ledge, located between Rocky Point in Warwick and North Point in Bristol, and the mouth of Mount Hope Bay. Due to the favorable habitat conditions that exist within the navigation channel, many lobstermen set their pots within the channel (Olszewski and Lynch, 2005).

The passage of LNG vessels could inconvenience the commercial harvesting of lobster as a result of the moving security zones established by the Coast Guard. Lobstermen in these areas would be required to avoid or vacate the areas affected by the moving security zone. However, this effect would be temporary (up to about 18 minutes, as discussed in more detail in section 4.12.5) and limited to periods when the LNG ships are in transit to the facility. Commercial fishermen are trained in the rules, safety procedures, and regulations within the waters of Narragansett Bay. Additionally, they are currently subject to similar restrictions along the channel while other types of commercial vessels are in transit to Mount Hope Bay. For these reasons, it is not expected that the transiting LNG ship would cause a significant disruption in the commercial shellfishing industry (Olszewski and Lynch, 2005). Passage of the LNG vessels could also damage lobster gear that is placed within the navigation channel. However, because the LNG ships would use an existing dredged federal navigation channel that is maintained specifically to allow passage by large vessels, the placement of lobster gear in this channel by lobstermen assumes these inherent risks. Lobstermen who actively fish these areas typically factor in the potential for broken gear in the economics of their operations (Olszewski and Lynch, 2005).

Finfish fisheries in the project area include demersal (bottom-dwelling) and pelagic (water column) fish. Historically, commercial fishing occurred for several of these species in the Narragansett Bay watershed. However, due to the current status of fish populations, commercial fishing has been essentially eliminated from Mount Hope Bay and the Taunton River. The finfish community in Narragansett Bay has changed from an assemblage dominated by demersal species to one currently dominated by pelagic fish species and longfin squid. Important finfish found in the bay include winter flounder, scup, bluefish, striped bass, tautog (blackfish), and menhaden (EPA, 1992). Trawling for finfish occurs in Narragansett Bay from April through November. Trawling activities are concentrated within the East Passage, within the waters on the northeast side of Jamestown north to Hope Island, and south of Hog Island in the waters west of Prudence Island. The passage of LNG vessels could inconvenience the commercial harvesting of finfish as a result of the moving security zones. However, with the exception of a small area south of Hog Island, most of the trawling activities take place outside of areas that would be affected by the security zones for LNG ships transiting to the proposed LNG terminal. Trawling boats in this area would be required to temporarily avoid or vacate the area during the transit of an LNG ship.

4.8.7 Visual Resources

4.8.7.1 LNG Terminal

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 would be constructed at an existing industrial terminal site in a location that is surrounded by industrial, commercial, and residential uses. The site is bordered on the north by the Taunton River and a wooded area; the east by a mix of industrial, commercial, and residential uses; the south by Route 79 and beyond that a mix of commercial, residential, and industrial

uses; and the west by the Taunton River. The terrain in the area of the site is flat along the river and slopes upward east and west of the river.

The most prominent visual feature of the proposed LNG terminal would be the LNG storage tank. Due to its location adjacent to the Taunton River and the density of the area, the tank would be highly visible from a number of locations in Fall River and Somerset. The concrete shell of the tank would be left unpainted and would be whitish-gray in color. The tank would be about 280 feet in diameter and about 195 feet high and would be constructed at a base elevation of about 25 feet above MSL. As a result, the anticipated elevation of the top of the tank would be about 220 feet above MSL. In comparison, the tanks currently located at the site are about 50 feet high, the electrical transmission towers adjacent to the site are about 300 feet high, and the stacks at the Montaup Power Plant across the Taunton River range in height from about 280 feet to 310 feet.

A visual analysis was conducted by Sasaki Associates, Inc. from areas with possible views of the LNG terminal site during leaf on and leaf off periods based on topography, surrounding buildings, and forested areas. The results of this study are shown on photographs provided in Appendix G. The most prominent views of the facilities would be from the back of the Border City Mill Complex Apartments and the Somerset side of the river. Although there are some existing visual distractions in the area (e.g., transmission lines, transmission towers, and buildings), the LNG tank associated with the terminal site would dominate the viewshed for these areas and would result in both temporary and permanent changes to the surrounding visual landscape.

Because of the limited potential for screening, the visual impacts associated with the LNG terminal would be unavoidable; however, Weaver's Cove Energy would use the dredged material to construct a landform north and east of the tank to provide some visual screening of the facility from locations to the east and northeast. The landform would have a height ranging between about 148 feet and 188 feet MSL; however, the LNG storage tank would still rise over the top of this landform. Disturbed areas within the site, including the earthen landform, would be covered with a layer of topsoil, if needed, to support vegetation, and planted with vegetation in accordance with a landscaping plan and/or a portion may be covered with material other than vegetation (e.g., crushed rock). Because Weaver's Cove Energy would be cleaning up and removing the existing facilities on the site, some beneficial impacts on the viewshed could occur. To ensure that visual impacts of the LNG terminal are minimized**, we recommend that:**

- **Weaver's Cove Energy prepare a Landscaping Plan showing how the northern and southern parcels of the LNG terminal site would be restored and revegetated. The Plan should include the locations and descriptions of specific measures and plantings to screen views of the LNG facilities from nearby residences. The Landscaping Plan should be filed with the Secretary for review and written approval by the Director of OEP <u>prior to construction</u>.**

Exterior lighting at the LNG terminal site would be installed as necessary for general plant operations, worker and visitor safety, and security. Floodlighting would be installed for critical process areas and the unloading facility. Lower intensity lighting would be installed along internal roads, at general plant areas, and at the perimeter fencing. The tank would be equipped with security and worker lighting on work platforms on the top of the tank, as well as the stairs leading to the dome. Lighting at the LNG terminal site would be in accordance with OSHA requirements, other applicable codes, and proper security practices. Weaver's Cove Energy would downcast the lighting at the internal roads and perimeter fence to minimize offsite light scatter.

In its *Notice of Proposed Construction or Alteration* submitted to the Federal Aviation Administration (FAA), Weaver's Cove Energy requested that the proposed LNG storage tank not be required to display marking or lighting designed to meet FAA standards. The FAA's Advisory Circular 70-7460-1K, Chapter 1, Subsection 5(b)(2) indicates that no marking and/or lighting is considered necessary or required in instances where "the object may be so located with respect to other objects or terrain; removed from the general flow of air traffic; or may be so conspicuous by its shape, size, or color that marking or lighting would serve no useful purpose." As previously discussed, the proposed 195-foot-tall LNG storage tank would be located in an area with existing electrical transmission towers that are about 300 feet tall and stacks at the Montaup Power Plant that are between 280 and 310 feet tall. There is also a steep bluff to the east of the site with several buildings in excess of four stories in height located at the top of the bluff. The closest operating airport to the LNG storage tank is the New Bedford regional airport, which is located more than 10 miles northwest of the site. In addition, because of its size, the tank would be clearly visible during daylight hours and the security and worker lighting on the top of the tank would be lit between sunrise and sunset. Although this lighting would not be designed to meet FAA standards (e.g., it would not flash or strobe), it would make the tank visible at night. As a result, marking or lighting the tank in accordance with FAA standards would not enhance its visibility and would not serve a useful purpose as indicated by Advisory Circular 70-7460-1K.

In addition to the site itself, the LNG ships would temporarily affect the visual landscape while in transit and docked at the LNG terminal. The LNG ships expected to deliver LNG to the site would typically have a total length of about 950 feet, a beam (width) of about 145 feet, and a loaded draft of about 37.5 feet. As discussed in section 2.2.2, LNG ships have a distinctive appearance compared with other transport ships due to a high freeboard (i.e., that portion of the ship above water). Weaver's Cove Energy estimates that the total travel time of a 145,000 m^3 LNG ship would be just over 4 hours from the time the ship enters Narragansett Bay to being secured at the berth (see section 4.9.4). Docking, LNG cargo unloading, and undocking would take less than 24 hours. Although the visual impacts associated with the LNG ships would be unavoidable, they would be temporary and short term.

4.8.7.2 Pipeline Facilities

The pipelines facilities would be located on private lands that are not subject to federal or state visual management standards. Visual resources along the pipeline route are a function of geology, climate, and historical processes and include topographic relief, vegetation, water, wildlife, land use, and human uses and development. The vegetation along the pipeline route consists largely of grasses, shrubs, and small- to medium-diameter trees on mostly flat to rolling terrain.

Weaver's Cove Energy proposes to use a maximum of a 75-foot-wide construction right-of-way for the Northern Pipeline route and a 100-foot-wide construction right-of-way for the Western Pipeline route. Some areas along both routes would be widened for temporary extra workspaces. Visual impacts associated with the construction right-of-way and temporary extra workspaces would include the removal of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, and machinery and tool storage. Other visual effects could result from the removal of large individual trees that have intrinsic aesthetic value; the removal or alteration of vegetation that may currently provide a visual barrier from undesirable views; or landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture.

Visual impacts would be greatest where the pipeline route parallels or crosses roads and the pipeline right-of-way may be seen by passing motorists, on residents where vegetation used for visual screening of existing utility rights-of-way would be removed, and in forested areas. 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 reestablishment

of vegetation following construction would be relatively fast (generally less than 5 years). The impact would be greater in forest land, which would take many years to regenerate mature trees. The greatest potential visual impact would result from the removal of large specimen trees, which would take longer than other vegetation types to regenerate and would be prevented from reestablishing on the permanent right-of-way.

The majority of the Northern Pipeline would be located within the existing Shell Oil right-of-way and portions would be adjacent to an existing railroad. Construction within or adjacent to existing rights-of-way typically reduces impacts on visual resources because it minimizes vegetation clearing. The existing Shell Oil easement, however, has not been maintained and vegetation, including trees, has been allowed to reestablish on the right-of-way. This vegetation would be cleared during construction of the Northern Pipeline and would result in both short-term and long-term impacts on visual resources depending on the type of vegetation that is removed. In contrast to the existing conditions of the Shell Oil easement, Weaver's Cove Energy would maintain its permanent right-of-way along the Northern Pipeline route in a herbaceous state.

The Northern Pipeline would cross five roadways: Collins Road, Wilson Road, Clark Street, Terry Lane, and Country Club Road. Some screening vegetation including trees would be cleared at the first four of these roads, which may increase the visibility to the west towards the river at these crossings. The crossing at Country Club Road is located adjacent to a large open area and would have only a short term impact on visual resources. In addition to these road crossings, the Northern Pipeline route would be constructed from or within River Street with the incorporation of the River Street Variation into the proposed route. By constructing the pipeline from or within the road, impacts on mature vegetation would be minimized (see section 3.5.3)

The 0.1 mile of newly created right-of-way at the end of the Northern Pipeline route would be constructed through a forested area. The establishment of a new pipeline right-of-way through this forested area would create a permanent visual impact. Although the temporary portion of the construction right-of-way would be allowed to revert to preconstruction conditions, the new permanent right-of-way would be maintained in an herbaceous state. The significance of these visual impacts is reduced because this right-of-way segment is not visible from any residences or public roads.

The Western Pipeline would be located adjacent to or within existing rights-of-way for the majority of the route (about 1.8 miles or 72 percent). The existing rights-of-way consist of public roads and powerline facilities. The pipeline right-of-way would be visible to passing motorists on the roads at several locations. The removal of vegetation within the construction right-of-way, which currently screens the powerline facilities, would result in both short-term and long-term impacts on visual resources depending on the type of vegetation that is removed.

The Western Pipeline would cross five roads (Riverside Avenue, County Street, Prospect Street, Brayton Avenue, and Swansom Road) and be adjacent to Riverside Avenue and Clifford M. Holland Road. Little visual screening exists along Riverside Avenue and County Street and construction of the pipeline in these areas would have only a temporary visual impact. Tree screening in the form of trees and shrubs exist to varying degrees along the other four roads. Construction would remove some of this visual screening at or along these roads, which would increase the visibility of the right-of-way and the adjacent existing transmission lines. In its comments on the draft EIS, Weaver's Cove Energy indicated that it is considering installing the pipeline within Clifford M. Holland Road to preserve the existing vegetation along this road (see section 3.5.4).

The 0.7 mile of newly created right-of-way associated with the Western Pipeline is comprised of 0.4 mile across the Taunton River and 0.3 mile through a forested area at the end of the pipeline route.

The newly created right-of-way across the Taunton River would not be visible and would not affect visual resources in the area. The establishment of a new pipeline right-of-way through the 0.3 mile of forested area would create a permanent visual impact. Although the temporary portion of the construction right-of-way would be allowed to revert to preconstruction conditions, the new permanent right-of-way would be maintained in an herbaceous state. The significance of these visual impacts is reduced because this right-of-way segment is not visible from any residences or public roads.

We received comments from the Massachusetts EFSB regarding the loss of trees that provide aesthetic value, shade, and/or visual screening for four residential areas in close proximity to the pipeline construction rights-of-way. Two of these areas are along the Northern Pipeline route (MPs 0.54 to 0.91 and around MP 2.0) and two of these areas are located along the Western Pipeline route (MPs 0.49 to 0.54 and MPs 1.51 to 1.82). Weaver's Cove Energy has incorporated route variations that would avoid or minimize visual impacts on the two areas along the Northern Pipeline route (River Street Variation and Golf Course Variation). In addition, Weaver's Cove Energy has developed site-specific measures to minimize visual impacts on the area between MPs 1.51 and 1.82 of the Western Pipeline route (Jaffrey Street Variations) (see sections 3.5.3 and 3.5.4). The fourth area between MPs 0.49 and 0.54 of the Western Pipeline route is discussed below.

After crossing the Taunton River, the Western Pipeline route would make landfall at about MP 0.48 just south of Annette Avenue on property owned by Somerset Power, L.L.C. There are five residences located north of Annette Avenue between MPs 0.49 and 0.54. These residences are located immediately adjacent to the street and there is little or no vegetation between the houses and the edge of the street. There are, however, several deciduous and evergreen trees on the Somerset Power, L.L.C. property that provide varying levels of visual screening of the Montaup Power Plant from these residences. It appears based on a field review of the area that most of these trees would be removed during construction of the pipeline. We evaluated alternative Taunton River crossing locations and minor route variations around the Montaup Power Plant that would avoid the Annette Avenue area. However, none of these alternatives or route variations was determined to be environmentally preferable to the proposed pipeline route (see section 3.5.4). Four of the five residences between MPs 0.49 and 0.54 would be located within 50 feet of the construction work area and Weaver's Cove Energy would prepare site-specific residential construction mitigation plans to minimize impacts on these residences. However, as previously noted, the trees that would be removed during construction in this area are on property owned by Somerset Power, L.L.C. Therefore, to ensure that potential impacts associated with the loss of visual screening in this area are minimized, in addition to or in conjunction with the residential construction mitigation plans for this area, **we recommend that:**

- **Weaver's Cove Energy file with the Secretary for the review and written approval of the Director of OEP <u>prior to construction</u>, a Visual Screening Plan developed in consultation with and approved by Somerset Power, L.L.C. that includes measures to replace screening vegetation removed from the temporary construction right-of-way between MPs 0.49 and 0.54 of the Western Pipeline route.**

Construction and operation of the new aboveground facilities associated with the Northern and Western Pipelines would have a permanent impact on visual resources. Both facilities would be located in forested areas. The meter and regulation station at the end of the Northern Pipeline route would affect about 0.9 acre of shrub land within the Riverfront Business Park. The meter and regulation station at the end of the Western Pipeline route would affect about 1.4 acres of forest land. However, neither station site is located in an area that is visible from residences or major roads.

4.9 SOCIOECONOMICS

The Weaver's Cove LNG Project would involve construction of an LNG terminal in the City of Fall River in Bristol County, Massachusetts. In addition, two natural gas pipelines totaling about 6.1 miles long would be constructed from the LNG terminal through Fall River and the Towns of Somerset, Swansea, and Freetown to existing pipeline systems. Some of the potential socioeconomic effects from construction, operation, and maintenance of the project are related to the number of construction workers that would work on the project and their impact on population, public services, nearby homes and businesses, and temporary housing during construction. Other potential impacts are related to construction and operation of the LNG terminal, such as increased traffic or disruption of normal traffic patterns in the vicinity of the terminal site. Other effects associated with the project include increased property tax revenue, increased job opportunities and income associated with local construction employment, and local expenditures by the company and non-local construction workers.

The potential impact of the project on land use and residences in the project area is discussed in section 4.8. A discussion of the project's effects on population and employment, public services, housing, traffic, tax revenue, transportation, and environmental justice is provided below.

4.9.1 Population, Economy, and Employment

Table 4.9.1-1 provides a summary of selected demographic and socioeconomic statistics for the state, county, and cities where project facilities are proposed. The population of Bristol County was 534,678 in 2000 and had increased 5.3 percent in the previous 10 years.

TABLE 4.9.1-1

Existing Socioeconomic Conditions for the Weaver's Cove LNG Project

State/County/City	Population		Population Density a/		Per Capita Income (1999)	Civilian Labor Force (2001)	Unemployment Rate (percent)		Top Two Major Industries
	1990	2000	1990	2000			2000	2001	
MASSACHUSETTS	6,018,101	6,349,097	768	810	$25,952	3,317,479	2.6	3.7	1. Education, Health, and Social Services 2. Manufacturing
Bristol County	506,324	534,678	911	962	$20,978	274,768	3.8	4.8	1. Education, Health, and Social Services 2. Manufacturing
Fall River	92,703	91,938	2,988	2,964	$16,118	42,019	4.9	5.8	1. Manufacturing 2. Education, Health, and Social Services
Somerset	17,655	18,234	2,177	2,248	$22,420	9,418	2.9	3.6	1. Education, Health, and Social Services 2. Manufacturing
Swansea	15,411	15,901	668	689	$21,776	8,620	3.4	3.9	1. Education, Health, and Social Services 2. Manufacturing
Freetown	8,522	8,472	233	232	$24,237	4,515	3.6	4.3	1. Education, Health, and Social Services 2. Manufacturing

a/ Persons per square mile, based on population and land area size: Massachusetts (7,840 sq. mi.), Bristol County (556 sq. mi.), Fall River (31.02 sq. mi.), Somerset (8.11 sq. mi.), Swansea (23.07 sq. mi.), and Freetown (36.58 sq. mi.).

Sources: U.S. Census Bureau, DP-3 Profile of Selected Economic Characteristics: 2000; Commonwealth of Massachusetts Division of Employment and Training, Employment and Wages ES-202 Series; and U.S. Department of Labor, Bureau of Labor Statistics, Local Area Unemployment Statistics.

The City of Fall River, where the LNG terminal would be located, has the highest population and population density of the cities and towns that would be affected by the project.

The main industries in the county and cities that would be affected are education, health, social services, and manufacturing. The unemployment rate for the City of Fall River was 5.8 percent in 2001, which was higher than the rates for the state and Bristol County (3.7 and 4.8 percent, respectively), and higher than the remaining cities that would be affected by the project.

Weaver's Cove Energy estimates that an average of 185 workers would be employed during the 36-month-long construction period of the LNG terminal, with a peak workforce of 275 personnel. Of the peak workforce, Weaver's Cove Energy estimates that 15 management/staff jobs and 195 supervisor/crew jobs would be given to local workers (i.e., within 50 miles of the site). The remaining 65 employees would be hired from outside the Fall River area, including personnel highly qualified in mechanical, electrical, and instrumentation work and control tradesmen.

Approximately 36 months would be required to complete dredging and dredged material reuse activities. Weaver's Cove Energy estimates it would employ up to 75 workers for these activities, approximately half of which would be local hires.

Population impacts within the project area are expected to be temporary and proportionally small. A majority of the impacts would come from the temporary influx of construction personnel. The total population change would equal the total number of non-local construction workers, plus any family members accompanying them. Assuming all 103 non-local construction workers relocate to the project area with family members, this would equate to 267 people using a typical household size of 2.59 persons (U.S. Department of Commerce, 2003). This temporary increase in population corresponds to less than 1 percent of the existing population and would not have a permanent impact on population. A brief decrease in the unemployment rate could occur as a result of construction due to the hiring of local workers for construction and the increased demands on the local economy. However, given the relatively short construction period, the impacts on the economy and employment as a whole would be temporary and minimal.

Thirty permanent employees would be required for operation of the LNG terminal. Weaver's Cove Energy has indicated it would hire and train local workers to the extent possible. Given the small number of permanent workers, the project would not have a significant impact on the permanent population, economy, or employment.

We received a scoping comment and comments on the draft EIS regarding the limited number of permanent jobs that would be created by the proposed LNG terminal compared to the higher number of permanent jobs that have been created by the development of similar sized parcels elsewhere. We recognize that different types of development could create more jobs than the proposed project. However, no such developments have been proposed for the LNG terminal site that would be consistent with local plans (see section 4.8.2).

Construction of the pipeline facilities, including the Taunton River crossing, is anticipated to occur over 10 months, beginning in early 2007 and to be completed concurrent with the completion of the LNG terminal. The pipeline facilities would be constructed with one spread each for the Western Pipeline, the Northern Pipeline, and the Taunton River crossing. A peak construction workforce of 60 to 140 personnel is anticipated, all of which Weaver's Cove Energy anticipates would likely be hired from the local area. Following construction, Weaver's Cove Energy plans to contract with Algonquin to operate the pipelines. Due to the short length of the pipelines, its unlikely Algonquin would hire additional permanent staff.

4.9.2 Housing

Housing is relatively abundant in the vicinity of the Weaver's Cove LNG Project. Rental vacancy rates are higher in the City of Fall River than the remaining cities and the whole of Bristol County (see table 4.9.2-1). Table 4.9.2-2 provides the number of vacant housing units and hotel/motel/inn rooms for the county and cities in the vicinity of the proposed project.

TABLE 4.9.2-1

2000 Housing Characteristics for the Project Area

County/City	Total Housing Units	Total Vacant Housing Units	Vacancy Rate (percent)
Bristol County	216,918	11,507	5.3
Fall River	41,857	3,098	7.4
Somerset	7,143	156	2.2
Swansea	6,070	182	3.0
Freetown	3,029	97	3.2

Source: U.S. Census Bureau, American FactFinder.

TABLE 4.9.2-2

Temporary Accommodations Available in the Project Area

County/City	2000 Vacant Housing Units Available for Rent	2000 Vacant Housing Units Available for Seasonal, Recreational, or Occasional Use	2003 Hotels/Motels/Inns Rooms	2003 Campground/Recreational Vehicle (RV) Park Sites
Bristol County	4,562	2,038	a/	a/
Fall River	1,819	100	82	0
Somerset	43	19	152	0
Swansea	19	38	0	0
Freetown	7	38	0	0
Westport	a/	a/	133	25
Assonet	a/	a/	a/	65

a/ The number of individual housing units, rooms, and campground/RV sites is not available.

Sources: Bristol County Convention and Visitors Bureau (www.bristol-county.org).
U.S. Census Bureau, DP-1. Profile of General Demographic Characteristics: 2000

Temporary housing is available in the form of daily, weekly, and monthly rentals in motels, hotels, campgrounds, recreational vehicle parks, apartments, and houses. Construction could affect the availability of housing. Assuming that local construction workers do not require housing and given the high vacancy rates and the number of available units, the existing temporary housing should be sufficient to meet the demand for short-term housing required by the non-local construction workforce. The additional 30 employees anticipated for operation of the LNG terminal are expected to be local hires. These individuals should not affect the local housing availability.

4.9.3 Public Services

Two hospitals are located in Fall River, with a combined total of 497 beds. There are no hospitals in Somerset, Swansea, or Freetown. There are 15 long-term care facilities and two rest homes in Fall River. One long-term care facility is located in Somerset. Two long-term care facilities and one rest home are located in Swansea. Freetown has no long-term care facilities (Massachusetts Department of

Housing and Community Development, 2002). We received scoping comments regarding access to the hospitals in Fall River during operation of the project if the Braga and Brightman Street Bridges need to be closed at the same time during the passage of LNG ships. A discussion of the potential for bridge closures and impacts on traffic is presented in section 4.9.4.

The Fall River Police Department had a 2003 workforce of 210 police officers in uniform, major crime, traffic enforcement, and emergency response units, as well as 45 volunteer personnel in the auxiliary unit. The Fall River Fire Department has eight engine companies, four ladder companies, and one fire rescue with a total of 240 personnel operating out of six fire stations. The Division of Emergency Medical Services operates three medical rescue units. Somerset has 30 law enforcement employees and two fire stations with 31 personnel. Swansea employs 29 full time police officers and 24 part time officers, while Freetown has 17 full time officers and 10 part time officers. The limited number of permanent employees associated with the proposed project would not result in long-term impacts on public services. However, fire and other emergencies at the proposed LNG terminal could require the services of local fire departments and emergency response units.

We received a scoping comment regarding the current capacity of the Fall River fire department to respond to an incident or fire at the LNG terminal. Weaver's Cove Energy has indicated that it would be the first responder to an incident at the terminal, but would rely on the local fire departments to provide public safety and assistance in responding to any emergency. In addition, the LNG ships, tractor tugs, and terminal facilities would be equipped with internal fire-fighting equipment, and the LNG ship crews would be trained to respond to shipboard fires. In accordance with 49 CFR Part 193.2509 and our recommendation in section 4.12.5, Weaver's Cove Energy would develop an emergency response plan and coordinate procedures with local fire departments and other emergency response planning groups, state and local law enforcements, and appropriate federal agencies (see more discussion of emergency response and evacuation planning in section 4.12.5).

We received scoping comments regarding the public costs of ensuring the security of LNG ships as they transit and dock at the LNG terminal. These costs have not yet been determined. The final costs associated with security would be determined after the specific security needs and responsibilities have been established by the Coast Guard through consultations with other federal, state, and local agencies. The specific security-related costs for the proposed project are not yet available. However, as an indication of these costs, KeySpan LNG has estimated the state and local security costs for LNG deliveries to Providence at $40,000 to 50,000 per trip, based on the resources required in the Coast Guard's Vessel Transit Security Plan. The security practices presently employed to secure the LNG vessel transit through Boston Harbor to the Distrigas facility in Everett, Massachusetts, also provide an indication of the potential magnitude of the costs involved. A recent report for Congress (Parfomak, 2003) indicates that the per-ship costs associated with the LNG terminal in Everett, Massachusetts after September 11, 2001 are approximately $80,000, of which $37,500 are covered by local and state governments. Weaver’s Cove Energy has stated that it would be willing to provide funding for the local emergency response services and is continuing its consultations with these agencies. Specifically, Weaver’s Cove Energy stated it would be willing to cover the cost of security in Fall River similar to what Distrigas is providing to the City of Everett. Both pre- and post-September 11, 2001, Distrigas has underwritten the entire cost of fire and police details provided by the City of Everett at the Everett marine terminal during the unloading of LNG ships. Weaver’s Cove Energy has stated that it believes it should be possible to enter into a similar agreement covering the proposed security operations at the Fall River location and during transit of Narragansett Bay. Nevertheless, we have recommended that Weaver’s Cove Energy provide a plan identifying the mechanisms for funding project-specific costs that would be imposed on state agencies and local communities to better define the potential financial burden on these entities (see section 4.12.5).

We received a scoping comment from the President of the Fall River City Council (City of Fall River, 2003) requesting funding for the training of firefighters and suggesting mitigation measures to offset the public services cost to the City (i.e., an annual contribution of $250,000 and two new vehicles for the fire and police departments). Weaver's Cove Energy has indicated that it would consult with the City of Fall River regarding their requests for funding and suggested mitigation measures. See section 4.12 for our recommendation that Weaver's Cove Energy provide a comprehensive plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies including funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base.

We received a comment from the presidents of St. Anne's Hospital and Southcoast Hospitals Groups indicating that their facilities would not have the capacity to handle large numbers of casualties in the event of an incident at the LNG terminal. As indicated in section 4.12, we have concluded that potential accidents involving the proposed project are unlikely and that the risk is negligible. Because we realize that the risks associated with hazardous materials can never be entirely eliminated, we have recommended additional mitigation measures in section 4.12, including a requirement that Weaver's Cove Energy develop an Emergency Response Plan prior to any operation of the proposed project. As a result, it is unlikely for an incident to occur that would affect the public. However, in the unlikely event that a low probability, high consequence incident results in large numbers of public injuries or casualties, and the capacity of the local hospitals to handle such an event is exceeded, other medical facilities throughout the region would be called upon for assistance.

4.9.4 Transportation and Traffic

Vehicle Traffic

The LNG terminal site is located directly adjacent to North Main Street and Route 79. Route 79 is a major north-south transportation corridor. The entrance to the site is via New Street off of North Main Street and shares an intersection with the entrance and exit ramps off of southbound Route 79. The entrance and exit ramps from northbound Route 79 to North Main Street are located approximately 1,300 feet south of the existing entrance to the LNG terminal site.

Manual and mechanical traffic counts were obtained over a 72-hour period on North Main Street and the Brightman Street Bridge to determine hourly traffic flow trends during weekdays and Saturdays (Meridian Associates, Inc., 2003). Daily traffic volumes along North Main Street at the primary access intersection to the terminal site are just over 10,000 vehicles per day and 700 vehicles per hour during peak travel times (i.e., weekdays between 7:00 and 9:00 AM and 4:00 and 6:00 PM). The Brightman Street Bridge accommodates approximately four times as much traffic, or over 40,000 vehicles per day and 2,800 vehicles per hour.

The former use of the LNG terminal site as a petroleum products distribution facility is estimated to have generated 245 trips per day, up to 210 of which were truck trips. The ramp intersection between North Main Street and Route 79 immediately adjacent to the existing entrance to the terminal site currently operates at acceptable levels. The existing roadway geometry along North Main Street and the Route 79 intersection provide adequate sight distance and are able to readily accommodate truck-turning movements. The existing entrance to the LNG terminal site at this intersection does not have a traffic signal in place and average accident rates are below district-wide averages. We received comments on the draft EIS from the MassHighway and SRPEDD that this highway interchange does not meet federal highway design standards for interchanges on divided highways. Weaver's Cove Energy has initiated consultation with the MassHighway regarding the interchange. On October 29, 2004, Weaver's Cove Energy and the MassHighway discussed potential improvements that could be implemented at the interchange, but no formal recommendations were made. Potential measures include a flashing beacon on

the southbound ramps of Route 79 and North Main Street and re-striping the travel lanes on the two roads, particularly in the vicinity of the northbound ramps. Weaver's Cove Energy believes that the operational impact from the LNG trucks on the capacity of this interchange would be comparable to the previous trucking use; however, if the MassHighway recommends that improvements are necessary at the interchange, Weaver's Cove Energy has stated that it would provide funding for any reasonable improvements.

The Saturday traffic volumes on North Main Street and the Brightman Street Bridge are approximately 18 to 21 percent lower than weekdays.

Construction activities at the LNG terminal site are estimated to generate 700 vehicle trips per day related to construction employees (based on the peak workforce of up to 350 workers traveling to and from the site during LNG terminal construction and dredging activities) and 80 vehicle trips per day related to construction equipment and materials delivery. The majority of the workers would likely access the site via Route 79, although workers residing within Fall River may access the site via North Main Street. It is expected that construction workers would park in a temporary parking lot on the northern parcel of the site, and be bussed to the main construction area. Access to this parking lot would be via North Main Street, approximately 0.3 mile north of the existing main entrance to the site. No temporary construction roads are proposed for the LNG terminal. These increased traffic levels would be temporary and limited to the period of construction (about 3 years) at the LNG terminal site.

The traffic during operation at the LNG terminal would vary depending on the market demand of the LNG and the availability of specialized LNG trucks needed to distribute the product. The facility is expected to operate 24 hours per day, 7 days per week, and peak site activity would vary throughout the day and week depending primarily on the schedule of ship arrivals. An LNG ship is expected to arrive at the terminal every 5 to 7 days. Approximately 50 LNG truck trips and 70 employee vehicle trips are estimated per day during average operating conditions, which would be lower than the estimated historic traffic volumes at the site and represent only a very small increase in the existing road traffic. Weaver's Cove Energy expects that the LNG trucks would use the New Street site entrance at the North Main Street/Route 79 entrance intersection. Employees and visitors would use an entrance located about 0.4 mile north on North Main Street, which would reduce the amount of traffic at the truck entrance intersection (see figure 2.2.1-1). The anticipated traffic volume resulting from operation of the LNG terminal, even during peak operation periods, would not significantly increase the existing traffic volumes on local area roadways or be significantly higher than the estimated previous volumes when the Shell Oil facility was operational. No alterations of or improvements to the existing roads around the LNG terminal sites would be required by the project.

The existing Brightman Street Bridge is a bascule bridge located approximately 1 mile south of the LNG terminal site. This bridge must be opened to allow passage of vessels exceeding its limited 30-foot-high clearance, including vessels that have historically served the oil terminal on the site. The horizontal clearance width of the existing bridge is 98 feet (HNTB Companies, 2003). Demolition of the existing bridge (including the bridge abutments) would be necessary to accommodate the LNG ships. A new bascule bridge is being constructed approximately 1,500 feet north of the existing bridge as part of the reconstruction and relocation of Highway 6. This new bridge would have a vertical clearance height when closed of 60 feet and a horizontal clearance width of 200 feet. The new bridge would need to be opened to allow the arriving and departing LNG ships to pass.

We received comments on the draft EIS indicating that construction of the new bridge and demolition of the existing bridge are behind schedule and would not be completed by the time Weaver's Cove Energy proposes to begin operating the LNG terminal. Weaver's Cove Energy has indicated that it expects demolition of the existing bridge will be completed by 2008. This, however, is inconsistent with information we received in a letter on October 13, 2004, from the MassHighway, which indicates that

construction of the new Brightman Street Bridge and demolition of the existing bridge is currently expected to be completed some time in 2010. Based on this schedule, it appears that the proposed LNG terminal would not be able to receive any LNG and thus not be able to send out any natural gas until some time in 2010.

The existing Brightman Street Bridge has been opened an average of 860 times per year from 2000 to 2002, with the majority of these openings for pleasure craft during the June through September recreational boating season. At current marine traffic levels, openings of the new bridge are expected to decrease by as much as 80 percent (SRPEDD, 2003c). Thus, even with the additional openings of the new bridge required for the 50 to 70 LNG ships per year, the number of openings of the new bridge would be substantially lower than the current number of bridge openings of the existing bridge.

We received scoping comments and comments on the draft EIS regarding the potential for the Braga Bridge (Interstate 195) to be closed to traffic due to security concerns at the same time as the Brightman Street Bridge is open to allow ship passage, and the potential for these closures to affect the travel of emergency services and ambulances across the Taunton River to medical facilities in Fall River. The Braga Bridge is approximately 8,000 feet or 1.5 miles south of the new Brightman Street Bridge. If it is determined that the Braga Bridge needs to be closed during ship transit, Weaver's Cove Energy has indicated that it would adjust its ship transit plans to prevent the simultaneous closings of the two bridges. This could be accomplished by slowing or briefly halting the vessel between the two bridges, thereby allowing the vessel to completely clear one bridge with traffic flow resuming before the Brightman Street Bridge is opened to accommodate passage of the ship. In order to ensure that the potential impacts on emergency vehicles traveling to medical facilities in Fall River are reduced, we have recommended that any security plans make allowances to have at least one of the Braga and Brightman Street Bridges open to traffic during passage of LNG ships and that consideration be given to scheduling bridge closures to avoid peak traffic periods (see section 4.12.5.2).

We also received comments on the draft EIS expressing concern regarding the potential impacts on traffic and the local economies that would occur if the Mount Hope and Pell (Newport) Bridges are closed to traffic during LNG vessel passage. During the Coast Guard's recent security workshops, workshop participants determined that it would not be necessary to close the bridges (except for the Brightman Street Bridge, which would be "closed" to road traffic every time any large ship passes) unless the threat condition or current intelligence raises a concern about security issues. While bridge closures are one of the many tools available to the Coast Guard, other alternatives to a complete bridge closure under consideration include closing the outboard lanes only, placing law enforcement officials on the bridge at strategic locations, or employing technology that provides suitable security alternatives.

Weaver's Cove Energy completed a traffic analysis to identify the potential impacts on traffic if the Pell (Newport) Bridge, Mount Hope Bridge, Braga Bridge, and Brightman Street Bridge are closed during passage of LNG ships (MDM Transportation Consultants, Inc., 2004). The study used an automated traffic recorder to quantify the regional traffic using these bridges. In addition, these traffic counts were used to estimate potential delays and queuing (back-up) distances at the bridges based on how long each bridge might be closed to traffic. Table 4.9.4-1 lists the traffic volume at each bridge and the potential maximum distance and average duration of traffic back-ups in the event that the bridges would need to be closed to all traffic during passage of LNG ships. Values in the table represent peak season traffic volumes. Maximum back up distance and average traffic delays would be less during non-peak season periods. However, maximum traffic delays for some vehicles would be longer than the average delays listed on the table.

TABLE 4.9.4-1

Existing Traffic Volume and Impacts of Bridge Closures

Traffic Data	Pell (Newport) Bridge	Mount Hope Bridge	Braga Bridge	Brightman Street Bridge
Weekday Morning Peak Hour				
Volume	2,630	1,665	6,140	2,720
Percent of Daily Traffic	8.5	7.0	7.5	6.7
Peak Flow/Direction	61%/EB	66%/NB	53%/WB	65%/EB
Peak Season Backup Length and Time a/, b/	EB – 0.34 mi/4.2 min WB – 0.30 mi/4.1 min (Route 114/138 on-ramp) WB – 0.12 mi/3.4 min (Route 238 on-ramp)	SB – 0.32 mi/5.1 min NB – 0.33 mi/5.2 min (Route 138/Boyd's Lane) NB – 0.27 mi/5.0 min (Route 114 (Bristol Ferry Road))	EB – 0.59 mi/6.1 min WB – 0.24 mi/4.9 min (Central Street on-ramp) WB – 0.36 mi/5.3 min (Route 138 on-ramp) WB – 0.30 mi/5.1 min (I-195 Westbound Mainline)	EB – 0.49 mi/9.8 min (Route 6 Eastbound Mainline) EB – 1.14 mi/12.1 min (Route 138 on-ramp) WB – 0.23 mi/8.8 min (Route 79 Southbound Ramp) WB – 0.50 mi/9.8 min (Davol Street Ramp)
Weekday Evening Peak Hour				
Volume	2,790	2,165	6,400	3,600
Percent of Daily Traffic	9.0	9.2	7.8	8.8
Peak Flow/Direction	62%/WB	52%/SB	53%/EB	59%/WB
Peak Season Backup Length and Time a/, b/	EB – 0.22 mi/3.8 min WB – 0.52 mi/4.9 min (Route 114/138 on-ramp) WB – 0.20 mi/3.7 min (Route 238 on-ramp)	SB – 0.62 mi/6.2 min NB – 0.32 mi/5.2 min (Route 138/Boyd's Lane) NB – 0.26 mi/4.9 min (Route 114 (Bristol Ferry Road))	EB – 0.68 mi/6.4 min WB – 0.34 mi/5.2 min (Central Street on-ramp) WB – 0.37 mi/5.3 min (Route 138 on-ramp) WB – 0.23 mi/4.8 min (I-195 Westbound Mainline)	EB – 0.45 mi/9.6 min (Route 6 Eastbound Mainline) EB – 0.98 mi/11.5 min (Route 138 on-ramp) WB – 0.47 mi/9.7 min (Route 79 Southbound Ramp) WB – 1.14 mi/12.1 min (Davol Street Ramp)
Saturday Midday Peak Hour				
Volume	1,955	1,680	5,360	2,440
Percent of Daily Traffic	8.0	8.0	7.3	7.6
Peak Flow/Direction	56%/EB	58%/NB	54%/WB	53%/WB

TABLE 4.9.4-1 (cont'd)

Existing Traffic Volume and Impacts of Bridge Closures

Traffic Data	Pell (Newport) Bridge	Mount Hope Bridge	Braga Bridge	Brightman Street Bridge
Peak Season Backup Length and Time a/, b/	EB – 0.20 mi/3.7 min WB – 0.26 mi/3.9 min (Route 114/138 on-ramp) WB – 0.10 mi/3.4 min (Route 238 on-ramp)	SB – 0.39 mi/5.4 min NB – 0.30 mi/5.1 min (Route 138/Boyd's Lane) NB – 0.21 mi/4.9 min (Route 114 (Bristol Ferry Road))	EB – 0.51 mi/5.8 min WB – 0.24 mi/4.8 min (Central Street on-ramp) WB – 0.33 mi/5.2 min (Route 138 on-ramp) WB – 0.23 mi/4.8 min (I-195 Westbound Mainline)	EB – 0.31 mi/9.1 min (Route 6 Eastbound Mainline) EB – 0.62 mi/10.2 min (Route 138 on-ramp) WB – 0.24 mi/8.9 min (Route 79 Southbound Ramp) WB – 0.80 mi/10.9 min (Davol Street Ramp)

a/ Distance and duration of traffic backups are based on a 6-minute closure of the Pell (Newport) Bridge, an 8-minute closure of the Mount Hope Bridge, an 8-minute closure of the Braga Bridge, and a 16-minute closure of the Brightman Street Bridge. The closure times are based on the bridges being closed up to 5 minutes in advance of ship arrival and the estimated speed of the ships as they pass under the bridges (1.25 to 6 minutes depending on the bridge). Up to an additional 5 minutes is included for the closure of the Brightman Street Bridge.

Back up length represents the maximum queue extent or distance traffic would be backed up for the closure period

Backup time represents the average delay for a vehicle impacted by a bridge closure. The average delay time represents a motorist arriving at the midpoint of a bridge closure period and includes travel time to the bridge through the queue once the bridge is re-opened.

b/ Some traffic backups would be distributed to secondary roads that connect with the main bridge roads. These connecting roads are shown in parentheses. All other traffic backups would occur on the main bridge roads.

EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound.

Source: MDM Transportation Consultants, Inc., 2004

As shown in table 4.9.4-1, the potential impacts on traffic are expected to be minor in the event that the three fixed bridges are closed during passage of LNG ships. At the Pell (Newport) Bridge, the longest average traffic delay would likely occur in the westbound lanes during weekday evenings, with traffic backing up onto the Route 114/138 on-ramp (4.9 minutes). At the Mount Hope Bridge, the longest average traffic delay would likely occur during weekday evenings in the southbound lanes at the approach to the bridge (6.2 minutes). At the Braga Bridge, the longest average traffic delays would likely occur during weekday evenings in the eastbound lanes (6.4 minutes). The longest average traffic delay at the new Brightman Street Bridge would be 12.1 minutes both during weekday mornings in the eastbound lanes, with traffic backing up onto Route 138, and in the westbound lanes with traffic backing up onto the Davol Street ramp. Delays experienced by some motorist near the front of the queues could last at least as long as the length of the time each bridge is closed, which Weaver's Cove Energy estimates would be 6 minutes at the Pell Bridge, 8 minutes at the Mount Hope and Braga Bridges, and 16 minutes at the Brightman Street Bridge. However, the delays at the Brightman Street Bridge would be similar to those that occur associated with the current transit of coal vessels and the previous transit of large oil tankers. In addition, as discussed above, because the new Brightman Street Bridge would have a higher vertical clearance, the number of openings of the new bridge is expected to be substantially lower, even with the addition of 50 to 70 LNG ships per year.

Weaver's Cove Energy has stated that it would develop a Traffic Management Program in consultation with the MassHighway, the Rhode Island DOT, the Coast Guard, the Massachusetts State Police, and other local authorities if any project approval is received from the EOEA and the FERC. Additional discussion of shipping transportation and safety is provided in section 4.12.5.

Construction of the pipelines would involve 60 to 140 workers along three spreads, for up to 280 vehicle trips per day from these spreads. Additional vehicle traffic would result from equipment or material deliveries into and out of the pipe yard each day. The pipe yard would be located adjacent to the meter and regulation station site for the Northern Pipeline in Freetown, which would be within the Riverfront Business Park. Many of the roads adjacent to the pipeline rights-of-way are narrow and may not be able to easily accommodate high volumes of construction workers' vehicles. The parking of vehicles along these roads could increase traffic congestion. Weaver's Cove Energy would minimize the number of vehicles traveling and parking on local roads. Weaver's Cove Energy has indicated that some construction workers would be bussed to the construction sites from a central parking location. Other specialized workers (e.g., welders, supervisors) would access the construction sites by their vehicles as necessary.

Traffic may also be slowed where construction of the pipeline requires minor detours for short periods of time, which may be the case at road crossings or where construction occurs beneath existing roads. Lane closures, and resulting traffic impacts, may also result in areas along the Western Pipeline where the pipeline would be installed adjacent to existing roadways. Weaver's Cove Energy would schedule construction activities involving work within roadways and at specific crossings to avoid commuter traffic and minimize potential impact on school bus schedules. Work involving crossings of individual driveways and private roadways would be coordinated with residents to minimize potential interference with access. Weaver's Cove Energy would also weld sections of pipeline needed at road crossings before excavating the trench to minimize the amount of time the trench is open. Road crossings would generally be completed within a 12-hour period. Traffic lanes and home access would be maintained except during brief periods for laying pipeline. Steel plates would be available at all times so that a temporary platform could be made across the trench should the need arise (e.g., for emergency vehicles). All roadway surfaces would be restored to the specifications of the local or state authorities. Impacts on local traffic would be temporary and limited to the period of construction.

No impacts on traffic would occur along the pipeline routes as the result of pipeline operations.

Ship Traffic

Many commercial vessels utilize Narragansett Bay, Mount Hope Bay, and the Taunton River. Tankers and cargo ships call on various industrial facilities along the waterfront in Fall River and Somerset. Coast Guard data for 2002 indicates 723 ocean-going vessels entered Narragansett Bay and 112 of these vessels proceeded to Fall River or Somerset. The 112 ships transiting up Mount Hope Bay and the Taunton River consisted of:

- 60 coal ships calling on Brayton Point or Montaup Power Plants;
- 11 chemical carriers calling on Borden & Remington;
- 18 general cargo vessels calling on the Fall River State Pier; and
- 23 passenger ships calling on the Fall River State Pier.

Cruise ships have also frequently entered Narragansett Bay. Between May and October 2002, approximately 25 cruise ships were anchored off Newport. These ships typically entered the bay in the morning and sailed again later in the same day. As noted above, 23 passenger ships called on the Fall River State Pier between the months of June and October 2002 but the trade is reported to have been discontinued.

There are also several ferries and water taxi services that transit Narragansett Bay and utilize the channel that would be used by LNG ships. Ferry service between Providence and Newport is provided from May 1 through October 31, with five daily trips during weekdays and six daily trips on weekends. Service is provided between Bristol and Prudence Island with five daily trips during the week and six daily trips on the weekend during the summer months. In the winter months, the number of trips between Bristol and Prudence Island is two for both weekdays and weekends. Service between Newport and Jamestown occurs from late April to late October with eight daily trips on weekdays and nine daily trips on weekends. There is also ferry service between Newport and Block Island and between Point Judith and Block Island. The Newport to Block Island ferry runs one daily trip on both weekdays and weekends. Normal ferry service between Point Judith and Block Island consists of two to three daily trips on both weekdays and weekends from October through June and 8 daily trips on weekdays and ten daily trips on weekends from July through September. There is a high-speed ferry between Point Judith and Block Island that runs from May 13 to October 12, with six daily trips on both weekdays and weekends. Lastly, there is a high-speed ferry between Quonset Point and Martha's Vineyard that runs from May through October. Normal ferry service during the peak season, June through Labor Day, consists of two to three daily trips on both weekends and weekdays. During non-peak season, the schedule consists of one or two trips on both weekends and weekdays. Many of these ferry routes cross or use the federal channel that would be transited by LNG ships traveling to and from the proposed LNG terminal.

Construction of the proposed LNG terminal and dredging of the federal channel would not be expected to interfere with commercial ship traffic. Because the temporary mooring of the dredge and work barges would occupy only a small portion of the federal channel at any given time, this equipment would not present a significant obstruction to navigation. In addition, transit and mooring of the work barges would be required to comply with applicable COE and Coast Guard regulations. To mitigate potential impacts on ship traffic, Weaver's Cove Energy would develop a Navigation Work Plan to ensure the safe passage of waterborne commercial and recreational traffic during the proposed dredging operations and pipeline installation.

Operation of the LNG terminal itself would not affect commercial shipping in Narragansett Bay, Mount Hope Bay, or the Taunton River. None of the structures to be constructed as part of the ship berth or unloading facilities would be located within the navigation channel. Navigational marking and operation of the structures would be conducted in accordance with applicable Coast Guard and COE regulations.

The existing commercial ship traffic in Narragansett Bay includes LPG carriers and a variety of fuel and oil tankers; therefore, the addition of LNG ships would be generally consistent with existing uses. As is currently the case for LPG tankers, the Coast Guard would enforce a safety and security zone around the LNG ships during transit and berthing, which would increase the frequency with which safety and security zone could affect other marine traffic and could increase the number of delays experienced by other commercial ship traffic. Additional information on the Coast Guard's safety and security zone and the anticipated effect of the project on commercial ship traffic is provided in section 4.12.5.

Weaver's Cove Energy estimates that about 50 to 70 ships per year would pass through Narragansett Bay and enter Mount Hope Bay and the Taunton River to deliver its cargo to the LNG terminal. The LNG ships would use existing deep-draft shipping lanes within the bays. The transit time for an LNG ship once it enters Narragansett Bay to the time it is berthed at the terminal is estimated to be just over 4 hours (see table 4.9.4-2).

TABLE 4.9.4-2

Estimated LNG Ship Transit Time Associated with the Weaver's Cove LNG Project a/

Direction/ Action	Begin	End	Distance	Average Speed	Estimated Time
Inbound					
Transit	Entry of Narragansett Bay b/	Pell Bridge	3.9 nautical miles (nm)	10 knots	23 minutes
	Pell Bridge	Sandy Point	6.4 nm	10 knots	38 minutes
	Sandy Point	Braga Bridge	8.6 nm	5 knots	103 minutes
	Braga Bridge	Proposed Turning Basin	2.0 nm	3 knots	40 minutes c/
Turning/ Berthing	Not Applicable (NA)	NA	NA	NA	60 minutes
Total			20.9 nm		264 minutes (4.4 hours)
Outbound					
Unberthing/Turning	NA	NA	NA	NA	60 minutes
Transit	Proposed Turning Basin	Braga Bridge	2.0 nm	3 knots	40 minutes c/
	Braga Bridge	Sandy Point	8.6 nm	6 knots	86 minutes
	Sandy Point	Pell Bridge	6.4 nm	10 knots	43 minutes
	Pell Bridge	Entry of Narragansett Bay b/	3.9 nm	12 knots	20 minutes
Total			20.9 nm		249 minutes (4.2 hours)

a/ Estimates are based on a 145,000 m^3 LNG ship.

b/ For the purposes of this estimate, entry of Narragansett Bay is considered to be the crossing line between Beavertail Point and Brenton Point.

c/ The inward and outward times between the Braga Bridge and the proposed turning basin assumes that traffic on the Braga Bridge would not be stopped or if it is stopped, that it would not be necessary to slow or stop the LNG ship between bridges. Weaver's Cove Energy estimates that normal transit would provide adequate time to ensure resumption of traffic flow across the Braga Bridge before the Brightman Street Bridge traffic would be stopped to allow opening of the bridge and ship transit.

During operation, the safety and security zone (generally 2 miles ahead and 1 mile astern) around transiting LNG ships could inconvenience and result in delays of other commercial ship traffic in the area. The safety and security zone enforced around each LNG ship and around the ship unloading facility while a ship is docked would widen the area restricted to boaters. This could cause additional impacts on recreational boating and fishing, as well as commercial fishing activities, but these impacts would be temporary during ship transit (see section 4.8.6.2).

A task force of waterway users and stakeholders, including representatives of the Coast Guard, has begun an assessment of current risk factors and mitigation measures for such risks on commercial activities and recreational boating in the Narragansett Bay area. The task force completed a study titled *Ports and Waterways Safety Assessment Workshop Report.* This initial report identified the potential for economic impacts to occur on the Narragansett Bay area as a result of closure of the waterway north of Prudence Island, Rhode Island. The report also identified existing mitigation measures to address this issue, and potential new measures that could be implemented by members of the task force. See section 4.12.5 for additional discussion of shipping safety during operation of the proposed project.

We estimate that the delay to a ship scheduled to depart from an existing Fall River berth due to inward passage of an LNG ship in the navigation channel would be between 60 and 90 minutes. To estimate the potential cost of ship delays, we multiplied the estimated costs per hour of shipping delays used by the COE in the EIS for the Providence River Maintenance Dredging Project by the hours of potential shipping delays per year due to LNG shipments estimated in a study prepared by Moffatt and Nichol International (MNI) for the KeySpan LNG Facility Upgrade Project (Moffatt & Nichol International, 2004). The COE estimated that the cost of a 1 hour shipping delay was $1,700. Adjusting this estimate upward for inflation at a rate of about 3 percent per year since the COE's analysis, we estimate that the current cost of a 1 hour shipping delay would be about $2,300.[17] Using 2001 and 2002 shipping data from the COE, the MNI study did not specifically assess current shipping delays experienced by vessels en route to Fall River or the incremental effect of adding LNG ship traffic to the existing ship traffic to Fall River, but it did assess the incremental increase in shipping delays that would result from the addition of LNG ship deliveries to Fall River if the KeySpan LNG facility was also receiving LNG shipments. The MNI study suggests that LNG ships transiting to Fall River could increase annual total shipping delays by about 20 hours per year. By multiplying this anticipated increase in annual shipping delays due to LNG ships (which is 20 hours assuming no ships currently experience delays[18]) by the estimated costs per hour of a shipping delay ($2,300), we estimate that LNG shipments to the proposed LNG terminal could increase the collective cost of shipping to Fall River by about $46,000 per year.

Train Traffic

An existing railroad track owned and operated by CSX is located adjacent to the LNG terminal site. The railroad is currently used for mixed freight service to the City of Fall River, typically consisting of one short train per day. In 1995, the MBTA proposed converting the existing railroad to a high-speed commuter rail line between New Bedford and Boston. Weaver's Cove Energy would consult with CSX to develop measures to ensure that railroad operations are not adversely affected by construction and operation of the proposed project facilities. See section 4.8.3.1 for additional discussion of the proposed commuter rail line.

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[17] This estimate is probably conservative because the COE's estimate of $1,700 was based on the cost of a 35 foot draft, double hulled oil tanker, which is likely a higher per hour cost than the cost of ships calling on Fall River.

[18] This assumption is conservative because deep draft vessels currently calling on Fall River likely experience delays due to tidal conditions and the need to travel to the port on a rising tide.

4.9.5 Property Values

Comments were received at Weaver's Cove Energy's open houses and during the scoping process regarding property devaluation and impacts to homeowners insurance caused by the presence of an LNG storage tank. The LNG terminal would be constructed on a brownfield site that is zoned for industrial use and was previously used to store and distribute petroleum products. The immediately abutting properties are all also zoned for industrial use.

Weaver's Cove Energy developed a voluntary real estate buyout/easement program for two areas adjacent to the LNG terminal site. The purpose of the program was to both offer compensation to property owners who feel they may be inconvenienced during construction activities and to preserve the existing character and uses of the properties. Block A is directly east of the railroad tracks that are east of the southern parcel of the terminal site. This area is zoned for industrial use and includes 25 lots that are owned by 14 property owners. The area includes 1 diesel engine/truck repair business, 1 commercial laundry, and 1 storefront property, 1 vacant parcel made up of 4 lots, 10 single-family homes, 2 two-family homes, and 1 three-family home. Weaver's Cove Energy has offered to purchase these properties at a price above current market appraisal or a market appraisal conducted immediately before the sale closes. Block B is east of North Main Street and is zoned "general residence." The area includes 15 parcels that are owned by 13 property owners, and includes 11 single-family homes, 1 two-family home, 2 vacant parcels, and 1 lot with a two-car oversized garage. The property owners in this area were offered a series of cash payments in return for a commitment to maintain their property in its present condition and use.

Weaver's Cove Energy consulted with real estate experts regarding the impact of the proposed LNG terminal and pipelines on property values (Giroux, 2003; Appraisal Consultants of New England Corporation, 2003). The proposed facilities are not anticipated to negatively impact property values. The values of properties proximate to the site may already reflect their location near an industrially zoned parcel that supported a large petroleum products storage and distribution terminal from its construction in the 1920s to the mid 1990s. The petroleum storage and distribution facility at its peak stored up to 64,000,000 gallons of petroleum products in 35 storage tanks. Product was distributed throughout the region via truck, rail, and dedicated pipeline. It was during this time period that many of the residential areas and commercial businesses in the vicinity of the site were developed.

Property values in areas proximate to the existing LNG storage facility on Bay Street in Fall River were also studied. The results of this study indicated that the Bay Street LNG facility has not deterred residential development in surrounding areas. Several new homes have been constructed in the vicinity of the facility since its activation in 1970. A condominium project is scheduled to be constructed next to the facility in the near future. In addition, a survey of recent sales in the area indicates that property values or price increases have not been diminished because of the facility.

KeySpan LNG commissioned a market analysis to assess the impacts of the LNG terminal and LNG ships associated with the Distrigas LNG terminal have had on surrounding property values in Everett, Massachusetts. The market analysis, conducted by KTR Newmark LLC, reviewed home sales occurring within a 2-mile radius of the existing Distrigas LNG facility from 1985 to 2004. Thirty-three single family home sales were surveyed in the market area surrounding the facility. The results of the market analysis indicated that all properties in this area experienced an average annual appreciation of 14 percent for the period between 1985 and 2004, as compared to 12.8 percent, 17.7 percent, and 14.9 percent for Massachusetts, the Boston area, and Middlesex County, respectively. For the period between 1995 and 2004, the average annual price increase in the market area around the Distrigas LNG terminal was 15.7 percent, which exceeded the average increases of 12.9 percent, 15.6 percent, and 13.4 percent for Massachusetts, the Boston area, and Middlesex County, respectively.

A real estate study performed by the Real Estate Counseling Group of Connecticut, Inc. for a planned Granite State Gas facility in Wells, Maine also supports the findings of the above studies (Real Estate Counseling Group of Connecticut, 1995). In this study, local tax assessors were contacted in four New England communities in the proximity of existing LNG storage facilities (Haverhill, Ludlow, and South Yarmouth, Massachusetts; and Tilton, New Hampshire) as well as communities where LNG storage facilities had been recently built (North Carolina, Georgia, and Indiana) and asked: 1) whether they had received property owner requests for lower valuations due to the presence of an LNG facility; and 2) whether the presence of a storage tank was a factor they considered in doing their valuations. The study concluded that in no case did the planned LNG facilities play a role in the assessment and that no requests for lower valuations had been made or granted.

A 1993 study conducted by the Argonne National Laboratory examined the economic impacts of the presence of "noxious" facilities on local wages and property values (Clark and Nieves, 1993). Eight types of these facilities were studied: nuclear power plants; coal-, gas-, or oil-fired power plants; military chemical weapons sites; hazardous waste sites; refineries; chemical weapon storage facilities; former storage sites that are now contaminated; and LNG facilities. The study examined the effects of 262 facilities on standardized 1,000 square-mile areas across the United States. Eleven of these were LNG facilities. Thirteen of the 262 facilities were located in New England. The results of the study concluded that the presence of 5 of the 8 types of "noxious" facilities have a significantly negative effect on property values and a positive effect on wages. However, the study concluded that the presence of an LNG facility did not have a significant positive or negative effect on either wages or property values (Clark and Nieves, 1993).

Another study by McCluskey and Rausser (2001) evaluated the potential for perceived risk to affect property values. This study analyzed the dynamics between media coverage, distance from the facility, and perceived risk per their effect on property values. The results of this study revealed that the greater the perceived risk, as generated mainly through media coverage, and the closer the property to the facility or site, the greater the negative impact on property values. This study suggests that a facility like the proposed LNG terminal, which has been covered extensively by the press and is perceived as a safety risk, could impact property values near the facility (McCluskey and Rausser, 2001). However, Weaver's Cove Energy reported that recent home sales near the facility appear to be comparable both in terms of days on the market and sale price as a percentage of asking price as other homes in the city as a whole.

Based on the location of the LNG terminal on an existing industrially zoned site and the information from these general and site-specific studies, we do not believe that the LNG terminal would negatively affect property values in the surrounding area. Because the pipeline routes are predominantly located within existing utility corridors, operation of these pipelines is also not expected to have a measurable impact on property values.

Another concern voiced by residents and property owners is the effect of the LNG terminal on homeowner insurance rates and the availability of insurance coverage. In response to these expressed concerns, Weaver's Cove Energy consulted with insurance advisors who have indicated that the LNG terminal would not have an impact on homeowner insurance rates. Homeowner insurance rates are generally set on a county-wide basis, with individual rate adjustments made to reflect the age and value of the property and the claims record of the owner; insurance rates are not based on the surrounding landscape or structures at the local level. However, insurance companies may reject coverage in an area based on high risks. Typically in Massachusetts, insurance coverage is denied when a property is in a poor state of repair or located along the coast where it would be vulnerable to storms. The properties in the vicinity of an industrial facility may be older and not as well maintained. These types of factors would affect the availability of insurance coverage, not the presence of the facility itself (Giganti Insurance, 2004). In cases when insurance coverage is denied, basic property insurance is available from

the Massachusetts Property Insurance Underwriting Association through its Fair Access to Insurance Requirements Plan.

4.9.6 Tax Revenues

Construction and operation of the project would have beneficial impacts on local sales tax revenue. The total revenue of the City of Fall River in 2002 was $140,686,971. Federal and state educational aid accounts for 48.9 percent of that amount, and other state receipts account for another 14.2 percent. Fall River property taxes currently account for 25.7 percent of its revenue ($36,156,552).

Operation of the Weaver's Cove LNG Project would contribute anticipated annual tax revenues of $3,000,000, which would make Weaver's Cove Energy the largest single taxpayer in Fall River. Construction of the pipeline would modestly increase tax revenues through an annual ad valorem tax of $150,000.

As discussed in section 4.8.2, the Harbor Plan recommends that dredging of the federal navigation channel be conducted and estimates that the cost would be $4.7 million in public funds. Weaver's Cove Energy would fund the initial and maintenance dredging of the federal navigation channel necessary to accommodate LNG ships. As a result, the Weaver's Cove LNG Project would have a beneficial economic impact on the City of Fall River because the City would not have to commit the public funds necessary to conduct these dredging activities.

4.9.7 Environmental Justice

Executive Order 12898 on Environmental Justice requires that each federal agency address disproportionately high and adverse health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. As part of the preparation of this EIS, the NEPA review process must provide opportunities for effective community participation and involve consultation with affected communities. If the proposed action will result in significant adverse effects to minority or low-income populations or Native American tribes, the NEPA analysis should address those impacts as part of the alternatives analysis and identify appropriate mitigation measures to address the effects.

Massachusetts' Environmental Justice Policy focuses on enhancing opportunities for residents to participate in decision making, enhancing review of large new sources in environmental justice neighborhoods,[19] ensuring all facilities comply with existing regulations, and encouraging economic growth in neighborhoods where there is existing infrastructure, in particular where there is an opportunity to clean up a contaminated site (brownfield). Although the EOEA has indicated that the proposed facilities do not trigger the requirements for enhanced notification and outreach pursuant to its Environmental Justice Policy, it has encouraged Weaver's Cove Energy to engage in significant public outreach efforts in nearby communities and asked that the EIS include a summary of any community meetings sponsored by Weaver's Cove Energy.

As discussed in section 1.5, Weaver's Cove Energy made efforts to develop its project in consultation with residents in neighboring communities and to evaluate the potential impacts of the project on those communities. Interested parties were given opportunities to participate in the NEPA review process, such as participating in the public scoping meeting for the draft EIS, submitting written comments on the project to the FERC, and informing the FERC of its interest in receiving copies of

[19] Environmental justice areas are defined under Massachusetts' Policy as communities with a median annual household income at or below 65 percent of the statewide median income, 25 percent of residents who are foreign-born, or 25 percent of residents who lack English language proficiency.

public documents related to the project. In addition, interested parties were given the opportunity to comment on the draft EIS, and we have responded to these comments in this final EIS. As part of its public outreach program, Weaver's Cove Energy has:

- published its Notice of Environmental Review in two Fall River newspapers *The Herald News* and the *Fall River Spirit,* as well as in the *Somerset Spectator* and the Portuguese language community newspaper *O Jornal*;
- distributed about 3,700 notices to residents and business owners within a 1-mile radius of the LNG terminal site which publicized the public scoping meeting that was held on July 29, 2003;
- held informational open houses on July 22 and July 29, 2003 for the benefit of community members; and
- maintained project and contact information on its website (www.weaverscove.com), operational since July 31, 2003.

In addition to these efforts by Weaver's Cove Energy, the FERC staff has participated in meetings and consultations with federal, state, and local agencies, issued its NOI, and, in conjunction with the staff of the MEPA Office of the EOEA, held a scoping meeting on July 29, 2003 in Swansea, Massachusetts to receive comments on the project (see section 1.6). The comments we received during the scoping process are summarized in the table provided in Appendix C, and are addressed throughout this document. We have also continued to consult with agencies, conducted two public comment meetings on the draft EIS, and received numerous oral and written comments on the draft EIS, which we have responded to in this document (see Appendix K).

Environmental Justice Areas and Potential Impacts

We received several comments regarding the environmental justice of siting the proposed facilities in Fall River. To address these concerns, we identified environmental justice areas in the vicinity of the proposed project and conducted an analysis of potential impacts that could disproportionately affect these areas.

To identify potential environmental justice areas, we reviewed available state, county, and municipal statistics regarding median income and poverty levels. Table 4.9.7-1 provides the general ethnic mix of the counties and cities that would be affected by the proposed project. Table 4.9.7-2 provides the general economic status of these counties and cities. As shown on these tables, the percentages of minority populations within the cities and towns that would be affected by the project are lower than the state averages. However, the median household income in the City of Fall River is lower than the state median household income and the percentage of persons living below the poverty level in Fall River is higher than state percentage.

We also reviewed environmental justice maps provided to us by the EPA that illustrate environmental justice communities as defined under federal guidelines (see figure 4.9.7-1). We determined from these sources that the closest environmental justice area is located in the City of Fall River directly southeast of the LNG terminal site. Other environmental justice areas are located in Fall River along the shore of the Taunton River. We received comments on the draft EIS that our analysis and figure 4.9.7-1 omitted certain environmental justice populations near the proposed LNG terminal site. As stated above, the information on figure 4.9.7-1 is based on information provided by the EPA, which in turn was based on data from the U.S. Census Bureau.

Insert figure

4.9.7-1 Environmental Justice Communities in the Vicinity of the LNG Terminal and Navigation Channel

TABLE 4.9.7-1

Racial/Ethnic Statistics for the Project Area

State/County/City	Racial/Ethnic Group, 2000 (percent)							Persons of Hispanic or Latino Origin (percent) a/
	White	Black	Native American and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Persons Reporting Some Other Race	Persons Reporting Two or More Races	
MASSACHUSETTS	84.5	5.4	0.2	3.8	<0.1	3.7	2.3	6.8
Bristol County	91.0	2.0	0.2	1.3	<0.1	3.1	2.3	3.6
Fall River	91.2	2.5	0.2	2.2	<0.1	1.4	2.6	3.3
Somerset	98.2	0.2	0.1	0.5	<0.1	0.2	0.8	0.5
Swansea	97.9	0.4	0.1	0.4	<0.1	0.3	1.0	0.6
Freetown	96.2	0.7	0.2	0.6	<0.1	1.1	1.2	0.7

a/ People who identify themselves as Hispanic or Latino may be of any race. Thus, the percent Hispanic should not be added to the percentage for racial categories.

Source: U.S. Department of Commerce, U.S. Census Bureau, State and County QuickFacts (www.census.gov).

TABLE 4.9.7-2

Economic Statistics for the Project Area

State/County/City	Median Household Income (1999)	Persons Below the Poverty Level (1999) (percent)	Households Receiving Public Assistance (percent)
MASSACHUSETTS	$50,502	9.3	2.9
Bristol County	$43,496	10.0	3.9
Fall River	$29,014	17.1	6.5
Somerset	$51,770	4.0	1.9
Swansea	$52,524	4.9	2.9
Freetown	$64,576	5.0	1.2

Source: U.S. Department of Commerce, U.S. Census Bureau

Potential impacts that could disproportionately affect environmental justice areas during construction and operation of the project include visual impacts from the presence of the LNG storage tank, traffic impacts associated with vehicle traffic during construction and operation of the project, air quality and noise impacts, and impacts on public safety from potential incidents at the LNG terminal and in the navigation channel. A summary and analysis of these impacts as they may pertain to environmental justice is presented below. More detailed assessments of visual resources, traffic, air quality and noise, and reliability and safety are included in sections 4.8.7, 4.9.4, 4.11, and 4.12 of this final EIS.

As discussed in section 4.8.7, the primary visual impact of the project on the surrounding areas would be the LNG storage tank. The new tank would be larger than the tanks previously located on the site and would be highly visible from a number of locations in the City of Fall River and the Town of Somerset, including the environmental justice area directly southeast of the LNG terminal site (see figure 4.9.7-1). To the extent possible, Weaver's Cove Energy would provide some visual screening of the tank by constructing a landform east of the tank and implementing a landscape design plan with plantings that are native to the area. In addition, because Weaver's Cove Energy would be cleaning up and removing the existing facilities on the site, some beneficial impacts on the viewshed could occur. The nearby environmental justice areas would not bear disproportionately higher visual impacts because the impact would affect each of the surrounding communities equally.

The increased amount of vehicular traffic on North Main Street and Route 79 during construction of the LNG terminal and Northern Pipeline would affect the environmental justice area southeast of the project site (see section 4.9.4). The effects of this traffic would be temporary and limited to the period of construction. During operation, Weaver's Cove Energy indicated that LNG trucks would use the New Street site entrance at the North Main Street/Route 79 entrance intersection, while employees and visitors would use an entrance located about 0.4 mile north on North Main Street. The anticipated traffic volume resulting from operation of the LNG terminal, even during peak operation periods, would not significantly increase the existing traffic volumes on local area roadways or be significantly higher than the estimated previous volumes when the Shell Oil facility was operational. Additionally, Weaver's Cove Energy is in discussions with the MassHighway regarding potential improvements at the Route 79 and North Main Street intersection (see section 4.9.4) that, if implemented, could improve the existing intersection Therefore, the nearby environmental justice area is not expected to be disproportionately affected by the increase in traffic.

As discussed in section 4.11.1, operation of the proposed project would result in air emissions from three sources: LNG ships and tugs, LNG trucks, and stationary equipment (heaters and emergency engines) associated with the LNG facility. However, the operational air emissions from the LNG terminal would not cause or significantly contribute to a violation of an ambient air quality standard; therefore, the environmental justice areas would also not be disproportionately affected by the project.

As discussed in section 4.11.2, increases in sound levels would occur during construction and operation of the LNG terminal facilities. During construction, increases in sound levels would occur primarily during daylight hours and are not expected to significantly contribute to existing noise levels. Dredging and dredge stabilization, however, would occur up to 24 hours per day for the entire 3-year construction period. Since these activities would potentially exceed noise regulations, we have recommended that Weaver's Cove Energy prepare a noise mitigation plan that would reduce noise impacts on the surrounding communities, including those with environmental justice populations. During operation of the terminal, noise would be generated by LNG trucks and stationary equipment including pumps, compressors, motors, heaters, and fans. The additional traffic from LNG trucks arriving and departing via Route 79 would have minimal impact on the ambient noise levels in the adjacent environmental justice areas. The stationary noise source would be predominantly the four operating LNG sendout pumps. As shown in table 4.11.2-5, the preliminary noise analysis shows that the future increase in noise levels to the nearby environmental justice community would be comparable to, and in some cases lower than, those in the other surrounding areas. We have also recommended that Weaver's Cove Energy conduct post-construction noise surveys to ensure operation of the facilities does not exceed applicable noise regulations; therefore the nearby environmental justice areas are not expected to be disproportionately affected by an increase in noise levels during operation of the project.

In the event of an incident at the LNG terminal, environmental justice areas near the navigation channel and the LNG terminal could be affected. As discussed in section 4.12.4, the project would comply with all applicable building and safety codes and thermal radiation and vapor dispersion exclusion zone requirements designed to protect public safety. No prohibited activities would be allowed within these exclusion zones. The facilities would also include fire detection and suppression equipment and an earthen dike that would contain any spill of LNG at the terminal site. In spite of all the safety measures that would be incorporated into the design and operation of the facilities, any incident at the proposed terminal would not disproportionately affect the environmental justice areas. As shown on figure 4.9.7-1, LNG ships would pass low-income and minority populations that are within 1 mile of the navigation channel. However, these LNG ships would also pass communities along the navigation channel in Rhode Island that are among the wealthiest in that state. The potential for an incident onboard an LNG ship would be borne equally by all communities along the navigation channel; therefore, the environmental justice areas in the City of Fall River would not be disproportionately affected.

In summary, we do not believe construction and operation of the proposed project would result in disproportionate adverse impacts on environmental justice. The project would involve the redevelopment of an existing brownfield site consistent with its historic use and with the City of Fall River's development plan. In addition, the project is expected to generate a number of temporary and permanent employment opportunities, taxes and other revenue streams within the Fall River area, and, with the use of appropriate mitigation measures, would not result in significant adverse impacts on the local environment and natural resources. Although some of the neighborhoods in the vicinity of the LNG terminal can be characterized as having lower incomes than average, the potential impacts described above would affect all of the communities surrounding the LNG terminal, and would not disproportionately impact only the environmental justice areas.

HUD-assisted Housing Developments

We also received comments regarding the proximity of HUD-assisted developments and the impact of siting the LNG terminal in the vicinity of these developments.[20] The siting of HUD-assisted developments is restricted based on the presence of nearby hazardous material operations; however, there are no requirements for the siting of hazardous materials operations in relation to existing HUD-assisted developments.

4.9.8 Recreation and Special Uses

The economic importance of Narragansett Bay has been identified and evaluated in several papers including *The Economic Importance of Narragansett* Bay by Tyrell et al. (1994); *Narragansett Bay Summit 2000, Marine Recreation and Tourism in Narragansett Bay: Critical Values and Concerns, Working Draft* by Colt et al. (2000); and *The Economic Value of Narragansett Bay, A Review of Economic Studies* by Pacheco and Tyrell (2003). Economically important activities associated with the bay include tourism, recreational boating and fishing, and commercial fishing. The total estimated annual value of all outdoor recreational activities in Rhode Island was estimated at about $6.7 billion, of which about $2 billion was associated with bay-related outdoor recreation activities (Tyrell and Harrison, 1999, as cited in Colt et al., 2000; and Tyrell and Harrison, 2000, as cited in Pacheco and Tyrell, 2003). The net economic value of sailing alone has been estimated at $165 million (Colt et al., 2000). Additionally, on an average annual basis, it has been estimated that about 300,000 recreational anglers make about 1 million fishing trips annually in Rhode Island waters and the revenues from these activities are about $150 million (DeAlteris et al., 2000, as cited in Pacheco and Tyrell, 2003). As discussed in sections 4.8.6.2 and 4.12.5.2, construction and operation of the proposed facilities would impact recreational boating and fishing during dredging and the arrival, unloading, and departure of LNG ships. This effect would be limited primarily to the summer months when the bay and its tributaries are most heavily used. While some recreational boaters may be inconvenienced or even experience delays if they are traveling in the opposite direction of LNG ships in the narrowest parts of the ship route, we do not believe this would have a significant economic impact on recreation within the Narragansett Bay watershed.

The majority of the LNG transit from the mouth of Narragansett Bay to the proposed LNG terminal would be through Rhode Island waters. The Rhode Island commercial fishery supports approximately 4,500 license holders. The direct dockside value of commercial landings has fluctuated widely over the last 10 years between a high of $86 million recorded in 1999 and a low of $69 million in 2003. Landings of shellfish, lobster, and ground fish provide the mainstay of the industry. The total value of the industry, however, when domestic sales, exports, purchase of supplies and services, and other generators of economic activity are factored in, is estimated to be in excess of $500 million (R.I. Seafood Council, as cited in DEM, 2004) and perhaps as high as $700 million annually (DeAlteris et al., 2000, as

[20] The nearest HUD-assisted development is a 100-unit elderly housing complex approximately 3,200 feet from the center of the proposed LNG tank. In addition, there is state-funded affordable low income family housing approximately 1,850 and 2,900 feet from the center of the proposed LNG tank.

cited in Pacheco and Tyrell, 2003). Tyrell et al. (1994) estimated that the value of the catch from Narragansett Bay in 1993 was approximately $24 million. Shellfish, particularly Northern quahog are the most abundant and commercially important species in Narragansett Bay and account for the majority of the revenues from the annual catch (Tyrell et al., 1994). Lobster is the second most important commercial fishery in Narragansett Bay (Tyrell et al., 1994), which in 1994 averaged about $2.5 to $3.0 million annually. Commercially important finfish in the bay include winter flounder, scup, bluefish, striped bass, tautog, and menhaden. Tyrell et al. (1994) estimated that the annual value of the finfish catch attributable to the bay from 1984 to 1994 ranged between $1.1 and $1.4 million annually, but accounted for less than 5 percent of the annual commercial finfish landing in Rhode Island. The potential effects of the project on commercial fishing and shellfishing are discussed in section 4.8.6.2 and 4.12.5.2. In general, these effects would be primarily limited to a temporary disturbance of fishing and shellfishing activities within the area encompassing the moving safety and security zone during the passage of the LNG ships, which would not likely have a significant economic impact on commercial fishing and shellfishing within Narragansett Bay.

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 issuance 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. Weaver's Cove Energy, as a non-federal party, is assisting the FERC in meeting its obligations under section 106 and the implementing regulations in 36 CFR 800.

4.10.1 Results of the Cultural Resources Surveys

LNG Terminal

Aboveground Cultural Resources

Weaver's Cove Energy conducted a survey to identify aboveground historic properties that could be affected by construction of the LNG terminal, and submitted the results to the FERC and the Massachusetts State Historic Preservation Office (SHPO) (Epsilon, 2003a, 2003b, 2003c, 2003d). Weaver's Cove Energy broadly defined the area of potential effects (APE) to include both the 73-acre terminal site and its viewshed. The viewshed was defined as any area within a 1-mile radius of the LNG terminal site from which the proposed facilities would be visible. In total, the APE measured approximately 129 acres in extent and included five discontinuous parcels along the east and west banks of the Taunton River (three in Fall River and two in Somerset) in addition to the LNG terminal site. We concur with this definition of the APE.

The survey combined background research with a field investigation. The background research identified three previously recorded properties in Fall River (Wm. B. Canedy House, Border City Mills, and Sagamore Mills No. 1 & 3) and one previously recorded property in Somerset (the Montaup Power Plant). The field survey visited each of these resources and identified five more properties: four in Fall River (two structures on New Street, the Lower North Main Street area, and St. John's Cemetery) and one in Somerset (the Riverside Avenue South area). The structures on New Street are located on the LNG terminal site and the other structures are located within the viewshed.

Three of the properties documented by Weaver's Cove Energy are listed in the NRHP: Wm. B. Canedy House, Border City Mills, and Sagamore Mills No. 1 & 3. The Wm. B. Canedy House is a federal style, single-family dwelling constructed circa 1806. Border City Mills and Sagamore Mills No. 1 & 3 are both large mill complexes constructed in the last quarter of the nineteenth century. The proposed project would be visible from Border City Mills and Sagamore Mills No. 1 & 3, and partially visible from the Wm. B. Canedy House.

Weaver's Cove Energy recommended four of the remaining properties as eligible for listing in the NRHP: the Montaup Power Plant, the Lower North Main Street area, St. John's Cemetery, and the Riverside Avenue South area. The Montaup Power Plant is an electrical generating facility constructed between 1923 and 1925. The Lower North Main Street area is defined as a district encompassing 12 individual structures (9 contributing to eligibility and 3 non-contributing), including the Wm. B. Canedy House; the other structures consist of a school (Wiley School) and 10 dwellings (7 contributing), all constructed during the nineteenth or early twentieth centuries. St. John's Cemetery contains over 500 marked burials ranging in date from 1850 to 1986, with most dating from the mid to late nineteenth century. The Riverside Avenue South area is defined as a district encompassing 47 residential and commercial structures that date from the late nineteenth to early twentieth centuries. The proposed project would be visible from the Montaup Power Plant, the Riverside Avenue South Area, and the Lower North Main Street Area, and only minimally visible from St. John's Cemetery.

Weaver's Cove Energy recommended the two structures located along New Street on the LNG terminal site as ineligible for listing in the NRHP. These resources consist of a 1920s era office building and a 1950s era garage. Both structures would be demolished during construction of the LNG terminal.

Weaver's Cove Energy conducted an analysis of existing visual conditions at and within the viewshed of the properties that are listed in or recommended eligible for the NRHP. The purpose of this analysis was to determine if the viewsheds of these properties contributed to their historical or architectural significance. Existing modern structures, industrial facilities, and/or transmission towers were identified within the viewsheds at each of these properties, and research indicated that viewshed was a character defining feature at only one of the properties (Riverside Avenue South area). As a result, Weaver's Cove Energy concluded that the viewsheds do not contribute to the significance of the Wm. B. Canedy House, Border City Mills, Sagamore Mills No. 1 & 3, the Montaup Power Plant, the Lower North Main Street area, and St. John's Cemetery.

Weaver's Cove Energy recommended that the viewshed of the Riverside Avenue South area contributed to its historical and architectural significance. Many of the residential structures contained within the area were positioned to take advantage of views towards the Taunton River. Nevertheless, the viewshed of the area historically included unobstructed views of industrial facilities, including Border City Mills, Sagamore Mills No. 1 & 3, and the existing petroleum storage tanks on the LNG terminal site.

In a letter dated September 25, 2003, the SHPO indicated that the survey methods were "reasonable" and found the "survey products…technically adequate" (Massachusetts Historical Commission (MHC), 2003d, 2004a). We concur. At present, additional consultation with the Massachusetts SHPO is required.

Terrestrial Archaeological Resources

Weaver's Cove Energy conducted an archaeological reconnaissance survey of the southern and northern parcels of the proposed LNG terminal site (Public Archaeology Laboratory (PAL), 2003a, 2003b; Graves and Brett, 2003; MHC, 2003c). In a letter dated June 12, 2003, the Massachusetts SHPO determined that the southern parcel "does not retain sufficient integrity to be considered archaeologically sensitive", but found that the northern parcel had the potential to contain intact archaeological deposits (MHC, 2003a).

A subsequent survey of the southern and northern parcels of the LNG terminal site was conducted in October 2003. The investigation documented significant soil disturbance within both parcels due to previous developments. No archaeological sites were identified during the survey, and no additional archaeological investigations were recommended for this area (Graves and Brett, 2003).

Weaver's Cove Energy submitted a report on the survey results to the Massachusetts SHPO (PAL, 2003h, 2003m) and to the FERC. In a letter dated December 17, 2003, the SHPO concurred that no additional archaeological investigations of the LNG terminal site are warranted (MHC, 2003e). We also concur.

Underwater Archaeological Resources

The Rhode Island SHPO indicated that the dredging of the existing federal navigation channel would have "no effect on significant cultural resources" (Epsilon, 2003e; Rhode Island Historical Preservation and Heritage Commission, 2003). We agree. The Massachusetts SHPO and Massachusetts Board of Underwater Archaeology (BUAR) indicated that it was not necessary to survey the existing federal navigation channel or those portions of the turning basin that have been previously dredged

(Epsilon, 2003a; MHC, 2003a, 2003b; BUAR, 2003). However, both the Massachusetts SHPO and BUAR recommended that Weaver's Cove Energy conduct a marine archaeological reconnaissance survey of those areas within the proposed turning basin that were not dredged previously.

Weaver's Cove Energy conducted a marine archaeological reconnaissance survey of the previously non-dredged portions of the proposed turning basin in September 2003 (Robinson and Ford, 2003). No prehistoric or historic cultural resources or evidence of intact marine soils with the potential to contain archaeological remains were identified. Consequently, no additional archaeological investigations of the turning basin were recommended (Robinson and Ford, 2003).

Weaver's Cove Energy submitted a report on the survey results to the Massachusetts SHPO, the BUAR (PAL, 2004a), and to the FERC. In letters dated January 28, 2004 (BUAR, 2004) and February 17, 2004 (MHC, 2004a), the BUAR and SHPO concurred that no additional archaeological investigations of the turning basin are warranted. We also concur.

Pipeline Facilities

Aboveground Cultural Resources

Weaver's Cove Energy conducted an investigation to identify aboveground cultural resources that could be affected by construction of the Northern and Western Pipelines. Weaver's Cove Energy defined the APE for such resources as the proposed meter and regulation stations located at the ends of each pipeline plus their respective viewsheds. The pipelines were excluded from the APE because they would be constructed belowground and would not introduce new visual elements into their respective settings. We concur with this definition of the APE.

No resources were identified as a result of this investigation, and Weaver's Cove Energy recommended that no additional investigations for aboveground cultural resources are warranted (Epsilon, 2003b, 2003c).

Weaver's Cove Energy informed the Massachusetts SHPO in a letter dated September 9, 2003 that no aboveground cultural resources were present within or near the originally- proposed locations of the meter and regulation stations (Epsilon, 2003c). In a letter dated September 25, 2003, the SHPO indicated that the survey methods were "reasonable" and found the "survey products…technically adequate" for this investigation (MHC, 2003d, 2004a). We concur.

Weaver's Cove Energy subsequently conducted supplemental surveys of the Northern Pipeline route and three variations (the Northern Parcel, Golf Course and River Street Variations), a revised location for the meter and regulation station site at the terminus of the Northern Pipeline, and a pipe yard (Graves and Brett, 2004; PAL, 2004b). As a result of these investigations, Weaver's Cove Energy documented a historic cemetery, the Winslow Burial Ground, to the north of the revised meter and regulation station site at the Northern Pipeline's terminus. The cemetery dates from the late eighteenth century and contains at least 41 internments. Although the cemetery would not be impacted physically by construction of the meter and regulation station, Weaver's Cove Energy recommended installing protective fencing along the boundaries of its construction right-of-way in the vicinity of the cemetery "to prevent any inadvertent impacts" to the burial ground.

Weaver's Cove Energy submitted the results of the supplemental surveys to the Massachusetts SHPO (PAL, 2004c, 2004d) and the FERC. In a letter dated August 31, 2004 (MHC, 2004b), the Massachusetts SHPO agreed with the plan to fence the construction right-of-way in the vicinity of the Winslow Burial Ground. We also concur. In addition, the SHPO requested "plans and elevation

drawings of the meter station and photographic simulations for the meter station and Pipeyard in relation to the cemetery".

In a filing dated October 29, 2004, Weaver's Cove Energy provided additional information on the Winslow Burial Ground. Weaver's Cove Energy concluded that the cemetery, which is heavily overgrown and surrounded by dense vegetation, would not be visible from the meter station and pipe yard. Therefore, Weaver's Cove Energy recommended that the burial ground be excluded from the APE for aboveground cultural resources. However, Weaver's Cove Energy has not provided the SHPO with the requested additional information.

Terrestrial Archaeological Resources

Weaver's Cove Energy conducted an archaeological reconnaissance survey of the Northern Pipeline route and the terrestrial portion of the Western Pipeline route including the meter and regulation station sites (PAL, 2003a, 2003b; Graves and Brett, 2003; MHC, 2003c) as recommended by the Massachusetts SHPO (MHC, 2003a, 2003b).

The archaeological reconnaissance survey of the Northern Pipeline route consisted of background research and a limited field inspection. The background research identified two previously recorded prehistoric sites within the pipeline corridor: an Early Archaic period lithic artifact scatter (16-BR-109), and a prehistoric village site with an unidentified cultural/temporal affiliation (16-BR-106). The field investigation was limited to a 0.13-mile-long segment of the pipeline between MP 3.46 and the end of the pipeline. Access to the remainder of the pipeline was denied by the property owners, and field inspections of these areas were not conducted.

The survey indicated that a majority of the examined segment was previously disturbed or had a low potential for containing intact archaeological deposits. A short segment of the pipeline corridor from MPs 3.52 to 3.55, however, was characterized as having a moderate potential for containing intact archaeological remains. No cultural resources were identified as a result of the survey, and Weaver's Cove Energy did not attempt to relocate 16-BR-109 and 16-BR-106.

Although the field inspections did not examine the Northern Pipeline route from MPs 0.0 to 3.46, Weaver's Cove Energy characterized this segment as having a low potential for containing intact archaeological deposits, based on planned construction of the pipeline within an existing and previously disturbed pipeline right-of-way and use of an in-kind/same-trench pipeline replacement method.

As a result of its survey, Weaver's Cove Energy recommended an intensive (locational) archaeological survey of the Northern Pipeline route from MPs 3.52 to 3.55 and no additional survey of the remainder of the route, provided that the installation of the pipeline would be an in-kind/same-trench replacement of the existing naphtha pipeline, and that no new right-of-way beyond the existing pipeline's permanent right-of-way/easement would be used. If a new trench is required, and/or if new right-of-way beyond the existing pipeline's permanent right-of-way/easement is required, intensive (locational) survey was recommended (PAL, 2003i, 2003k, 2003l; Graves and Brett, 2003).

Weaver's Cove Energy submitted a report on the survey results to the Massachusetts SHPO (PAL, 2003h, 2003m), and to the FERC. In a letter dated December 17, 2003, the SHPO concurred with Weaver's Cove Energy that an intensive (locational) archaeological survey is warranted from MPs 3.52 to 3.55 of the Northern Pipeline route and that additional survey of the remainder of the pipeline is unwarranted (MHC, 2003e, 2003f).

In filings dated January 28 and February 5, 2004, however, Weaver's Cove Energy provided additional/new information. The January 28 filing provided corrected alignment sheets updating the location of the naphtha pipeline corridor from MP 3.0 to the terminus of the Northern Pipeline route, and a revision to the location of the meter and regulation station at the terminus of the route. The February 5 filing identified, based on the corrected alignment sheets, a new segment between MP 3.44 and 3.48 of the Northern Pipeline route considered to be archaeologically sensitive. This segment was recommended for intensive (locational) survey. In addition, this filing indicated that Weaver's Cove Energy was unable to provide definitive documentation as to the width of the naphtha easement corridor, and that the proposed construction right-of-way may or may not be co-extensive with it. Weaver's Cove Energy indicated that there may be areas where pipeline removal (and, therefore, same-trench replacement) may not be feasible. Also, Weaver's Cove Energy identified a new pipe storage yard near the Northern Pipeline route which may require survey. As a result of this additional/new information, we recommended that Weaver's Cove Energy adopt the Northern Parcel Variation and the Golf Course Variation (see section 3.5.3), portions of which may require survey.

Weaver's Cove Energy subsequently conducted an intensive (locational) archaeological survey of the archaeologically sensitive areas along the Northern Pipeline route, as well as the revised location for the meter and regulation station at the terminus of the Northern Pipeline (Graves and Brett, 2004). The intensive (locational) survey, which consisted of systematic shovel testing, identified two sites: the Head of Cove 2 and Barnaby Swamp 2 Sites (Graves and Brett, 2004). The Head of Cove 2 Site was characterized as a disturbed scatter of prehistoric lithic artifacts dating from the Late Archaic to Late Woodland periods. Weaver's Cove Energy identified the site as unlikely to contain significant data, and no additional investigation was recommended. The Barnaby Swamp 2 Site consisted of a prehistoric lithic scatter with an unknown cultural/temporal affiliation. Weaver's Cove Energy indicated that the site may contain additional significant information, and either avoidance or further investigation was recommended.

The intensive (locational) archaeological survey was followed by an archaeological reconnaissance survey of the temporary workspace (TWS) and additional temporary workspace (ATWS) along the Northern Pipeline (i.e., areas outside the existing naphtha pipeline corridor) and three variations for the Northern Pipeline (the Northern Parcel, Golf Course and River Street Variations) (PAL, 2004b). The archaeological reconnaissance survey, which combined archival research with a field inspection of the project area, examined approximately 2.91 miles of TWS and ATWS along the Northern Pipeline route and Northern Parcel Variation, as well as the 0.99-mile-long Golf Course Variation and the 0.19-mile-long River Street Variation (PAL, 2004b). As a result of this investigation, 1.23 miles of TWS and ATWS along the Northern Pipeline route and 0.27 miles of the Golf Course Variation were assessed as having a moderate to high potential for containing archaeological resources, and an intensive (locational) archaeological survey of these areas was recommended. The remainder of the Northern Pipeline route and Golf Course Variation, in addition to the entire River Street Variation, was assessed as possessing a low potential for containing intact archaeological deposits, and no additional investigation of these areas was recommended.

Weaver's Cove Energy submitted the results of the intensive (locational) and archaeological reconnaissance surveys to the Massachusetts SHPO (PAL, 2004c, 2004d) and the FERC. In a letter dated August 31, 2004 (MHC, 2004b), the SHPO commented on both investigations. With regard to the intensive (locational) archaeological survey, the SHPO found that the Head of Cove 2 Site is ineligible for listing in the NRHP, but that the Barnaby Swamp 2 Site may be a significant cultural resource. The SHPO concurred with the management recommendations for both sites. Specifically, the SHPO agreed that no additional testing of the Head of Cove 2 Site is warranted, and that either avoidance or a site examination archaeological survey of the Barnaby Swamp 2 Site is appropriate. The SHPO also agreed with the results and recommendations of the reconnaissance archaeological survey, including the

recommendation for an intensive (locational) survey of the archaeologically sensitive areas along the Northern Pipeline route and the Golf Course Variation. We concur with these findings.

Weaver's Cove Energy subsequently conducted the required intensive (locational) survey of the high sensitivity areas along the Northern Pipeline and the Golf Course Variation (Waller and Brett, 2005a), as well as a site examination archaeological survey of the Barnaby Swamp 2 Site (Waller and Brett, 2005b). Fieldwork for the intensive (locational) survey consisted of pedestrian reconnaissance augmented by shovel testing. Five new sites (the CSX#1, CSX#2, ISP#1, ISP#2, and the Taunton River Marsh sites) were identified as a result of this work. All five sites consisted of prehistoric lithic artifact scatters (small amounts of historic materials were also recovered from CSX#1, CSX#2, ISP#2, and the Taunton River Marsh sites). Weaver's Cove Energy concluded that all five sites have limited potential to contain "significant archaeological deposits", and no additional testing of these sites was recommended (Waller and Brett, 2005a). Fieldwork at the Barnaby Swamp 2 Site consisted of shovel testing augmented by unit excavation. The testing failed to document intact archaeological deposits at the site, which was assessed as not eligible for listing in the NRHP. No additional testing of the Barnaby Swamp 2 Site was recommended (Waller and Brett, 2005b).

Weaver's Cove Energy submitted the results of the intensive (locational) and site examination surveys to the Massachusetts SHPO (PAL, 2005), and to the FERC. In a letter dated March 11, 2005 (MHC, 2005), the SHPO commented on these investigations and disagreed with Weaver's Cove Energy's eligibility and management recommendations. The SHPO concluded that the five new sites identified during the intensive (locational) survey may possess research potential, and recommended site examination archaeological surveys at each site. The SHPO assessed the Barnaby Swamp 2 Site as eligible for listing in the NRHP, and recommended either archaeological site examination to better define site context and research potential, or archaeological data recovery at this site. The SHPO also requested an avoidance plan for protecting those portions of the site located outside the APE. Weaver's Cove Energy has not yet conducted the recommended site examination surveys, or prepared data recovery or avoidance plans for the Barnaby Swamp 2 Site.

The reconnaissance survey of the Western Pipeline route indicated that a small portion of the pipeline, between MPs 0.5 and 0.8, was previously disturbed or had a low potential for containing intact archaeological deposits. The remainder of the pipeline was found to have a moderate (MPs 0.8 to 2.2) or high (MPs 2.2 to 2.5) potential for containing intact archaeological remains. No archaeological sites, however, were identified during the survey.

As a result of its investigation, Weaver's Cove Energy recommended an intensive (locational) archaeological survey of the moderate and high sensitivity areas identified between MPs 0.8 and 2.52 of the Western Pipeline. No additional archaeological investigations were recommended for the low sensitivity area identified from MPs 0.5 to 0.8 (Graves and Brett, 2003; PAL, 2003i, 2003k, 2003l).

Weaver's Cove Energy submitted a report on the reconnaissance survey results for the Western Pipeline to the Massachusetts SHPO (PAL, 2003h, 2003m), and to the FERC. In a letter dated December 17, 2003, the SHPO concurred with the survey results and recommendations (MHC, 2003e, 2003f). We also concur.

Weaver's Cove Energy subsequently conducted an intensive (locational) survey of the archaeologically sensitive areas along the Western Pipeline route. Fieldwork for this investigation consisted of systematic shovel testing. Two archaeological resources, the Wetland 3 Find Spot and the Slade Farmstead and Cemetery, were identified as a result of this survey. The Wetland 3 Find Spot consisted of an isolated prehistoric projectile point. No additional investigation was recommended. The Slade Farmstead and Cemetery consisted of the remains of a late nineteenth century farmstead and

associated cemetery. Although the site contained numerous features, such as stone foundation walls, a cellar hole, a possible brick chimney foundation, a stone-lined well, and two marked burials, the majority of these features were found outside Weaver's Cove Energy's proposed construction corridor; only three stone walls, associated berms, and a low density artifact scatter were identified within the construction corridor. Weaver's Cove Energy concluded that the site could contain important information about nineteenth century agricultural sites in the region. Because the majority of the site is located outside the construction corridor, however, no additional archaeological investigation was recommended. Restoration of any stone walls or berms impacted during construction also was recommended.

Weaver's Cove Energy submitted the results of the intensive (locational) survey to the Massachusetts SHPO (PAL, 2004c) and the FERC. In a letter dated August 31, 2004 (MHC, 2004b), the SHPO found that the Wetland 3 Find Spot is ineligible for listing in the NRHP and agreed that no additional investigation is warranted. The SHPO also concurred that the Slade Farmstead and Cemetery may be a significant resource, but recommended either avoidance or a site examination archaeological survey for this resource. We concur with the SHPO.

Weaver's Cove Energy subsequently conducted a supplemental intensive (locational) survey along the Western Pipeline (Waller and Brett, 2005a), in addition to a site examination archaeological survey of the Slade Farmstead and Cemetery (Waller and Brett, 2005c). The intensive (locational) survey examined a new route variation, the Jaffrey Street Variation, and an associated workspace. Fieldwork for this investigation consisted of pedestrian reconnaissance augmented by shovel testing. No sites were identified during the survey (Waller and Brett, 2005a). Shovel testing and unit excavation at the Slade Farmstead yielded a small artifact assemblage dating from the mid to late nineteenth century, but no evidence of intact archeological deposits was discovered. Weaver's Cove Energy assessed the site as not eligible for listing in the NRHP, and no additional testing of the site was recommended (Waller and Brett, 2005c).

Weaver's Cove Energy submitted the results of the intensive (locational) and site examination survey to the Massachusetts SHPO (PAL, 2005), and to the FERC. In a letter dated March 11, 2005 (MHC, 2005), the SHPO concurred with the results of the intensive locational survey, but disagreed with the eligibility and management recommendations for the Slade Farmstead and Cemetery. The SHPO assessed the Slade Farmstead as eligible for listing in the NRHP, but concluded that the site's research potential was exhausted within the APE. Therefore, the SHPO recommended that the project would have no adverse effect on the site. The SHPO also requested an avoidance plan for protecting those portions of the site located outside the APE.

Underwater Archaeological Resources

Weaver's Cove Energy conducted a marine archaeological reconnaissance survey of the Western Pipeline route within the Taunton River as recommended by the Massachusetts SHPO and Massachusetts BUAR (MHC, 2003a, 2003b; BUAR, 2003; Robinson and Ford, 2003). No prehistoric or historic cultural resources and no evidence of intact marine soils with the potential to contain archaeological remains were identified. No additional archaeological investigation of the marine portion of the Western Pipeline route was recommended (Robinson and Ford, 2003).

Weaver's Cove Energy submitted a report on the results of its investigation to the Massachusetts SHPO, the BUAR (PAL, 2004a), and the FERC. In letters dated January 28, 2004 (BUAR, 2004) and February 17, 2004 (MHC, 2004a), the BUAR and SHPO concurred that no additional archaeological investigations of the marine portion of the Western Pipeline are warranted. We also concur.

4.10.2 Native American Consultation

On August 26, 2003, Weaver's Cove Energy sent letters to the Wampanoag Tribe of Gay Head (Aquinnah) and the Assonet Band of the Wampanoag Nation to request comments from each tribe regarding the proposed project (PAL, 2003c, 2003d). In a follow-up telephone call on October 8, 2003 the Wampanoag Tribe of Gay Head (Aquinnah) advised Weaver's Cove Energy that it would defer comment on the project to the Assonet Band of the Wampanoag Nation (PAL, 2003f). In a follow-up telephone call on November 4, 2003, the Assonet Band of the Wampanoag Nation advised Weaver's Cove Energy that it would review the project and requested an on-site meeting (PAL, 2003j). Weaver's Cove Energy agreed to continue its consultation with the tribe and schedule an on-site meeting at a future date.

On August 26, 2003, Weaver's Cove Energy also sent a letter requesting comments on the project from the Massachusetts Commission on Indian Affairs (CIA) (PAL, 2003e). The CIA failed to respond to this letter and to a follow-up telephone call from Weaver's Cove Energy on October 8, 2003 (PAL, 2003g).

4.10.3 Unanticipated Discoveries

Weaver's Cove Energy developed a plan for responding to the unanticipated discovery of historic properties or human remains during construction of its project (*Unanticipated Discovery of Historic Properties of Human Remains*). Weaver's Cove Energy submitted this plan to the Massachusetts SHPO; to date, however, the SHPO has not commented on the plan.

4.10.4 Compliance with the NHPA

Consultation is not complete for the project. Consequently, we have not completed the process of complying with section 106 of the NHPA. The FERC, in consultation with the Massachusetts SHPO, will determine whether construction of the Weaver's Cove LNG Project would adversely affect any historic properties. If a historic property would be adversely affected, mitigation would be proposed and the FERC would notify the ACHP.

To ensure that the FERC's responsibilities under the NHPA and its implementing regulations are met, **we recommend that:**

- **Weaver's Cove Energy defer construction of the LNG terminal and Northern and Western Pipelines and associated aboveground facilities <u>until</u>:**

  a. Weaver's Cove Energy provides the SHPO with the appropriate plans, drawings, and photographic simulations for the meter station and pipeyard in relation to the Winslow Burial Ground, and provides the SHPO's comments on this information;

  b. Weaver's Cove Energy conducts the recommended site examination surveys at the CSX#1, CSX#2, ISP#1, ISP#2, and the Taunton River Marsh sites, and files with the Secretary the evaluation reports and the SHPO's comments on the reports;

  c. Weaver's Cove Energy conducts additional site examination at the Barnaby Swamp 2 Site, and files with the Secretary the report and the SHPO's comments on the report;

d. Weaver's Cove Energy files with the Secretary an avoidance plan for the Slade Farmstead and Cemetery and the SHPO's comments on the plan;

e. Weaver's Cove Energy files with the Secretary and the SHPO any additional required survey and evaluation reports, and any required treatment or avoidance plans, and the SHPO's comments on all reports and plans; and

f. The Director of OEP reviews and approves all cultural resources reports and plans, and notifies Weaver's Cove Energy 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

Climate

The regional climate of the project area is classified as northern temperate continental. The project area lies in the path of the "prevailing westerlies." This movement system is characterized by extensive masses of contrasting air originating in higher and lower latitudes interacting to produce low-pressure storm systems. Air masses are of three types: cold, dry air from sub-arctic North America; warm, moist air from the Gulf of Mexico and the subtropical Atlantic; and cool, damp air from the North Atlantic. Due to the dominant westerly wind flow, exposure to the North Atlantic air mass is far less in both frequency and duration than exposure to the other air masses.

National Ambient Air Quality Standards

The EPA has established National Ambient Air Quality Standards (NAAQS) for six pollutants: sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns in diameter (PM_{10}), and lead (Pb). The EPA is currently working to implement a NAAQS for $PM_{2.5}$. 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 DEP. The standards established by the DEP are referred to as the Massachusetts Ambient Air Quality Standards (MAAQS). Fall River is in attainment of the NAAQS for all criteria pollutants, except ozone. All of Massachusetts is classified as a "serious non-attainment area" for the 1-hour ozone standard. The DEP has also established a 1-hour NO_2 policy for sources with a potential to emit 250 tons per year (tpy) of NO_2. The proposed LNG terminal would emit less than 250 tpy of NO_2, so the DEP policy is not applicable. The NAAQS/MAAQS along with the appropriate Significant Impact Levels (SILs) and estimated background concentrations for the project area are listed in table 4.11.1-1.

TABLE 4.11.1-1

Ambient Air Quality Standards

Air Pollutant	Averaging Period	Background Level	Primary Standard	Secondary Standard	Percent of NAAQS/MAAQS	Significant Impact Level ($\mu g/m^3$)
Sulfur Dioxide ($\mu g/m^3$)	3-Hour a/	246.3	NA	1,300	19	25
	24-Hour a/	110.0	365	NA	30	5
	Annual b/	13.1	80	NA	16	1
Carbon Monoxide (ppm)	1-Hour a/	12.7	35	35	36	2,000
	8-Hour a/	5.0	9	9	56	500
Nitrogen Dioxide ($\mu g/m^3$)	Annual b/	44.7	100	100	45	1
Ozone c/ (ppm)	1-Hour a/	0.136	0.12	0.12	113	NA
	8-Hour a/	0.113	0.08	0.08	141	NA
Particulate Matter less than 10	24-Hour a/	91.0	150	150	61	5
microns ($\mu g/m^3$)	Annual b/	32.0	50	50	64	1
Particulate Matter less than 2.5	24-Hour a/	37.9	65	65	58	NA
microns ($\mu g/m^3$)	Annual b/	13.3	15	15	89	NA
Lead d/	NA	NA	NA	NA	NA	NA

a/ The second high designation indicates that the concentration listed is representative of the second high concentration measured at the monitoring station.
b/ The highest annual average concentration.
c/ All of Massachusetts is classified as "serious" non-attainment for 1-hour ozone standard.
d/ Lead is not monitored in Massachusetts.
$\mu g/m^3$ micrograms per cubic meter
ppm parts per million

Existing Air Quality

Air quality data contained in reports from the DEP Division of Air Quality Control (DAQC) and monitoring data provided by the EPA were reviewed to characterize ambient (background) air quality related to regulated criteria pollutants. The pollutants include SO_2, CO, NO_2, O_3, PM_{10}, $PM_{2.5}$, and Pb. A summary of these data is presented in table 4.11.1-2.

TABLE 4.11.1-2

Existing Ambient Air Concentrations

Air Pollutant	Monitoring Station	Averaging Period	1999	2000	2001	Background Level
Sulfur Dioxide ($\mu g/m^3$)	Fall River	3-Hour a/	193.9	246.3	159.8	246.3
	Fall River	24-Hour a/	55.0	110.0	57.6	110.0
	Fall River	Annual b/	10.5	13.1	13.1	13.1
Carbon Monoxide (ppm)	Providence	1-Hour a/	8.1	6.5	12.7	12.7
	Providence	8-Hour a/	5.0	4.6	4.0	5.0
Nitrogen Dioxide ($\mu g/m^3$)	Providence	Annual b/	44.7	37.6	37.8	44.7
Ozone c/ (ppm)	Fairhaven	1-Hour a/	0.125	0.101	0.136	0.136
	Fairhaven	8-Hour a/	0.109	0.09	0.113	0.113
Particulate Matter less than 10 microns ($\mu g/m^3$)	Providence	24-Hour a/	61.0	91.0	86.0	91.0
	Providence	Annual a/	29.0	29.0	32.0	32.0
Particulate Matter less than 2.5 microns ($\mu g/m^3$)	Fall River	24-Hour a/	37.9	29.6	37.0	37.9
	Fall River	Annual b/	11.8	11.7	13.3	13.3
Lead d/	NA	NA	NA	NA	NA	NA

a/ The second high designation indicates that the concentration listed is representative of the second high concentration measured at the monitoring station.
b/ The highest annual average concentration.
c/ All of Massachusetts is classified as "serious" non-attainment for 1-hour ozone standard.
d/ Pb is not monitored in Massachusetts.
$\mu g/m^3$ micrograms per cubic meter
ppm parts per million

Air Quality Control Regions

Air Quality Control Regions (AQCRs) were established by the EPA and local agencies, in accordance with section 107 of the CAA, 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. Fall River is located in the Metropolitan Providence Interstate AQCR.

Regulatory Requirements for Air Quality

The proposed LNG terminal would generate air emissions through both short-term construction activities and long-term operation of the stationary emission units at the facility. Emissions from all phases of construction and operation of the emission units would be subject to applicable state and federal air regulations.

The new stationary air emission sources associated with operating the proposed LNG terminal are listed in table 4.11.1-3.

TABLE 4.11.1-3

Emission Source Information

Air Emission Source (quantity)	Heat Rating (MMBtu/hr)	Horsepower Rating	Energy Source
Water/Glycol heaters (12)	59 (each)	NA	Natural Gas
Emergency Generator (1)	8	1,160	Diesel Fuel
Diesel Fire Pump (1)	1.21	175	Diesel Fuel

MMBtu/hr million British thermal units per hour

Air emission sources in the Commonwealth of Massachusetts are regulated at the federal level by the CAA, as amended, and at the state level by the CMR. The federal regulations established as a result of the CAA and the CMR that are potentially applicable to the project include:

- New Source Performance Standards (NSPS);
- New Source Review (NSR)/Prevention of Significant Deterioration (PSD) review;
- Title V Operating Permits;
- National Emission Standards for Hazardous Air Pollutants (NESHAPs);
- Federal Class I Area Protection;
- General Conformity; and
- State Regulations.

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. The NSPS apply to new, modified, or reconstructed sources.

Subpart Dc of 40 CFR 60 applies to small industrial, commercial, or institutional steam generating units that are modified, constructed, or reconstructed after June 9, 1989 and have maximum heat input rates of more than 10 MMBtu/hr but less than 100 MMBtu/hr. Subpart Dc establishes specific emissions limits for SO_2 (for coal and oil fired units) and PM (for coal fired units). The proposed boilers would not be oil or coal-fired, so the emission limitations would not be applicable. However, Subpart Dc would be applicable for reporting and recordkeeping requirements.

Subpart Kb of 40 CFR 60 potentially applies to any volatile organic liquid storage unit that is modified, constructed, or reconstructed after July 23, 1984 and has a capacity of 75 m^3 or greater. Subpart Kb applicability is dependent on the construction date, size, and vapor pressure of the storage vessel and its contents. Subpart Kb applies to new tanks, unless otherwise exempted, that have a storage capacity between 75 m^3 (19,813 gallons) and 151 m^3 (39,890 gallons) containing VOCs with a maximum true vapor pressure greater than or equal to 15.0 kilopascals (kPa) or storage capacity greater than or equal to 151 m^3 containing VOCs with a maximum true vapor pressure greater than or equal to 3.5 kPa. The LNG storage tank would operate at approximately -260° F and the prominent VOC (propane) has a vapor pressure of 0.0007 kPa at this storage temperature. Therefore, the LNG storage tank would not be subject to NSPS Subpart Kb. However, the LNG storage tank would have a closed vent system comparable to those required by Subpart Kb. The boil-off gas from the tank would be collected and routed to the boil-off gas compressors for recovery to prevent fugitive emissions to the atmosphere.

Prevention of Significant Deterioration

Title I of the CAA establishes guidelines for the preconstruction/modification review of large air emission sources. Construction of sources in attainment areas must be reviewed in accordance with the PSD regulations. To be classified as a new major PSD source, the potential emissions from the source must be: either greater than 100 tpy for any pollutant regulated by the EPA under the CAA for sources that are among the 28 source categories listed in section 169 of the CAA, or greater than 250 tpy for any pollutant regulated by the EPA under the CAA for sources that are not among the 28 source categories listed in section 169 of the CAA. A Best Available Control Technology (BACT) analysis and detailed dispersion modeling are required if a facility is classified as a major PSD source.

Fossil fuel boilers (or combination thereof) totaling more than 250 MMBtu/hr heat input are identified in the list of 28 source categories in section 169 of the CAA; therefore, the applicability threshold for PSD review for the proposed LNG terminal is 100 tpy. Table 4.11.1-4 presents the annual maximum potential emissions from the proposed LNG terminal and relevant PSD and NSR threshold criteria.

TABLE 4.11.1-4

Operating Air Emissions Summary for Proposed LNG Terminal a/

	NO_2		CO		SO_2		$PM_{10}/PM_{2.5}$		VOC		Pb	
Emission Unit (Quantity)	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr
Water/Glycol heaters (12) b/	31.1	7.7	42.0	10.5	1.7	0.4	24.6	6.1	12.0	3.0	1E-03	4E-04
Fire Pump (1) c/	0.3	1.7	0.1	0.4	9E-03	0.1	0.1	0.4	0.1	0.4	9E-07	6E-06
Emergency Generator (1) c/	2.1	13.8	0.6	3.9	0.1	0.4	0.4	2.5	0.4	2.9	6E-06	4E-05
Land-Based Total Emissions	33.5	23.2	42.7	14.8	1.8	0.8	25.1	9.0	12.5	6.3	1E-03	4E-04
Operating Permit Threshold	50	NA	100	NA	100	NA	100	NA	50	NA	10	NA
PSD Threshold Criteria	NA	NA	100	NA	100	NA	100	NA	NA	NA	100	NA
LNG Ships While Docked	13.5	---	0.7	---	66.4	---	5.3	---	0.9	---	Neg. d/	---
Total Terminal Emissions	47.0	---	43.4	---	68.2	---	30.4	---	13.4	---	1E-03	---
NSR Threshold	50	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA

a/ Emissions of beryllium, mercury, sulfuric acid mist, asbestos, vinyl chloride, fluorides, hydrogen sulfide, total reduced sulfur, reduced sulfur compounds, CFCs, halons, and ozone depleting substances are negligible.

b/ The calculations for the Water/Glycol heaters assume 12 heaters operating at maximum capacity (59 MMBtu/hour/unit) for short-term emissions and 11 heaters operating at maximum capacity for the entire year (8,760 hours) for annual emissions.

c/ Emergency Generator and Fire Pump potential emissions calculations based on 300 hour per year operation.

d/ The lead emissions from the LNG ships were not provided by Weaver's Cove Energy and are assumed to be negligible (Neg.) with respect to the PSD major source thresholds.

NO_2 nitrogen dioxide
CO carbon monoxide
SO_2 sulfur dioxide
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
VOC volatile organic compound
Pb lead

lb/hr pounds per hour
tpy tons per year

As shown in table 4.11.1-4, the maximum emissions from the proposed LNG terminal would be less than 100 tpy for each of the criteria pollutants. Therefore, the proposed LNG terminal would not be a major source and would not be subject to PSD review.

Non-attainment New Source Review

Title I of the CAA establishes guidelines for the preconstruction/modification review of large air emission sources. Construction of sources in non-attainment areas must be reviewed in accordance with the NSR regulations. As discussed above, the entire Commonwealth of Massachusetts is classified as a serious non-attainment area for ozone (40 CFR 81.322). There are special requirements for sources of VOC and NO_x, the two ozone precursors that are regulated by section 182(f) of the CAA. Ozone NSR in Massachusetts is required for new major stationary sources that emit more than 50 tpy of NO_x or VOC. Stationary sources are defined by 310 CMR 7.00 Appendix A to include any marine vessel emissions while docked at the facility. Therefore, the LNG ship emissions that would be generated while docked at the LNG terminal are included in table 4.11.1-4. Because the land-based and docked ship emissions would total less than 50 tpy of NO_x and VOC, the LNG terminal would not be subject to NSR.

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 40 CFR 70 and the permits required by these regulations are often referred to as Part 70 permits. Massachusetts has incorporated this program in 310 CMR 7.00 Appendix C of its Air Pollution Control Regulations.

If a facility's potential to emit exceeds the criteria pollutant or hazardous air pollutant (HAP) thresholds, the facility is considered a major source. The major source threshold level for an air emission source in Massachusetts is 100 tpy for PM_{10}, SO_2, and CO and 50 tpy for NO_x and VOC. The major source HAP thresholds for a source are 10 tpy of any single HAP or 25 tpy of all HAPs in aggregate. Potential HAP emissions from the proposed LNG terminal (in aggregate) would be 5.37 tpy, which are below the major source thresholds.

As shown in table 4.11.1-4, the potential emissions for each pollutant at the proposed LNG terminal do not exceed the Title V threshold limits. Therefore, the LNG terminal would not be a major source of air emissions and would not require a Part 70 permit. Massachusetts has not established a minor source operating permit program. However, the DEP would require an Air Plan Approval for the project (discussed below), which would constitute authorization to construct and operate the proposed air emission sources.

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 only eight types of hazardous substances (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 potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

LNG storage and processing facilities are not one of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable to these types of facilities. Part 63 establishes HAP emission standards for 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 (proposed as Subpart DDDDD); and reciprocating internal combustion engines (Subpart ZZZZ). These subparts establish requirements for major sources of HAPs only. As indicated above, the potential HAP emissions (in aggregate) from the LNG terminal would be 5.37 tpy. The single largest HAP emitted by the terminal would be hexane with a potential to emit of 5.12 tpy. Therefore, the LNG facility would not be a major source of HAPs and would not be subject to the NESHAPs.

Federal Class I Area Protection

The United States Congress designated certain lands as Mandatory Federal Class I (Class I) areas in 1977. Class I areas were designated because the air quality was considered a special feature of the area (e.g., national parks or wilderness area). These Class I areas, and any other areas that have been redesignated Class I areas since 1977, are given special protection under the PSD program. The PSD program establishes air pollution increment increases that are allowed by new or modified air pollution sources. 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).

As determined previously, the proposed LNG terminal would not be subject to the PSD regulations. Therefore, the Federal Class I area protection provisions would not apply to this project.

General Conformity

A conformity analysis must be conducted if a federal action will generate emissions that will exceed the conformity thresholds levels (*de minimis*) of the pollutant(s) for which an air basin is in nonattainment. A conformity analysis must show that the emissions will conform to the SIP and will not reduce air quality in the air basin, which can be demonstrated through offsets, SIP provisions, or modeling. Emissions from sources subject to NSR or PSD requirements are exempt and are deemed to have conformed. The requirements for a conformity analysis are listed in 40 CFR Parts 6, 51, and 93, and became effective March 15, 1994.

The EPA had designated the Commonwealth of Massachusetts as a “serious non-attainment area” for the 1-hour ozone standard. A federal conformity analysis is required for any project in a “serious non-attainment area” that would result in combined direct and indirect emissions of either NO_x or VOCs equal to or greater than 50 tons per year. However, in April 2004, the EPA designated eastern Massachusetts (EMA) as a "moderate non-attainment area" under the 8-hour ozone standard and, after June 15, 2005, the ozone conformity applicability thresholds for this area will be 100 tons per year of NO_x and 50 tons per year of VOC emissions. In previous instances, the Commission has interpreted its authorization to commence construction as the Commission’s final action, which would trigger the effectiveness of its conformity determination. This action would not occur prior to June 15, 2005. As shown in table 4.11.1-5, the maximum emissions of NO_x and VOCs from the proposed LNG terminal are estimated to be 78.0 and 14.2 tons per year, respectively, both of which are below the thresholds requiring a conformity analysis under the 8-hour ozone standard.

We note that the DEP believes applying a 100 ton per year threshold for NO_x after June 15, 2005 constitutes backsliding and is inconsistent with the requirements of the federal Clean Air Act. Therefore, the DEP wants to require any project generating 50 tons per year or more of NO_x emissions after June 15, 2005 to meet the General Conformity criteria under 40 CFR Part 51.858.

TABLE 4.11.1-5

Total NO_x and VOC Emissions for the Weaver's Cove LNG Project

Source	Service	Pollutant	Time/Distance	Units	Emissions	Units
INDIRECT EMISSIONS (assuming 7,000 LNG trucks per year, each having a 1.2 miles roundtrip)						
LNG Trucks	Idling (1hour)	NO_x	7,000	hours/year	0.1	tons/year
LNG Trucks	Idling (1hour)	VOC	7,000	hours/year	negligible	tons/year
LNG Trucks	Driving	NO_x	8,400	miles/year	0.1	tons/year
LNG Trucks	Driving	VOC	8,400	miles/year	negligible	tons/year
LNG Ships & Tugs	Transport	NO_x			16.2	tons/year
LNG Ships & Tugs	Transport	VOC			0.2	tons/year
LNG Ships & Tugs	Unloading	NO_x			28.1	tons/year
LNG Ships & Tugs	Unloading	VOC			1.5	tons/year
Total Indirect		NO_x			44.5	tons/year
Total Indirect		VOC			1.7	tons/year
DIRECT EMISSIONS (based on proposed BACT controls)						
Heaters		NO_x	8,760	hours/year	31.1	tons/year
Heaters		VOC	8,760	hours/year	12.0	tons/year
Fire Pump		NO_x	300	hours/year	0.3	tons/year
Fire Pump		VOC	300	hours/year	0.1	tons/year
Emergency Generator		NO_x	300	hours/year	2.1	tons/year
Emergency Generator		VOC	300	hours/year	0.4	tons/year
Total Direct		NO_x			33.5	tons/year
Total Direct		VOC			12.5	tons/year
TOTAL PROJECT EMISSIONS						
		NO_x			78.0	tons/year
		VOC			14.2	tons/year

However, the implementation rule adopted by the EPA on April 30, 2004, specifies that areas will not be obligated to continue to demonstrate conformity for the 1-hour standard as of the effective date of the revocation of the 1-hour standard. For a determination effective after June 15, 2005, the EPA would consider the Weaver's Cove LNG Project exempt from the requirements of general conformity as long as the yearly emissions would be below the applicability threshold under the 8-hour standard for the life of the project and provided that the project's emissions of any pollutant would not comprise more than 10 percent of the region's total emissions of that pollutant. As shown in table 4.11.1-6, the Weaver's Cove LNG Project emissions for NO_x or VOC would be approximately 0.21 and 0.05 percent of the projected 2007 total emissions of NO_x and VOC in the EMA. Therefore, no conformity determination is required for this project.

TABLE 4.11.1-6

DEP NO_x and VOC Emission Budgets for the Weaver's Cove LNG Project

Non-attainment Pollutant	EMA 2007 Projected Emissions a/ (tons per summer day)	Weaver's Cove Energy's Projected Emissions \(tons per peak day) b/	Weaver's Cove Energy's Contribution (percent)
NO_x	606	1.3	0.21
VOC	491	0.24	0.05

a/ Source of the 2007 projected emissions; Final Eastern Mass SIP Sept 2, 2002.
b/ Peak day emissions were conservatively calculated by dividing the yearly emissions by 60 LNG ship deliveries.

State Air Plan Approval

The DEP requires an Air Plan Approval for all new facilities meeting specific criteria set forth in 310 CMR 7.02. The regulation prohibits the construction, substantial reconstruction, or alteration of any regulated facility unless the plans, specifications, proposed standard operating procedures, and proposed maintenance procedures for such a facility have been approved by the DEP. It is through this preconstruction permit review process that the DEP implements the key federal and state regulations. In addition, the Air Plan Approval process serves as the state's mechanism for noise impact review (see section 4.11.2 for details). In addition to the requirements set forth in 310 CMR 7.02, the regulations also require the application of BACT for each pollutant regulated as part of the Air Plan Approval. BACT is an emission limitation based on the maximum degree of reduction of any regulated air contaminant that the DEP determines, on a case-by-case basis, is achievable taking into account energy, environmental, and economic impacts.

Weaver's Cove Energy originally proposed the following control technology and emission limitations to constitute BACT for the water/glycol heaters at the proposed LNG terminal:

- Low NO_x combustion to reduce NO_x emissions to 15 ppm;
- Efficient combustion controls to minimize CO, VOC, PM_{10}, and PM; and
- Use of natural gas as the only fuel, minimizing PM_{10} and SO_2 emissions.

We received comments from the DEP regarding Weaver's Cove Energy's proposed emission limitations/controls for the water/glycol heaters and the information that was used as basis for these emission controls. Specifically, the DEP indicated that:

- Weaver's Cove Energy's proposed BACT was inconsistent with the DEP's March 21, 2001 Draft Internal DEP/BWP Best Available Control Technology Guidance and was not approvable;

- Weaver's Cove Energy's BACT analysis underestimated the uncontrolled baseline emission rate of the heaters;

- The DEP recently permitted a similar-sized project at the University of Massachusetts that implemented more stringent emission controls than those proposed Weaver's Cove Energy; and

- Weaver's Cove Energy should implement Selective Catalytic Reduction (SCR) and a CO oxidation catalyst on each of the heaters, which would reduce NO_x and CO emissions, but could result in a slight increase in PM_{10} emissions due to the unreacted ammonia that would result from the use of SCR.

In response to the DEP's comments, Weaver's Cove Energy revised the BACT analysis to include ultra dry low NO_x burners. These burners would meet 9 ppm NOx rather than standard low NO_x burners that would have met 15 ppm NO_x. Weaver's Cove Energy conducted a top-down BACT analysis for the DEP to confirm that these emission controls meet the definition of BACT. The DEP said it would make the final BACT determination prior to issuing an air plan approval for the project, which Weaver's Cove Energy would need prior to commencing construction of the proposed project.

Fugitive Dust and Odor

DEP regulation 310 CMR 7.09 requires that dust- or odor-causing emissions from construction or operation of a fossil fuel utilization facility not cause or contribute to a condition of air pollution. The measures proposed by Weaver's Cove Energy to mitigate potential odors and dust are addressed in the impacts and mitigation section below.

Particulate and Opacity Limits

DEP regulations in 310 CMR 7.02(8)(h), Table 4 limit new fossil fuel utilization facilities with a heat input from 3 to 250 MMBtu/hr heat input to a PM emission rate of 0.10 pounds per MMBtu. The emission rates for all of the LNG terminal's combustion equipment would be below this limit. The opacity limit (310 CMR 7.06) of 20 percent would be met by the facility by burning natural gas and diesel fuel (for emergency equipment).

Air Quality Impacts and Mitigation

Construction of the proposed LNG terminal and pipelines would have temporary adverse impacts on air quality due to fugitive dust emissions. The amount of fugitive dust would depend on the moisture content and amount of stabilizer added to the sediments. Weaver's Cove Energy proposes to control fugitive dust from construction activities at the LNG terminal site by applying water to roads and other areas, using gravel drives and wheel washing stations, as necessary, requiring trucks to be covered to minimize material loss, and by sweeping-up accumulated soils from paved areas at the LNG terminal site regularly**.** Fugitive dust from construction of the pipelines would be minimized by spraying water over the exposed soils as necessary.

Construction of the LNG terminal and pipelines would also result in tailpipe emissions from a variety of sources, including cranes, forklifts, front end loaders, dump trucks, sideboom tractors, graders, generators, vibratory rollers, concrete pumps and trucks, water trucks, and pick-up trucks. The construction vehicle emissions were estimated using two air quality models: MOBILE6 and PART5. These models assume that construction equipment used for dredged material stabilization (e.g., pug mill) would operate 24 hours per day for the entire construction period and equipment used to place and grade the stabilized dredged material (e.g., loaders, dump trucks, vibratory rollers, and graders) would operate less than 12 hours per day. These models also assume that the construction equipment would use transportation-grade diesel fuel containing 0.05 weight percent sulfur. In table 4.11.1-7, the estimated construction tailpipe emissions are compared to regional air emissions estimated by the DEP for intra-agency state implementation plan development and attainment designations.

Impacts associated with construction vehicles are difficult to estimate based on the time and space variant characteristics of the emissions. Estimates are complicated by the fact that the construction equipment would not follow defined paths (such as paved roadways) and would frequently change speed and direction. However, based on the estimated emissions shown in table 4.11.1-7, it appears that construction equipment emissions would be relatively low based on the projected emissions for the region. Furthermore, due to the intermittent and temporary nature of these emissions, their impact on air quality would be minimal. In addition, the primary pollutants emitted by the construction vehicles would be NO_x and CO. The ambient air quality standard for NO_2 is an annual average and the CO standards are significantly higher than any other standards (see table 4.11.1-1). For these reasons, the short-term and intermittent NO_2 and CO emissions from the construction vehicles are not expected to exceed the NO_2 or CO standards.

TABLE 4.11.1-7

Estimated Peak Daily and Total Construction Vehicle Tailpipe Emissions

	NO_x		CO		SO_2		$PM_{10}/PM_{2.5}$		VOC	
Emission Source	tons a/	lb/day	tons a/	lb/day	tons a/	lb/day	tons a/	lb/day	tons a/	lb/day
Construction Equipment LNG Terminal	92.4	286.0	51.0	135.0	0.5	2.0	1.1	9.0	8.3	26.0
Construction Equipment Pipeline	4.7	101.0	5.9	108.0	0.1	2.0	0.1	2.0	0.9	17.0
Construction Total b/	97.1	387.0	56.9	243.0	0.6	4.0	1.2	11.0	9.2	43.0
DEP Regional Estimates c/		3.49E5		1.19E6						5.48E4
Percent of Regional Emissions		0.11		0.02						0.08

a/ These emission levels are representative of the entire construction period.

b/ The total construction emissions are summed for the entire construction period and peak daily emissions. These emission numbers are conservative because peak daily emissions from the LNG terminal and pipeline construction activities are expected to occur at different times during the project, which would result in lower emissions that are presented in the table.

c/ The NO_2 and VOC emission estimates from the DEP represent the projected 2002 summertime construction and mining emissions in Bristol County, MA (NO_x - 174.3 tons/day and VOC - 27.4 tons/day). The emissions were estimated by the DEP in the September 2002 *Eastern Massachusetts Supplement to the July 1998 Ozone Attainment State Implementation Plan Submittal*, Appendix 2, Table 1. The CO emissions are based on the average between the DEP estimated wintertime emissions for 1999 (571 tons/day) and the DEP projected 2012 CO emissions (617 tons/day) for the entire state of Massachusetts for non-road engines. These CO emissions were estimated by DEP in an intra-agency policy deliberations background document dated September 2000.

NO_2 oxides of nitrogen
CO carbon monoxide
SO_2 sulfur dioxide
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
VOC volatile organic compounds
lb/day pounds per day

Diesel engine emission standards and mandatory reductions in diesel fuel sulfur content have been adopted that would reduce emissions from heavy duty construction vehicles. However, the diesel sulfur fuel reductions are not required until mid-2006, and the engine emission standards would be implemented in two stages that are not scheduled to be completed until 2007. To decrease emissions in the immediate future, the EPA and DEP have both created voluntary diesel retrofit program to encourage the use of various technologies such as diesel particulate filters and oxidation catalysts. In its comments, the EPA suggested that Weaver's Cove Energy should implement the same controls that were required by the Connecticut DOT for the I-95 New Haven Harbor Crossing Corridor Improvement Program. These controls require all construction equipment with diesel engines greater than or equal to 60 Hp in size that are on the project for more than 30 days to be outfitted with emission control devices (such as oxidation catalysts) and/or use clean fuels. These controls also limit the idling of diesel vehicles to three minutes or less. Weaver's Cove Energy has agreed to abide by the performance standards set forth in the DEP diesel retrofit program which may result in the implementation of similar controls to those used in the New Haven Harbor Crossing Corridor Improvement Program. Because use of low sulfur diesel, diesel particulate filters, and oxidation catalysts have been demonstrated to significantly reduce the SO_2, PM_{10}, CO, and VOC emissions from engines, **we recommend that:**

- **Weaver's Cove Energy use transportation grade (0.05 weight percent sulfur) or better diesel fuel in all construction equipment, including dredging equipment, for the proposed project, evaluate the feasibility of using catalysts and diesel particulate filters on this equipment, and placing idling limits on the construction vehicles to further reduce PM_{10}, CO, and VOC emissions.**

Operation of the LNG terminal would result in air emissions from three sources: LNG ships and tugs, LNG trucks, and stationary equipment (heaters and emergency engines) associated with the LNG facility. The estimated emissions from the LNG ship and tugs during each delivery of cargo are summarized in table 4.11.1-8.

TABLE 4.11.1-8

Estimated Air Emissions from the LNG Ships and Tugs a/

	PM_{10}		SO_2		NO_x		CO		VOC	
Source	lb/delivery	tpy	lb/delivery	tpy	lb/delivery	tpy	lb/delivery	tpy	lb/delivery	tpy
Tugs b/	46	1.3	23	0.7	996	29.9	104	3.2	25	0.7
LNG Ship Arrival, Departure, and Maneuvering c/	7	0.2	75	2.3	29	0.9	12	0.3	2	0.1
LNG Ships While Docked d/	178	5.3	2,213	66.4	451	13.5	25	0.7	29	0.9
Total	231	6.8	2,311	69.4	1,476	44.3	141	4.2	56	1.7

a/ These estimates represent the emissions for the entire delivery process. The emissions included in the applicability of NSR are only the emissions generated while the ships are docked at the terminal.
b/ The tug emissions are representative of new tugs using diesel fuel with 0.05 weight percent sulfur.
c/ These emissions are based on the LNG ships using 75 percent boil-off gas and 25 percent fuel oil (1.5 weight percent sulfur).
d/ The emissions from the LNG ships are based on an estimated fuel oil sulfur content of 1.5 weight percent.
NO_x oxides of nitrogen
CO carbon monoxide
SO_2 sulfur dioxide
PM_{10} particulate matter less than 10 microns in diameter
VOC volatile organic compounds
lb/delivery pounds per LNG ship delivery
tpy tons per year

Ships are anticipated to deliver LNG to the proposed terminal approximately 50 to 70 times per year (each delivery lasting up to 18 to 24 hours). The EPA recommended that the speed of the marine vessels should be reduced to mitigate impacts of marine vessel emissions. The EPA also suggested that the LNG ships should be required to use cleaner fuels, such as LNG boil-off gas, when in transit close to land. The ships used to transport LNG to and from the terminal would be escorted by and under the jurisdiction of the Coast Guard. As such, the Coast Guard, not Weaver's Cove Energy, would dictate the speed of the LNG ships within Mount Hope Bay and the Taunton River. However, the LNG ships would be expected to travel at relatively slow speeds in these areas, averaging about 5 knots in Mount Hope Bay and about 3 knots in the Taunton River. Since the LNG ships would not be dedicated solely to the project, Weaver's Cove Energy does not have the authority or ability to control the fuels burned by the ships at or near the shore. The EPA also requested we evaluate the potential for LNG ships to use electric power during berthing to reduce marine vessel emissions. We do not think this is feasible for safety reasons since the ships would need to keep their equipment running to enable the ship's captain to react quickly in an emergency. The EPA also requested that we evaluate the feasibility of retrofitting tug engines to generate less pollution. Weaver's Cove Energy has indicated that the tugs would either be units currently on order for tug owners/operators or they would be ordered specifically for service at the LNG terminal. For either scenario, the tugs would be subject to the IM MARPOL Annex VI regulation for NO_x emissions and 40 CFR Part 94 of the EPA regulations for criteria pollutant emissions from marine engines. Therefore, the tugs would conform to the highest current standards and would not require any retrofitting. In addition to the MARPOL regulation and 40 CFR 94, EPA issued a final rule in June 2004 to reduce diesel engine emissions from non-road sources such as marine vessels (40 CFR Parts 1039. 1048, 1051, 1065, and 1068). This rule includes a sulfur content limit for locomotive and marine diesel fuel of 500 ppm starting in June 2007 and 15 ppm starting in June 2012. Because the tugs would

not begin operation until at least 2008, the maximum sulfur content in the tug fuel would be 500 ppm (0.05 percent by weight).

Due to the limited number of ships and the short time frame of each visit, marine vessels are only expected to be present a fraction of the time (about 12 percent of the year). Due to the short and infrequent duration of LNG ship presence, the impacts from these vessels are expected to be minimal. In addition, the total emission of SO_2 and NO_x (the primary pollutants generated by the ships) in the regional air basin are expected to decrease as a result of natural gas being used in place of other fossil fuels such as coal and fuel oil. Nevertheless, these emissions have been assessed with the LNG truck and stationary LNG terminal equipment emissions (heaters and emergency engines emissions) discussed below.

It was assumed for the truck traffic that:

- up to twelve trucks would be standing in the queue during peak operating periods with a maximum of 100 trucks being loaded per day;
- the LNG truck loading bays would always be full;
- the estimated loading time would be 1 hour; and
- the estimated number of trucks per year would be 7,000.

The PM_{10} emission rates for the trucks were estimated using the EPA PART5 emission estimation model and the CO and NO_x emissions from the trucks were estimated using the MOBILE6 emissions estimation model. The estimated PM_{10}, SO_2, NO_x, and CO emission rates from PART5 and MOBILE6 (in units of grams per mile and grams per vehicle-hour) were used to assess the ambient air impacts from the truck traffic. The truck traffic emissions were modeled using the mobile source model CAL3QHC.

The emissions from the LNG ships, tugs, and LNG terminal stationary sources (listed in table 4.11.1-3) were modeled using the EPA industrial source complex short term version 3 (ISCST3) modeling program. The heaters and the emergency equipment were modeled in separate model runs because the units would not operate simultaneously. The impacts from the emergency generator and fire pump were similar to or lower than the impacts from the heaters; therefore, the predicted impacts from the heaters were used to assess the impacts of the LNG stationary sources of emissions on air quality. The results of the CAL3QHC and ISCST3 modeling were combined and compared to the applicable NAAQS. These results are summarized in table 4.11.1-9. The modeling results shown in table 4.11.1-9 are based on NO_x emissions of 15 ppm and PM_{10} emissions of 0.01 lb/MMBtu from the heaters. Weaver's Cove Energy has since reduced the proposed NO_x emission limit for the heaters to 9 ppm and the PM_{10} emissions guarantee to 0.00865 lb/MMBtu, resulting in ambient air impacts below the levels shown in table 4.11.1-9. As shown in this table the air emission from the trucks and stationary sources at the proposed LNG terminal would not cause a violation of any ambient air quality standard.

TABLE 4.11.1-9

Potential Air Quality Impacts from Operation of the Proposed LNG Terminal

Pollutant	Averaging Period	Total ISCST3 and CAL3QHC Concentration a/ ($\mu g/m^3$)	Monitored Background Concentration b/ ($\mu g/m^3$)	Total Predicted Concentration c/ ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Concentrations Relative to Standard (percent)
NO_x	Annual	20.7	45	65.7	100	65.7
SO_2	3-Hour	874	246	1,120	1300	86.2
	24-Hour	149.4	110	259.4	365	71.1
	Annual	3.6	13	16.6	80	20.8
CO	1-Hour	1,176	14,732	15,908	40,000	39.8
	8-Hour	338	5,800	6,138	10,000	61.4
PM_{10}	24-Hour	52.3	91	143.3	150	95.5
	Annual	6.1	32	38.1	50	76.2

a/ The impacts from the LNG truck emissions were estimated based on the increased impact provided by Weaver's Cove Energy in a combined assessment of the LNG terminal heaters and the LNG trucks over the impact estimated from the heaters alone. The impacts from the truck emissions would be minor relative to the heaters and marine vessel emissions.

b/ The background concentrations are based on local monitoring data (see "Existing Air Quality" in section 4.11.1).

c/ The total predicted concentration is the sum of the background concentration and the modeled concentration. This concentration must remain below the applicable NAAQS.

NO_x oxides of nitrogen
CO carbon monoxide
SO_2 sulfur dioxide
PM_{10} particulate matter less than 10 microns in diameter
VOC volatile organic compounds
$\mu g/m^3$ micrograms per cubic meter

During the EIS scoping process, we received comments regarding the potential risk of incidental ingestion, inhalation, or dermal contact with the soils and dredged material on the LNG terminal site. As discussed in section 4.2.2, Weaver's Cove Energy proposes to cover most of the southern parcel with stabilized dredged material. The primary potential for ingestion, inhalation, or dermal contact with this material would be during construction, when dredged material placement and grading activities are in progress. To assess the human risks of these activities, Weaver's Cove Energy conducted a Method 3 Risk Assessment. The assessment, which is discussed in more detail in section 4.2.2, concluded that the proposed activities would pose no risk to workers or citizens on or in the vicinity of the construction site. To minimize the potential for incidental ingestion, inhalation, or dermal contact with the stabilized dredged material, Weaver's Cove Energy would control dust emissions during construction, revegetate exposed soils, and install permanent fencing around the facility following construction.

We also received comments regarding the potential for objectionable odors to be released from the dredged material. The greatest potential for odors would be shortly after the dredged material is brought to the surface and when it is still wet. Weaver's Cove Energy plans to stabilize the dredged material shortly after excavation by mixing with Portland cement. This would significantly reduce any odors emanating from the dredged material (Nimenskern, 2004). If objectionable odors persist after the addition of Portland cement, Weaver's Cove Energy could add lime to the stabilized dredged material for additional odor mitigation. Because the potential for development of objectionable odors is uncertain, and because the dredging program would last for up to three years, **we recommend that:**

- **Weaver's Cove Energy develop a nuisance odor complaint and abatement plan to investigate and address complaints related to odor emissions from the dewatered and stabilized dredged sediments. The plan should include procedures for adjacent landowners to contact a Weaver's Cove Energy representative regarding objectionable odors, a process for investigating and addressing the complaints, and**

a description of mitigative measures that would be implemented to abate the problem. The nuisance odor complaint and abatement plan should be filed with the Secretary prior to construction. In addition, Weaver's Cove Energy should include any odor complaints in the weekly status reports filed with the FERC. The report should include a discussion of how odor complaints were resolved.

Other comment letters expressed concern about the long-term effects of leaks and fumes from the LNG terminal operations. The facility would operate as a closed system and natural gas would not be vented to the atmosphere during normal operations. Natural gas would also not be flared. Furthermore, natural gas is non-toxic and non-carcinogenic.

The odorant (ethyl mercaptan) that would be added to the natural gas would be stored onsite in a closed system that would be filled by tanker truck approximately once every 4 to 8 months. Because this refill rate is much less frequent than a drum or cylinder system, the potential for an accidental release is reduced. The vapors from the storage system would be recycled to the delivery tanker truck during filling operations to eliminate emission to the atmosphere.

4.11.2 Noise

Noise Environment

Project-related noise would affect the local environment during construction of the proposed LNG terminal and pipelines and during operation of the LNG terminal. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather conditions and the effects of seasonal vegetative cover. Two measures used by federal agencies to relate the time-varying quality of environmental noise to its known effect on people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the day-night sound level (L_{dn}). The $L_{eq(24)}$ is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. The L_{dn} is the average of the daytime sound level (L_{day}) and the nighttime sound level (L_{night}) with 10 decibels of the A-weighted scale (dBA) added to the L_{night}, to account for people's greater sensitivity to sound during nighttime hours. L_{day} is the average sound level from 7 AM to 10 PM. L_{night} is the sound representative of the location between the hours of 10 PM and 7 AM. The Commonwealth of Massachusetts uses the sound level that is exceeded more than 90 percent of the time (L_{90}) to estimate the impact of proposed projects.

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This publication evaluates the effects of environmental noise with respect to health and safety. The document provides information for state and local governments to use in developing their own ambient noise standards. 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. The FERC has adopted this criterion for new compression and associated facilities and it is used here to evaluate the potential noise impact from operation of the LNG terminal. An L_{dn} 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 DEP regulates noise as an air contaminant under 310 CMR 7.10, which prohibits "unnecessary emissions" of noise. The DEP administers this regulation through Noise Policy DAQC 90-001 dated February 1, 1990. The policy limits a source to a 10-dBA increase in ambient measured L_{90} at the project property line and at the nearest residence. The policy also prohibits "pure tone" conditions in which the sound level at the octave band center frequency exceeds the levels of the two adjacent octave bands by three or more decibels.

Figure 4.11.2-1 shows the topography surrounding the LNG terminal site. The LNG terminal site is relatively flat and bounded by the Taunton River to the west. The topography along the river to the south and north of the LNG terminal site is also relatively flat. Following construction, the topography of LNG terminal site would be similar to current conditions with the exception of an approximately 100-foot-tall landform that would be constructed north and east of the process area.

Existing land uses surrounding the proposed LNG terminal site include a mixture of industrial, transportation, corridor, commercial, open space, and residential uses. There are several noise sensitive areas near the site, including the closest noise sensitive areas (NSAs) listed in table 4.11.2-1 and shown on figure 4.11.2-2.

TABLE 4.11.2-1

Noise Sensitive Areas Near the Proposed LNG Terminal Site

NSA	Distance (feet) and Direction a/	Town/City	Description
NSA 1	1050 South	Fall River	Residence, Border City Mills Apartment Building on Weaver Street, adjacent to Highway 79
NSA 2	1250 East	Fall River	Residence on Alton Road
NSA 3	2000 Southeast	Fall River	Residence, Highlander Nursing and Rehabilitation Center
NSA 4	3250 East	Fall River	Residence on Bradley Court
NSA 5	2600 Northeast	Fall River	Residence on North Main Street
NSA 6	2400 Northwest	Somerset	Residence on Riverside Avenue
NSA 7	3000 Southwest	Somerset	Residence on Owen Avenue
NSA 8	1950 East	Fall River	Wiley Elementary School

a/ Distance and direction is relative to the center of the proposed LNG storage tank
NSA Noise sensitive area

An ambient sound survey of existing noise levels at the NSAs was conducted between September 5 and 9, 2002. The purpose of the sound survey was to document the existing acoustical environment at the NSAs prior to operation of the LNG terminal. This noise study included short-term and long-term noise measurements. Short-term weekday and weekend noise measurements were made during daytime and nighttime hours for a duration of 20 minutes. The short-term noise measurements were taken at each NSA location on Thursday, September 5 between 12:30 PM and 4:00 PM (weekday - daytime), on Saturday, September 7 between 10:45 AM and 2:30 PM (weekend - daytime), on Friday, September 6, 2003 between 12:00 AM and 3:15 AM (weekday - nighttime), and Saturday, September 7, 2003 between 12:00 AM and 3:15 AM (weekend - nighttime). Long term noise measurements were taken at NSAs 1, 2, and 3 from noon on Thursday, September 5 until noon Monday, September 9.

Insert Figure

4.11.2-1 Area Topographic Map

Insert Figure

4.11.2-2 Noise Sensitive Areas

Because noise impacts are most significant when existing background noise is lowest, the lowest noise levels measured for each location were used to assess the ambient noise impact of the project. The lowest L_{dn} calculated for the three 24-hour periods (midnight to midnight) at each continuous noise monitor was used to estimate the L_{dn} for other NSAs.[21] Based on noise data and the types of noise sources surrounding the various NSAs, the L_{dn} measured at NSA 1 was used as the existing L_{dn} for NSAs 6, and 7, the L_{dn} measured at NSA 2 was used as the existing L_{dn} for NSAs 5 and 8, and the L_{dn} measured at NSA 3 was used as the existing L_{dn} for NSA 4. The L_{90} calculated from the short-term noise measurements for NSA 1, NSA 2, and NSA 3 were compared to the L_{90} calculated for the continuous (long-term) noise measurements at these locations to validate the use of the short-term measurements for demonstrating compliance with the DEP noise regulation. The short-term noise measurements compared well with the continuous noise measurements; therefore, the short-term noise measurements were included in determining the representative L_{90} for each NSA. The L_{90} and L_{dn} values established by the noise study are summarized in table 4.11.2-2.

TABLE 4.11.2-2

Existing Noise Levels at the Closest Noise Sensitive Areas (dBA)

Location	L_{90}	L_{day}	L_{night}	L_{dn}
NSA 1	43	54.9	51.1	58.3
NSA 2	41	60.3	56.9	64.0
NSA 3	47	53.6	51.7	58.4
NSA 4	39	53.6	51.7	58.4
NSA 5	42	60.3	56.9	64.0
NSA 6	43	54.9	51.1	58.3
NSA 7	39	54.9	51.1	58.3
NSA 8	51 a/	60.3	56.9	64.0

a/ L_{90} at NSA 8 (Wiley Elementary School) is based on the lowest daytime noise measurement at NSA 2
dBA decibels of the A-weighted scale
L_{eq} 24-hour equivalent sound level
L_{day} daytime sound level
L_{night} nighttime sound level
L_{dn} day-night sound level

Noise Impacts and Mitigation

Construction of the LNG facilities would occur over a 3-year period. Construction of the LNG terminal, dredging, and dredged material reuse would take place during the entire construction period. The construction of the ship unloading facility would take approximately 12 months and would occur in the middle of the project schedule. Construction of the pipelines, including the Taunton River crossing, would take approximately 10 months at the end of the construction period. The noise associated with these construction activities would be intermittent, as equipment would be operated on an as-needed basis. Construction activities at the LNG terminal and also along the pipeline routes would generate short-term increases in sound levels predominately during daylight hours, when the most significant construction activities would occur. The most prevalent sound source would be the internal combustion engines on the construction equipment. Some of the equipment would be electric powered, reducing the total noise from construction equipment. The maximum noise levels from the impact pile-driving at the nearest residence (1,250 feet away) would be approximately 76 dBA at the higher force. Pile-driving

[21] Weaver's Cove Energy estimated the L_{dn} for the five NSAs where 24-hour monitoring was not conducted by comparing the short-term monitoring data collected at these sites to the long-term continuous monitoring data that was collected for NSAs 1, 2, and 3. Weaver's Cove Energy then selected the noise level at NSAs 1,2, or 3 that was most representative of the short-term monitoring result collected at the five NSAs.

activities would be restricted to daytime hours to prevent nighttime noise impacts. The estimated noise levels generated by other construction equipment are provided in table 4.11.2-3.

TABLE 4.11.2-3

Noise Levels from Various Construction Equipment/Activities

Equipment/Activity	Noise Level (dBA) at 50 feet
Backhoe a/	82
Mobile Crane a/	81
Truck a/	80
Generator a/	79
Clamshell dredge b/	67 at 250 feet
Tugs b/	82

a/ Noise level data are based on BBN, 1977
b/ Noise levels based noise estimates from the May 1998 Final Environmental Impact Statement/Environmental Impact Report and Final Feasibility Study prepared by the Port of Oakland and the U.S. Army Corps of Engineers for the Oakland Harbor Navigation Improvement (50-foot) Project
dBA decibels of the A-weighted scale

Dredging and dredge stabilization would occur up to 24 hours per day for the entire 3-year construction period. Dredging would include the use of tugs and excavators while dredged material offloading and stabilization would include conveyors, a pug mill, and two hydraulic excavators. The estimated noise impact from the dredged material offloading and stabilization would be 67 dBA at the nearest residence in Fall River (875 feet away) and 59 dBA at the nearest residence in Somerset (2,250 feet away). This equates to nighttime noise level increases of 16.0 dBA at the nearest residence in Fall River and 8.6 dBA at the nearest residence in Somerset. These noise estimates do not include any reductions from the earthen berm and landform that would be constructed onsite. This berm and landform would be expected to provide a minimum noise reduction of about 10 dBA at noise receptors east of the terminal site. The noise reduction would be dependent on the size and location of the landform relative to the noise receptor and the construction activity. The landform would require approximately 24 months of development before it could sufficiently reduce noise. Therefore, Weaver's Cove Energy may install temporary noise barriers or other mitigation until such time as the landform is sufficient to effectively reduce noise if it is determined that this noise mitigation is necessary to comply with the FERC noise standard of 55 dBA L_{dn}. The dredging equipment would be moving periodically; however, the most significant period of time at any one general location would be in the turning basin. The dredging equipment operating in the turning basin would be located as close as 650 feet from residences in Somerset and 1,300 feet from residences in Fall River. Using the noise levels in table 4.11.2-3, we performed an analysis to estimate the maximum noise impact from dredging operations (assuming one dredge and one tug). Based on this analysis, we estimate the maximum noise level attributable to the dredging equipment would be 62.3 dBA at the nearest residence in Somerset and 56.2 dBA at the nearest residence in Fall River. This equates to nighttime noise increases of 11.5 dBA and 6.3 dBA at the nearest residents in Somerset and Fall River, respectively. Because the dredging and dredged material stabilization activities would potentially exceed 55 dBA L_{dn} at the nearest NSA and would potentially occur 24 hours per day for approximately 3 years, **we recommend that:**

- **Weaver's Cove Energy prepare a noise mitigation plan to ensure that the dredging, offloading, and stabilization operations do not contribute more than 55 dBA L_{dn} to the ambient noise level at any noise sensitive area and file the plan with the Secretary <u>prior to construction</u>.**

Construction of the proposed pipelines would require operating construction equipment close to residential areas. These pipeline construction activities would occur during daylight hours, six days per week. Pipeline construction is like having an assembly line, with crews conducting separate but sequential activities, each generally proceeding at rates ranging from several hundred feet to a mile per day. Depending on the distance between each crew in the assembly line, construction activities in any one area could last from several weeks to several months on an intermittent basis. On some portions of the pipeline routes, the stovepipe technique would be used to install the pipelines (see section 2.4.2.2). This technique would result in more intense construction activities for a shorter period in select areas. While receptors in the immediate vicinity of the construction activities would experience an increase in noise, this effect would be temporary and local. Nighttime noise would not be expected to increase because pipeline construction activities would be limited to daytime hours except under special circumstances where additional time is required to complete an activity to minimize a safety hazard prior to leaving the site for the day. The average noise level generated by the construction equipment that would be used for pipeline construction activities ranges between about 79 and 82 dBA at a distance of 50 feet. The noise from construction activities would be dominated by the loudest piece of equipment. The closest residence is approximately 15 feet from the proposed pipeline centerline. Conservatively assuming an average noise level of 82 dBA at 50 feet, the maximum noise level at this residence would be approximately 92.5 dBA. A 92.5 dBA noise level for eight hours a day is equivalent to an L_{dn} of 87.7 dBA. Because noise levels diminish rapidly with distance, this noise level would be of limited duration and would decrease significantly as the construction equipment moves away from the residence.

Stationary equipment and mobile sources would generate noise during operation of the proposed LNG terminal. About 50 trucks per day would load LNG at the LNG terminal. Because these trucks would arrive and depart via Route 79, this additional traffic would have minimal impact on the ambient noise levels. The stationary noise generating equipment at the LNG terminal would include pumps, compressors, motors, heaters, and fans. The predominant stationary noise source would be the four operating LNG sendout pumps. Frequency-specific data were not available from the prospective equipment manufacturers; therefore, expected sound power levels were calculated from the literature using the expected size or capacity of the equipment (Hoover & Keith, 1981). The expected noise levels for each stationary source and the sound transmission losses for the proposed control measures are listed in table 4.11.2-4.

All of the noise generating equipment at the proposed LNG terminal would be located inside an insulated metal enclosure except the LNG sendout pumps, water cooler fans, and air injection system cooling fans. In addition to the insulated enclosure, an earthen landform is proposed for the east side of the site. The landform would be at least 40 to 50 feet taller than the top of any on site noise source and, therefore, would reduce the level of direct noise experienced at the nearby NSAs.

Noise impacts were estimated using spreadsheet-based calculations. The reference sound power level data were decreased with distance from the source to the receptor through geometric spreading and atmospheric absorption. The calculations include anticipated noise reduction from the enclosure and the landform. The results of this analysis are summarized in table 4.11.2-5.

The maximum predicted L_{dn} and L_{90} that would result from operation of the LNG facilities would be 40 and 46.4 dBA, respectively, and would occur at NSA 6. In addition, the predicted L_{dn} and L_{90} increases would be no more than 0.3 and 1.8 dBA, respectively, at any noise sensitive area. The noise level attributable to the proposed LNG terminal would be less than 55 dBA L_{dn} (i.e., the FERC noise criterion) at all NSAs and the estimated future increase would be less than 10 dBA L_{90} (i.e., the DEP noise criterion) at all NSAs. The proposed LNG terminal would not generate pure tones which are sounds that can be heard as a single pitch. Because the proposed LNG terminal and pipelines do not include the addition of new compressors, a perceptible increase in vibration at any NSA is not anticipated under normal operating conditions.

TABLE 4.11.2-4

Anticipated Noise Levels (dBA) and Sound Transmission Losses at the Proposed LNG Terminal

Equipment	Quantity	Total (dBA)	Octave Band Frequency (Hertz) 31	63	125	250	500	1,000	2,000	4,000	8,000
LNG sendout pumps	4	109	98	99	100	102	102	105	102	98	92
BOG screw compressors a/	3	86	82	84	84	92	85	77	68	59	53
BOG pipeline compressor a/	1	81	87	88	85	83	80	75	68	60	51
Water heater circ. Pumps a/	12	80	89	86	83	81	77	76	69	61	51
Water heaters with blower a/	12	93	112	108	103	97	90	83	76	69	62
Water cooler fans	2	92	103	103	103	93	86	86	81	76	71
Water pump (BOG cool) a/	1	65	74	71	68	66	62	61	54	46	36
Instrument air compressor a/	1	76	92	83	79	74	73	72	68	62	55
Air injection compressors (centrifugal) a/	2	86	98	95	92	89	82	80	76	68	57
Air injection compressors (reciprocating) a/	2	86	91	92	89	88	85	80	73	65	56
Air injection cooling fans	12	100	111	111	111	101	94	94	89	84	79
Air injection cooling pump a/	1	66	76	73	70	68	64	63	56	48	38

a/ These noise sources would be located in an insulated metal building. The noise level data shown above includes the reduction in noise from the insulated building and are representative of the noise level approximately 1.3 feet from the source.

BOG = Boil-off-Gas

TABLE 4.11.2-5

Estimated Noise Impact from Proposed LNG Terminal

NSA	Distance to NSA (feet) a/	Existing Noise Level (dBA) L_{90}	Existing Noise Level (dBA) L_{dn}	Level Attributable to Project (dBA) L_{90}	Level Attributable to Project (dBA) L_{dn}	Total L_{dn} (dBA)	Future Increase (dBA) L_{90}	Future Increase (dBA) L_{dn}
NSA 1	1,050	43	58.3	36	42.4	58.4	0.8	0.1
NSA 2	1,250	41	64.0	27	33.4	64.0	0.2	0.0
NSA 3	2,000	47	58.4	33	39.4	58.5	0.2	0.1
NSA 4	3,250	39	58.4	25	31.4	58.4	0.2	0.0
NSA 5	2,600	42	64.0	21	27.4	64.0	0.0	0.0
NSA 6	2,400	43	58.3	40	46.4	58.6	1.8	0.3
NSA 7	3,000	39	58.3	29	35.4	58.3	0.4	0.0
NSA 8	1,950	51	64.0	24	30.4	64.0	0.0	0.0

a/ Measured from the center of the LNG storage tank to the NSA
NSA noise sensitive area
dBA decibels of the A-weighted scale
L_{90} noise level that is exceeded 90 percent of the time
L_{dn} day night sound level

Because the noise analysis is based on preliminary design, and to ensure that the proposed LNG terminal operates in compliance with these guidelines, **we recommend that:**

- **Weaver's Cove Energy should make all reasonable efforts to assure its predicted noise levels from the LNG terminal are not exceeded at the NSAs and file noise surveys showing this with the Secretary no later than 60 days after placing the LNG terminal in service. However, if the noise attributable to the operation of the LNG terminal exceeds 55 dBA L_{dn} at an NSA or the noise increase exceeds 10 dBA L_{90} at an NSA, Weaver's Cove Energy should file a report on what changes are needed and should install additional noise controls to meet the level within 1 year of the in-service date. Weaver's Cove Energy should confirm compliance with these requirements by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.**

4.12 RELIABILITY AND SAFETY

Three federal agencies share in the oversight of the safety and security of LNG import terminals: the Coast Guard, the Pipeline and Hazardous Materials Safety Administration of the DOT, and the FERC. The FERC authorizes the siting and construction of LNG import terminals and is the lead federal agency under NEPA to analyze the environmental, safety, security, and cryogenic design of proposed facilities. The Coast Guard has authority over the safety of LNG vessels and the marine transfer area. The Coast Guard also has authority over the security of the LNG vessels and the entire LNG facility. The DOT has exclusive authority to promulgate and enforce safety regulations and standards over the onshore LNG facilities beginning at the last valve immediately before the LNG storage tank(s).

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 Interagency Agreement ensures a seamless safety and security review by the three federal agencies.

The operation of the proposed 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. 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.[22] More recently, an operational accident occurred in 1979 at the Cove Point LNG facility in Lusby, Maryland, when 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, resulting in 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 LPG 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 and that of the proposal (i.e., high-pressure steam boilers that power refrigerant compressors would not be used here

[22] 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, February 1946."

nor are they used at any LNG facility under FERC jurisdiction), the sequence of cascading events identifies potential failure modes that warrant further evaluation. This issue was discussed at the May 5, 2004 cryogenic design and technical review conference conducted in Swansea, Massachusetts, and Weaver's Cove Energy indicated that gas detectors would need to be installed at air intakes. To ensure that all potential hazards are addressed, we have provided a recommendation in section 4.12.2, *Cryogenic Design and Technical 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 are summarized and discussed in section 4.12.5. LNG truck safety issues are examined in section 4.12.6. A discussion on security awareness related to terrorism is presented in section 4.12.7. The reliability and safety issues related to the natural gas pipelines are discussed in section 4.12.8. Additional safety issues identified in scoping are addressed in section 4.12.9. Conclusions on safety issues are in section 4.12.10.

4.12.1 LNG Hazards

LNG's principal hazards result from its cryogenic temperature (-260° 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 designed for ultra cold conditions. Such thermal stresses could subsequently subject the material to brittleness, fracture, or other loss of tensile strength. These hazards, however, are not substantially different from hazards associated with the storage and transportation of liquid oxygen (-296° F) or several other cryogenic gases that are routinely produced and transported in the United States.

Methane, the primary component of LNG, is colorless, odorless and tasteless, and is classified as a simple asphyxiant. Methane could, however, cause extreme health hazards, including death, if inhaled in significant quantities within a limited time. At very cold temperatures, methane vapors could cause freeze burns. Asphyxiation, like freezing, normally represents a negligible risk to the public from LNG facilities.

When released from its containment vessel and/or transfer system, LNG will first produce a vapor or gas. This vapor, if ignited, represents the primary hazard to the public. LNG vaporizes rapidly when exposed to ambient heat sources such as water or soil, producing 620 to 630 standard cubic feet of natural gas for each cubic foot of liquid. LNG vapors in a 5 to 15 percent mixture with air are highly flammable. The amount of flammable vapor produced per unit of time depends on factors such as wind conditions, the amount of LNG spilled, and whether it is spilled on water or land. Depending on the amount spilled, LNG may form a liquid pool that will spread unless contained by a dike.

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. An unconfined methane-air mixture will burn slowly, tending to ignite combustible materials within the vapor cloud, whereas fast flame speeds tend to produce flash burns rather than self-sustaining ignition.

LNG is not explosive as it is normally transported and stored. However, LNG vapors (primarily methane) can explode if contained within a confined space, such as a building or structure, and ignited.

There is no evidence, however, suggesting that LNG is explosive in unconfined open areas. Experiments to determine if unconfined methane-air mixtures will explode have been conducted and, to date, have all been negative. Unconfined methane-air mixtures will burn but will not explode. Nevertheless, a number of experimental programs have been conducted to determine the "amount of initiator charge" required to detonate an unconfined methane-air mixture.

Over the years, various parties have occasionally expressed the energy content of an LNG storage tank or LNG ship in equivalent tons of trinitrotoluene (TNT), as an implied measure of its 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 an explosion 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 of about 20 to 25 meters per second (66 to 82 ft/sec) and local over pressures up to 0.2 psig have been estimated for methane rich fuels, well below the flame speeds and over pressures associated with explosion.

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 as described above, 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 TNT. Such a small overpressure is not expected to cause significant damage to an LNG vessel. However, the RPT may increase the rate of LNG pool spreading and the LNG vaporization rate.

4.12.2 Cryogenic Design and Technical Review

The cryogenic design and technical review emphasizes the engineering design and safety concepts and 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.

Study and evaluation of information for the proposed design and installation of the LNG terminal at Fall River, Massachusetts has been performed by FERC staff. The design and specifications submitted for the proposed facility are considered to be preliminary but would be the basis for any detailed design to follow. A significant amount of the basic design involving final selection of equipment manufacturers, process conditions and safety related issues will be completed in the next phase of project development if authorization is granted by the Commission.

The facility would be located on a relatively small site and Weaver's Cove Energy proposes to use a full containment LNG storage system to minimize the land area required for storage and spill containment. The protection of the external wall of a full containment storage system could significantly enhance the safety of the product in the event of a credible attack on the facility. The proposed layout of the facility, design features of the process systems, including operating control, safe shut down, monitoring and spill containment, are consistent with the requirements of the proposed installation. Appropriate emphasis has been placed on aspects of reliability, operational ability, and security of the proposed facility.

As a result of the technical review of the information provided by Weaver's Cove Energy in the submittal documents, a number of concerns were raised by staff relating to reliability, operability, and safety of the facility. In response to staff's questions, Weaver's Cove Energy provided written answers prior to the site visit and technical review meeting. Outstanding issues that require resolution are listed below as specific recommendations. Follow up on those items requiring additional action shall be documented in reports to be filed with the FERC.

We recommend that the following measures should apply to the LNG terminal design and construction details. Information pertaining to these specific recommendations should be filed with the Secretary for review and 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. This information should be submitted a minimum of 30 days before approval to proceed is required.

- **Weaver's Cove Energy should provide a technical review of its facility design that:**

  a. Identifies all combustion/ventilation air intake equipment and the distance(s) to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids, and flammable gases).

  b. Demonstrates that these areas would be adequately covered by hazard detection devices and indicate how these devices would isolate or shutdown any combustion equipment whose continued operation could add to or sustain an emergency. Fired heaters should be shut down in the event of an LNG spill, or presence of a flammable vapor cloud.

Weaver's Cove Energy should file this review <u>prior to initial site preparation</u>.

- **Prior <u>to initial site preparation</u>, Weaver's Cove Energy should provide documentation, or a limited waiver, on how the LNG tank would meet NFPA 59A table 2-2.4.1, which requires the distance from the edge of the impoundment to the property line, to be not less than 0.7 times the container diameter. The separation distance from the LNG tank impoundment wall to the property boundaries on the southwestern area of the site where the proposed plant property line abuts the shoreline of the Taunton River does not appear to meet the 0.7 criteria.**

- **<u>Prior to initial site preparation</u>, Weaver's Cove Energy should file a firewater system design that provides for fire water flow to be maintained for a minimum of two hours, in accordance with code requirements. The fire water tank should be automatically filled from the city mains supply and the city mains pressure should be continuously monitored. The fire tank should include an alarm to indicate low pressure. As an alternative, river water may be evaluated for use in the firewater system.**

- **The portion of the planned retaining wall on the riverbank, which is opposite the tanks, shall be designed to ensure the stability of the LNG storage tank in a SSE event. A slope stability analysis shall be conducted in order to ascertain the adequacy of the proposed retaining wall structures. The LNG tank shall be designed to withstand the SSE event as required by 49 CFR Part 193 and NFPA 59A (2001). All other structures shall be designed to withstand the effects of an**

Operating Basis Earthquake, as required by 49 CFR Part 193 and NFPA 59A (2001), and, further, the condition of these structures shall not adversely affect the stability and integrity of the tank in the SSE event. <u>Prior to initial site preparation</u>, Weaver's Cove Energy should file the results of the hydraulic test and stone column field test, and the final LNG storage tank design for seismic review and approval by the Director of OEP.

- **The final design should include a re-evaluation of the use of butterfly valves for high pressure isolation.**

- **The final design of the hazard detection equipment should include redundancy and fault detection and fault alarm monitoring in all potentially hazardous areas and enclosures.**

- **The final design of the hazard detection equipment should provide flammable gas and UV/IR hazard detectors with local instrument status indication as an additional safety feature.**

- **The final design should include a boiloff gas flow measurement system for the LNG storage tank.**

- **The final design should include a reliable measurement system to monitor deflections during the hydraulic test. At a minimum, this system should include two slope indicator ducts which bisect the tank in mutually perpendicular directions, monitoring points at the terminals of these ducts, and other monitoring points along the perimeter of the concrete shell, so that sag, warping, tilt, and settlement can be monitored. Tolerances for sag, tilt, and shell warping should meet or exceed the limits specified by the tank manufacturer.**

- **The final design of the LNG tank carbon steel piping support plates and connections to piping supports should provide adequate corrosion protection. Provisions for corrosion monitoring and maintenance of carbon steel attachments should be included in the design and maintenance procedures.**

- **The final design of the LNG pumps should include discharge flow measurement for minimum flow recycle control.**

- **The final design should include provisions to ensure that hot glycol/water circulation is operable at all times when LNG is present in the LNG booster pump discharge piping or when the temperature in the LNG inlet channel to any vaporizer is below 0°F.**

- **The final design should include detection instrumentation and shut down procedures for vaporizer tube leak, shell side overpressure, or bursting disc failure.**

- **The final design should include temperature measurement of the vaporizer common discharge header, which should alarm the low temperature condition.**

- **The final design should include provisions to recover boil-off gas, under all conditions, in the event that the send out vaporization system is not in operation.**

- **The final design should include automatic isolation valves at the suction and discharge of screw compressors and reciprocating boil-off compressors.**

- **The final design should ensure that air gaps are 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: would continuously monitor for the presence of a flammable fluid; would alarm the hazardous condition; and would shutdown the appropriate systems.**

- **The final design of the relief vent stacks should include Resistance Temperature Detectors capable of measuring low and high temperature.**

- **The final design should ensure that dry nitrogen be supplied for purging cold systems.**

- **The final design should include safeguards to protect above ground fire water piping, including post indicator valves, from inadvertent damage.**

- **The final design should include a fire protection evaluation carried out in accordance with the requirements of NFPA 59A, chapter 9.1.2.**

- **The final design should include procedures for offsite contractors' responsibilities, restrictions, limitations, and supervision of the contractors by Weaver's Cove Energy staff.**

- **Security personnel requirements prior to and during LNG vessel unloading should be filed <u>prior to commissioning</u>.**

- **Operation and Maintenance procedures and manuals, as well as emergency plans, emergency evacuation plan and safety procedure manuals, should be filed <u>prior to commissioning</u>.**

- **The contingency plan for failure of the outer LNG tank containment should be filed <u>prior to commissioning</u>.**

- **Copies of the U.S. Coast Guard security plan, vessel operation plan, and emergency response plan should be provided to FERC staff <u>prior to commissioning</u>.**

- **A copy of the criteria for horizontal and rotational movement of the inner vessel for use during and after cool down should be filed <u>prior to commissioning</u>.**

- **The FERC staff should be notified of any proposed revisions to the security plan and physical security of the facility <u>prior to commencement of service</u>.**

- **Progress on the construction of the LNG terminal should be reported in monthly reports filed with the Secretary. Details should include a summary of activities, 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 a biennial basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Weaver's Cove Energy 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 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 boil-off 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, including imbedded pipe supports, 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.**

- **A foundation elevation survey of the LNG tank should be made on an annual basis.**

- **Significant non-scheduled events, including safety-related incidents (i.e., LNG or natural gas releases, fires, explosions, mechanical failures, unusual overpressurization, and major injuries) and security-related incidents (i.e., attempts to enter site, suspicious activities) should be reported to FERC staff within 24 hours. 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. 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 for five minutes or more 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 safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes gas or LNG;

l. safety-related incidents to LNG vessels occurring 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, FERC staff would determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports should include investigation results and recommendations to minimize a reoccurrence of the incident.

LNG tank siting must be in compliance with NFPA 59A table 2.2.4.1, which requires that the impoundment for tanks larger than 70,000 gallons be located at least 0.7 times the container diameter from buildings and property lines. The separation distance between the outer wall of the proposed LNG storage tank and the property line abutting the Taunton River does not appear to meet this requirement.

In response to recommendation 32 in the draft EIS, Weaver's Cove Energy submitted that its proposed tank location meets the underlying intent of the requirement. NFPA 59A section 2.2.4.1 states that the minimum separation distance between LNG containers and "exposures" shall be in accordance with table 2.2.4.1. NFPA-1 and NFPA-30 define "protection for exposures" as being protection for "structures on property adjacent to liquid storage." Since the adjacent property in question is a river, Weaver's Cove Energy notes that this property cannot contain any permanent structures within 0.7 container diameter of the LNG container impoundment. On September 20, 2004, Weaver's Cove Energy requested that the DOT grant it a limited waiver from the requirement in NFPA 59A section 2.2.4.1, which is incorporated by reference in 40 CFR 193.2051.

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 (predominately used in the United States);
- Spherical storage tanks (predominately used in LNG carriers);
- 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 (Cameron/Hackberry was the first project proposing this design in the United States; Freeport LNG was the second; and currently, numerous LNG projects are proposing this type of tank design);
- Prestressed 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).

These tank categories are described in Annex H of the European Standard for LNG facilities (EN 1473) and are summarized below for the LNG storage tanks commonly found in proposals before the Commission.

H.1 Single containment tank

A single primary container and generally an outer shell designed and constructed so that only the primary container is required to meet the low temperature ductility requirements for storage of the product.

The outer shell of a single containment storage tank is primarily for the retention and protection of insulation and to contain the purge gas pressure, but is not designed to contain refrigerated liquid in the event of leakage from the primary container.

An above ground single containment tank shall be surrounded by a bund (dike) wall to contain any leakage. Examples of single containment are given in figure H.1.

H.3 Double containment tank

A double containment tank is designed and constructed so that both the inner self supporting primary container and the secondary container are capable of independently containing the refrigerated liquid stored. To minimize the pool of escaping liquid, the secondary container should be located at a distance not exceeding 6 meters from the primary container.

The primary container contains the refrigerated liquid under normal operating conditions. The secondary container is intended to contain any leakage of the refrigerated liquid, but it is not intended to contain any vapor resulting from this leakage.

Examples of double containment tanks are given in figure H.3. Figure H.3 does not imply that the secondary container is necessarily as high as the primary container.

H.4 Full containment tank

A tank designed and constructed so that both self supporting primary container and the secondary container are capable of independently containing the refrigerated liquid stored and for one of them its vapor. The secondary container can be 1 or 2 meters distance from the primary container.

The primary container contains the refrigerated liquid under normal operating conditions. The outer roof is supported by the secondary container. The secondary container shall be capable both of containing the refrigerated liquid and of controlled venting of the vapor resulting from product leakage after a credible event. Examples of full containment tanks are given in figure H.4.

Insert Figure

H.1 Examples of Single Containment Tanks

Insert Figure

H.3 Examples of Double Containment Tanks

Insert Figure

H.4 Examples of Full Containment Tanks

Single-, double- and full-containment LNG storage tanks have been authorized by the Commission for use at new LNG import facilities or expansions of existing terminals; and single- and double-containment tanks have been constructed and operated. Although construction of full-containment tanks has not yet started in the U.S., approximately 50 have been constructed world wide. During the review of earlier proposals, a number of issues have surfaced concerning the applicability of existing codes and regulations to full-containment tank. Specifically, the term "full containment" does not appear in U.S. codes or standards for LNG facilities, including the Federal Safety Standards in 49 CFR Part 193, NFPA 59A, or API 620. As a result some have made the assumption that to design and construct a full-containment tank in accordance with the European code for LNG facilities (EN 1473) would satisfy the U.S. code 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 FERC and OPS do not agree because neither NFPA 59A nor Part 193 exclude full containment 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).

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 requires a separation of 0.7 times the diameter from the property line. The proposed tank for the Weaver's Cove LNG Project meets the 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. 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 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.

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. The intent of the barrier is not to define a containment or impounding area for thermal radiation or flammable vapor exclusion zone calculations or other code requirements.

Weaver's Cove Energy has proposed to install an earthen structure around the LNG tank. The structure would be 15 feet high and would enclose an area of approximately 400 feet by 1,300 feet. The structure's volumetric capacity would exceed 100 percent of the LNG tank's maximum liquid capacity. Rainwater collected by the dike would be drained into a sump and pumped out in accordance with 49 CFR section 193.2173. This barrier would confine LNG on the project property in the event of any hypothetical catastrophic event, and would also prevent process area spills from leaving the plant.

4.12.4 Siting Requirements - Thermal and Dispersion Exclusion Zones

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, DOT revised 49 CFR 193 to incorporate NFPA 59A (1996 edition) into the LNG regulations. On April 9, 2004, DOT further revised 49 CFR Part 193 to incorporate the 2001 edition of NFPA. The following sections specifically address offsite hazards:

- **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. 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.

- **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.

For the following LNG facilities that are proposed for this project, we have identified the applicable siting requirements from Part 193 and NFPA 59A:

- One 1,260,000-barrel (200,000 m^3) LNG storage tank - Parts 193.2057 and 2059 require the establishment of thermal and flammable vapor exclusion zones for LNG tanks. NFPA 59A 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.

- Marine cargo transfer system consisting of three 16-inch-diameter unloading arms, a 16-inch-diameter vapor return line, one 30-inch-diameter liquid unloading line to the storage tank, and a 20-inch-diameter vapor return line - Parts 193.2001, 2057, and 2059 require thermal and flammable vapor exclusion zones for the transfer system. NFPA 59A does not address LNG transfer systems.

- Five 2,120 gpm in-tank pumps and five 1,800 gpm sendout pumps - Parts 193.2057 and 2059 require thermal and flammable vapor exclusion zones. NFPA 59A 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.

- Four vertical shell and tube type vaporizers - 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 (2001) specifically excludes transfer areas at the water edge of marine terminals. When the DOT 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 LNG plants 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. 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 Office of Pipeline Safety) determines that a shorter time is acceptable. Again, given the confusion in applying the two requirements, 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 for exclusion zone calculations. 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 discussions with DOT OPS 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 the impoundment system serving a single LNG storage tank must have a volumetric capacity of 110 percent of the LNG tank's maximum liquid capacity. For an LNG storage tank of a full containment design, the outer concrete tank wall would serve as the impoundment system and be sized to accommodate 110 percent of the inner tank volume. To be conservative, none of the volume between the inner and outer tank walls that would be occupied by perlite insulation has been included in the outer tank impoundment capacity.

All potential LNG spills occurring from the storage tank withdrawal header, the vaporizer and sendout pump area, the ship unloading line and the truck transfer area would be directed to a central impoundment, located north of the process area. The LNG ship unloading platform and jetty would be constructed of curbed concrete decking, and sloped to drain potential spills toward shore. A curbed concrete pad would be installed beneath the onshore portion of the unloading piping, and a sloped concrete trench used to drain jetty and onshore spills to the central impoundment. Curbed concrete pads

would be installed beneath the sendout pumps, vaporizers, boil-off gas condenser, and all LNG-containing piping. A sloped concrete trench would direct spills into the impoundment and concrete sump. Sloped and curbed concrete pads would also be installed to drain spills from the truck loading racks and the transfer piping.

The central impoundment would consist of an earthen impoundment (140-foot by 140-foot by 5-foot deep) and a concrete sump (59-foot by 59-foot by 4-foot deep). The earthen impoundment with a capacity of 733,090 gallons has been sized to contain a 10-minute, full flow spill from the ship unloading line. The flow rate in this line would be 52,834 gpm, which would correspond to a 10-minute spill volume of 627,127 gallons after accounting for pump runout and the drainage of LNG contained in the pipe. The concrete sump with a capacity of 104,158 gallons has been sized to contain the design spills from the LNG storage tank, transfer piping, and process areas. The total capacity of the central impoundment would be approximately 837,248 gallons.

In accordance with section 2.2.3.5 of NFPA 59A, 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. Although the LNG storage tank would be equipped with five in-tank pumps, Weaver's Cove Energy states that only four pumps would be active under normal operating conditions. The design flow for each of these pumps is 2,120 gpm. With four pumps operating, the volume for a 10-minute spill from the in-tank pump discharge header would be 100,011 gallons, including drainage from the affected piping system. This spill would be contained by the concrete sump. However, since the fifth in-tank pump would not be physically isolated from use during normal operating conditions, it should be included in determining the design spill for the storage tank. The resulting 10-minute spill volume of 124,391 gallons (including drainage from the affected piping system) would overflow the concrete sump but still be contained within the earthen impoundment.

The sendout pumps discharge into a 16-inch-diameter header which supplies LNG to the vaporizers. A 10-minute spill from this header, with five sendout pumps operating, would release approximately 90,000 gallons of LNG, which would be contained in the concrete sump. Weaver's Cove Energy determined that the design spill for the process/vaporization area would be an accidental release from a broken 1-inch instrument connection on the discharge header. The design spill size for this accidental release is 17,600 gallons. A 10-minute spill from the truck station header would release approximately 14,000 gallons of LNG, which would be contained by the concrete sump.

Weaver's Cove Energy also selected the design spill for the marine transfer area as an accidental release from a broken 1-inch instrument connection on the discharge header of the unloading arms, flowing at full capacity for 10 minutes. The design spill size for this accidental release is 4,350 gallons. However, our 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, determined that a failure of the 4-inch-diameter valve bypass on the unloading line would be a more appropriate credible accidental leakage source. This design spill of 52,257 gallons would be contained by the concrete sump.

Table 4.12.4-1 presents the impounding area and spill size volume for the various spill scenarios. Since all of the design spills would be directed to the same central impoundment, the largest spill of 124,391 gallons (from the in-tank pump discharge header) would represent the design spill for subsequent exclusion zone calculations.

TABLE 4.12.4-1 **Impoundment Areas**			
Source	Spill Size (gallons)	Impoundment System	Impoundment Size(gallons)
LNG storage tank	52,834,410	Outer concrete tank wall	59,884,318
Ship unloading line	627,127	Central impoundment	837,248
Design spills:			
In-tank pump withdrawal header	124,391	Central Impoundment	837,248
Sendout pumps and vaporizers	17,600 / 90,000	Concrete sump	104,158
Truck transfer area	14,000	Concrete sump	104,158
Ship unloading line - 4" connection	52,257	Concrete sump	104,158

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 thermal radiation. Exclusion distances for various flux levels were calculated according to 49 CFR 193.2057 and section 2.2.3.2 of NFPA 59A, using the "LNGFIRE III" computer program model developed by the Gas Research Institute. NFPA 59A establishes certain atmospheric conditions (0 mph windspeed, 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 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, Weaver's Cove Energy selected the following ambient conditions to produce the maximum distances: windspeeds of 15 and 26.5 mph; ambient temperature of 12° F; and 50 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. We agree with Weaver's Cove Energy's selection of atmospheric conditions.

Using these ambient criteria, FERC staff calculated thermal radiation distances for incident flux levels ranging from 1,600 to 10,000 British thermal units per square foot per hour (Btu/ft^2-hr) for an LNG storage tank fire. Since the outer concrete tank provides the required impounding volume, the area of the impoundment is the appropriate parameter for thermal exclusion calculations. The outer concrete tank diameter (270 feet) was used as the pool diameter, with a flame height equal to the top of the outer concrete tank wall (149 feet). Target height was set at ground level (0 feet).

Thermal radiation distances were also determined for a 1,600 Btu/ft^2-hr incident flux level for the design spill of 124,391 gallons (from the in-tank pump discharge header) to the central impoundment. As previously discussed, the spill would overflow the concrete sump but would still be contained by the earthen impoundment. However, the associated thermal radiation exclusion zone would need to be based on the larger surface area of the earthen impoundment rather than on the concrete sump. Due to the larger design spill, the concrete sump would need to be deepened by approximately 9 inches to accommodate the full 124,391 gallons.

Table 4.12.4-2 presents the calculated maximum distances for incident flux levels ranging from 1,600 to 10,000 Btu/ft^2-hr as calculated by FERC staff. Although there are no prohibited activities within the modeled exclusion zones, the calculations for the impoundment sump are based upon a deepened sump with a capacity of 124,391 gallons. Consequently, **we recommend that:**

- **Weaver's Cove Energy revise the design of the impoundment sump to accommodate a design spill from the LNG storage tank in-tank pump discharge header with five pumps operating at maximum capacity. <u>At least 30 days prior to initial site preparation</u>, Weaver's Cove Energy should submit revised calculations showing the 1,600 Btu/ft^2-hr exclusion zone for the altered impoundment sump would meet the requirements of Title 49 CFR Part 193.**

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)
(1) Design spill	Property line that can be built upon.	1,600	320
(2) Storage tank impoundment	Outdoor assembly area occupied by 50 or more people.	1,600	995
(3) Storage tank impoundment	Offsite structures used for occupancies or residences.	3,000	775
(4) Storage tank impoundment	Property line that can be built upon.	10,000	445

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.

In a Two-Part Report prepared for Fall River and filed as comments on the draft EIS, Dr. Jerry Havens commented that the exclusion zone calculations contained significant errors because a spill from the transfer line from the ship was omitted from the determination of either thermal radiation or flammable vapor exclusion zones. As identified in the previous section, the facility has been designed for all potential LNG spills occurring from the storage tank withdrawal header, the vaporizer and sendout pump area, the ship unloading line and the truck transfer area to be directed to a central impoundment. Exclusion zone calculations are based on the concrete sump, which has been sized to contain the largest of the design spills.

Weaver's Cove Energy states that the 1,600 Btu/hr-ft^2 zone for the storage tank containment fire would extend over Route 79 toward the south, which is under the control of the Commonwealth of Massachusetts. Route 79 does not fall within the restricted usage for this zone, which is for outdoor assembly by groups of 50 or more persons. As a result, there are no restrictions planned for Route 79, and there should be no affect on traffic by the normal operation of the facility including cargo unloading operations. Also, the Massachusetts Highway property on North Main Street is outside the thermal exclusion zones, and the facility would not affect the use of this property.

The 1,600 Btu/hr-ft^2 zone, and part of the 3,000 Btu/hr-ft^2 zone, would also extend over a 1.2-acre property to the south that consists mostly of wetlands. Weaver's Cove Energy refers to this property as the "wedge lot" due to the triangular shape formed by its borders along the Taunton River, the proposed LNG facility, and the steep embankment to Route 79. Under the definitions in 193.2007, Weaver's Cove Energy would need to demonstrate that it or a government agency legally controls all activities on this lot in accordance with Parts 193.2057 and 2059. Consequently, **we now recommend that:**

- **Weaver's Cove Energy provide evidence of its ability to exercise control over the activities that occur within the portions of the thermal exclusion zones that fall outside the site property line. Alternatively, Weaver's Cove Energy may apply to the Department of Transportation for approval of a waiver, from its Title 49 CFR Part 193 regulation, that specifies what alternative mitigation measures or plan Weaver's Cove Energy may provide that would afford an equal or greater level of thermal radiation protection as the requirement for control over activities within the modeled exclusion zones. Weaver's Cove Energy should file this evidence or waiver <u>prior to initial site preparation.</u>**

Weaver's Cove Energy has determined that the last owner of the wedge lot was the Sagamore Manufacturing Company. However, this corporation was involuntarily dissolved in 1983 and did not assign its residual rights to any individual or another corporation. Therefore, the current ownership of the lot is uncertain, and this situation may hinder the efforts of Weaver's Cove Energy to obtain technical "legal control" over the property. In any case, Weaver's Cove Energy believes that the unusable nature of the wedge lot would itself satisfy the regulations.

The wedge lot contains only 0.29 acre of upland and would be virtually inaccessible to an assembly of people. Physically getting onto the property from the state highway would be a challenge due to the steep embankment. The highway was built at an elevation tens of feet above the grade of the surrounding land, including the wedge lot. No access exists underneath the highway, and no easements exist permitting transit through either the highway property or the proposed LNG facility property. It is also unlikely that a large group of people would travel by boat to congregate on the small piece of upland, but if so, that would negatively impact the quality of the wetlands and could require that an action be taken under state wetlands protection regulations. Additionally, based on the Fall River zoning ordinances, section 86-2, this property could not be built upon due to its lack of street line frontage. Given all of these characteristics, no prohibited activities could reasonably occur on the property, and Weaver's Cove Energy requested, on September 20, 2004, that the DOT grant it an exemption or waiver from the requirement of legal control over activities on the wedge lot. This request is pending.

We received comments suggesting that the 1,600 Btu/ft²-hr limit may not be low enough to protect the public from adverse heat exposure. The DOT examined this issue during the rulemaking process which established the use of this criterion. In their Advance Notice of Proposed Rulemaking (Notice No. 77-4, Docket No. OPSO-46), which was used to develop 49 CFR Part 193, the DOT suggested 3.1 kilowatts per square meter (kw/m²)(1,000 Btu/ft²-hr) as an acceptable level for direct human exposure to thermal flux. After the public review period, it was determined that the evidence and information supported the use of 5 kw/m² (1,600 Btu/ft²-hr) as the limit for direct human exposure.

However, some of the comments we received on the proposed Weaver's Cove LNG Project specifically ask for the distance to 1.6 kw/m² (507 Btu/ft²-hr). This flux level is associated with an uncovered person experiencing burns after approximately 3 minutes of continuous exposure. For the LNG storage tank containment fire, this flux level could potentially extend 1,640 feet from the center of the tank. We note that the 507 Btu/ft²-hr flux level would not reach the William J. Wiley Elementary School, the Highlander Rehab and Nursing Center, or the Pleasant View public housing project. Furthermore, Part 193.2057 does not require any exclusions beyond 1,600 Btu/ft²-hr.

<u>Vapor Dispersion Zone</u>

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. Sections 2.2.3.3 and 2.2.3.4 of NFPA 59A and Part 193.2059 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 (one half the lower flammability limit of LNG vapor) under meteorological conditions that 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.

Potential LNG spills occurring from the storage tank withdrawal header, the vaporizer and sendout pump area, the ship unloading line and the truck transfer area would be directed to a central impoundment, located north of the process area. Since all of these spills would be directed to the same impoundment, the largest spill of 124,391 gallons (from the in-tank pump discharge header) would represent the design spill for determining flammable vapor exclusion zones.

As discussed in the draft EIS, Weaver's Cove Energy used a cold vapor to liquid volumetric ratio of 1:235 and calculated that 3,184,955 cubic feet (ft^3) of cold vapor would result from the vaporization of an in-tank pump withdrawal header spill with four pumps operating. Weaver's Cove Energy claimed that since the entire volume of cold vapor would be contained by the facility's earthen structure, occupying about 45 percent of the 7,171,695 ft^3 capacity, and that the vapor dispersion exclusion zone would not extend beyond the LNG terminal site.

In the previously referenced Two-Part Report prepared for Fall River and filed as comments on the DEIS, Dr. Jerry Havens disputed the assertion that the entire volume of cold vapor would be contained within the main dike impoundment because it would be physically impossible for the vapor from the spill to fill the impoundment without warming and mixing with air while being evolved. As a result he states that the flammable vapor exclusion zone for this design spill should be recalculated using the FEM3A model as authorized by Part 193.

The effects of provisions for containing vapors as a means of mitigating flammable vapor hazards are permitted to be considered in the calculations by NFPA 59A section 2.2.3.3. Increasing the vapor detention capacity can reduce the vapor source strength and correspondingly reduce the downwind distance to the ½ LFL. It is acknowledged that the calculations of vapor overflow rates do not account for the mixing of evolved vapor that is likely to occur over extended periods of time. This can be especially problematic for certain sump/impoundment configurations that allow for longer term vapor retention.

To account for this phenomenon, FEM3A has been recommended as the proper methodology for calculating exclusion zones. However, the actual ability to apply the model at this time is the subject of an ongoing technical dispute in this proceeding. Issues have been raised concerning the availability of the model in the public domain; validation of the model for the low wind speed and stable atmospheric conditions specified in Part 193; and its performance as a unique terrain model that is significantly different than DEGADIS. Regardless of the debate in that proceeding, it must also be noted that the model has not been used in any of the myriad proposals before the Commission. While the issues concerning the model may ultimately be resolved in the proper forum of the technical standards committee or the DOT regulatory process, the model should be viewed as a potential long term solution, rather than in the timeframe of this project.

As a result, FERC staff performed a supplementary vapor dispersion analysis for the design spill by conservatively assuming no earthen structure on the plant perimeter. While the design spill from all five in-tank pumps would be contained within the earthen impoundment, it would overflow the concrete

sump. Due to the increased surface area providing heat for vaporization, the exclusion zone would extend offsite if all vapor retention by the earthen structure surrounding the facility were neglected. Consequently, staff performed additional vapor dispersion modeling in which the concrete sump was deepened by approximately 9 inches to accommodate the full 124,391 gallons. Using these dimensions, SOURCE5 estimated that vapor would overtop the earthen impoundment within 6 minutes with a vapor production rate of 10.9 kg/sec. A transient DEGADIS simulation, with the atmospheric conditions specified by 49 CFR 193, predicts that 2.5 percent average gas concentration would extend 640 feet from the center of the concrete sump. This flammable vapor exclusion zone, based on a revised impoundment sump, would not extend offsite. Consequently, **we recommend that:**

- **Weaver's Cove Energy revise the design of the impoundment sump to accommodate a design spill from the LNG storage tank in-tank pump discharge header with five pumps operating at maximum capacity. <u>At least 30 days prior to initial site preparation</u>, Weaver's Cove Energy should submit revised calculations demonstrating that the flammable vapor dispersion exclusion zone for the altered impoundment sump would meet the requirements of Title 49 CFR Part 193.**

The supplementary analysis performed by FERC staff using DEGADIS does not take into account any effects by topography, such as the vapor retention effects of the earthen structure surrounding the facility. Since this mitigative effect is not included, the results are conservative and indicate that the facility would be in compliance with 49 CFR 193 provided the impoundment sump is revised as recommended.

A secondary issue that needs to be addressed is distance from potential spill locations at the ship unloading area to the earthen dike. While it is an appropriate design philosophy to direct potential spills away from equipment to remote impoundments, it is also relevant to consider the control of vapors produced in the channels or trenches leading to these impoundments. Long trenches increase the surface area available for heat transfer and, correspondingly, increase vapor generation. A number of vapor control options are available including: vapor fences, fixed high expansion foam generators, reduced trench lengths and/or surface area, and additional sumps at intermediate locations along transfer piping. As a result, **we recommend that:**

- **Weaver's Cove Energy examine provisions to retain any vapor produced along the transfer line trenches and other areas serving to direct LNG spills to associated impoundments. Measures to be considered may include, but are not limited to: vapor fencing, intermediate sump locations, or trench surface area reduction. Weaver's Cove Energy should file final drawings, including cross sections, and specifications for these measures with the Secretary <u>at least 30 days prior to initial site preparation</u> for review and approval by the Director of OEP.**

4.12.5 Marine Safety[23]

The February 2004 Interagency Agreement provides the framework for the participating agencies to work in a coordinated manner to address the full range of issues regarding safety and security at LNG import terminals. The FERC closely coordinates its pre-certificate review of the proposal with the Coast Guard, which has authority over the safety of LNG vessels and the marine transfer area as well as the security of the LNG vessels and the entire LNG facility.

[23] This section was written with the cooperation and assistance of the U.S. Coast Guard, Marine Safety Office Providence.

The hazards associated with the marine transportation of LNG differ from land-based hazards. Whereas the land-based facilities have features to both limit the duration of LNG spills and contain credible spill volumes, an LNG spill on water may be unconfined and may vaporize rapidly due to heat input from the water.

The history of LNG shipping has been free of major incidents, and none have resulted in significant quantities of cargo being released (see section 4.12.5.3). No incidents have occurred at existing LNG terminals during the 50 years of operation that resulted in any significant quantities of cargos being released. However, the possibility of an LNG spill from a ship over the duration of the proposed project must be considered. Historically, the events most likely to cause a significant release of LNG were a ship casualty such as:

- a vessel colliding with an LNG ship in transit;
- an LNG ship alliding[24] with the terminal or a structure in Narragansett Bay or Mount Hope Bay;
- a vessel alliding with an LNG ship while moored at the terminal; or
- a grounding sufficiently severe to puncture an LNG cargo tank.

However, the attacks on September 11, 2001, have made the public keenly aware of additional risks that must be considered in the evaluation of marine safety and security:

- a deliberate attack on an LNG ship by a terrorist group.

Any of the above events would have to occur with sufficient impact to breach the LNG ship's double hull and cargo tanks. Previous incidents with LNG ships have primarily involved grounding, and none of these have resulted in the breach of the double hull and subsequent release of LNG cargo.

The following discussion provides a chronology of the LNG ship voyage from the liquefaction facility to the import terminal, disclosing the risks at each step and how they are managed. Details and analysis are provided in subsequent sections.

LNG Vessels and Ocean Voyage

Imported LNG could be obtained from exporting terminals throughout the world and delivered by LNG ships to the proposed terminal. Exporting countries include Algeria, Australia, Brunei, Indonesia, Malaysia, Nigeria, Oman, Qatar, Trinidad, and United Arab Emirates. In 2003, LNG imports to the U.S. included: 72 percent from Trinidad, 12 percent from Nigeria, 10 percent from Algeria, 3 percent from Qatar, 2 percent from Oman, and 1 percent from Malaysia.

The LNG ships used to import LNG to the United States would be constructed and operated in accordance with the IMO Code for the Construction and Equipments of Ships Carrying Liquefied Gases in Bulk, the SOLAS, and 46 CFR 154, which contain the U.S. safety standards for vessels carrying bulk liquefied natural gas. Foreign flag LNG ships are required to possess a valid IMO Certificate of Fitness and a Coast Guard Certificate of Compliance.

[24] "Allision" is the action of dashing against or striking upon a stationary object (e.g., the running of one ship upon another ship that is docked) – distinguished from "collision", which is used to refer to two moving ships striking one another.

In 1993, amendments to the IMO's Code for the Construction and Equipments of Ships Carrying Dangerous Chemicals in Bulk require all tankers to have monitoring equipment with an alarm facility that is activated by detection of over-pressure or under-pressure conditions within a cargo tank. In addition, the cargo tanks are 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 carbon dioxide system for protecting machinery including the ballast pump room, emergency generators, and compressors.

As a result of 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 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, for vessels and cargos. 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:

Ships:

- Ships must develop security plans and have a Ship Security Officer.
- 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 indicating that the security of the ship is under threat or it has been compromised.
- Ships must have a comprehensive security plan for international port facilities, focusing on areas having direct contact with ships.
- Ships may have certain equipment onboard to help maintain or enhance the physical security of the ship.

Port facilities:

- The port facility must have a security plan and a Facility Security Officer (FSO); and
- Certain security equipment may be required to maintain or enhance the physical security of the facility.

Both ships and ports must:

- Monitor and control access;
- Monitor the activities of people and cargo;

- Ensure the security and availability of communications; and
- Complete a Declaration of Security.

LNG Vessel Transit in Narragansett Bay

An internationally recognized Traffic Separation Scheme established by the IMO serves vessel traffic in the approach to Narragansett Bay through Rhode Island Sound. This provides inbound and outbound routes which are separated by a central buffer zone. All foreign-registered and many U.S. flagged large ships entering Narragansett Bay are boarded by a pilot from the Northeast Marine Pilots who directs the entire transit to one of the destination docks at Davisville/Quonset, Newport, the Ports of Providence, Somerset, and Fall River.

LNG ships would access the LNG terminal site via the East Passage of Narragansett Bay and the federal navigation channel in Mount Hope Bay and the Taunton River (see figure 4.12.5-1). One pilot would direct the LNG ship throughout the entire 21-nautical mile transit of Narragansett Bay to the LNG terminal site. According to Weaver's Cove Energy, a second pilot would board the ships prior to the Brightman Street Bridge to assist in transiting through the bridge. A tractor tug would escort the LNG ships up Narragansett Bay to Sandy Point where two additional tractor tugs would join the escort up the federal navigation channel. LNG ships would enter the channel during a rising tide to ensure sufficient water depth for safe navigation. The vessel master would be on the bridge monitoring the pilot's commands and would retain overall responsibility for the safe navigation of the LNG ship. The Coast Guard would have a security boarding team onboard during the transit if required by the Vessel Transit Security Plan. Other security measures during the transit would be carried out in accordance with the Vessel Transit Security Plan (see section 4.12.5.2).

The LNG ship would normally transit Narragansett Bay during daylight hours. Docking, LNG cargo unloading, and undocking would take less than 24 hours. The LNG ship would normally depart during daylight hours on the second day. When leaving the berth, the bow of the LNG ship would be moved forward into the turning basin while the tugs rotate the stern to line the ship up for the exit down the Taunton River.

In addition to the Northeast Marine Pilots, the Coast Guard would control the transit of the LNG vessel through the harbor and while unloading cargo. Typical Coast Guard requirements for other LNG import terminals include 96- and 24-hour advance notification of the vessel arrival at which time Coast Guard personnel would board the LNG vessel offshore for an inspection of the ship safety systems and a security sweep. Other requirements would include: a Coast Guard escort through Narragansett Bay to the dock; establishment of a moving safety and/or security zone around the vessel while en route and during unloading operations; an inspection of the dock safety systems prior to commencing cargo transfer; and monitoring all operations until the vessel departs. Maintaining security of the dock and vessel would be the responsibility of the facility in cooperation with other federal, state and local partners as described in the Facility Security Plan (see section 4.12.7).

insert figure

4.12.5-1 Proposed LNG Ship Route

LNG Vessel Casualties

The operational controls by the Coast Guard and the Northeast Marine Pilots, as well as the characteristics of Narragansett Bay, minimize the possibility of an LNG cargo spill from groundings, collisions, and allisions. The Coast Guard would enforce a moving safety and security zone around the LNG vessel that would clear the channel of all vessels in the vicinity of the LNG vessel to reduce the likelihood of any collisions, including those of the tonnage and speed required to cause an LNG spill (see section 4.12.5.3). The segment of the transit from the mouth of Narragansett Bay through the East Passage to Sandy Point is relatively wide and deep. From Sandy Point through Mount Hope Bay and up the Taunton River to the LNG terminal site, the federal navigation channel has an authorized depth of 35 feet and a minimum width of 400 feet. The generally even and soft bottom without rocky protrusions makes an LNG spill from cargo tanks highly unlikely in a grounding incident. The proposed LNG terminal would be located at the northern end of the federal channel, where large commercial vessel traffic is primarily limited to bi-weekly coal deliveries (about 30 per year) to the Montaup and Brayton Point Power Plants.

To minimize the potential of an inbound LNG vessel alliding with the bridges or other fixed structures, a navigation simulation study was performed at the Marine Safety International (MSI) vessel simulator facility in Middletown, Rhode Island to test navigation in the channel, including all bridge transits and turning of the LNG ship prior to departure (see *Navigation Simulation Studies* in section 4.12.5.1). The simulation program was initially used to determine the feasibility of and dredging requirements for transiting the federal navigation channel with an LNG ship, including transit through the new Brightman Street Bridge. The program is now being used to refine handling techniques, determine the optimum number and power of tugs required, and establish limiting operational parameters such as wind speed and direction. LNG vessel transits through the new Brightman Street Bridge have been successfully simulated in wind speeds of up to 25 knots on the ship beam.

Deliberate Attack on an LNG Vessel

In addition to addressing the potential hazards from LNG vessel casualties, the possibility of a deliberate attack on an LNG ship by a terrorist group must also be considered. Security of the LNG vessel is the responsibility of the owner/operator and the master of the vessel. Security of the LNG vessel facility is the responsibility of the owner/operator of the facility. Protection of the LNG vessel and the import terminal would involve personnel from the Coast Guard, Weaver's Cove Energy security staff, and state and local law enforcement. The Coast Guard would establish a safety and security zone around the LNG vessels in transit and while docked. Only personnel or vessels authorized by the Captain of the Port would be permitted in the safety and security zone.

Weaver's Cove Energy would provide security for the terminal according to a Facility Security Plan prepared under 33 CFR Part 105 and approved by the Coast Guard Captain of the Port (see section 4.12.7). Some of the requirements include:

- a Facility Security Assessment to identify site vulnerabilities, possible security threats, consequences of an attack, and facility protective measures;
- a Facility Security Plan with 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 Maritime Security (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 also 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, screen visitors and contractors, and assist in maintaining security of the marine terminal during cargo unloading. Weaver's Cove Energy would be required to submit their Facility Security Plan to the Captain of the Port at least 60 days prior to commencement of operations. In order to ensure that the responsibilities of Weaver's Cove Energy's security staff enhance overall security, **we recommend that:**

- **Weaver's Cove Energy coordinate with the Coast Guard to define the responsibilities of Weaver's Cove Energy's security staff in supplementing other security personnel and in protecting the LNG ships and terminal.**

A Security Analysis was prepared by Lloyd's Register North America for the project (see section 4.12.5.3). This analysis provides a basis for estimating the potential magnitude of a hazard from a successful terrorist attack, and for developing LNG vessel and waterfront security plans. In addition, the DOE released a study by Sandia National Laboratories, *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water* (Sandia Report) in December 2004. The 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. The analysis of accidental events found that groundings and low speed collisions could result in minor ship damage but not a cargo spill; while high speed collisions could cause a 0.5 to 1.5 m^2 cargo tank breach area. 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 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 methodology described in the ABSG Consulting Inc. (ABSG) study, *Consequence Assessment Methods for Incidents Involving Releases from Liquefied Natural Gas Carriers*, and revised in staff's responses to comments on the report (issued June 18, 2004), was used to calculate the thermal radiation distances for several holes ranging in diameter from 1 meter to 3.9 meters. Using the methodology, we have estimated distances for a nominal 2.5-meter and 3-meter diameter hole to range from 4,340 to 4,810 feet for a thermal radiation of 1,600 Btu/ft^2-hr, the level which is hazardous for persons located outdoors and unprotected, from 3,330 to 3,701 feet for 3,000 Btu/ft^2-hr, an acceptable level for wooden structures, and from 1,970 to 2,174 feet for 10,000 Btu/ft^2-hr, a level sufficient to damage process equipment, for these size holes respectively.

These intentional breach scenarios provide guidance in developing the operating restrictions for LNG vessel movements through the East Passage of Narragansett Bay and the federal navigation channel in Mount Hope Bay and the Taunton River, as well as in establishing potential impact areas for emergency response and evacuation planning. The inbound transit through the East Passage of Narragansett Bay would pass by Newport and Middletown, Rhode Island on the east side, and Jamestown

on the west. After turning at Sandy Point, the LNG vessels would pass by Bristol and Portsmouth in the vicinity of the Mount Hope Bridge. The transit within the federal channel through Mount Hope Bay and the Taunton River would pass by Woodman Street and the south of Fall River, the State Pier near the center of Fall River, and the Braga Bridge, and Somerset, Massachusetts. Some areas of development along the shoreline in these communities could be within a potential transient hazard area during the LNG vessel transit; while parts of North Fall River would be exposed to a potential hazard while the LNG vessel is at the dock and unloading cargo. Assuming an LNG vessel would transit the Taunton River at 3 knots while under tug assist, the adjacent communities would be exposed to a potential transient hazard for less than 30 minutes. In addition, a temporary hazard would exist around the slip during part of the 10- to 12-hour period while the LNG vessel is at the dock and unloading cargo. The operational restrictions to be imposed by the Northeast Marine Pilots on LNG vessel movements through this area, as well as the requirements that the Coast Guard would impose in its operating plan would minimize the possibility of a hazardous event occurring along the vessel transit.

Emergency Response and Evacuation Planning

Prior to commencing service, Weaver's Cove Energy would prepare 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…" Typically, the manuals are prepared at the later stages of the construction process and submitted to the FERC as a requirement prior to placing the facility in service.

While the worst-case scenarios evaluated for the onshore facility in section 4.12.3 and for marine spills in 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.

A number of organizations and individuals commented on the need to consider evacuation plans and warning systems. While recognizing that preparing emergency procedures typically occurs at the end of the construction phase rather than at the draft EIS stage, there remain a number of issues concerning the viability of emergency evacuation that have not been satisfactorily resolved. Therefore **we recommend that:**

- **Weaver's Cove Energy develop emergency evacuation routes for the areas along the route of the LNG vessel transit in conjunction with the local emergency and town officials and file the routes with the Commission for review and approval by the Director of OEP prior to initial site preparation.**

In addition, **we recommend that:**

- **Weaver's Cove Energy develop an Emergency Response Plan (including evacuation) and coordinate procedures with 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;

d. evacuation routes for residents along the route of the LNG vessel transit;

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 Emergency Response Plan should be filed with the Secretary for review and approval by the Director of OEP prior to commencement of service. Weaver's Cove Energy should notify FERC staff of all meetings in advance and should report progress on its Emergency Response Plan at 6-month intervals starting at the commencement of construction.

4.12.5.1 Narragansett Bay and the Ports of Fall River and Somerset

The East and West Passages of Narragansett Bay and Mount Hope Bay combine to form a sizable body of navigable water open to the sea and accessible to large oceangoing vessels of varying types and sizes up to 100,000 tons. Mount Hope Bay is open to Narragansett Bay East Passage about 12 miles from the sea, at Sandy Point. A deepwater federal navigation channel in the Taunton River, which flows into Mount Hope Bay, extends 9 miles northeast to the Ports of Fall River and Somerset, Massachusetts.

An internationally recognized Traffic Separation Scheme established by the IMO serves vessel traffic in the approach to Narragansett Bay through Rhode Island Sound. This provides inbound and outbound routes which are separated by a central buffer zone. All foreign-registered and many U.S. flagged large ships entering Narragansett Bay are boarded by a pilot from the Northeast Marine Pilots, who directs the entire transit to one of the destination docks at Davisville/Quonset, Newport, Providence, Somerset, and Fall River.

Commercial marine traffic enters Narragansett Bay via the inbound separation lane from Rhode Island Sound that leads to the East Passage, past the City of Newport, Rhode Island. A number of vessels, mainly car carriers, proceed to Davisville/Quonset; naval vessels proceed to their base at Newport; and in the summer season, cruise ships proceed to an anchorage off Newport. Most commercial traffic proceeds into Upper Narragansett Bay to the Port of Providence in a federal navigation channel. The COE is in the process of dredging this channel to its authorized depth of 40 feet. A smaller number of vessels turn eastwards and enter the navigation channel leading to Fall River. This federal navigation channel ends in the turning basin adjacent to the proposed LNG terminal site.

LNG ships would access the LNG terminal site via the East Passage of Narragansett Bay and the federal navigation channel in Mount Hope Bay and the Taunton River (see figure 4.12.5-1). From the mouth of Narragansett Bay, the LNG ships would proceed up the East Passage to Sandy Point. This segment of the route is relatively wide (0.25 to 0.75 mile) and deep (60 to 120 feet). At Sandy Point, the ships would turn east and follow the federal navigation channel through Mount Hope Bay and up the Taunton River to the LNG terminal site. At least initially, ships in this segment may be restricted to one-way traffic and daylight only transits. The federal navigation channel has an authorized depth of 35 feet

and a minimum width of 400 feet. The channel was originally dredged in 1920 and was last maintained in the 1970s. Weaver's Cove Energy proposes to conduct maintenance and improvement dredging of the federal navigation channel to accommodate deeper draft LNG ships (see section 2.4.1.3).

One pilot would direct the LNG ship throughout the entire 21-nautical mile transit of Narragansett Bay to the LNG terminal site. Weaver's Cove Energy has indicated that a second pilot would board the ships prior to the Brightman Street Bridge to assist in transiting the bridge. A tractor tug would escort the LNG ships up Narragansett Bay to Sandy Point where two additional tractor tugs would join the escort up the federal navigation channel. The LNG ships would enter the channel during a rising tide to ensure sufficient water depth for safe navigation.

The three tugs would maneuver the LNG vessel to the dock and assist with berthing. At the end of cargo unloading, the tugs would undock the LNG vessel and turn it in the turning basin. At least one tug would remain on standby to assist in emergency situations, for example the breaking of mooring lines and drifting toward Somerset. Other potential emergency situations would be evaluated on a case-by-case basis and would determine if the LNG vessel would remain at the dock, be maneuvered to the turning basin or towed down the Taunton River, depending on the nature of the hazard, weather conditions, tides and other factors. The turning basin would be dredged to -41 feet in order to serve as an emergency area for all tidal conditions, such as times when the channel may not have sufficient depth.

En route to the LNG terminal, LNG ships would pass under or through four highway bridges: Pell Bridge, Mount Hope Bridge, Braga Bridge, and Brightman Street Bridge. The locations of these bridges are shown on figure 4.12.5-1. A new Brightman Street Bridge, located about 0.7 mile downstream of the LNG terminal site, is currently under construction. The existing bridge is being replaced with a bascule-type bridge that is to be completed in 2010. A summary of the bridges and associated vertical and horizontal clearances for ship passage is provided in the following table. The LNG vessels would have about 5 feet vertical clearance for the Mount Hope and Braga Bridges.

TABLE 4.12.5-1

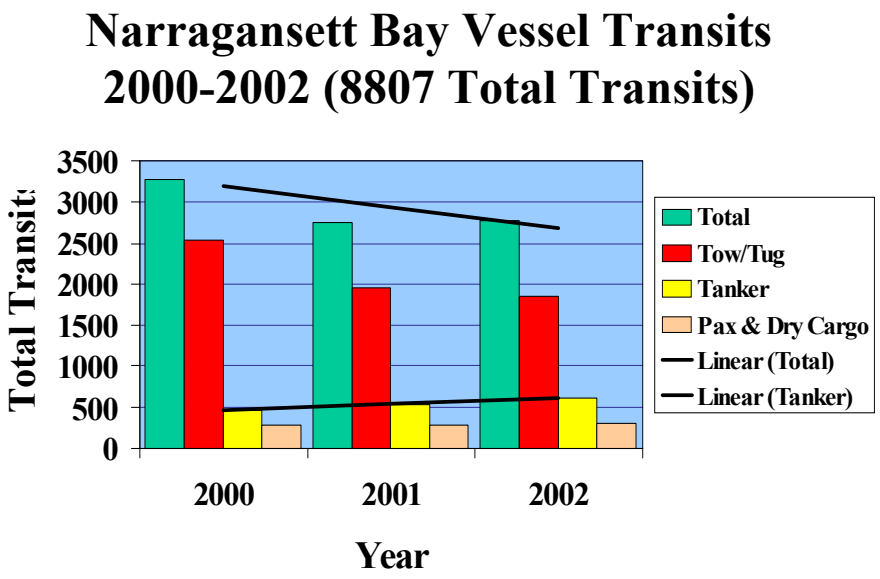
Bridges Along the Proposed LNG Ship Route

Bridge Name	Highway/Road	Horizontal Clearance (feet)	Vertical Clearance (feet)
Pell Bridge	Route 138	1,500	194
Mount Hope Bridge	Route 114	400	135
Braga Bridge	Interstate 195	400	135
Brightman Street Bridge	Brightman Street	200 a/	Unlimited a/

a/ Clearances specified for bascule-type bridge currently under construction.

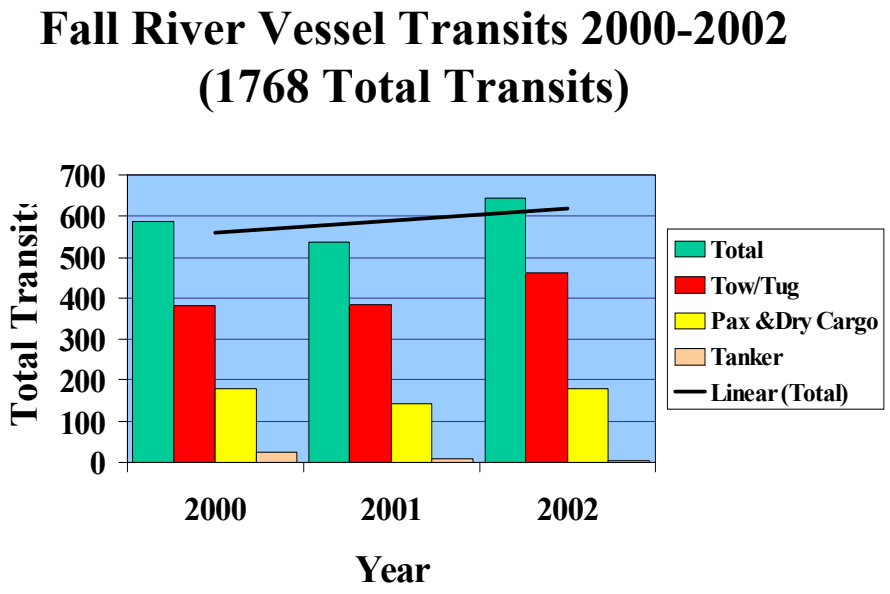
Current Traffic

Data regarding shipping activity in Narragansett Bay are available from multiple sources. The Northeast Marine Pilots, Coast Guard, COE, and Massachusetts Highway District 5 each record various ship movements within the bay. Generally accepted statistics are those provided through the COE's Navigation Data Center annual data for Waterborne Commerce. These statistics were used by the Coast Guard and a cross-section of waterways users during a formal Ports and Waterways Safety Assessment of Narragansett Bay conducted in September of 2004. The statistics below account for both inbound and outbound transits of the federal navigation channels in Narragansett Bay.



PAWSA Narragansett Bay, September 2004

The majority of Narragansett Bay traffic is destined for Providence. The COE's Waterborne Statistics for Fall River for the same period 2000-2002 are:



PAWSA Narragansett Bay, September 2004

The Coast Guard records port calls based on vessels entering a specific zone. In the case of the Coast Guard Marine Safety Office Providence, their zone data covers Rhode Island and Southeastern Massachusetts ports that are entered via Narragansett Bay and also includes the Massachusetts ports of New Bedford and Cape Cod. Analysis of the Coast Guard data for 2002 indicates that 723 vessels entered Narragansett Bay, of which 112 proceeded to Fall River or Somerset. Further analysis by vessel type indicated that of these 112 vessels, 60 were coal deliveries to Brayton Point or Montaup Power Plants, 11 were chemical carriers visiting Borden & Remington, 18 were general cargo vessels berthed at Fall River State Pier, and 23 were passenger vessels also calling at Fall River State Pier.

The COE Navigation Data Center for Waterborne Commerce statistics only records trips in waterways and channels maintained by the COE; therefore, the data do not capture Narragansett Bay traffic proceeding to Newport or Davisville/Quonset because this traffic does not pass any channels that are maintained by the COE. Currently, vessel traffic destined for Davisville/Quonset is limited primarily to car carriers delivering automobiles; these vessels transit Narragansett Bay approximately 60 times per year (accounting for both inbound and outbound transits). All vessels proceeding to Fall River transit the federal navigation channel in Mount Hope Bay and the Taunton River and are, therefore, included in the COE data.

Vessels proceeding to Providence enter a separate navigation channel north of Sandy Point. In 2001, the COE reported a total of 930 inbound vessels proceeding to Providence. This total comprised 64 dry cargo and passenger vessels, 105 tankers, 324 tugs, and 437 non-self propelled barges. The vast majority of the vessels were non-self propelled barges, either towed by tugs or integrated tug-barge units carrying petroleum and petroleum products in domestic trade.

There are several passenger ferry, cruise ship, and water taxi services operating within Narragansett Bay. These vary from year to year depending upon demand and economic conditions. The Narragansett Bay area is a yachting center and contains many marinas, including two upstream from the proposed LNG terminal site. Opening records for the Brightman Street Bridge from 2000 to 2002 give some indication of the recreational traffic in the Taunton River. However, these bridge records only include traffic that cannot pass under the existing bridge's height restriction of 27 feet when in the lowered position. The records were obtained from Massachusetts Highway District 5 Office and were collated for a study commissioned on behalf of the new bridge construction project. Analysis shows the highest number of bridge openings occurred in 2002 with a total of 961 openings. The breakdown was 37 for steamers and motorships, 95 for fishing vessels, 700 for pleasure craft, 226 for tow boats, and 96 for towed craft. The tow boat and towed craft included movements associated with the construction of the new bridge and is, therefore, not regular annual traffic.

To more accurately characterize the local marine traffic, Weaver's Cove Energy conducted a survey in the Mount Hope Bay and the Taunton River over a 3-day period in August 2004. This is traditionally the busiest time of year for recreational traffic and the survey period included the waterfront festival "Fall River Celebrates America". Data was collected at various points, including a monitoring position at the Brightman Street Bridge, which in effect recorded all river traffic passing the proposed LNG terminal site. Traffic was recorded on three consecutive days, nominally between 8 am and 6 pm.

According to this August survey, peak weekend traffic occurred from 12 to 4 PM and consisted of about 30 inbound and 30 outbound craft per hour. Peak weekday traffic occurred from 4 to 6 PM and consisted of about seven inbound and seven outbound craft per hour. Of the total traffic recorded, approximately 82 percent were described as motor craft having an average length of 15 to 25 feet, 15 percent were identified as jet skis, and 3 percent were sailing boats. The only larger traffic recorded was two tugs and barges associated with the construction of the new Brightman Street Bridge. Additional information regarding shipping traffic and bridge openings is included in section 4.9.4.

In conclusion, the shipping data collected from a number of sources produced considerable variation. However, the data do indicate that commercial traffic entering Narragansett Bay averages roughly two to three commercial vessels per day. Commercial traffic in the Taunton River averages one vessel every 2 to 3 days. In addition, the following details and trends were identified and were supported by information on transit schedules provided by Northeast Marine Pilots:

- *Tankers* - Most vessels entering Narragansett Bay are typically 40,000-ton domestic tankers, self and non-self propelled, carrying petroleum products to Providence and East Providence. The trade is evenly spread throughout the year, vessels transit by day and night, and only a few deeper draft vessels require tidal lift. The only tankers entering the Taunton River are small chemical carriers of typical size 9,000 tons visiting Borden & Remington at a frequency of about one per month.

- *Coal Ships* - A total of 60 ships transited the Taunton River channel in 2002 to discharge coal cargoes, averaging 40,000 tons each, with almost equal deliveries to Brayton Point and Montaup Power Plants. Both of these facilities are located in the Town of Somerset. There was a small bias in trade towards the summer months and all transits required tidal lift. These transits were carried out in daylight to aid in the approach to the Brayton Point Power Plant and in the passage through the existing Brightman Street Bridge.

- *Liquefied Petroleum Gas Ships* - An average of 10 to 12 ships per year typically unloaded 20,000 to 30,000 metric tons of LPG per visit at Providence, with most visits occurring from fall to late winter, and all transits entering from Narragansett Bay at Brenton Point are subject to special safety and security measures imposed by the Coast Guard.

- *Car Carriers* - Car carriers transit lower Narragansett Bay and then turn west to offload at Davisville; therefore, they do not proceed towards either Providence or Mount Hope Bay. In 2002, a total of 28 car carriers offloaded at Davisville. These carriers typically berthed after 6:00 a.m. and departed in the afternoon of the same day.

- *Passenger/Cruise Ships* - A total of 23 passenger ships docked at the Fall River State Pier between the months of June and October 2002, but the trade is reported to have been discontinued. In the same year, 25 cruise ships anchored off Newport between the months of May and October. These ships typically entered Narragansett Bay in the morning and sailed again in late afternoon the same day.

- *General cargo* – In 2002, a total of 18 small cargo ships ranging between 1,000 and 3,000 tons called at Fall River. General cargo and dry bulk vessels visited Providence throughout the year at an average of five per month. The largest cargoes were about 40,000 tons, which consisted of scrap iron loaded in Providence.

- *Tugs* - The large number of tugs indicated in the COE data is most likely the result of tugs assisting each of the ships transiting the federal navigation channels, and the large numbers of tankbarge traffic. The Northeast Marine Pilots also confirmed that the integrated tug-barge units also employed additional tugs to assist with berthing. Most currently available local tugs are of the conventional (i.e., non-tractor) type, although one tractor tug did begin service in Narragansett Bay in late 2004. These tugs were not included in the Coast Guard data because they were based locally and were not classified as ships entering the Coast Guard zone.

- *Recreational vessels* - During the summer months, yachting regattas are held within Narragansett Bay. In Fall River for 2002, 82 percent of the Brightman Street Bridge openings were for pleasure and fishing boats and 89 percent of these openings were between May and October.

Future Traffic

The dredging of the federal navigation channel would allow slightly deeper draft and/or fully loaded coal ships to access the existing power plants, and could result in correspondingly fewer vessel transits. The wider opening of the new Brightman Street Bridge would also enable the passage of larger, broader beam coal ships to access Montaup Power Plant, which could also result in fewer vessel transits.

Maintenance dredging of the navigation channel to Providence to restore it to a depth of 40 feet will once again allow deeper draft vessels to enter the port, will reduce delays to vessels that currently have to wait for the correct tidal conditions, and will reduce the need for lightering of certain vessels before entering the port. There is no indication that deepening this channel will result in an increase in the total number of vessels transiting lower Narragansett Bay on passage to Providence.

It is also reasonable to assume that any increase in numbers for specific trades such as car carriers will probably be balanced by a reduction in numbers for other trades such as oil tankers as new, large integrated tug-barge units replace smaller tank barges. The foregoing vessels, although routed through the relatively open water of lower Narragansett Bay, do not enter the channel to Fall River, which the proposed LNG ships would transit.

The proposed project would result in one additional vessel entering Narragansett Bay and transiting the federal navigation channel in Mount Hope Bay and the Taunton River every 5 to 7 days, for a total of about 50 to 70 ships each year. This number of additional ships is similar to the current total number of deep draft coal ships delivering to the Brayton Point and Montaup Power Plants. In addition, KeySpan LNG filed an application with the FERC on April 30, 2004, to upgrade its existing LNG storage facility in Providence, Rhode Island by converting the LNG terminal to a facility capable of receiving marine deliveries. The proposed KeySpan LNG Facility Upgrade Project, if approved, would receive about 50 LNG ships a year, and LNG ship transit to this facility is through Narragansett Bay and the Providence River Harbor and Channel.

The federal navigation channel in Mount Hope Bay and the Taunton River would be dredged by Weaver's Cove Energy to accommodate LNG ships with cargo capacities up to 145,000 m^3. Even taking into account the proposed project's anticipated shipping activity, the channel would remain under utilized. Existing and anticipated future traffic in addition to the project's intended trade would not result in traffic congestion because no commercial ships can proceed up the Taunton River beyond the LNG terminal site due to insufficient water depths. The total utilization of the channel would be approximately 170 to 250 ships per year with no specific seasonality.

Ship Traffic in the Navigation Channel

There are a number of factors that influence the movement of ship traffic in the federal navigation channel in Mount Hope Bay and the Taunton River. These include:

- *Channel Depth and Current* - The channel has a project depth of 35 feet and the private channel leading to the Brayton Point Power Plant has a depth of 34 feet. This results in deep draft ships utilizing tidal lift, approximately 4-foot mean tide in the project area, to transit the channel. Weaver's Cove Energy proposes to dredge the channel to a depth of

37 feet and LNG ships would utilize tidal lift as described in the Dredging Program Report. The current in the channel is low, generally about 0.5 knot, and rarely exceeds 1 knot. Channel transits would be undertaken on a rising tide and timed to minimize current effects in the area of the Brightman Street Bridge.

- *Daytime/Nighttime Transit* - Existing practice is for deep draft vessels to transit the channel only during daylight hours. Weaver's Cove Energy has indicated that LNG ships would initially only transit during daylight hours but, as experience is gained, the option of adopting nighttime transits would be considered in full cooperation with the pilots and the Coast Guard. Nighttime transits could require installation of additional navigational aids and flood lighting of the fender line at the new Brightman Street Bridge.

- *One-Way Traffic* - Arrangements are in place to permit a vessel, scheduled to depart from upper Narragansett or Mount Hope Bays, to commence its outward passage and wait or anchor temporarily at a suitable location, such as Sandy Point, to allow the LPG ship to pass. In this case the total time of the delay would be approximately 60 minutes. It is anticipated that similar one-way restrictions, resulting in similar delays should they coincide with the scheduled movements of another vessel, may be applied by the Coast Guard to the proposed LNG ship transits. It is estimated that the delay to a ship scheduled to depart from an existing Fall River berth due to inward passage of an LNG ship in the navigation channel could be between 60 and 90 minutes.

- *Tugs* - LNG ships delivering cargo to the proposed terminal would have tug support for all phases of arrival and departure, channel navigation, and for standby and fire fighting duties during LNG unloading operations. Although there are established tugboat operations in the Narragansett Bay area, Weaver's Cove Energy would provide dedicated tractor tugs with fire-fighting capabilities. Ownership arrangements are not yet established but the tugs would be contracted to the proposed project for all LNG ship movements and would be available at other times for general shipping movements, such as car carrier berthings, within the Narragansett Bay and Cape Cod areas.

- *Moving Safety and Security Zone* - The Coast Guard currently imposes a moving safety and security zone around LPG ships en route to Providence and would impose a similar zone enforced by a Coast Guard escort for LNG ships. As discussed above, the worst-case effect of this moving safety zone would be an estimated 60 to 90-minute delay to other ships. In the federal navigation channel, any delay would be concurrent with, not in addition to, any delay due to one-way traffic.

- *Reduced Visibility* - The Narragansett Bay area experiences fog mostly during spring and fall months. The fog can be localized with limited visibility in the Newport area and clear visibility in the upper Narragansett Bay and Mount Hope Bay. For berthings that require tidal lift during daylight hours, fog delays could extend to 24 hours.

- *High Winds* - LNG ships present a relatively high wind sail area and their operation in narrow waterways requires specific controls. Based on an analysis of wind data recorded by the PORTS station at Borden Flats, the prevailing winds in Mount Hope Bay are from the southwest and blow almost parallel to both the main channel and to the transit through Brightman Street Bridge. Northeast Marine Pilots have reported that the relatively high ground on both sides of the channel north of the Braga Bridge generally result in reduced wind effects from the conditions recorded at Borden Flats. The most severe limiting conditions would be transverse winds experienced at the transit through

Brightman Street Bridge. The simulation program would be used to determine the limiting conditions of wind strength and direction. Based on initial simulations, Weaver's Cove Energy believes operations could be conducted safely at wind speeds up to 20 knots but that high winds may delay operations for 24 hours six times per year, and for 48 hours once per year. If, in the future, nighttime channel transit is authorized, both wind and fog delays could be reduced to 12 hours due to the availability of both daily tidal cycles.

- *Pilotage* - Northeast Marine Pilots provide pilotage of the LNG ships from the pilot boarding station at the entrance to Narragansett Bay until the LNG ship is secured in the berth at the proposed LNG terminal. As described above, a number of pilots have been involved in the simulation studies to date and additional pilots would be provided the training in the future.

- *Ice Conditions* - Ice occasionally forms on the Taunton River during winter months. During the 2002/2003 winter months, ice formation was observed across the turning basin on three occasions. In 2004, which experienced an unusually long severe cold spell during January, the Taunton River north of the Braga Bridge was completely iced over, with many aids to navigation (buoys) dragged from their station. Ice was of sufficient thickness to disrupt or delay large commercial ships. While Coast Guard icebreaking resources were required in January 2004, the proposed tractor tugs would likely be able to break through the ice formations typically experienced in the Taunton River. Under exceptional winter conditions (such as 2004), Coast Guard cutters with icebreaking capability have entered Narragansett Bay to maintain open navigation channels. Weaver's Cove Energy would seek Coast Guard assistance to supplement the proposed project's tugs in the event of unusually thick ice.

Navigation Simulation Studies

Safe navigation in the channel, including all bridge transits and turning of the LNG ship prior to departure, was evaluated using the marine vessel simulators at MSI in Middletown, Rhode Island. A select number of pilots with Northeast Marine Pilots and a former pilot experienced in LNG ship handling and tractor tug operations have been involved in a simulation program conducted for Weaver's Cove Energy. MSI modeled the navigation channel from Narragansett Bay to the LNG terminal site using data on existing LNG ships of the size and type that could be used to deliver LNG to the proposed terminal.

The MSI facility is being used by the pilots to simulate the entire passage of a 145,000 m^3 LNG ship and its attendant tugs from Narragansett Bay to the berth at the proposed ship unloading facility. The simulation program was initially used to determine the feasibility of and dredging requirements for transiting the federal navigation channel with an LNG ship, including transit through the new Brightman Street Bridge. The program is now being used to refine handling techniques, determine the optimum number and power of tugs required, and establish limiting operational parameters such as wind speed and direction.

The simulation program included rare emergency situations such as tug failure, loss of main engine power on an LNG ship, and escorting an LNG ship backwards down the channel following an aborted inward passage. All of these situations were successfully simulated and are included in a full training program that has been prepared to qualify the Northeast Marine Pilots in the handling of LNG ships and in the optimal utilization of modern tractor tugs. Only pilots who have satisfactorily completed the training course would be hired by Weaver's Cove Energy.

The simulation program evaluated the control of an LNG ship during transit through the new Brightman Street Bridge. Based on the results of these transit simulations, it was determined that transiting the bridge with an LNG ship is fully practical by the pilots who have experience with similar transits through the existing bridge. The new bridge will be equipped with protection piers or cells on approaches from both directions and a fender system on both sides of the 200-foot-wide channel opening. When raised to the open position, the roadway sections will swing upwards and outwards, clear of the channel fender line. LNG ship transit through the bridge would be conducted at a low speed of approximately 3 knots such that the energy of the ship, even in the fully loaded condition, would be less than the design impact energy capacity of the protection cells. The fender system protecting the bridge will be independently mounted at the sides of the channel and located some distance away from the main bridge structure. Weaver's Cove Energy anticipates that the sides of the LNG ships could occasionally contact the fender system panels. As a standard operating procedure, Weaver's Cove Energy would maintain a stock of spare fender panels and immediately replace any damaged panels in cooperation with the bridge owner.

The simulation program was also used to identify the benefits of relocating existing or installing additional navigational aids to enhance the margins of safety of the transits. The recommendations to date include installation of the following navigation aids: two additional buoys on the inward approach to the Mount Hope Bridge; three new buoys and a set of leads for the section of channel immediately upstream of the Braga Bridge; and four new buoys in the section north of the new Brightman Street Bridge, including the expanded turning basin. Weaver's Cove Energy also proposes to finance the installation of a PORTS buoy or equivalent data transmitting device at a location adjacent to the proposed ship unloading facility and turning basin. The nearest PORTS buoy is on Borden Flats at the confluence of the Taunton River channel and the private side channel that serves the Brayton Point Power Plant. The pilots would be equipped with hand-held receivers that allow them to access PORTS data from ships they are piloting. Real-time information from the existing and proposed buoys would be beneficial to navigation in the navigation channel from Borden Flats to the proposed berth.

4.12.5.2 Requirements for LNG Ship Operations

The arrival, transit, cargo transfer, and departure of LNG ships in Narragansett Bay would adhere to the procedures of Operations and Emergency Manuals to be developed by Weaver's Cove Energy in consultation with the Coast Guard Marine Safety Office, Providence, Rhode Island. These procedures would be developed to ensure the safety and security of all operations associated with LNG ship transit and unloading. The manuals would contain specific requirements for the LNG ship, pre-arrival notification, transit through Narragansett Bay, the waterfront facility, cargo transfer operations, Coast Guard inspection and monitoring activities, and emergency operations. The Coast Guard Marine Safety Office Providence would monitor each LNG ship in accordance with these manuals.

Some of the anticipated key provisions of the manuals would be the establishment of a moving safety and security zone for all inbound, outbound, and moored LNG ships; the use of a minimum of three tugs to assist in the Taunton River and to maneuver the ship into the berth; and one tug to remain with the LNG ship while it is moored at the berth.

The Coast Guard regulations in 33 CFR 127, apply to the marine transfer area of waterfront facilities between the LNG ship and the last manifold or valve located immediately before a storage tank. Further, title 33 CFR 127 regulates the design, construction, equipment, operations, inspections, maintenance, testing, personnel training, fire fighting, and security of LNG waterfront facilities. The safety systems, including the communications, emergency shut down, gas detection, and fire protection must comply with the regulations in 33 CFR 127. Under 33 CFR 127.019, Weaver's Cove Energy would

be required to submit two copies of its Operations and Emergency Manuals to the Captain of the Port Providence.

Title 33 CFR 127 separates cargo transfer operations into three distinct phases: Preliminary Transfer Inspection (section 127.315); Declaration of Inspection (section 127.317); and LNG Transfer (section 127.319). These different sections require specific actions to be completed prior to and during the transfer. Additionally, there are specific actions required in the case of a release of LNG (section 127.321).

In accordance with 33 CFR 127.007, Weaver's Cove Energy submitted a Letter of Intent to the Coast Guard on May 12, 2004, conveying its intention to build an LNG facility at the proposed site. On September 1, 2004, the Coast Guard issued a notice in the Federal Register requesting comments on the maritime operation and waterways management aspects of the proposed LNG facility. The original comment period ended on November 1, 2004, and was subsequently extended to January 25, 2005 in response to public requests for additional time to comment on the proposal. Additionally, the Coast Guard Captain of the Port Providence held a public meeting on December 7, 2004, to receive direct public input on the proposal. Upon completion of its review, the Coast Guard would issue a Letter of Recommendation to address the suitability of the Narragansett Bay and the Taunton River for LNG transport with regard to the following items:

- density and character of marine traffic;
- locks, bridges, or other manmade obstruction;
- depth of water;
- tidal range;
- protection from high seas;
- underwater pipes and cables; and
- distance of berthed vessels from the channel, and the width of the channel.

While the Letter of Recommendation would address the suitability of Narragansett Bay and the Taunton River for LNG ship transportation, it would not constitute a final authority to commence LNG operations. It is anticipated that the Coast Guard will decide on a Letter of Recommendation as soon as possible after the Commission issues the final EIS, or wait until after the Commission makes an overall public interest determination of the proposal. Issues related to the public impact of safety and security or exclusion zones are addressed later in the development of the Coast Guard's LNG Vessel Transit Security Plan. An initial plan has been developed in conjunction with state and local law enforcement communities. In addition, the Coast Guard would establish a safety and security zone under 33 CFR 165 for LNG vessels in transit and while docked. Only personnel or vessels authorized by the Captain of the Port are permitted in the safety and security zone.

Results of Coast Guard Security Workshops

The Coast Guard recently completed a series of project-specific security workshops with port stakeholders and federal, state and local agencies. The workshop participants identified measures that would be necessary to responsibly manage the risks associated with LNG traffic. These measures complement the Maritime Transportation Security Act regulations enacted on July 1, 2004. The Coast Guard has identified protocols to mitigate specific risks and created an initial Vessel Transit Security Plan, which will become the basis for appropriate security measures for each Maritime Security threat level. Prior to the LNG vessel being granted permission to enter Narragansett Bay, 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 Security Code, and the security protocols established by the Captain of the Port in the Vessel Transit Security Plan.

To help gauge local concern with the safety and security of LNG shipments to Rhode Island, the Coast Guard Captain of the Port initiated a series of security workshops beginning in December 2004 with federal, state, local and industry law enforcement stakeholders to weigh preventative measures. Participants considered competent industry studies from ABSG and Sandia National Laboratories to help validate a vulnerability assessment submitted by the applicant. After weighing their concerns, the group was able to identify specific protocols to mitigate risk, which became the baseline for security planning.

As a result of these workshops, the Coast Guard has identified additional resources, public and/or private, to provide suitable afloat, underwater, landside, and aviation security or surveillance capabilities to implement prevention and mitigation strategies necessary for LNG operations. These resources are not currently available in the Captain of the Port Providence area of responsibility. A detailed security plan describing the resources and prevention/mitigation strategies has been provided to the FERC. The plan includes an offshore security sweep by a Coast Guard boarding team, aerial surveillance, and an escort to the dock by armed security boats to enforce a safety and security zone. While the vessel is at the dock, the plan would include a combination of resources including Coast Guard security boats with state and local police details to complement the Facility Security Plan (see section 4.12.7). The details of this security plan have been designated Sensitive Security Information as defined in Title 49 CFR Part 1520. Because any unauthorized disclosure of this plan could be employed to circumvent the security measures, it is not releasable to the public. Additionally, any security plan is a dynamic document that is subject to change with advances in technologies and improvements in intelligence gathering.

The security plan is robust and necessary considering the demographics and configuration of both the transit route and the marine terminal site. Several concerns were raised about the necessity for bridge closures during the transit. The workshop participants have determined it is not necessary to close the bridges unless the threat condition or current intelligence raises a concern about security issues. The law enforcement agencies in the region have demonstrated the capability to manage a bridge closure during transits of LPG vessels in the past. Maintaining that capability is built into the present security plan, should it be required, but this option will only be executed when absolutely necessary.

During the public meetings, several people commented on the cost of applying additional security measures and the potential burden on local taxpayers. To meet its anticipated security responsibilities in Rhode Island, the Coast Guard initiated a formal proposal for additional resources through its internal budgeting process for inclusion in the 2006 appropriations bill. A determination on that proposal is pending. To address the expense for state and local resources, the applicant has proposed to fund un-reimbursed state and local security costs just as the Everett Terminal does today.

We recognize that the initial Vessel Transit Security Plan is a dynamic document that has been prepared well before import operations would commence, and that the port's overall security picture may change over that time period. 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:**

- **Weaver's Cove Energy should annually review its waterway suitability assessment for the project; update the assessment to reflect changing conditions; provide the updated assessment to the cognizant Captain of the Port/Federal Maritime Security Coordinator for review and validation; and provide a copy to the FERC staff.**

Impact of Vessel and Facility Security Requirements

The potential impacts to other commercial and recreational boaters can be evaluated for several general security requirements: 1) moving safety and security zones for inbound and outbound LNG

vessels; 2) safety and security zones around a moored LNG vessel; and 3) other measures as deemed appropriate. About 50 to 70 cargo deliveries per year would average about once per week for each inbound and outbound transit. For the upper limit of 70 cargo deliveries per year, the impact would be once every 5 days.

Applying a moving safety and security zone would restrict other vessels 2 miles ahead, 1 mile behind, and approximately 1,500 feet on either side of the LNG vessel. The Captain of the Port currently places similar restrictions on all high-interest vessels by regulation in 33 CFR 165.121. The LNG ships would transit 21-nautical-miles from the entrance of the Narragansett Bay at Brenton Point to the Weaver's Cove LNG terminal. For the first half of this trip, an LNG vessel would travel at an average speed of 10 knots. The LNG vessel would then slow to an average speed of 5 knots from Sandy Point to the Braga Bridge. After that point, it would travel at an average speed of 3 knots through the final 2 nautical miles of the transit. Based on these assumed speeds, it would take about 4 hours for LNG ships to complete the 21-nautical-mile trip from the entrance to the Narragansett Bay at Brenton Point to the proposed LNG terminal. Minimum visibility conditions would have to be satisfied before the LNG ship would be allowed to proceed inbound from the ocean, ensuring that the Coast Guard could adequately monitor the safety and security zone.

The application of the safety and security zone on land has minimal impact. The regulation provides the Coast Guard and local law enforcement personnel with the authority to implement additional control measures within the zone, such as check points, should such action be warranted based on a specific threat or credible intelligence. Additionally, it is important to note that the requirements of 33 CFR 165.121 were designed to apply to any high-interest vessel transiting Narragansett Bay and does not give consideration to safety or security measures that may be applied to mitigate risk. Considering the robust security plan that was devised during the Coast Guard-sponsored workshops, it is likely that LNG-specific security zone regulations will be promulgated.

The Coast Guard would establish a safety and security zone around the Weaver's Cove Energy marine terminal when an LNG vessel is at the dock. The Coast Guard has not defined the size of a restricted zone around a docked LNG ship but has stated that it would make every effort to minimize disruptions to other waterway users. The Coast Guard security zones for this project would not be treated as absolute exclusion zones that would preclude all other vessel movements. Rather, other commercial and recreational vessels may be allowed to transit through the security zones with the permission of the Captain of the Port.. It is also anticipated that any security zone which may be applied to the facility when the unloading berth would be unoccupied would be much smaller and would not adversely impact regular river traffic.

With respect to a 3,000-foot "land and sea" security zone around an LNG vessel at the dock, the Coast Guard has developed a vessel transit security plan that provides the desired level of security without creating unnecessary restrictions (i.e. closing the waterway and evacuating all persons within a 3,000-foot radius would not be acceptable procedures). A number of issues were identified during scoping and the draft EIS comment period regarding the potential of bridge closures: the impact of traffic backups on local roads and highways; compensation for time-sensitive shipments; method of notice; the impact of bridge closures on the ability of emergency vehicle to access Fall River hospitals.

The Coast Guard has completed a series of security workshops involving federal, state and local officials representing law enforcement and emergency response agencies, as well as stakeholders in the maritime community. As part of the review of the LNG vessel transit through Narragansett Bay to the terminal on the Taunton River, the Coast Guard considered what security measures are needed, which may or may not include an order to close one or more of the bridges along the vessel route (see table 4.12.1-1). While bridge closures are one of the many tools available to the Coast Guard, it should not be

assumed that routine bridge closures would be mandatory. Other alternatives to a complete bridge closure under consideration include closing the outboard lanes only, placing law enforcement officials on the bridge at strategic locations, or employing technology that provides suitable security alternatives. We are aware that the Pell (Newport) Bridge has been closed on occasion to vehicular traffic during the passage of LPG ships (the closure lasts about 5 to 7 minutes). Since the new Brightman Street Bridge will be a bascule-type bridge, it must be closed to allow the passage of large ships including LNG vessels, regardless of other security concerns.

The Braga Bridge is approximately 8,000 feet or 1.5 miles south of the new Brightman Street Bridge. If it is determined that the Braga Bridge needs to be closed during ship transit, Weaver's Cove Energy has indicated that it would adjust its ship transit plans to prevent the simultaneous closings of the two bridges. This could be accomplished by slowing or briefly halting the vessel between the two bridges, thereby allowing the vessel to completely clear one bridge with traffic flow resuming before the Brightman Street Bridge is opened to accommodate passage of the ship. Recognizing that closure of both the Braga and Brightman Street Bridges at the same time would temporarily deny emergency vehicle access to Fall River hospitals, **we recommend that:**

- **any security plans make allowance to have at least one of the Braga and Brightman Street bridges remain open during the passage of LNG vessels through the federal navigation channel in the Taunton River and that consideration be given to scheduling bridge closures to avoid peak traffic periods.**

Weaver's Cove Energy completed a traffic analysis to identify the potential impacts on traffic if the Pell (Newport) Bridge, Mount Hope Bridge, Braga Bridge, and Brightman Street Bridge are closed during passage of LNG ships (see section 4.9.4). The study used an automated traffic recorder to quantify the regional traffic using these bridges. In addition, these traffic counts were used to estimate potential delays and queuing (back-up) distances at the bridges based on how long each bridge might be closed to traffic. Table 4.9.4-1 in section 4.9 lists the traffic volume at each bridge and the potential maximum distance and average duration of traffic back-ups in the event that the bridges would need to be closed to all traffic during passage of LNG ships.

As shown in table 4.9.4-1, the potential impacts on traffic are expected to be minor in the event that the three fixed bridges are closed during passage of LNG ships. At the Pell (Newport) Bridge, the longest average traffic delay would likely occur in the westbound lanes during weekday evenings, with traffic backing up onto the Route 114/138 on-ramp (4.9 minutes). At the Mount Hope Bridge, the longest average traffic delays would likely occur during weekday evenings in the southbound lanes at the approach to the bridge (6.2 minutes). At the Braga Bridge, the longest average traffic delays would likely occur during weekday evenings in the eastbound lanes (6.4 minutes). The longest estimated average traffic delays at the new Brightman Street Bridge would be 12.1 minutes both during weekday mornings in the eastbound lanes, with traffic backing onto Route 138, and in the westbound lanes with traffic backing onto the Davol Street ramp. However, the delays at the Brightman Street Bridge would be similar to those that occur associated with the current transit of coal vessels and the previous transit of large oil tankers. In addition, as discussed above, because the new Brightman Street Bridge would have a higher vertical clearance, the number of openings of the new bridge is expected to be substantially lower, even with the addition of 50 to 70 LNG ships per year.

The moving safety and security zone and the safety and security zone at the terminal may affect other commercial, ferry, and recreational traffic using the bay and river. The magnitude of the effect would also be influenced by three other factors: the amount of time it takes to obtain a pilot, other competing ship traffic in the federal navigation channel, and interaction with ferry traffic.

In some areas, the moving safety and security zone could delay the passage of other ships. This presently occurs with LPG vessels which can sometimes delay other vessels using the East Passage or federal navigation channel as they wait or anchor at suitable locations to allow the LPG ship to pass. It is expected that if both the Weaver's Cove Energy and KeySpan LNG terminals are constructed, as many as 100 to 130 LNG ships could potentially move in and out of Narragansett Bay every year. The inbound and outbound traffic of LNG ships moving through either Providence or Fall River could delay other commercial ships in the area.

KeySpan LNG and BG LNG retained MNI to assess the potential impacts of LNG shipping on commercial marine traffic in the Narragansett Bay. MNI reports that about 720 commercial vessels transit the bay each year, and approximately 3 percent of these vessels already experience some delay due to the existing traffic. MNI estimates that if the KeySpan LNG facility was receiving its proposed shipments, a total of about 5 percent of commercial ships using the Narragansett Bay may experience some delay each year. MNI also states that if both the Weaver's Cove Energy and the KeySpan LNG terminals were receiving their proposed shipments, a total of about 6 percent of commercial vessels using the bay may be delayed each year.

Although the traffic impacts due to ships proposed for the Weaver's Cove Energy project were not studied separately, these ships would be expected to have less impact than those analyzed for the KeySpan LNG Facility Upgrade Project. Most commercial vessels using the Narragansett Bay transit to and from Providence and, therefore, would only need to wait for a Weaver's Cove LNG ship while it passed between Sandy Point and the entrance to the Narragansett Bay. A commercial vessel attempting to travel in the opposite direction of an LNG ship in this area may experience a delay of up to about 1 to 1½ hours. However, as is currently done for LPG vessel transits to/from Providence, the ship's agent, the Northeast Marine Plots, and the Coast Guard work together to schedule transits to minimize disruptions to other commercial traffic. Since additional security measures have been implemented for LPG transits post 9/11, there have been no complaints from commercial vessel operators regarding undue or unnecessary delays during LPG transits. The impact on ferry traffic would generally be small because most of the ferry routes only cross the LNG ship route and conflicts could be managed by schedule coordination. The impact on the Providence to Newport ferry could be more significant because the ferry and LNG ships would travel along the same route for several miles. MNI identified this potential conflict in its study and suggested that the impact could be reduced if the Coast Guard allows the ferry to operate outside of the channel and overtake or pass the LNG ship in transit at specific locations. The Coast Guard has indicated that it may grant permission for the ferry to pass the LNG ship or transit through portions of the security zone.

Commercial fishing boats might also be affected by the security zones imposed by the Coast Guard as LNG ships transit the federal navigation channel, particularly if the width of the security zone encompasses the entire width of the waterway. However, the security zone would be a moving zone around the ship, so these impacts would be temporary and of short duration at any given point along the shipping route. In addition, depending on their individual drafts, commercial fishing boats might be able to go around the LNG ships at points that are sufficiently wide for them to be outside of the security zone. To mitigate the impacts of security zones, the Coast Guard would routinely provide Notice to Mariners prior to the arrival and departure of LNG ships as the Coast Guard currently does for LPG vessels and for other activities such as the Tall Ship parades. The notification system employed for safety and security zones consists of broadcasts on radio frequencies used by mariners. This notification may be given from minutes to more than 1 hour before the security zone is enforced. Broadcasts are intentionally not made further in advance for security reasons. Picket boats would also precede the LNG ship to inform vessels of the approaching security zones.

Operation of the LNG terminal could also affect recreational boating and fishing during the weekly transit and unloading of the LNG ships. The safety and security zone around a moored LNG ship may prevent recreational boaters from boating or fishing in the vicinity of the moored ship for approximately 24 hours. In many areas, the waterway that would be traveled by the LNG ships is sufficiently wide to allow recreational craft, which generally are not confined to the federal channel, to navigate around the LNG ships without significant delay. To estimate what kind of delay might result from a passing LNG ship in areas where the waterway is narrower, we identified the locations where the moving safety and security zone has the greatest potential to encompass the entire width of the waterway. We specifically looked for areas where there might be less than approximately 1,500 feet of open water on both sides of the LNG ship route (the anticipated width of the safety and security zone on either side of the ship). These areas include the East Passage between Newport and Jamestown, the Mount Hope Bridge area, and the Taunton River. For an LNG vessel in transit at 10 knots, recreational craft attempting to travel in the opposite direction at a narrow location may need to wait up to 18 minutes for the LNG ship to pass before proceeding on its way. For an LNG vessel in transit at 5 knots, recreational vessels may be delayed for up to 36 minutes. When an LNG vessel would be traveling between the Braga Bridge and the proposed LNG terminal at an average speed of 3 knots, the delay may be up to 60 minutes for boaters docked alongside the Taunton River downstream of the facility. For boaters near or upstream of the facility, an additional 60 minute delay may be experienced while the LNG vessel would be berthed or turned.

The extent of the impact on recreational boaters would depend on the number of boats in the project area during the 50 to 70 days per year that LNG vessels would call on the LNG terminal. These impacts would primarily occur during the peak recreational boating season between about May and September. As noted above, the Coast Guard is expected to use a program of announcements to give advance notice of approaching LNG ships. Weaver's Cove Energy has stated that it is willing to consider limiting ship transits during peak recreational traffic weekend hours and using early morning periods, subject to tidal conditions. With the agreement of the Coast Guard and the pilots, Weaver's Cove Energy would also look to eventually using nighttime transits for the LNG ships, which would further reduce the impact to boaters.

Several commentors have expressed the concern that local communities would have to bear some of the costs of ensuring the security of the LNG facility and the LNG vessel while in transit and unloading at the dock. In response to the need for increased resources, the Marine Safety Office Providence has submitted a Resource Change Proposal to Coast Guard Headquarters that outlines the additional resources required by the local Coast Guard. The potential costs to the states and local communities have not yet been estimated. However, as an indication of these costs, KeySpan LNG has estimated state and local security costs for LNG deliveries to Providence at $40,000 to 50,000 per trip, based on the resources required in the Coast Guard's Vessel Transit Security Plan. The security practices presently employed to secure the LNG vessel transit through Boston Harbor to the Distrigas facility in Everett, Massachusetts, also provide an indication of the potential magnitude of the costs involved. A recent report for Congress (Parfomak, 2003) indicates that the security costs per ship to the Everett facility are approximately $80,000, of which $37,500 is covered by state and local governments. Weaver's Cove Energy suggests that it should be held to a standard similar to that agreed to by Distrigas in respect of Distrigas' LNG terminal in Everett, Massachusetts. Both pre- and post-9/11, Distrigas has underwritten the entire cost of fire and police details provided by the City of Everett at the Everett marine terminal during the unloading of LNG tankers. Distrigas and the Massachusetts Office of Public Safety agreed on a cost sharing proposal regarding increased state expenditures associated with enhanced security measures. Although it has not seen the contents of this agreement, Weaver's Cove Energy believes it should be possible to enter into a similar agreement covering the proposed security operations at the Fall River location and during the transit of Narragansett Bay. Nevertheless, to better define the potential burden on the local communities, **we recommend that:**

- **Weaver's Cove Energy provide a comprehensive 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. This plan should be filed with the Secretary <u>prior to initial site preparation</u> for review and approval by the Director of OEP.**

4.12.5.3 LNG Ship Safety

Since 1959, LNG has been transported by ship without a major release of cargo or a major accident involving an LNG ship. Starting in 1971, LNG began arriving at the Distrigas facility in Everett, Massachusetts. To date, more than 450 cargoes, with volumes ranging from 60,000 to 125,000 m^3, have been delivered into the Port of Boston without incident. During 2003, a total of 506 billion cubic feet (204 cargos) of LNG was imported into the United States. For 30 years, LNG shipping operations have been safely conducted in the United States.

The world's LNG ship fleet numbers 151, with an additional 57 ships contracted for delivery by 2006. During the last 40 years, LNG ships have made over 33,000 voyages and safely transported over 2.72 billion cubic meters of LNG. This includes over 1,500 voyages to or from United States ports. Currently, all of the ships in the LNG fleet operate under a foreign flag with foreign crews. A foreign flag ship must have a Certificate of Compliance inspection by the Coast Guard to ensure compliance with International safety standards.

History

During the 33,000 voyages that have been completed since the inception of LNG maritime transportation, there have been only eight significant incidents involving LNG ships, none of which resulted in spills due to rupturing of the cargo tanks. These 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.

- ***Mostafa Ben Boulaid*** had a check valve fail when unloading at Cove Point, Maryland, in April 1979, releasing a small quantity of LNG onto the ship and causing some minor fracture of the deck plating. Activation of the ship's safety systems (i.e., the emergency shutdown system and water spray system), along with excellent response of the crew, kept the incident from propagating, thus minimizing any serious damage.

- ***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 ship and delivered to its United States destination.

- ***LNG Libra's*** propeller shaft fractured while the ship was en route to Japan with a full cargo in October 1980. The ship was taken under tow, and the cargo was safely transferred to another LNG ship and delivered to its 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 from its docking berth at Skikda, Algeria in February 1989 during severe winds 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.

- ***Norman Lady*** was struck by the USS Oklahoma City nuclear submarine while rising to periscope depth near the Strait of Gibraltar in November 2002. The 87,000 cubic meter LNG tanker, which had just unloaded its cargo at Barcelona, Spain, sustained only minor damage to the outer layer of its double hull but not to its cargo tanks.

There have also been some incidents that involved the release of small quantities of LNG, such as minor leaks from seals and gaskets, some of which required that operations be temporarily stopped in order to rectify the malfunction.

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 ships 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 ships to prevent or control all types of potential incidents.

The insulation of cargo tanks on LNG carriers is a complex assembly of many layers. The relief valve capacity of LNG carriers is designed to compensate for over-pressure caused by fire. The potential that impingement by a cryogenic liquid could cause brittle fracture of the ship's hull was known to the Coast Guard in the mid-1970s when the U.S. regulation for LNG carriers in 49 CFR Part 154 were being developed. Accordingly, the regulations require the use of special crack-arresting steel in strategic locations throughout the vessel's hull. LNG carriers used in U.S. waters must also be constructed in accordance with the IMO Code for the Construction and Equipments of Ships Carrying Liquefied Gases in Bulk. This standard requires that the vessel inner hull adjacent to the cargo tanks be protected against contact from liquid cargo through a combination of proper material selection, adequate insulation, and use of heating systems.

As required by the IMO conventions and design standards, hold spaces and insulation areas on an LNG carrier 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 carriers 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 carriers are fitted with dry chemical powder-type extinguishing systems and CO_2 smothering systems for fighting fires.

Unlike many conventional crude oil tankers, all LNG ships used to deliver LNG to this 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 ship. An earlier Federal Power Commission (FPC, predecessor to the FERC) study estimated that the double-bottom of an LNG ship would be sufficient to prevent cargo tank penetration in about 85 percent of the cases that penetrated a single-bottom oil tanker.

The probability of an LNG ship 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 FPC study estimated 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 ship at berth (FERC, 1996). The analysis assumed a 125,000 m^3 LNG ship 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 ship for a range of potential collision angles. The resulting minimum striking speeds are presented in table 4.12.5-2 for the two principal cargo systems.

TABLE 4.12.5-2

Minimum Striking Speed to Penetrate LNG Cargo Tanks

	Minimum Striking Speed (knots)	
Angle of Impact	Spherical Tanks	Membrane Tanks
Greater than 60 degrees	4.5	3
45 degrees	6.3	4
30 degrees	9	6
15 degrees	18	12

For membrane tanks, the critical beam-on striking speed is 3.0 knots, and for spherical tanks, the critical on-beam 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 shows the critical speed necessary for a 20,000-ton vessel to puncture the outer hull of an LNG carrier 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 or the release of LNG.

Hazards

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 under water 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 the effects of dispersion would dilute the vapors below the lower flammable limit for methane. The maximum range of potentially flammable vapors (i.e., the distance to the lower flammable limit) 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 segment of the transit from the mouth of Narragansett Bay through the East Passage to Sandy Point is relatively wide and deep. From Sandy Point through Mount Hope Bay and up the Taunton River to the LNG terminal site, the federal navigation channel has an authorized depth of 35 feet and a minimum width of 400 feet. The generally even and soft bottom without rocky protrusions makes an LNG spill from cargo tanks highly unlikely in a grounding incident.

The final EIS for the Calcasieu LNG Project (Lake Charles, LA) (September 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/hr-ft^2 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 re-examined 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. 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 only applied 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.

During the past year, 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 conservative assumptions among the various parties. 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 Consultants 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. Further, 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 Carriers*, 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. The revised study provides the methodology 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 a unconfined spill on water; 4) thermal radiation distances for LNG pool fires on water; and 5) and flammable vapor dispersion distances.

A detailed evaluation of the consequences of a terrorist attack on a modern membrane LNG tanker was prepared by Lloyd's Register North America for the Weaver's Cove LNG Project and filed under CEII. The study evaluated the consequences of attacks on an LNG ship 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 of the inner hull at the waterline was found to be the average most probable "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 used to investigate damage scenarios for a loaded LNG tanker.

In December 2004, the DOE released a study by Sandia National Laboratories, *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*. The 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. The analysis of accidental events found that groundings and low speed collisions could result in minor ship damage but not a cargo spill; while high speed collisions could cause a 0.5 to 1.5 m^2 cargo tank breach area. 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 of more than 5 to 7 m^2, which is a more appropriate range to use in calculating potential hazards from spills.

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 (5,250 feet). Large, unignited LNG vapor releases were found to be unlikely, but could extend to 2,500 meters (8,200 feet) for nominal 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 or 6,300 to 6,825 feet), but would increase the expected fire duration. Rapid phase transitions are possible for large spills but the effects would be localized near the spill source and should not cause extensive structural damage.

The methodology described in the ABSG study and revised in staff's responses to comments was used to calculate the thermal radiation and flammable vapor dispersion distances for several holes ranging

in diameter from 1 to 3.9 meters. Based on the penetration of the largest cargo tank of a 140,000 m^3 LNG ship, a potential spill of 23,000 cubic meters 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. Thermal radiation calculations are based on an ambient temperature of 50º F, a relative humidity of 50 percent, and a 20 mile per hour wind speed.

TABLE 4.12.5-3

LNG Spills on Water

LNG Release and Spread				
Hole Diameter	1.0 meter	2.5 meters	3.0 meters	3.9 meters
Hole Area	0.8 square meters	5 square meters	7 square meters	12 square meters
Spill Time	94 minutes	15 minutes	10.6 minutes	6.1 minutes
Pool Fire Calculations				
Maximum Pool Radius	340 feet	817 feet	935 feet	1,103 feet
Fire Duration	94 minutes	15 minutes	10.8 minutes	6.5 minutes
Distance to:				
1,600 Btu/ft^2-hr	2,200 feet	4,340 feet	4,810 feet	5,476 feet
3,000 Btu/ft^2-hr	1,710 feet	3,330 feet	3,701 feet	4,206 feet
10,000 Btu/ft^2-hr	1,040 feet	1,970 feet	2,174 feet	2,459 feet

Flammable vapor dispersion calculations were based on an ambient temperature of 50º F, 50 percent relative humidity, a 4.5 mph wind speed and atmospheric stability class F. Based on a 1-meter diameter hole, an unignited release would result in an estimated pool radius of 420 feet. The unignited vapor cloud would extend to 9,030 feet to the lower flammability limit and 12,300 feet to one half the lower flammability limit. It is important to identify certain key assumptions of conditions that must exist in order to achieve the maximum 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 its maximum distance over land surfaces without encountering an ignition source, and subsequently burning back to the source. Flammable vapor dispersion for larger holes was not performed since, realistically, the cloud would not even extend to the maximum distance for a 1-meter diameter hole before encountering an ignition source.

The inbound transit through the East Passage of Narragansett Bay would pass by Newport and Middletown, Rhode Island on the east side, and Jamestown on the west. After turning at Sandy Point, the LNG vessels would pass by Bristol and in the vicinity of the Mount Hope Bridge. The transit within the federal channel through Mount Hope Bay and the Taunton River would pass by Woodman Street and the south of Fall River, the State Pier near the center of Fall River, and the Braga Bridge, and Somerset. Some areas of development along the shoreline in these communities could be within a potential transient hazard area during the LNG vessel transit; while parts of North Fall River would be exposed to a potential hazard while the LNG vessel is at the dock and unloading cargo.

Assuming an LNG vessel would transit the Taunton River at 3 knots while under tug assist, the adjacent communities located within the 4,340 to 4,810-foot distance to the 1,600 Btu/hr-ft^2 thermal radiation level for a nominal 2.5 and 3-meter diameter hole would be exposed to a potential transient hazard for less than 30 minutes. While transiting the East Passage to Sandy Point at 10 knots, the

transient hazard to shoreside communities would be less than 10 minutes. In addition, a temporary hazard would exist around the slip during part of the 10- to 12-hour period while the LNG vessel is at the dock and unloading cargo. For a spill in the vicinity of the dock, approximately 1,600 to 2,100 buildings, including primarily single-family residences but also some multi-family units, would be within this temporary hazardous area. Also located in this area are the William J. Wiley Elementary School, the Highlander Rehab and Nursing Center, the Pleasant View public housing project, the Border City Mills apartment building, and a MassHighway facility.

In addition, the potential impact on infrastructure and industrial development was also evaluated. A thermal radiation level of 10,000 Btu/ft^2-hr is associated with potential damage to equipment and infrastructure. A fire associated with a potential spill in the vicinity of the Weaver's Cove Energy dock, resulting from a nominal cargo tank hole of an intentional event could expose the Somerset power plant, the proposed LNG storage tank, approximately ½ mile of Route 79, and ½ mile of proposed commuter rail to a thermal radiation level of 10,000 Btu/ft^2-hr for 10- to 15-minutes.

For potential spills at the new Brightman Street Bridge and the Braga Bridge, the number of residences, buildings, schools and other facilities located within the 1,600 Btu/ft^2-hr transient hazard area would be approximately 1,600 to 2,300 and 1,200 to 1,600, respectively. At Fall River near Woodman Street, approximately 800 to 1,200 residences would be located in the transient hazard area. Approximately 100 to 300 residences and buildings, including the Roger Williams University Bristol campus, would be located in the transient hazard area at the Mount Hope Bridge. The western-most portions of the U.S. Naval Station in Newport, including the track and field area, would also lie within a 1,600 Btu/hr-ft^2 transient hazard area. The transient hazard area from an LNG vessel spill in the main channel of the East Passage in the vicinity of Newport and Jamestown would not affect most shoreside areas. However, potential spill locations in deepwater areas outside the main channel and closer to shore were also evaluated. For a spill outside the normal route, an estimated 660 to 720 and 420 to 610 residences in Jamestown and Newport, respectively, would fall within these potential transient hazard areas.

The operational restrictions to be imposed by the Northeast Marine Pilots on LNG vessel movements through this area, as well as the requirements that the Coast Guard would impose in its operating plan will minimize the possibility of a hazardous event occurring along the vessel transit.

By focusing on the "worst case" intentional breach scenarios 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 estimated "worst case" intentional breach scenarios should not be misconstrued as defining an exclusionary zone. Rather they provide guidance in developing the operating restrictions for LNG vessel movements in the East Passage of Narragansett Bay and the federal navigation channel in Mount Hope Bay and the Taunton River, as well as in establishing potential impact areas for emergency response and evacuation planning.

4.12.6 LNG Truck Safety

Proposed LNG Truck Operations

The proposed LNG terminal would include four outdoor LNG truck loading stations, each with a weigh scale to prevent overfilling. The truck loading area would be equipped with multiple safety

features, both passive and active. Hazard detection would include combustible gas detectors, low temperature sensors potential spill areas, and UV/IR flame detectors. Hazard control would include wheeled and hand-held dry chemical fire extinguisher and fire water hydrants and monitors. Potential LNG spills would be contained and drained by trenches to a remote impoundment sump. Each trailer would also have a high-level petcock to check the LNG level inside the trailer during filling.

The facility is designed to load a maximum of 100 LNG trucks per day; however, an average of about 50 LNG trucks per day would be the normal usage. In comparison, the former use of the site as a petroleum products distribution facility is estimated to have generated up to 210 trucks per day.

The LNG trucks would enter and exit the highway system via the existing plant entrance and exit ramp off Route 79, directly across Main Street from the plant entrance. This is the same route previously used by petroleum product tankers and no change in road geometry is required to accommodate the LNG trucks. Leaving the site, trucks would have direct access to Routes 79 and 24 and Interstate 195. The trucks loaded at these stations would provide an alternative source of LNG for many of the satellite facilities throughout the Northeast that are presently served by the Distrigas LNG facility, as well as a potential source for industrial customers.

LNG Truck Operations in New England

The transportation of LNG by truck from the Distrigas LNG import terminal in Everett, Massachusetts began in 1971. Approximately 250,000 LNG trucks have been loaded at the facility through the end of calendar year 2001 (see table 4.12.6-1). For the 31-year period, this represents an annual average of 8,056 trucks per year. However, the number of LNG truck loadings can vary significantly from year to year, depending on the severity of the weather and the number of LNG ship cargoes delivered to the Distrigas LNG terminal.

TABLE 4.12.6-1

LNG Truck Loadings at the Distrigas LNG Terminal

Year(s)	Trucks	Max/Year
1971-1979	43,694	
1980-1989	95,027	15,656
1990-1999	83,613	12,885
2000-2001	27,397 a/	16,813 a/
Total	249,731	

a/ Estimated from MMBtu truck sendout data.

LNG deliveries by truck have been made to approximately 25 facilities in the northeast, including LNG peakshaving plants, as well as to large and small satellite plants. While the majority of the deliveries are made to facilities in Massachusetts, Rhode Island, and Connecticut, more distant trips are made north to Lewiston, Maine and south to McKee City, New Jersey. The mean distance between Distrigas and the receiving plant is 70 miles.

One of the satellite facilities presently supplied by Distrigas is the Commonwealth Gas LNG plant in Fall River, which receives an average of 200 LNG truck deliveries per year. Loaded LNG trucks from Everett travel south on Route 24 to Fall River, and follow Route 138 to Bradford Avenue to the terminal site on Bay Street.

Restrictions on LNG trucking have been imposed by some local authorities: curfews when children are arriving or leaving school; routing to avoid congested main streets; avoiding certain bridges where a preferred alternative exists; parking restrictions; and prohibition from tunnels. Restrictions on LNG trucking in Fall River have not been established.

When LNG trucking commenced in 1971, six trucking companies served the Distrigas trade. That number subsequently dropped to two, with well over 90 percent of the Distrigas trade handled by Transgas of Lowell, Massachusetts with the remainder by L.P. Transport of Chester, New York.

LNG truck drivers receive one week of training specific to LNG operations. A licensed, experienced, newly hired driver receives a one day classroom session and one day of hands-on truck yard training, followed by three days of on-the-road operation with a fully qualified and experienced LNG truck driver as co-pilot. The "Transgas LNG Safety Handbook" serves as the basic instructional material.

Since May 1983, LNG transporters and operators of storage facilities have participated in an emergency response cooperative agreement -- "LNG Trucking Emergency Response Plan for New England," sponsored by the New England Gas Association. The plan, which has undergone several revisions, divides New England into 15 zones, each having a designated response company with the capability of responding to an LNG trucking emergency with qualified personnel and specialized equipment. The main objectives of the plan are to:

- Provide initial information on the characteristics of LNG;
- Provide a means of contacting personnel trained in the safe handling of LNG and in the proper techniques of handling a damaged LNG truck;
- Identify technical resources available to local authorities responding to the scene of an LNG truck emergency;
- Provide a framework for "responding companies" in the Voluntary Assistance Agreement, which defines the roles and obligations of participating New England shippers, LNG terminals, and LNG truck carriers; and
- Serve as the LNG Truck Emergency Preparedness Plan.

The organization of the plan incorporates the use of: a) LNG truck carriers; b) a zone response network; c) chemical transportation emergency center; and d) an emergency plan committee.

LNG Truck Accident History

While the history of LNG trucking has been free of major incidents, the possibility of an LNG truck accident over the duration of the project cannot be discounted. Unlike conventional gasoline or oil tank trailers, LNG trailers are of a double-shell construction -- an inner tank constructed of a cryogenic alloy to contain the LNG; an outer tank of carbon steel; and an evacuated annular space containing perlite insulation. Stiffening rings are incorporated in the outer shell to improve its structural strength and prevent its collapse. A typical 11,000-gallon tanker has a length of 42 feet, an inner tank diameter of 7 feet 4 inches, and an outer tank diameter of 8 feet. LNG trailer design must comply with the requirements of 49 CFR Part 173. Drivers must meet the training requirements in 49 CFR Part 172.

The LNG trucks have a relatively high center of gravity compared to other petroleum trucks, due to the low density of LNG and the large tank diameter. This feature increases the truck's susceptibility to

over turning accidents in some situations. However, the double-shell construction provides additional damage protection to minimize the potential for a major shell failure and product release.

In 1979, the DOT sponsored a study to quantitatively evaluate the risks associated with the then-current and future levels of LNG trucking from the Distrigas LNG terminal. The study was in part a response to an approval by the DOE in 1978 for a three-fold increase of LNG imports at Everett. The final report, "Assessment of Risks and Risk Control Options Associated with Liquefied Natural Gas Trucking Operations from the Distrigas Terminal, Everett, Massachusetts," was completed by Arthur D. Little, Inc. in June 1979.

The study included an evaluation of all known LNG truck accidents in the United States from 1970 through 1977, alternatives to LNG trucking, and risk control options. While the study found the risks associated with the then-current LNG trucking operations may be fairly low, it presented a number of options which could reduce risk levels even further. It was estimated that the accident rate per mile could be reduced by 60 percent if these recommendations were followed. In fact, the accident rate has dropped by 80 percent.

Table 4.12.6-2 summarizes LNG truck accidents from 1970 through 1977 and 1978 through 2002. The accident rate of the second period decreased by approximately 80 percent compared with the first period.

TABLE 4.12.6-2

LNG Truck Accident Summary

Years	Number of Accidents	Miles Traveled (millions)	Accidents Per Year	Accidents Per Million Miles
1970-1977	13	26	1.6	0.5
1978-2002	8	81 a/	0.3	0.1

a/ Estimated for 1995 through 2002 based on trucking levels.

Rollovers, which accounted for 76 percent (16) of the accidents over the 33-year period, are attributed to the relatively high center of gravity. Only four of the accidents resulted in a loss of product, because of the additional damage protection provided by the double-shell construction. Three were relatively minor leaks from fittings or valves damaged in the accident. In the only accident involving tank damage, 20 percent of the cargo was spilled. None of the releases resulted in an ignition of vapors and subsequent fire. If an LNG truck accident were to occur along the truck route, the potential hazard would depend on the severity of the accident and whether the cargo tank or associated valves sustained damage. This in turn would determine if the evacuation of nearby residences or businesses was necessary as well as what radius to evacuate. From the historical data, LNG truck accidents have resulted in only minor spills without an LNG fire. According to the 2004 Emergency Response Guide, for a large spill of either LNG or LPG, both widely transported throughout New England, the initial evacuation of ½ mile should be considered; while an evacuation of 1 mile should be considered for a truck involved in a fire.

Although the A.D. Little study was prepared in the late 1970s, it is a comprehensive analysis that accurately depicts the LNG trade some 25 years later for several reasons: 1) the LNG trucking levels have remained within the maximum predicted in the report; 2) the LNG truck routes are essentially unchanged other than minor variations to improve safety; 3) the annual mileage has remained within the limits of the study; and 4) the destinations are essentially unchanged (except that five satellite plants in Connecticut have been taken out of service). As a result, the conclusions on the safety of LNG truck transportation

remain valid. Further, the 33 years of operation in New England without a public fatality or the ignition of LNG vapors from an LNG truck spill supports the relative safety of this mode of transportation.

4.12.7 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 33 CFR 127. Requirements for maintaining security of the marine terminal are in 33 CFR 105.

In the aftermath of the terrorist attacks that occurred on September 11, 2001, terrorism has become a very real issue for the facilities under the Commission's jurisdiction. The FERC, like other federal agencies, is faced with a dilemma in how much information can be offered to the public while still providing a significant level of protection to the facility. Consequently, the FERC has removed energy facility design plans and location information from its website to ensure that sensitive information filed under CEII is not readily available (RM02-4-000 and PL02-1-000 issued February 20, 2003).

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 these agencies, specifically with the Coast Guard to address this issue. The Coast Guard now 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 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. A Security Task Force has been created and is addressing ways to improve pipeline security practices, strengthen communications within the industry and the interface with government, and extend public outreach efforts.

In September 2002, the DOT's OPS issued non-public guidelines to LNG operators that direct them to develop new security procedures for onshore facilities. Operators were required to prepare a security plan within 6 months that responds to the five threat levels defined by the Office of Homeland Security. OPS conducts subsequent onsite reviews of the security procedures.

On October 22, 2003, the Coast Guard issued a series of six final rules, which promulgated the maritime security requirements of the Marine Transportation Security Act of 2002: Implementation of National Maritime Security Initiatives; Area Maritime Security; Vessel Security; Facility Security; Continental Shelf Facility Security; and the Automatic Identification System. The entire series of rulemakings establishes 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, all terminal owners or operators subject to 33 CFR 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 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 Office 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. 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.

4.12.8 Pipeline Facilities

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 degrees Fahrenheit 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.

4.12.8.1 Safety Standards

The DOT is mandated to provide pipeline safety under Title 49, U.S.C. Chapter 601. The Pipeline and Hazardous Materials Safety Administration's (PHMSA) 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. The PHMSA 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 Weaver's Cove LNG 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 on at least 5 days a week for 10 weeks in any 12-month period.
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. All pipelines installed in navigable rivers, streams and harbors must have a minimum cover of 48 inches in soil or 24 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.

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, MAOP, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. Preliminary class locations for Weaver's Cove Energy's pipeline facilities have been developed based on the relationship of the pipeline centerline to other nearby structures and manmade features. The Northern Pipeline would be constructed in about 3.26 miles of Class 3 locations and about 0.33 mile of Class 1 locations. The Western Pipeline would be constructed in about 2.37 miles of Class 3 locations and about 0.15 mile of Class 1 locations. However, all of the pipeline would be constructed to Class 3 specifications. If a subsequent increase in population density adjacent to the right-of-way indicates a change in class location for the pipeline, Weaver’s Cove Energy would be required to reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness 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. No later than December 17, 2004, gas transmission operators must develop and follow a written integrity management program that contains all the elements described in §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 [FR] 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[25] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle;[26] or
- any area in Class 1 or 2 where the potential impact circle includes an identified site.[27]

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 HCAs. The DOT regulations specify the requirements for the integrity management plan at § 192.911. The pipeline integrity management rule for HCAs requires inspection of the entire pipeline in HCAs every 7 years.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. 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.

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[25] The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline in psi multiplied by the pipeline diameter in inches.

[26] The potential impact circle is a circle of radius equal to the potential impact radius.

[27] 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.

The proposed lateral pipelines, which are expected to be operated under an agreement to be negotiated between Mill River Pipeline and Algonquin, would be operated according to standards and procedures that have been approved by the DOT.

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.

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. Weaver's Cove Energy would maintain liaisons with public authorities and local utilities and a current contact list would be included in the emergency response plan. Weaver's Cove Energy's liaison program would include: periodic fire fighting demonstrations emphasizing when and when not to extinguish a natural gas fire during an emergency and how to extinguish different types of natural gas fires; periodic visits with emergency response agencies (fire and police) to inform them of the nature and operation conditions of the pipeline facilities and to coordinate emergency response in the event of an accident; special informational meetings and training at the request of the municipality; periodic literature distribution to the emergency response agencies listing emergency telephone numbers for Weaver's Cove Energy and other pertinent data; and providing maps to police and fire departments showing the location of the pipeline within the boundaries of their communities.

4.12.8.2 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 4.12.8-1 presents a summary of incident data for the 1970 to 1984 period, as well as more recent incident data for 1986 through 2003, 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.[28]

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.

TABLE 4.12.8-1

Natural Gas Service Incidents by Cause

	Incidents per 1,000 miles of Pipeline (percentage)	
Cause	1970-1984	1986-2003
Outside force	0.70 (53.8)	0.10 (38.4)
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

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.8-1 provides a percentage 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 4.12.8-2 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 2003 data show that the portion of incidents caused by outside forces has decreased to 38.4 percent.

TABLE 4.12.8-2

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

[28] 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.

The pipelines included in the data set in table 4.12.8-1 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.

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 4.12.8-3 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 4.12.8-3

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

4.12.8.3 Impact on Public Safety

The service incident data summarized in table 4.12.8-1 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 4.12.8-4 presents the average annual fatalities that occurred on natural gas transmission and gathering lines from 1970 to 2003. 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 2003 decreased to 3.8 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 2.9 fatalities per year for this period.

TABLE 4.12.8-4

Annual Average Fatalities - Natural Gas Transmission and Gathering Systems a/, b/

Year	Employees	Nonemployees	Total
1970-June 1984	2.4	2.6	5.0
1984-2003 c/	-	-	3.8
1984-2003 c/	-	-	2.9 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.

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in table 4.12.8-5 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 302,000 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 pipeline facilities associated with the Weaver's Cove LNG Project might result in a public fatality every 16,000 years. This would represent a slight increase in risk to the nearby public.

TABLE 4.12.8-5

Nationwide Accidental Deaths a/

Type of Accident	Fatalities
All accidents	90,523
Motor vehicles	43,649
Falls	14,985
Drowning	3,488
Poisoning	9,510
Fires and burns	3,791
Suffocation by ingested object	3,206
Tornado, flood, earthquake, etc. (1984 to 1993 average)	181
All liquid and gas pipelines (1978 to 1987 average) b/	27
Gas transmission and gathering lines Nonemployees only (1970 to 1984 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.

4.12.9 Additional Safety Issues Identified in Scoping

Remote Siting - We received a number of comments which referenced that congress passed legislation on the need to site LNG facilities in remote locations. The comments are referring to the Pipeline Safety Act of 1979 (PL96-129, November 30, 1979) which directed the Secretary of Transportation to issue minimum safety standards for determining the location, design, installation, construction, initial inspection and initial testing of any new LNG facility. Section 6(d) of the Pipeline Safety Act listed several factors to consider in prescribing the rules, including "(F) the need to encourage remote siting."

On January 30, 1980, DOT issued the final rule that established Federal Safety Standards for LNG Facilities. Part 193.2057 requires the establishment of thermal exclusion zones around the facility and Part 193.2059 requires flammable vapor dispersion exclusion zones in order to protect people who live or work near the facility. The DOT stated that the safety advantages of "remote siting" were essentially obtained by compliance with the exclusion zone provisions, but without incurring such potential drawbacks as poor positioning relative to exiting pipelines, gas markets, or navigational needs.

On September 8, 2004, the Mayor of Fall River, Massachusetts, filed a petition with the DOT requesting that the Secretary issue regulations prescribing minimum safety standards for the location of new LNG facilities, as required by the Pipeline Safety Act of 1979, that specifically address: the projected population and demographic characteristics of the location; the existing and proposed land use near the location; the physical aspects of the location; the public safety capabilities of the community; and the need to encourage remote siting. The petition includes proposed regulations stating that no LNG facility shall be located at a site where the existing or estimated future population within 1 mile of the facility exceeds 5,000 individuals, or 1,000 individuals under the age of 12 or over 65; or is within 1 mile of a school, day care center, nursing home, or hospital. The proposed regulations also address proximity to highways and commuter rail lines, bridge closures, adequacy of local emergency services, and that offshore sites be given preference over onshore sites in populated areas. A joint petition was also filed by the Rhode Island Attorney General and Massachusetts Attorney General on September 8, 2004.

Several smaller LNG tanks - One comment suggested that several smaller tanks could be used or the tank compartmentalized to increase safety. If two 600,000 barrel LNG storage tanks were to be used instead of the proposed single 1,250,000 barrel tank, each individual tank would have a slightly reduced footprint and somewhat shorter thermal radiation exclusion zones than the proposed tank. But collectively, two tanks would cover a much larger portion of the site and also shift the thermal exclusion zones further to the north where property lines taper to the northeast and residences are closer. It is not feasible to divide the internal storage tank.

Safety Design Comparison and Improvements - Commentors requested a discussion of alternative safety measures and design improvements over the past 50 years, as well as design alternatives for other projects. Section 4.12.3 presents a review of the six principal LNG storage tank and retention system designs. The four original LNG import terminals in the United States as well as the majority of LNG peakshaving facilities utilize the single containment tank design (figure H.1). The double containment design (figure H.3) is used for the 1,000,000 barrel LNG storage tank at the EcoElectrica import terminal in Guayanilla, Puerto Rico, which commenced operations in July 2000. Many of the new LNG import terminals propose to use the full containment design (figure H.4).

Tank design evolution has seen an increasing use of internal LNG pumps, a necessity for the H.3 and H.4 configurations, and a means of eliminating any penetrations to the primary inner container for other designs. The use of internal LNG pumps results in a smaller design spill and the corresponding potential to reduce the flammable vapor dispersion exclusion zones required under the DOT's Federal

Safety Standards at Part 193.2059. Similarly, the low impoundment surface area for the H.3 and H.4 configurations can reduce the thermal exclusion zones around the facility under Part 193.2057. Other improvements over the years have witnessed the change from analog instrumentation and controls systems, with manually operated valves and local equipment operation; to distributed control systems with computer interface and remotely actuated valves and equipment, providing greater flexibility in operational controls and in responding to potentially hazardous events.

Bridge Integrity - A number of concerns were raised on the potential impact of LNG vessels on the integrity of one or more of the four bridges that would be encountered by the vessel transit: the impact of damage to bridges on the area's economy; the impact on traffic in the event of a collision with a bridge abutment; financial capability to restore damage to bridge abutments and compensation for delayed shipments; and changes to the abutments or fender systems.

Incidents involving ships in transit alliding with structures, such as bridge piers outside a channel, invariably result from ships proceeding at high speeds, often moving with a strong current, without tug escort and experiencing steering failure, electrical failure or a combination of both. The LNG ships transiting the Mount Hope Bay and the Taunton River would have attached tug escorts, would not be moving at high speeds, would not be carried along by strong currents, and would have duplicate steering gear and electric generator systems operating. Vessel traffic simulations have been performed at the MSI facility (see section 4.12.5.1) to identify the envelope of marine conditions and tug assist required to safely guide the LNG vessels through the Brightman Street and Braga Bridges. The simulations and operational controls imposed by the pilots should make the potential for bridge damage to be remote.

In 1997-1998, the proposed design of the new Brightman Street Bridge allowed a 150-foot opening for ships in the navigation channel. Later discussion with the Coast Guard resulted in the final design, which provides 200 feet of clear navigation channel. The Coast Guard requested an increase in width primarily to allow more room for large barges with tugs secured along the side. The width was also increased to take into consideration the long life expectancy of bridges, making provisions for future larger ships, such as ones with double hulls. The extensive ship handling simulations carried out at MSI have confirmed the adequacy of this final design width for the passage of 145,000 m^3 LNG ships.

The new Brightman Street Bridge would also have a fender system lining the relatively narrow opening between the piers. This system is designed to be completely independent and stand alone from the bridge support structure. The protection structure for each of the two main piers would be comprised of a pair of earth-filled circular steel sheet pile cells and a pile-supported fender beam. One fender, approximately 274 feet long, would run along each side of the navigational channel, with the fender beam sitting about 13 feet from the bridge foundation pier and reaching approximately 17 feet above MLW. These beams would be comprised of cast-in-place concrete, 7 feet wide by 12 feet high, supported on a series of steel pipe piles. Weaver's Cove Energy would maintain a stock of spare fender panels in case any are damaged by an LNG vessel.

Engineers from Han-Padron Associates, LLP confirm that these fenders would have sufficient capacity to arrest or deflect a fully loaded 145,000 m^3 LNG ship transiting at up to 3 knots while turned 16.5 degrees toward the fender. It is important to note that 16.5 degrees off of a straight course represents a worst-case scenario, since the narrow channel limits would prevent an LNG ship from achieving any further deviation. The engineers also state that, during an allision with the fender, no part of an LNG ship would come within 5 feet of any part of the bridge structure. At the maximum deflection, the fender would still be 8 feet away from the bridge pier but the wide upper part of the ship could reach a few feet closer.

Mitigation to prevent an LNG ship from getting into this position would be provided by the employment of powerful tractor tugs; the training of the Northeast Marine Pilots, tug masters, and LNG ship captains simultaneously at MSI; and the provision of additional aids to navigation as identified during previously completed and future simulations. Limiting LNG ships to passage only during certain favorable environmental conditions would also be established and enforced. In addition, the draft of LNG ships is relatively constant, only about 3 to 5 feet less in the ballast condition than the loaded condition; therefore, windage effects are not significantly greater in the ballast condition.

In the unlikely event that a LNG vessel collided with any of the four bridges, the effect on vehicular bridge traffic would depend on the extent of the damage and the time required for repairs.

Liability - Although this topic is outside the scope of the EIS and is more properly addressed in legal forums, several laws may apply. Financial responsibility for the compensation of personal or property losses due to a marine incident may be subject to the Limitation of Vessel Owner's Liability Act, 46 U.S.C. 181 et seq. Under 49 U.S.C. 60111, the Secretary of Transportation can order the operator of a LNG facility to demonstrate and maintain financial responsibility in at least the amount the Secretary considers adequate. In general, an LLC (limited liability company) business structure only protects the owners from personal liability for business debts and claims but does not protect the assets of the business itself.

4.12.10 Conclusions on Safety Issues

Much of the recent safety debate has centered on the size of worst case scenarios; the distance to various thermal radiation heat levels for LNG fires; the range of potentially flammable vapors; and the population and infrastructure that are located within the various hazard areas. These are some of the components of a consequence analysis.

However, the evaluation of safety is more than an exercise in calculating the consequences of worst case scenarios. Rather, safety is a determination of the acceptability of risk which considers: (1) the probability of events; (2) the effect of mitigation; and (3) the consequences of events.

Accidental Causes - Based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the Coast Guard and the local pilots, the likelihood of a cargo containment failure and subsequent LNG spill from a vessel casualty – collision, grounding, or allision – is highly unlikely. For similar reasons, an accident involving the onshore LNG import terminal or LNG trucking from the terminal is unlikely to affect the public. As a result, the risk to the public from accidental causes should be considered negligible.

Intentional Attacks - Unlike accidental causes, historical experience provides little guidance in estimating the probability of a terrorist attack on an LNG vessel or onshore storage facility. For a new LNG import terminal proposal, having a large volume of energy transported and stored near populated areas, the perceived threat of a terrorist attack may be considered as highly probable to the local population.

However, at the national level, potential terrorist targets are plentiful, many having national significance, while others with a large concentration of the public (major sporting events, skyscrapers, etc.) or critical infrastructure facilities. Currently, the United States has over 500 chemical facilities operating near large populations. U.S. waterways also transport over 100,000 annual shipments of hazardous marine cargo, including LPG, ammonia, and other volatile chemicals. Many of these substances pose a similar hazard to that of LNG.

Risk Management - While the risks associated with the transportation of any hazardous cargo can never be entirely eliminated, they can be managed. For potential targets where the threat is perceived to be high, resources can be directed to mitigate possible attack paths. Such efforts may deter potential attacks one target, but shift efforts to those that are less protected. As a result, the issue is how to best direct finite resources.

For the proposed project, it may be possible to apply risk management resources to manage realistic threats; however, an even greater level of resources may be required to manage the threats as perceived at the local level. The issue for the decision makers is whether the resources required to manage the risks are justified by the benefits, while recognizing that the risks cannot be entirely eliminated.

4.13 CUMULATIVE IMPACTS

Cumulative impact results when impacts associated with a proposed project are superimposed on, or added to, impacts associated with past, present, or reasonably foreseeable future projects within the area affected by the proposed project. Although the individual impacts of the separate projects may be minor, the effects from the projects taken together could be significant.

Existing environmental conditions in the project area have been influenced by human industry, activities, and development, which have permanently altered the natural ecosystems within the Narragansett Bay watershed. This is particularly true in and around the public ports within the bay including those at Providence, Quonset Point-Davisville, and Fall River.

Table 4.13-1 provides a list of other past, present, or reasonably foreseeable future projects or activities that have impacted or may cumulatively impact resources that would be affected by construction and operation of the Weaver's Cove LNG Project. The general locations of many of these projects/activities are shown on figure 4.13-1. These projects and activities include primarily those located in the vicinity of the proposed project. More distant projects are not assessed because these projects generally do not have regional effects and, therefore, do not contribute significantly to cumulative impacts in the proposed project area. Potential impacts associated with these projects that are most likely to be cumulatively significant are related to aquatic resources, upland or wetland vegetation, infrastructure and public services, vehicular traffic, ship traffic, land use, air quality/noise, and natural gas infrastructure. Cumulative impacts that could be most directly associated with the Weaver's Cove LNG Project are discussed below.

Aquatic Resources and Water Quality

The Mount Hope Bay and the Taunton River aquatic ecosystem is made up of a variety of habitats including open water, salt marshes, seagrass beds, cobble bottoms, oyster beds, soft bottoms, tidal flats, beaches, and rocky shores. The fish community within the area is estuarine with coastal migrant fishes that include striped bass, bluefish, tautog, winter flounder, summer flounder/fluke, scup, and weakfish. Additionally, this system provides habitats to various benthic organisms (both epifauna and infauna) including clams, quahogs, crabs, lobsters, snails, shrimps, sponges, barnacles, amphipods, and polychaete worms. These aquatic resources have been stressed due to overfishing, habitat alternation, and pollution (EPA, 2002a).

Overfishing is believed to have contributed to the declines that have been observed in many of the fish stocks in Mount Hope Bay. Currently, there are strict commercial and recreational fishing limits to help restore fish stocks. These restrictions have closed Mount Hope Bay to commercial trawlers and closed recreational fishing for winter flounder in the bay for 10 months of the year.

Dredging of ship channels and berths as well as coastal developments (e.g., piers, marinas, waterfront structures) have altered habitats within Mount Hope Bay. For example, eelgrass beds that once occurred extensively throughout the region have been nearly eliminated from Mount Hope Bay. Additionally, water temperatures in Narragansett and Mount Hope Bays have increased markedly over the past 40 years. Likely causes include global warming and the discharge of waste heat into the bay from local power plants. This warming has resulted in a loss of the usual winter-spring diatom bloom, with potential impacts on higher trophic levels because of changes in prey availability. Warmer water in winter may also increase predation rates by shrimp on larval winter flounder, contributing to recent population declines (Keller and Klein-MacPhee, 2000).

TABLE 4.13-1

Past, Present, and Future Projects That Could Cumulatively Impact Resources of Concern Near the Weaver's Cove LNG Project

		Primary Environmental Impact							
Activity/Project	Description	Aquatic Resources/ Water Quality	Vegetation	Public Services	Vehicular Traffic	Ship Traffic	Land Use	Air Quality/Noise	Gas Infrastructure
Past and Present Activities/Projects									
Residential/Commercial Developments	Various developments in Fall River, Swansea, and Somerset.	✓	✓	✓	✓	✓	✓	✓	
Commercial/Recreational Fishing	Historically, commercial and recreational fishing and shellfishing did occur in Mount Hope Bay and the Taunton River. Because of the current status of fish populations and poor water quality, commercial fishing and shellfishing have been essentially eliminated and recreational fishing and shellfishing for many species have been severely curtailed in these areas. However, both commercial and recreational fishing and shellfishing continue in some areas of Narragansett Bay	✓				✓			
Recreational Boating	Recreational boating, including motor boating and sail boating, is widespread throughout Narragansett Bay and also occurs to a lesser extent on the Taunton River. Current estimates indicate that there are as many as 60,000 registered boaters in Rhode Island and the number is increasing. These activities generally occur during the 6 warmer months of the year but are particularly concentrated during June, July, and August.	✓		✓	✓	✓	✓		
Regional Stormwater and Sewer Systems	Currently, the 19 Combined Sewer Overflow (CSO) Outfalls of the Fall River system discharge approximately 1.3 billion gallons of rainwater and sewage to the Mount Hope Bay each year.	✓							

TABLE 4.13-1 (cont'd)

Past, Present, and Future Projects That Could Cumulatively Impact Resources of Concern Near the Weaver's Cove LNG Project

		Primary Environmental Impact							
Activity/Project	Description	Aquatic Resources/ Water Quality	Vegetation	Public Services	Vehicular Traffic	Ship Traffic	Land Use	Air Quality/Noise	Gas Infrastructure
Brayton Point Power Plant	Fossil fuel burning, electricity generating plant located on the Lee and Taunton Rivers in Somerset.	✓	✓			✓	✓	✓	
Borden and Remington Corporation	Chemical distribution facility in Fall River. Docking facilities along the Taunton River - bulk storage of chemicals.	✓	✓			✓	✓	✓	
Montaup Power Plant	Fossil fuel burning, electricity generating plant located in Somerset.	✓	✓			✓	✓	✓	
Braga Bridge Rehabilitation	Work includes repairs to the bridge structure and concrete deck, and resurfacing the pavement. Currently scheduled to be completed in 2005 or 2006.			✓	✓				
Fall River State Pier	Upgrading and expansion of the existing Fall River State Pier.	✓		✓	✓	✓	✓	✓	
Aquaria Project	Desalination plant on the Taunton River in Dighton, Massachusetts. Project includes construction of 16-mile-long water pipeline. Scheduled to be in-service in 2005.	✓	✓	✓			✓		
Fall River CSO Abatement Project	Construction of a three-mile long, 20-foot diameter CSO tunnel to eliminate storm-related discharges. Located in the city's south end.	✓		✓	✓				
Brightman Street Bridge Replacement (Route 6)	Construction of a new, higher bridge and reposition Route 6 in Somerset and demolition of the old bridge. Scheduled to be completed in 2010.	✓		✓	✓	✓			
Resurfacing Route 138	Includes South Main Street, Broadway Extension, North Davol and South Davol Streets.			✓	✓				
Shaw's Boat Yard, Inc.	Retain unauthorized structures and install and maintain new structures in the Taunton River at Dighton, MA.	✓				✓			

TABLE 4.13-1 (cont'd)

Past, Present, and Future Projects That Could Cumulatively Impact Resources of Concern Near the Weaver's Cove LNG Project

		Primary Environmental Impact							
Activity/Project	Description	Aquatic Resources/ Water Quality	Vegetation	Public Services	Vehicular Traffic	Ship Traffic	Land Use	Air Quality/Noise	Gas Infrastructure
Bay State Gas Company	Excavate coal gasification-related materials from areas of the Taunton River, dispose of them and restore the sites. Located within the Weir Village section of Taunton, MA.	✓				✓			
Future Activity/Project									
Route 79 Relocation and Harbor Enhancement	Bring Route 79 down to grade and combine it with Davol Street to create a pedestrian-friendly boulevard as part of Fall River's waterfront plan.			✓	✓		✓		
Boardwalk in Somerset along the Taunton (recreation)	Construct a commercial boatyard for various marine related activities.	✓		✓		✓	✓		
Reconstruct North Main Street in Fall River	Construction will include North Main Street from the intersection of Herman Street going north to Freetown. Expected to begin in 2004.			✓	✓				
Quequechan Bike Path/Boardwalk	Extend the Heritage State Park boardwalk along the city's waterfront to Bicentennial Park and provide a link to Britland Park. It will traverse along Watuppa Pond, and the Quequechan and Taunton Rivers.			✓	✓		✓		
Commuter Rail	Extend existing Stoughton Line service from Boston to New Bedford and Fall River. Includes construction of track, bridges, grade crossings, intersection improvements, eight new commuter rail stations and two train layover facilities. Project currently on hold.	✓	✓	✓	✓		✓	✓	
City Pier Cleanup	City of Fall River is applying for EPA Brownfields Cleanup Grant for 4.2-acre parcel located on Davol Street.	✓					✓	✓	

TABLE 4.13-1 (cont'd)

Past, Present, and Future Projects That Could Cumulatively Impact Resources of Concern Near the Weaver's Cove LNG Project

		Primary Environmental Impact							
Activity/Project	Description	Aquatic Resources/ Water Quality	Vegetation	Public Services	Vehicular Traffic	Ship Traffic	Land Use	Air Quality/Noise	Gas Infrastructure
Hotel and Conference Facility	150- to 200-room hotel located along the waterfront at the city pier site.	✓		✓	✓		✓	✓	
KeySpan LNG Facility Upgrade Project	Modification of existing LNG peakshaving facility in Providence to allow for marine imports of LNG. Sendout pipeline providing natural gas to Algonquin's G-system.	✓	✓			✓	✓	✓	✓
Somerset LNG Project	Construction of a new LNG import terminal at Brayton Point in Somerset, MA. Sendout pipeline providing natural gas to Algonquin's G-system.	✓	✓	✓	✓	✓	✓	✓	✓
Marina Expansions	Proposals for the addition of approximately 2,056 boat slips within Narragansett Bay,most of which are associated with the Weaver Cove Marina in Portsmouth.	✓		✓	✓	✓	✓		

Insert Figure

4.13-1 Select Past, Present, or Future Activities/Projects Located Along the Taunton River

Current environmental conditions in Mount Hope Bay and the Taunton River do no meet designated water quality standards established in Massachusetts or Rhode Island (see section 4.3.2). These waterbodies have and are being degraded by both point and non-point sources of pollution. Non-point sources of pollution that affect water quality include stormwater runoff and wastewater discharge from residential, commercial, and industrial areas. Although the pretreatment of industrial wastewater is reducing the presence of industrial toxic pollutants from point sources, traces of metals and organic compounds are still found in area sediments (see section 4.2.2). Regardless of the source, the introduction of pollutants results in a variety of ecosystem impacts. The presences of some pollutants create potential human health risks primarily through the consumption of contaminated seafood. Nitrogen introduced into the Taunton River or Mount Hope Bay has resulted in excessive plant growth (algal blooms). When the algae die, they are decomposed by bacteria that consume dissolved oxygen, effectively suffocating fish and other organisms. Similarly, bacterial nitrification of ammonia discharged by wastewater treatment facilities can deplete waters of dissolved oxygen, making many areas uninhabitable (Caton, 2002). Fall River is presently working on a combined sewer outflow abatement program to improve water quality in Mount Hope Bay.

A specific source that has been singled out by regulators as contributing significantly to the degradation of the Mount Hope Bay ecosystem is the existing Brayton Point Power Plant. The power plant uses water from the bay to condense the steam used to produce electricity. The heated water is then discharged back into Mount Hope Bay at a temperature of up to 95º F. Studies indicate that these discharges have resulted in a distinct thermal plume within Mount Hope Bay. Although contested by the power plant operator, this thermal plume and the impingement/entrainment of aquatic organisms during operation of the water intake system have been cited by regulators as major factors in the decline of fish stocks (particularly winter flounder) in the bay. A recent draft permit issued by the EPA for the Brayton Point Power Plant seeks to substantially reduce the facility's impact on aquatic resources of Mount Hope Bay through applying stronger controls on the withdrawal of water from the bay and the discharge of heated water to the bay (i.e., reduction of the total annual heat discharge to the bay by 96 percent and the reduction of water withdrawn from the bay by 94 percent).

In the foreseeable future, there will likely be a number of projects or activities that result in additional stresses on the aquatic resources of the Taunton River and Mount Hope Bay. Non-point sources of pollution are predicted to continue to contribute significantly to water quality degradation (DEM, 2000). As listed in table 4.13-1, there are several waterfront projects in the region that could also degrade aquatic habitat in the project area.

Construction of the Weaver's Cove LNG Project would adversely affect surface water quality and biological resources associated with Mount Hope Bay and the Taunton River (see sections 4.3.2 and 4.6.2). Specific project activities such as dredging, dredge disposal, pipeline installation, and upland clearing/grading could result in a variety of impacts related to aquatic resources that include:

- increased water turbidity and resuspension of sediments;
- surface runoff/erosion;
- loss of wetland or upland vegetation;
- disturbance to benthic substrates (e.g., quahog habitats); and
- potential spills of hazardous substances.

Potential construction impacts on aquatic resources would be minimized by Weaver's Cove Energy's compliance with our recommendations, the FERC's Plan and Procedures, its onshore and offshore SPCC Plans, and adherence to the mitigative measures discussed in section 4.6.2. Nevertheless, the Weaver's Cove LNG Project could contribute to cumulative impacts on water quality and aquatic organisms when considered in relation to past, present, and reasonably foreseeable impacts on the Mount

Hope Bay and the Taunton River. Impacts from dredging could be compounded if other significant dredging projects were conducted concurrently (e.g., Somerset LNG Project).

The entrainment and impingement of fish (eggs, larvae, juveniles, and/or adults) during construction and operation of the Weaver's Cove LNG Project could also contribute to the cumulative impact on biological resources in Mount Hope Bay and the Taunton River. As discussed in section 4.6.2, the Weaver's Cove LNG Project could involve a one time appropriation of between 32 and 33 million gallons of water from the Taunton River to hydrostatically test the LNG tank and sendout pipelines. Furthermore, each ship unloading LNG at the terminal would take on between 11 and 14 million gallons of ballast water from the river. Given the facility could accommodate between 50 and 70 ships per year, the withdrawal of water for LNG ship ballast from the Taunton River could be between 550 and 980 million gallons per year during operation of the terminal. These withdrawals would be in addition to other existing or planned facilities in the area that currently withdraw or may withdraw much larger volumes of water such as the Brayton Point Power Plant near the mouth of the Taunton River and the Manchester Street Station on the Providence River.

The cumulative impacts of these withdrawals are difficult to quantify given that the numbers of aquatic organisms entrained or impinged during water intake is a function of the intake structure's location, design, capacity and approach velocity, and the abundance of organisms of various species in the general vicinity at the time of the withdrawal. Historically, the estimated average annual loss of fish eggs and larvae due to water withdrawals of up to 1 billion gallons per day (or 365 billion gallons per year) at the Brayton Point Power Plant were about 251 million winter flounder, 11.8 billion bay anchovy, 375 million windowpane flounder, and 3.5 billion tautog (EPA, 2002a). At the Manchester Street Station, where water withdrawals have been up to 258 million gallons per day (or 94 billion gallons of water per year), the average annual loss of fish eggs and larvae due to water withdrawals is estimated to be about 891 million eggs and larvae. Additionally, although estimates are not available, the number of eggs and larvae lost through ballasting of other ships that offload cargo within the Narragansett Bay watershed would also be a relatively large amount. For comparison, assuming 70 LNG ships per year and 14 million gallons of ballast water required per ship, operation of the proposed LNG terminal could result in the annual loss of eggs and larvae totaling about 1.3 million winter flounder, 5.8 million bay anchovy, 150,400 windowpane flounder, and 6.9 million tautog. Although the number of eggs and larvae potentially lost as the result of LNG ship ballasting would be much less than the numbers lost as the result of power plant operations, the cumulative impacts of these losses could further stress the fish populations in Mount Hope Bay and Narragansett Bay.

Even though existing permits require the Brayton Point Power Plant to reduce the quantity of water withdrawn to 56 million gallons per day, both the volume and aquatic impact of the power plant water withdrawals will likely still far exceed the volumes and potential aquatic impacts of water withdrawals associated with other existing or planned facilities on Mount Hope Bay and the Taunton River. Additionally, effective mitigation for the smaller volume withdrawals may be easy to implement. For example, the impacts from proposed withdrawals of 5 to 10 million gallons of water per day at the new desalination facility in Dighton (Aquaria Project) would be minimized by covering the intake structures with exclusionary mesh and withdrawing water at relatively low velocities.

During operation of the proposed LNG terminal, prop wash from LNG ships and tugs could temporarily increase suspended sediments and turbidity in the navigation channel and turning basin. Many past, current, and planned activities in the Taunton River and Mount Hope Bay involve ships that temporarily disturb bottom sediments, including ship traffic to the existing Montaup and Brayton Point Power Plants as well as any future traffic to the proposed KeySpan and Somerset LNG terminals. However, as with LNG ships delivering cargo to the proposed LNG terminal, sediments suspended by other ships would be expected to resettle shortly after ship passage. Additionally, even with the existing

and proposed facilities operating simultaneously, disturbance associated with prop wash would not be expected to occur at intervals that would prevent resettling after each ship. Some of the suspended sediments could settle out in adjacent shallow water areas, harbors, and marinas, which could ultimately result in increased sedimentation in these areas.

In conclusion, while construction and operation of the Weaver's Cove LNG Project could contribute cumulatively to impacts on aquatic resources and water quality in the Taunton River, Mount Hope Bay, and Narragansett Bay, we believe these impacts would be relatively short-term and/or minor in comparison to those from non-point sources of pollution or from operation of facilities such as the Brayton Point Power Plant and Manchester Street Station. Additionally, implementation of Weaver's Cove Energy's proposed mitigation measures and our recommendations in section 4.6.2 would reduce impacts of the proposed project such that, even when considered in light of past or present activities in the general project area, aquatic resources would not be adversely affected by project activities.

Vegetation and Wildlife

When projects are constructed at or near the same time, the combined construction activities would have a cumulative impact on vegetation and wildlife living in the immediate area. Right-of-way clearing and grading and other construction activities associated with the Weaver's Cove LNG Project along with other construction projects would result in the removal of vegetation, alteration of wildlife habitat, displacement of wildlife, and could have other secondary effects such as increased population stress, predation, and establishment of invasive plant species. The filling of salt marsh at the proposed terminal site and the removal of forest vegetation along the pipeline rights-of-way would have long-term impacts on vegetation and wildlife. These impacts would be greatest where other projects are constructed within the same time frame and areas as the proposed facilities (e.g., residential development in forested areas along the Western Pipeline route). Additional vegetation clearing along existing rights-of-way (electric transmission, pipeline, or railroad) can have the additive effect of creating a cleared corridor of significant widths. Given the developed nature of the landscape, the collocation of the proposed pipeline with existing utility rights-of-way allows for the consolidation of similar land uses. The collocation of the proposed pipelines with existing utility rights-of-way also reduces the total width by allowing overlap of construction workspace for the pipeline with the existing rights-of-way (see section 4.8.1.2). The collocation of the proposed pipelines with existing rights-of-way would be expected to minimize cumulative impacts on vegetation and wildlife.

As discussed above, it is possible that the development of both the Somerset LNG and Weaver's Cove Energy LNG projects could require an expansion of the existing Algonquin pipeline system. Although the specific nature of the improvements required by Algonquin to accommodate both projects is unknown, it is possible that additional pipeline looping may be necessary. The construction of additional pipeline could require widening of existing pipeline rights-of-way, resulting in both vegetation and wildlife impacts.

Infrastructure and Public Services

The cumulative impact of the Weaver's Cove LNG Project and other projects on infrastructure and public services would depend on the number of projects under construction at one time and the specific services required for each project. The small incremental demands of several projects occurring at the same time could become difficult for police, fire, and emergency service personnel to address. This problem would be temporary, and occur only for the length of construction. The operation of the proposed LNG terminal and associated facilities is not expected to have a major impact on public services since it would not result in the construction of new public roads, extensive new sewer or water systems, or significant changes in local population levels. There is however a concern that an incident at the LNG

terminal could exceed the current response capacity of the Fall River fire and police departments. Weaver's Cove Energy would coordinate with local fire departments to develop an emergency response plan to be used in the event of an incident at the LNG terminal. In addition, Weaver's Cove Energy would have its own fire-fighting equipment at the facility. See section 4.12 for additional discussion of fire and public safety impacts and Weaver's Cove Energy's liaison program with the area emergency response departments. The details of this plan and specifics regarding the role of the police and fire departments in the event of an incident are not available at this time.

We received comments on the draft EIS that state and local communities would have to bear some of the costs of ensuring the security of the LNG terminal and the LNG ships while in transit and unloading at the terminal. If more than one LNG import terminal is constructed and operated within the Narragansett Bay area, particularly if the facilities are in close proximity and each requires the services of one or more towns, the combined security costs of multiple projects could have a cumulative impact on some communities. There are currently two proposed LNG terminals (Weaver's Cove LNG Project and KeySpan LNG Facility Upgrade Project) and possibly a third planned LNG terminal (Somerset LNG Project) that would require LNG ships to transit Narragansett Bay. The operation of the proposed LNG terminals are not anticipated to have major impacts on public services because they would not result in the construction of new public roads, new sewer or water systems, or significant changes in local population levels. However, there has been public concern about the training of the local police, fire, and emergency responders and their capability to handle an incident at an LNG terminal or along the shipping route. Both Weaver's Cove Energy and KeySpan LNG would have their own fire-fighting equipment at the LNG facilities, and LNG ships would be required to have fire detection and protection systems. In addition, the tugs escorting the LNG ships would have fire-fighting equipment and trained personnel. Although the details regarding the specific demands and roles of the police and fire departments in the event of an LNG incident are not available at this time, we believe the efforts described above would minimize the cumulative effects of this project on existing public services. See sections 4.9.3, and 4.12.5 of this EIS for additional discussion of fire and public safety impacts and Weaver's Cove Energy's coordination with the area emergency response departments.

We also received comments expressing concern that local communities might be overburdened by the additional costs of ensuring the security of the LNG terminal and the LNG ships while in transit and unloading at the terminal. If more than one LNG terminal is constructed and operated within the Narragansett Bay area, particularly if the facilities are in close proximity and each requires the services of one or more towns, the combined security costs of multiple projects could have additional cumulative impact on some communities. The specific costs associated with security for the two proposed LNG terminals are not known at this time. As discussed below and in section 4.12.5, the Coast Guard has developed an initial Vessel Transit Security Plan for both the KeySpan LNG Facility Upgrade Project and the Weaver's Cove LNG Project that will become the basis for appropriate security measures.

The security measures anticipated to be implemented each time an LNG ship calls at Fall River or Providence would require Coast Guard as well as state and local agency support. Specific costs associated with Coast Guard support for the Weaver's Cove LNG Project or KeySpan LNG Facility Upgrade Project have yet to be specified. However, the specific costs associated with overtime and detail work by state and local agency personnel, including the local police, State Police, and other agencies, has been estimated to be in the range of $40,000 to $50,000 per LNG shipment.

Once these plans are finalized and the resources required to implement them have been identified, Weaver's Cove Energy and KeySpan LNG would be able to more specifically discuss the funding of such resources. In recent filings with the FERC, Weaver's Cove Energy has suggested that it be held to the same standard as the Distrigas LNG facility, which Weaver's Cove Energy says underwrites the entire cost of police and fire department details provided by the City of Everett, as required to provide security

during the unloading of LNG ships at the terminal. KeySpan LNG has stated that it would reimburse state and local agencies for the incremental costs associated with LNG ship security on a per-transit basis. We have recommended that both Weaver's Cove Energy and KeySpan LNG provide comprehensive plans identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies. We believe that the cost sharing suggested by Weaver's Cove Energy and our recommendation would minimize the potential for cumulative impacts associated with security costs if multiple LNG terminals are constructed in the Narragansett Bay area. It should also be noted that the Weaver's Cove Energy and KeySpan LNG terminals would be located in different states and cities, and while LNG ships traveling to the two terminals would share the same ship channel in the vicinity of Newport, Jamestown, Middletown, and Portsmouth, the remainder of the ship routes do not overlap, which would tend to mitigate cumulative costs on a single state or community.

Vehicular Traffic

As discussed in section 4.9.4, the truck traffic that can be expected during operation at the LNG terminal would vary depending on the market demand of the LNG and the availability of trucks for transporting the LNG. Approximately 50 LNG truck trips and 70 employee vehicle trips are estimated per day during average operating conditions, which would be lower than the estimated historic traffic volumes at the site and represent only a small increase in the existing road traffic. Weaver's Cove Energy expects that the LNG trucks would use the New Street site entrance at the North Main Street/Route 79 entrance intersection. Employees and visitors would use an entrance located about 0.4 mile north on North Main Street, which would reduce the amount of traffic at the truck entrance intersection. The anticipated traffic volume resulting from operation of the LNG terminal, even when considered in terms of projected future traffic volumes and in relation to reasonably foreseeable future projects, would not significantly increase the existing traffic volumes on local area roadways (MDM Transportation Consultants, Inc., 2003). Construction of a higher bridge at Brightman Street should alleviate some local traffic congestion by reducing the frequency the bridge would be closed to vehicular traffic.

Traffic congestion along the proposed pipeline routes is not expected to be a major problem. However, there is potential for cumulative traffic impacts if other projects such as road improvements are scheduled to take place at the same time and in the same area as the proposed LNG and pipeline facilities. Currently, we are not aware of any planned road improvement projects that would cumulatively add to construction traffic associated with the proposed project. Moreover, several factors would minimize the potential for cumulative traffic impacts, including the large area over which the proposed project is spread and the tendency for construction workers to frequently share rides and travel to and from work during off-peak hours. Additional measures proposed by Weaver's Cove Energy to minimize traffic impacts include scheduling to avoid commuter traffic and ensuring the availability of necessary traffic safety personnel. As such, potential cumulative impacts on traffic are expected to be temporary and short term.

Cumulative traffic impacts could also result if more than one LNG terminal is constructed in the Narragansett Bay area and bridges are closed during the passage of LNG ships. Specifically, cumulative road traffic impacts could also result if more than one LNG terminal is constructed in the Narragansett Bay area and the Pell (Newport) Bridge is closed during the passage of LNG ships. The Pell Bridge is located above the East Passage and is the only bridge that crosses the LNG ship route for the two proposed LNG terminals (i.e., Weaver's Cove Energy, KeySpan LNG) and the planned LNG terminal (i.e., Somerset LNG). The Pell Bridge is currently closed a few times a year to allow the passage of LPG ships. If both the and Weaver's Cove Energy and KeySpan LNG terminals are approved, up to 260 LNG ships (counting inbound and outbound trips) could pass under the bridge each year. If the Somerset LNG Project proposal moves forward and is approved, the number of LNG ship passages could be as high as 380. As discussed in section 4.12.5, it was determined during the Coast Guard's recent security workshops for the Weaver's Cove LNG Project that it would not be necessary to close the bridge for

every LNG ship transit associated with this project unless warranted by particular security concerns. Therefore, under normal circumstances, the Weaver's Cove LNG Project would not contribute to cumulative impacts associated with closures of the Pell (Newport) Bridge.

The estimated average daily traffic traveling both directions on the Pell Bridge is 27,700 vehicles (RIDOT, 2003). As discussed in section 4.9.4, Weaver's Cove Energy completed a traffic analysis to identify the potential impacts on traffic if the Pell (Newport) Bridge is closed during passage of LNG ships (MDM Transportation Consultants, Inc., 2004). The study used an automated traffic recorder to quantify the regional traffic using these bridges. In addition, these traffic counts were used to estimate potential average delays and maximum queuing (back-up) distances at the bridges based on how long each bridge might be closed to traffic. The study indicates that at the Pell (Newport) Bridge, the maximum anticipated average traffic delays due to a bridge closure during peak season use would range from about 4.2 minutes on the eastbound lanes during weekday mornings (with traffic backing up about 0.34 mile) to about 4.9 minutes on the westbound lanes during weekday evenings (with traffic backing up onto the Route 114/138 on-ramp for about 0.52 mile). The actual frequency of bridge closures cannot be determined and would depend on specific conditions at the time of the LNG ship passages. If, as an example, we assume the Pell Bridge would be closed for 10 percent of LNG ship transits, then delays of 5 minutes would be experienced up to 26 times a year if both the KeySpan LNG Facility Upgrade and Weaver's Cove LNG Projects were operating and up to 38 times a year if the Somerset LNG Project were also operating. Overall, the effect on traffic associated with bridge closures is not expected to significantly increase cumulative traffic impacts particularly since bridge closures would be temporary and are anticipated to be limited to periods of high national security alert. We do not anticipate these closures would necessarily affect emergency vehicle access, however, since the Pell Bridge is a state highway (Route 138) and the State Police typically exercises its authority to allow emergency vehicles to cross during bridge closures (Bianchi, 2004; Swansberg, 2004).

Ship Traffic

Traffic in the Taunton River currently averages one vessel every 2 to 3 days and also appears to be declining. As discussed in section 4.9.4, there were about 112 ocean-going vessel movements into the Fall River/Somerset area from Narragansett Bay in 2002. The Weaver's Cove LNG Project would result in one additional vessel entering the federal navigation channel in the Taunton River every 5 to 7 days (an additional 50 to 70 ships per year). Dredging the federal navigational channel and the wider opening of the new Brightman Street Bridge could provide greater access to deeper draft and broader beam ships that move up the Taunton River as well as reduce some of the current sources of shipping delays. For example, some deep-draft ships may be able to move more freely within the federal navigation channel without waiting for appropriate tidal conditions. As such, it is possible that the project could indirectly result in slightly fewer vessel transits to the Brayton Point or Montaup Power Plants by making it possible for fewer vessel trips to deliver the same amount of coal that was previously delivered (via larger or fully loaded ships).

However, even taking into consideration the shipping activity associated with the Weaver's Cove LNG Project, the federal navigation channel in the Taunton River would remain under utilized. Existing and anticipated future traffic and traffic associated with the Weaver's Cove LNG Project would not result in traffic congestion upstream of the Brightman Street Bridge since no large commercial ships can proceed up the Taunton River beyond the LNG terminal site due to insufficient water depths. Any LNG ships accessing a potential LNG facility at Brayton Point (Somerset LNG Project) would require additional coordination of ship movements in the northern portion of Mount Hope Bay. At this time, we anticipate that the total utilization of the federal navigation channel, (excluding tows and tugs) would be approximately 170 to 250 commercial ships per year if the Weaver's Cove LNG Project becomes operational.

It is conceivable that the dredging of the federal navigation channel could increase the number of large vessel movements in the Taunton River to levels higher than current projections. However, because we are not aware of specific proposals by other industrial or commercial operators, we do not view these activities as reasonably foreseeable and have not included additional ship traffic impacts in our analysis.

On April 30, 2004, KeySpan filed an application with the FERC seeking authorization to modify its existing Providence LNG storage and vaporization facility to allow import of LNG by ships (see section 3.2.1). If approved, about one LNG ship would unload its cargo at this facility every week beginning in late 2005. LNG ships accessing the KeySpan LNG facility would transit up Narragansett Bay and follow the East Passage to the entrance of the federal navigation channel near Sandy Point on Prudence Island. Ships would then turn into Upper Narragansett Bay and follow the navigation channel to the Port of Providence. The portion of the ship route along the East Passage would be the same for LNG ships moving to or from either Providence or Fall River. LNG ships accessing the KeySpan LNG and Weaver's Cove Energy facilities could cumulatively contribute to ship traffic delays in Narragansett Bay

If both the Weaver's Cove Energy and KeySpan LNG terminals are constructed and operated, as many as 100 to 130 LNG ships could potentially transit in and out of Narragansett Bay every year. To evaluate current conditions and the potential impact of LNG ships on existing commercial ship traffic, KeySpan LNG assessed five case scenarios using the Monte Carlo methodology (MNI, 2004). Vessel types included in the study were passenger or dry cargo ship, tanker, dry cargo barge, and tanker barge. Tugs were not counted as separate entities because it was assumed that they travel as an integrated entity with the barges. Recreational boats were not included in the simulation; however, it can be assumed that the impacts on recreational boaters would be less than on deep draft vessels since recreational boats have shallower drafts and are less restricted on where they can travel in the bay and river. Three of the five scenarios KeySpan LNG assessed assumed that both the Weaver's Cove and KeySpan LNG terminals would be operational. These three scenarios include:

- Case 3 - Future conditions assuming there are two LNG terminals (the KeySpan LNG and Weaver's Cove Energy LNG facilities), and 52 and 60 LNG ships per year call at each facility, respectively;

- Case 4 - The same as Case 3 but assumes a hypothetical 70 LNG ships per year call at the KeySpan LNG facility; and

- Case 5: The same as Case 4 but assumes future traffic conditions of non-LNG ships increases 50 percent.

If the proposed LNG ship traffic associated with the both the KeySpan LNG Facility Upgrade and Weaver's Cove LNG Projects are analyzed (Case 3), the anticipated LNG ship traffic on Narragansett Bay and within the navigation channel would approximately double in volume compared with the traffic of just one facility. Under these conditions, about 6 percent of the non-recreational vessels operating in Narragansett Bay would experience delays each year, which is double the number of ships that currently experience delays. In another scenario, if KeySpan LNG's ship traffic is modeled to account for a hypothetical increase to 70 LNG ships per year and these ships are added to Weaver's Cove Energy's proposed LNG ship traffic (Case 4), an average of 7 percent of the annual ship traffic in the bay would experience some delay. Lastly, for a worst-case scenario, if this increased KeySpan LNG traffic is added to Weaver's Cove Energy's proposed LNG ship traffic and then also added to a 50 percent hypothetical increase in non-LNG ship traffic (Case 5), an average of 8 percent of the annual ship traffic in the bay would experience some delay each year. Based on these analyses, it appears that the Coast Guard-required security zones during LNG ship transit and unloading would widen the area restricted to ships

and increase the number of ships that are delayed either entering or leaving the port. We note that the 50 percent increase is based on an assumption rather than on projections by port facilities currently receiving non-LNG ships in Narragansett Bay. However, in its comments on this draft EIS, the Coast Guard noted that Rhode Island voters recently approved a $48 million bond to improve the Quonset Point/Davisville port complex, including improved vessel berths and new railroad lines directly from the waterfront to the interior. It is expected that this will generate new business at Quonset/Davisville, including more vessel traffic, especially car carriers.

The cumulative impact on ferry traffic would generally be small because most of the ferry routes only cross the LNG ship routes and conflicts could be managed by schedule coordination. The cumulative impact of multiple LNG terminals on the Providence to Newport ferry could be more significant, however, because the ferry and LNG ships would travel along the same route for several miles. KeySpan LNG identified this potential conflict in its analysis of ship traffic and suggested that the impact could be reduced if the Coast Guard allows the ferry to operate outside of the channel and overtake or pass the LNG ships in transit at specific locations.

Commercial fishing boats might also be cumulatively impacted by the security zones imposed by the Coast Guard as LNG ships transit the federal navigation channel, particularly if the width of the security zone encompasses the entire width of the waterway. However, the security zone would be a moving zone around the ship, so these impacts would be temporary and of short duration at any given point along the shipping route. In addition, depending on their individual drafts, commercial fishing boats might be able to go around the LNG ships at points in the river that are sufficiently wide for them to be outside of the security zone. To mitigate the impacts of security zones, the Coast Guard would routinely provide Notice to Mariners prior to the arrival and departure of LNG ships as the Coast Guard currently does for LPG vessels and for other activities such as the Tall Ship parades. The notification system includes broadcasts on radio frequencies used by mariners and loudspeaker announcements made from Coast Guard, police, or other agency boats that precede the ship.

Operation of the LNG terminal could also have a cumulative impact on recreational boating and fishing during the weekly transit of the LNG ships if multiple LNG terminals are approved and constructed within the Narragansett Bay area. In most areas, the waterways that would be traveled by the LNG ships are sufficiently wide to allow recreational craft, which generally are not confined to the federal channel, to navigate around the LNG ships without significant delay. To estimate what kind of cumulative delays might result from passing LNG ships in areas where the waterway is narrower, we identified the locations where the ship channel would be used by LNG ships en route to different terminals and where the moving security zone has the greatest potential to encompass the entire width of the waterway. We specifically looked for areas where there is less than 3,000 feet of open water on both sides of the LNG ship route (the anticipated width of the safety and security zone on either side of the ship). These areas include the East Passage between Newport and Jamestown, which would be transited at a speed of about 10 knots (this area would be transited by all LNG ships regardless of terminal locations); and the entrance of Mount Hope Bay near Bristol Point, which would be transited at a speed of about 5 knots (this area would be transited by LNG ships en route to either the proposed LNG terminal site or Somerset LNG Project site). For an LNG ship in transit at 10 knots, recreational craft attempting to travel in the opposite direction at one of the narrow locations may be delayed up to 16 minutes for the LNG ship to pass before proceeding on its way, and up to 32 minutes at the entrance to Mount Hope Bay.

The extent of the impact on recreational boaters would depend on the number of boats in the project area during the days of the year that LNG ships would call on the LNG terminals. These impacts would be greatest during the peak recreational boating season between about May and September. As noted above, the Coast Guard would most likely use a program of announcements to give advance notice of each security zone.

Land Use

There are a variety of reasonably foreseeable residential, commercial, industrial, and transportation projects in the vicinity of the proposed LNG terminal and the pipeline routes (see table 4.13-1). Various agencies and organizations have made efforts to account for the cumulative impact of multiple development projects on land use by developing local and regional plans. These plans and the project's relationship to reasonably foreseeable projects are discussed in detail in sections 4.8.2 and 4.8.3. Although the Weaver's Cove LNG Project would affect existing land uses in the area, the project would be consistent with current land use plans and zoning ordinances. Consequently, the immediate cumulative land use effects of the project have already been considered. As discussed previously, it is conceivable that the development of multiple LNG projects in the region could result in a cumulative impact on the existing Algonquin pipeline system. Depending on the specific nature of an expansion by Algonquin, existing pipeline rights-of-way could be widened to accommodate additional pipeline (e.g., looping).

Air Quality/Noise

Construction of the proposed project and some of the reasonably foreseeable projects and activities listed in table 4.3-1 would involve the use of heavy equipment that produce noise, air contaminants, and dust. Operation of the proposed LNG facility would also contribute cumulatively to air emissions and noise in the project area.

Over the long term, the proposed LNG terminal and pipeline facilities would not exceed any of the applicable ambient air quality standards. Although the LNG terminal would emit NO_2, CO, SO_2, PM_{10}/$PM_{2.5}$, VOC, and Pb, the proposed terminal would not be a major source of air emissions under the PSD regulations for any of these pollutants (see section 4.11.1). The NO_x and VOCs emissions from the Weaver's Cove LNG Project would contribute to regional ozone concentrations (the entire Commonwealth of Massachusetts is classified as a serious non-attainment area for ozone). However, these emissions would be small in comparison to the total NO_x and VOCs emitted by existing sources in the area (e.g., Brayton Point or Montaup Power Plants, vehicle emissions). Because the operational emissions associated with the project would be less than 50 tpy of NO_x and VOC, the LNG terminal would not be subject to NSR (see section 4.11.1). Also, because the entire area is classified as serious non-attainment for the 1-hour ozone standard, projects that would generate large quantities of air emissions are required to offset their emission increase with emission reductions in the air basin. Therefore, Weaver's Cove Energy and other project proponents such as Somerset LNG and KeySpan LNG would either generate small amounts of air emissions or, if the air emission would be major, be required to provide offsets. In either case, the total increase in air emissions within the air basin would not be significant in comparison to other existing air emission sources.

Natural gas is a relatively clean and efficient form of energy compared to other fossil fuels because it is efficiently transported to end users and consists predominantly of simple hydrocarbons (methane and ethane). By burning natural gas rather than other fossil fuels such as coal or fuel oil, it could be possible to reduce the emissions of regulated pollutants (e.g., NO_x, SO_2, and PM_{10}) or unregulated greenhouse gases (e.g., CO_2). As such, it is possible that the Weaver's Cove LNG Project could cumulatively improve air quality in the region by providing a competitively priced source of natural gas that could replace the more polluting forms of energy that are currently being used.

Additional noise produced during construction of the Weaver's Cove LNG Project and other projects could create short-term annoyances to nearby residences. These noise impacts would be localized and would attenuate quickly as the distance from the noise source increases. Therefore, cumulative noise impacts associated with construction would be unlikely unless one or more of the

projects occur at the same time and in the same location. The operational noise from the Weaver's Cove LNG Project would not be significant. The other proposed LNG projects would be located at a distance from the proposed site and would have no effect on noise levels in the project area.

As discussed previously, it is conceivable that the development of multiple LNG projects in the region could result in a cumulative impact on the existing Algonquin pipeline system. Depending on the specific nature of an expansion by Algonquin, additional compression could be added to the existing pipeline system that would include additional air quality or noise impacts.

Natural Gas Infrastructure

We received a comment suggesting that we analyze the cumulative effects of the Weaver's Cove LNG Project in relationship to other planned energy infrastructure projects in the region. Currently, we are aware of two other companies that are considering construction of LNG import terminals in the Narragansett Bay area - Somerset LNG and KeySpan LNG. Whether or not these projects get built will depend on economics as well as regulatory approvals. Ultimately, the economic feasibility of these projects depends on the demand for LNG (and by extension natural gas). Based on a recent FERC study (FERC, 2003), it appears that by 2009 there will be demand during peak periods of use in New England for an additional 500 MMcfd of natural gas above what the current infrastructure is able to provide. More recently, the Power Planning Committee (2005) indicated that the anticipated additional demand for natural gas by 2009 will be between 420 MMcfd and 590 MMcfd. Given that there are several other LNG terminal projects proposed or under preliminary consideration in the New England region (see section 3.2), it appears unlikely that the market would support the construction of all of the projects proposed in the Narragansett Bay area. The need for additional modifications or improvements to the existing interstate pipeline system if two LNG import terminals are constructed depends on which facilities would be constructed. Based on information provided by Algonquin, it appears that Algonquin's system has capacity to accommodate the volumes from any single project without additional compression or looping provided $45 to $50 million of existing infrastructure improvements are made. These improvements could include either uprating or relaying some existing pipeline and other modifications. However, to accommodate the natural gas from multiple LNG import terminals, Algonquin would need to implement more significant expansions that could include increased compression and/or the installation of additional pipe.

FERC staff requested specific information from Algonquin regarding the additional facilities that would be needed to transport the volumes of natural gas proposed by Weaver's Cove Energy and KeySpan LNG. Recognizing that the specific facilities would depend on the actual delivery points and noting that KeySpan LNG has yet to request specific transportation service or identified delivery points. Algonquin provided information about the additional infrastructure that would be required assuming deliveries from both terminals would be made to Mendon, Massachusetts and Lambertville, New Jersey, the two natural gas delivery points identified by Weaver's Cove Energy.

The analysis reveals that substantial improvements would be required to accommodate the needed capacity to transport the vaporized LNG from the proposed Weaver's Cove and KeySpan LNG facilities operating at full sendout capacity, to deliveries at Mendon and Lambertville. Assuming sendout capacity of 400 MMcfd for Weaver's Cove Energy and 500 MMcfd for KeySpan LNG[29], Algonquin would need to:

[29] 500 MMcfd is more than the KeySpan LNG terminal is currently proposed for but is equal to the design capacity of the KeySpan LNG sendout pipeline.

- uprate the entire G System including the G-12 and G-20 Laterals to operate at a maximum of 811 psig; re-lay approximately 2.6 miles of 16-inch pipeline with 30-inch pipeline from the North Attleboro meter station to the South Attleboro meter station and approximately 0.9 miles of pipeline from the G-5 tap to the South Attleboro meter station; construct approximately 8.1 miles of pipeline between the G-1 tap and the Cumberland meter station; and construct approximately 5.2 miles of pipeline between the Cumberland meter station and the North Attleboro meter station;

- uprate the MAOP of the G-22 Lateral (Brayton Point Lateral) from the G-1 tap to MP 8.5 to 970 psig; install over-protection at MP 8.5 to protect the remaining 2.3 miles of the G-22 Lateral; and install over-protection at MP 0.0 to protect the G-1 System;

- reverse flow on its 30-inch-diameter pipeline by installing and modifying certain station piping and appurtenant station equipments at the Chaplin, Southeast, and Hanover Compressor Stations such that flow of natural gas within the 30-inch-diameter pipeline can be reversed, allowing the additional supply to backflow thorough to the western portion of the Algonquin system;

- review all meter stations along the pipelines that are to be uprated for additional changes due to the higher operating pressures; review internal piping and heater capacities for ability to accommodate increased inlet pressures. If the existing piping cannot accommodate the new pressures, install additional over-pressure protection. Review other meter stations for the effects of increased operating pressures due to the new operating conditions presented by the KeySpan LNG Facility Upgrade Project and the Weaver's Cove LNG Project; and

- install approximately 15 chromatographs throughout the system to accurately track the changes in heating value of the gas being delivered through the Algonquin system downstream of the BGLS Lateral and the proposed sendout pipelines for the Weaver's Cove LNG Project.

Additionally, because deliveries to Mendon are projected to be at a pressure of approximately 560 psig and Tennessee operates at a higher pressure, Algonquin would not be able to make the prescribed deliveries at Mendon without installing additional facilities. Moreover, because deliveries to the interconnect with Texas Eastern at Lambertville are projected to be at a pressure of approximately 575 psig and Texas Eastern operates at a higher pressure, Algonquin would not be able to make the prescribed deliveries at Lambertville without installing additional facilities. Algonquin's preliminary estimate of the cost of these facilities is approximately $140 million, which is based on Algonquin's preliminary review of the project and is subject to material adjustments as the result of site variations, additional work, permitting requirements, and other factors.

It is possible that the construction of the Weaver's Cove Energy, Somerset LNG, and/or KeySpan LNG import terminals also could indirectly or cumulatively result in other potential environmental impacts (both positive and negative) outside of the Narragansett Bay area. The proposals to build new LNG import facilities in the region is in response to current and future demand for natural gas. By providing new sources of competitively priced natural gas and LNG, these projects would help alleviate negative impacts on the economy and regional air quality that could potentially result from more limited access to these sources of energy (see sections 1.3 and 3.1). In addition to potential expansions of Algonquin's system as discussed above, construction of one or more LNG import terminals could result in other changes to the pipeline infrastructure in New England. In a recent study of natural gas infrastructure in the region, the FERC stated that the expansion of LNG deliveries to the area between

New York City and Boston would free up capacity on the Algonquin and Tennessee pipelines, thereby providing additional access to natural gas stored in New York and Pennsylvania (FERC, 2003). It seems likely, however, that accessing these storage areas would require some expansions or modifications of the Algonquin and Tennessee pipelines. Nevertheless, the construction of the Weaver's Cove Energy, Somerset LNG, and/or KeySpan LNG import terminals would reduce the overall need for new pipeline capacity in the region (FERC, 2003). This reduction in need for pipeline capacity would result in corresponding reductions in environmental impacts typically associated with pipeline expansions (e.g., temporary or permanent impacts on water quality, wetlands, vegetation, land use, air quality, etc.).

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE STAFF'S ENVIRONMENTAL ANALYSIS

The conclusions presented are those of the environmental staff of the FERC. The Coast Guard will present, in its Letter of Recommendation and LNG Operations Plan, its own conclusions and recommendations, prior to construction and operation. The Letter of Recommendation will address the suitability of Narragansett Bay and the Taunton River for LNG ship transportation, and the Coast Guard's Vessel Transit Security Plan will address issues related to the public impact of safety or security zones for LNG vessels. Likewise, the COE will present its own conclusions and recommendations in the dredging and wetland permits it may issue pursuant to section 10 and section 404 of the River and Harbors Act and the CWA, respectively. The EPA has the authority to review and veto the COE decisions on section 404 permits.

We (the Commission's staff) have determined that Weaver's Cove Energy has designed its proposal to mitigate most of the adverse environmental impacts that could result from the construction and operation of the Weaver's Cove LNG Project. Where we have identified remaining adverse impacts, we have developed, as appropriate, specific mitigation measures to reasonably avoid or minimize those impacts. We are recommending that these mitigation measures be attached as conditions to any authorization issued by the Commission. The Coast Guard's security plan that controls the LNG vessels operating through Narragansett Bay to/from the proposed terminal will further ensure the public safety. We conclude that if it is constructed and operated in accordance with Weaver's Cove Energy's proposed mitigation and our recommended mitigation measures, the proposed action would meet federal safety standards, can be operated safely, and would have limited adverse environmental impact. Our conclusions are based on information provided by Weaver's Cove Energy and data developed from data requests; field investigations by Commission staff; literature search; alternative analyses; comments from federal, state, and local agencies; and input from legislators, public groups, and individual citizens.

The discussion below summarizes the environmental impacts and the proposed or recommended mitigation for each resource analyzed in this final EIS. The impacts discussed in section 4 and summarized below would be most significant during the construction period. A detailed summary of specific project impacts and mitigation, which complements this section, is provided in a table in Appendix I to assist with MEPA's Section 61 Findings requirements in 301CMR 11.07(k).

Geology

Construction and operation of the proposed project would have minimal impact on geologic resources in the area, and the potential for geologic hazards or other natural events to significantly impact the project is low.

Existing soils at the LNG terminal site could liquefy during a major earthquake; however, the likelihood of a major earthquake occurring in the project area during the operating life of the proposed LNG terminal is low. To address this concern, soils beneath the LNG tank would be fortified with stone columns. Stone columns would reduce calculated liquefaction-induced settlements to acceptable design tolerances and improve the static load-bearing capacity of the soils.

As specified in NFPA 59A, predicted levels of ground shaking would also be incorporated into the final design of the LNG tank, its impoundment system, and other critical structures at the LNG terminal site. Seismic activity is not expected to adversely impact construction or operation of the proposed pipelines.

Stabilized dredged material would be used to raise the overall grade of the LNG site and to create an earthen berm and landform. The dredged material would not be susceptible to liquefaction; however, the slopes of the berm and landform and the shoreline stabilization structures would require final engineering design to ensure their stability. We have recommended that these final engineering designs be submitted for our review and approval before commencing with site construction.

It is unlikely that any tsunami or hurricane storm surge would occur of sufficient magnitude to impact the project. The proposed construction of the LNG terminal would include raising the overall elevation of the site, fortifying the existing sea wall, and constructing a berm around the facility, further reducing the potential for ocean-derived flooding or flash flooding to impact the site. Potential effects associated with high rainfall events would be mitigated by implementing the FERC Plan and Procedures, and Weaver's Cove Energy's Erosion and Sedimentation Control Plan.

Soils and Sediments

Construction of the proposed LNG terminal would permanently affect soils on the site and disturb sediments in the federal navigation channel and turning basin. Dredged sediments would be placed on the proposed LNG terminal site to raise the grade above the 100-year floodplain and to create an earthen berm and landform. Due to the generally level topography of the site, runoff and erosion of the native soils on the site would be minimal. The placement of the dredged material on the site would change the existing topography particularly in the area of the berm and landform, which would increase the potential for runoff and erosion. Weaver's Cove Energy would minimize erosion and sedimentation impacts during construction by implementing the mitigation measures specified in our Plan and Procedures as well as the measures specified in its site-specific Erosion and Sedimentation Control Plan. Furthermore, Weaver's Cove Energy would minimize potential soil contamination during construction by implementing the preventative and mitigative measures specified in its onshore and offshore SPCC Plans. The potential for runoff and erosion during operation of the LNG terminal facilities would be minimized by revegetating disturbed soils and implementing a permanent stormwater management system.

An existing federal navigation channel and turning basin would require maintenance and improvement dredging to accommodate the deep-draft LNG ships. Dredging operations conducted to meet the navigational requirements of the project would disturb about 2.6 million cubic yards of sediment. The dredged sediment would be loaded onto barges or scows and then transported to the LNG terminal site. The sediment would be stabilized with portland cement and used as engineered fill material on the LNG terminal site. We determined and Weaver's Cove Energy documented that the site could accommodate the reuse of all the dredged sediments (including 2-feet of overdredged sediment).

In contrast to our original review of the dredged materials, the revised analysis indicates the presence of a hotspot of various contaminants. Core TB-10 in the turning basin contains concentrations of a number of contaminants that are considerably higher than those same constituents in nearby cores. Based on our identification of this core as a hotspot for a number of contaminants, we believe that the sediment from this core and its immediate surroundings may need to be excavated separately from the remaining sediments in the turning basin, if the dredging is approved. However, because the dredging and management of contaminated sediments is largely an issue under the COE's jurisdiction, we have recommended that Weaver's Cove Energy consult with the COE regarding the appropriate method(s) for dredging and managing the sediment from turning basin core 10 and its immediate vicinity.

In accordance with the MCP requirements (310 CMR 40.0000), the sediment was comprehensively sampled and analyzed for COCs to evaluate potential risks from the reuse of the sediment on an upland site. Our analysis indicates that the concentrations of oils and other hazardous material in the proposed dredged sediment would pose no significant risk to human health. The analysis

indicates that the non-cancer risks for each receptor are less than the risk limit of 1.0 and the cancer risks are less than the risk limit of $1x10^{-5}$. In addition, none of the exposure point concentrations exceed Upper Concentration Limits.

A comparison of the 90th-percentile concentrations of PAHs and metals in the dredged sediments with background concentrations of PAHs and metals in soils (as determined by the DEP) indicates that none of the PAH concentrations exceed the most conservative DEP-defined background concentrations and many of the metals quantified in the dredged sediment may be attributable to background conditions as defined by the DEP. The COCs in dredged sediment that exceeded background levels were beryllium, chromium, lead, mercury, selenium, and silver. Although these six metals exceed DEP-defined background concentrations, only the concentration of beryllium exceeds the MCP S-1 soil standard. Based on additional testing conducted by Weaver's Cove Energy, the maximum concentration of beryllium in the existing site soils was comparable to those in the dredged sediment, indicating that the proposed reuse of the stabilized sediment would not introduce a contaminant to the site that is not already present.

As requested by the DEP, Weaver's Cove Energy conducted additional testing of the soils at the LNG terminal site to provide a further basis for compliance with the anti-degradation provision of the MCP. A revised Method 3 Risk Assessment based on the existing soil data from Shell Oil and the additional soil data generated by Weaver's Cove Energy indicates that upland placement of the dredged material at the LNG terminal site would pose no significant risk to human health or the environment. Our analysis of the upland reuse of the dredged sediments relative to the anti-degradation provision of the MCP indicates that upland reuse of the sediments would generally not create a reportable concentration (except for those constituents already present on the site that exceed their MCP reporting concentrations). Reuse of the sediments would result in increased concentrations of most metals at the site. However, these increases would not result in the exceedance of a reportable concentration for any metal except beryllium. As noted above, beryllium is present in the site soils; therefore, upland reuse of the sediments would not introduce a new contaminant to the site. In addition, the local background level of beryllium is likely to be higher than the DEP-published value of 0.9 mg/kg due to stack emissions from the two coal-fired power plants in Somerset.

The DEP has not yet made a final determination regarding the proposed upland reuse of the dredged material at the LNG terminal site. If the DEP does not determine that Weaver's Cove Energy's proposed upland reuse of the dredged sediments complies with the anti-degradation provision of the MCP, Weaver's Cove Energy would not be able to use the proposed site for upland placement of the dredged material. If this occurs, Weaver's Cove Energy would need to identify an alternative disposal site. For this reason, we have recommended that Weaver's Cove Energy provide a revised sediment placement plan if it is unable to verify the consistency of the proposed sediment reuse plan with the MCP.

Weaver's Cove Energy conducted Tier III testing of the sediments to determine their suitability for open water disposal. Weaver's Cove Energy's analysis of these results indicates that most of the proposed dredged material would be suitable for open water disposal. However, the COE and EPA are currently reviewing the Tier III testing results and have not concurred with Weaver's Cove Energy's determination regarding the suitability of the material for offshore disposal. Any alternative disposal options, including open water disposal, identified by Weaver's Cove Energy would require additional environmental review and FERC approval prior to dredging or construction of any of the proposed facilities.

The placement and reuse of dredged sediment at the proposed LNG terminal site could potentially improve the current site conditions by effectively isolating any soil hot spots for lead and LNAPL from potential receptors. The proposed LNG terminal site would be covered by between 5 and 25 feet of

stabilized dredged material. Our preliminary analysis indicates that this volume of stabilized fill would generally isolate any hot spots for lead contamination from potential receptors. However, those areas with the smallest thickness of fill (e.g., the area inside the LNG containment berm) may not completely isolate all potential receptors from LNAPL vapor contact. Because the calculations necessary to make a final determination of the potential for isolation of hotspots for lead and LNAPL must be carried out by an LSP, we have recommended that Weaver's Cove Energy provide the appropriate grading plans, cross section drawings, and risk assessments required to demonstrate the degree of isolation provided by the upland reuse of stabilized dredged materials.

Construction of the proposed pipelines would disturb soils and increase the potential for soil erosion and loss of soil productivity. Weaver's Cove Energy would control erosion and sedimentation during construction of the pipelines and ensure restoration of soil productivity by implementing the mitigation measures specified in our Plan and Procedures.

Water Resources

Groundwater

Construction and operation of the project would not have a significant impact on public or private drinking water supplies, or availability. No public or private drinking water wells or springs are known to be located within 150 feet of the project, and there are no federal or state sole-source aquifers, protected aquifers, or wellhead protection areas in the project area.

Soil and groundwater at the LNG terminal site are contaminated with petroleum from prior petroleum storage and distribution activities. LNAPL has been identified on the water table and active groundwater remediation is being performed in accordance with the MCP. The primary purpose of the groundwater remediation system is to recover LNAPL and prevent free product and contaminated groundwater from entering the Taunton River.

We have determined that placement of stabilized dredged material on the site, the installation of stone columns beneath the storage tank and the modification to the existing timber bulkhead would have minimal impacts on groundwater quality, the groundwater and contaminant flow regime, and the on-going remediation efforts. We also do not believe that use of the dredged material would further degrade existing site conditions. However, in accordance with the MCP, Weaver's Cove Energy must monitor groundwater levels and the effectiveness of the remediation system during project construction, and implement measures to prevent LNAPL or other contaminant migration to the Taunton River, shall monitoring indicate that it may occur. The DEP has stated that the construction of this facility requires Weaver's Cove Energy to conduct a response action and to be included on the Tier 1B Permit as a responsible party, potentially responsible party, or other party. Modifications to the existing remediation system may require that a revised Phase IV Remediation Plan, Phase V Operations and Maintenance Plan, and Remedial Operation Status Plan be submitted to the DEP.

Construction of the proposed pipelines could temporarily affect groundwater along the pipeline routes by increasing turbidity, causing fluctuations in ground water flow, and disrupting groundwater discharge. These effects would be mitigated by Weaver's Cove Energy's plan to backfill the trench with native material and restore natural contours and drainage patterns in accordance with our Plan.

The pipeline routes would pass near at least two known contaminated sites. Groundwater could be affected if contaminated soils or groundwater associated with these sites are encountered during construction. Groundwater could also be impacted by a spill of hazardous material during construction of both the LNG facilities and the proposed pipelines. Weaver's Cove Energy would implement their SPCC

Plan that would mitigate the potential for and impact of any spills of hazardous materials. We have also recommended that prior to construction, Weaver's Cove Energy prepare a plan for the discovery and management of contaminated soils or groundwater to address potential impacts if contaminated soils or groundwater are encountered during construction.

Surface Water

The proposed dredging of the federal navigation channel and turning basin would result in the excavation and removal of up to about 2.6 million cubic yards of sediment from the Taunton River and Mount Hope Bay. The primary impact on water quality associated with this dredging would be the resuspension of sediment in the water column. The suspended sediment could reduce light penetration and lower the rate of photosynthesis and aquatic productivity of an 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. Water quality could also be impacted if there is a spill of hazardous material into the water during construction.

Sediment fate and transport modeling indicates that suspended sediment impacts associated with proposed dredging activities would be temporary and primarily localized to the dredging areas. Our analysis indicates that contaminants associated with the dredged sediment would not likely pose a significant hazard. Elutriate tests indicate that most chemicals would remain tightly bound to the sediments and would not be released in significant quantities into the water column. Elutriate testing suggests that only copper and zinc in the sediments would be released into the water in concentrations that exceed EPA-published acute and chronic exposure-based screening criteria. We believe both of these metals would be quickly diluted by the surrounding river water and would not pose a substantial risk to the aquatic environment. Additionally, the DEP has indicated that Weaver's Cove Energy would need to develop a water quality monitoring program to evaluate the amount and extent of suspended sediment in the water column; determine if elevated levels of suspended sediments extend beyond the mixing zone; and ensure that Massachusetts' state surface water quality standards and criteria are met at the edge of the mixing zone.

Construction activities at the LNG terminal site could also affect the water quality of the Taunton River. Sediment dewatering and silt-laden stormwater runoff from the construction site could increase suspended sediment and turbidity levels in the river. Weaver's Cove Energy would minimize impacts of construction activities on water quality by implementing the erosion control measures in our Plan and Procedures, developing and adhering to a site-specific Erosion and Sedimentation Control Plan and a SPCC Plan, and complying with the requirements of its NPDES permits. Impacts on the Taunton River would also be minimized by Weaver's Cove Energy's implementation of a Stormwater Management Plan.

Construction of the Northern and Western Pipelines would require the crossing of 4 perennial and 11 intermittent streams. The largest of the perennial waterbodies is the Taunton River, which is approximately 2,200 feet wide at the proposed crossing location. Weaver's Cove Energy proposes to open-cut the river using the same dredging equipment that would used to excavate the federal navigation channel and turning basin. The material dredged from the pipeline trench would be placed on the LNG terminal site. Following installation of the pipeline, the trench would be backfilled with coarse-grained native sediments. We evaluated the potential to use the HDD technique to minimize impacts on the Taunton River but determined that an HDD crossing is not a practical alternative that provides a clear environmental advantage over the open-cut crossing method. Subsurface conditions at the proposed crossing locations appear to be unsuitable for the HDD technique and the presence of roads and a railroad adjacent to the river would interfere with fabrication of the pipe segment required for a HDD crossing.

The other 14 waterbodies vary in width from 3 to 12 feet. None of these streams are navigable and one of the perennial waterbodies, Steep Brook, is contained in a culvert at the proposed crossing location and would not be affected by the installation of the Northern Pipeline. The remaining 13 waterbodies would be crossed using the open-cut construction technique.

The potential effects of pipeline construction on waterbodies crossed using open-cut methods would be similar to those described for dredging. Weaver's Cove Energy would mitigate the impact of open-cut construction by implementation of a project-specific SPCC Plan and adherence to our Procedures.

Weaver's Cove Energy is currently planning to obtain water from the City of Fall River for hydrostatic testing of the LNG storage tank, LNG plant piping, and the sendout pipelines. If the City denies the use of its water or otherwise is unable to provide the water, Weaver's Cove Energy indicated that hydrostatic test water would be obtained directly from the Taunton River. After the hydrostatic testing is completed, Weaver's Cove Energy is proposing to discharge the test water directly into the Taunton River over a period of several days. The water would be filtered prior to discharge and would be returned at a rate and location that would minimize bottom disturbance and potential impacts on aquatic resources. The discharge of hydrostatic test water would be conducted in accordance with the FERC Procedures and the NPDES permit(s) issued by the DEP and/or EPA. The discharge of water would also be controlled, as necessary, to prevent erosion or scouring of the banks or bed of the river. Weaver's Cove Energy would coordinate with the City of Fall River to ensure that water requirements for hydrostatic testing from municipal sources would not impact public water availability.

Wetlands

Stabilization of the shoreline and construction of the ship unloading facility on the southern parcel would result in the filling of 0.04 acre of estuarine salt marsh, 0.94 acre of other intertidal habitat, and 0.19 acre of subtidal habitat, as well as impact a number of other state regulated wetland resources. Development of the northern parcel would fill 1.9 acres of palustrine emergent/scrub-shrub wetlands. Dredging of the federal navigation channel and turning basin would affect another 191 acres of subtidal habitat and about 0.23 acre of intertidal habitat. Construction activities on the terminal site would also alter the location of the coastal bank and reduce the area subject to coastal storm flowage. The filling of these resource areas would reduce the amount of habitat available to aquatic resources, reduce the amount of sediment available for the replenishment of coastal beaches, and alter sediment transport processes. However, the sheetpile used to armor the shoreline would also provide certain benefits, such as protecting the upland areas from storm damage and flooding.

Construction of the Northern and Western Pipelines would disturb about 2.82 acres of wetlands. Clearing, trenching, and other activities in wetlands could also affect wetland hydrology and water quality. The operation of heavy equipment in these wetlands could also compact wetland soils, create ruts, and result in increased sedimentation and turbidity. In addition, the pipeline trench could act as a conduit for subsurface water flow which could impact wetland hydrology. Following construction, about 0.47 acre of forested and scrub-shrub wetland would be converted to other wetland types; however, there would be no net loss of wetlands resulting from construction and operation of the pipeline facilities. Wetlands within the maintained segments of the permanent easement would re-establish as emergent wetlands, non-maintained areas of the permanent easement would revert to pre-construction wetland conditions, and wetlands within the temporary construction work area would also revert back naturally to their former state.

Weaver's Cove Energy took steps to avoid wetland impacts during the development of the project. For example, the LNG terminal facilities and dredge disposal areas were configured to avoid

several wetlands bordering the river on the southern parcel of the terminal site and the pipelines make use of existing rights-of-way to the maximum extent practical. Weaver's Cove Energy realigned a portion of the Northern Pipeline route since issuance of the draft EIS to increase the distance between the construction right-of-way and the Taunton River to avoid indirect impacts on wetlands bordering the river. Since issuance of the draft EIS, Weaver's Cove Energy has adopted two other route variations into the proposed Northern Pipeline route that would further reduce wetland impacts.

Weaver's Cove Energy proposes to minimize impacts on wetlands that cannot be avoided by implementing the protective measures specified in our Procedures. These measures would include installing sediment barriers where appropriate to contain and control sediment and prevent silt-laden runoff from entering wetlands; using construction mats or other stabilization measures to minimize the disturbance of wetland soils; segregating topsoil from the trench in unsaturated wetland soils; leaving existing root systems in place to the extent practicable to facilitate wetland revegetation; and installing trench breakers as necessary to prevent the draining of wetlands.

Weaver's Cove Energy proposes to compensate for permanent wetland impacts at the LNG terminal site that cannot be avoided or minimized by developing and implementing a Wetland Mitigation Plan. This plan includes the restoration and creation of about 0.74 acre of salt marsh on the site and the creation of about 0.18 acre of freshwater wetland on the site. About 0.13 acre of tidal creek would be constructed in the restored and created salt marsh to connect this area with the Taunton River. Additionally, about 0.18 acre of freshwater wetland would be created in an upland area. We have recommended that Weaver's Cove Energy consult with the COE and NOAA Fisheries regarding mitigation of wetlands as well as intertidal and subtidal habitats and file with the Secretary the results of these consultations and the COE-approved Wetland Mitigation Plan prior to construction.

Vegetation

The proposed LNG terminal site is located on industrial/commercial land with some remnant forest land, open land, and intertidal vegetation communities. Development of the LNG terminal would result in the permanent clearing of about 10.7 acres of forest land and the disturbance of 5.1 acres of vegetated open land. Following construction, portions of the site that are not covered by buildings, roads, gravel, or other hard surfaces would be restored and revegetated. Weaver's Cove Energy would also implement a landscape design plan that would include various plantings.

Construction of the Northern and Western Pipelines would disturb about 56.6 acres of vegetation consisting of 5.4 acres of upland forests, 39.6 acres of upland shrub lands, 6.6 acres of upland fields, 2.8 acres of wetlands, and 2.2 acres of landscaped lawns. Impacts on fields, lawns, and emergent wetlands would be temporary and short term. Impacts on trees and other woody vegetation would be longer term and about 3.9 acres of forest land on the permanent right-of-way and meter and regulation station sites would be permanently cleared. Weaver's Cove Energy has minimized the amount of woody vegetation that would be affected along the pipeline routes by colocating the proposed pipelines with existing, previously cleared rights-of-way.

Following construction, the portions of the construction rights-of-way that are not required for pipeline operations would be seeded with grasses and allowed to revert to their previous preconstruction condition through natural succession. The permanent right-of-way would also be restored with grasses, and operational impacts on vegetation would be minimized by the vegetation maintenance practices specified in our Plan and Procedures.

Wildlife and Aquatic Resources

Construction activities associated with the proposed LNG terminal and sendout pipelines could affect wildlife habitat through the cutting, clearing, and/or removal of existing vegetation within the construction work area. Wildlife would be temporarily displaced during construction and the limited removal of forest vegetation would have a localized, but long-term impact on wildlife. Weaver's Cove Energy would minimize these impacts by colocating the pipelines with other existing rights-of-way where possible, which would minimize the amount of forest clearing needed for the project.

The proposed maintenance and improvement dredging and shoreline modifications would have both direct and indirect impacts on aquatic resources including fish, shellfish, and benthic organisms. Direct alteration of the benthic substrate via dredging would remove the existing benthic community and may adversely affect prey species, suitable cover, settlement structure, and/or nursery and spawning habitat. Dredging would also directly impact an estimated 21 acres of suitable quahog habitat in the proposed turning basin. To mitigate impacts on quahogs and other shellfish from the development of the turning basin, Weaver's Cove Energy has indicated that it would coordinate with federal and state agencies to harvest and relay quahogs from the proposed dredging footprint prior to commencement of dredging activities and to develop and fund a plan to reseed quahogs in those areas where quahogs were harvested. In response to comments regarding the appropriateness of Weaver's Cove Energy's proposed quahog mitigation measures, we have recommended that Weaver's Cove Energy complete the coordination with applicable federal and state agencies regarding development and funding of mitigation measures to offset impacts on quahogs resulting from dredging of the proposed turning basin expansion.

Dredging and construction of the ship unloading facility and proposed shoreline modifications would also suspend sediment in the water column. These effects would mostly result in the temporary disturbance and displacement of aquatic organisms during construction. In addition, site runoff during project operations and prop wash associated with the transit of LNG ships could affect aquatic organisms.

Weaver's Cove Energy conducted elutriate tests and computer simulation modeling to investigate potential impacts of dredging on aquatic resources. As mentioned above, elutriate testing suggests that although some chemicals could be released into the water, the concentrations of these chemicals is unlikely to pose a significant hazard. Our analysis indicates that no species or life stage would be exposed to sublethal or lethal suspended sediment concentration levels during dredging.

Modeling results indicated that based on the proposed dredging plan, no life history stage of any species, other than winter flounder eggs, would be exposed to the minimum effects threshold during dredging. According to the results of the modeling, the redeposition of sediments from the proposed dredging could impact about 6.2 acres of winter flounder egg habitat. In addition, the dredging to expand the existing turning basin could directly affect another 11 acres of winter flounder egg habitat. To address agency concerns regarding these potential impacts, we have recommended that Weaver's Cove Energy prohibit in-water silt disturbing construction activities in the Taunton River and Mount Hope Bay during the winter flounder spawning period (January 15 through May 31) and mitigate the permanent loss of winter flounder habitat in the proposed turning basin expansion. Our recommendation requiring the time-of-year restriction to avoid adverse impacts on winter flounder would also apply to the proposed open-cut crossing of the Taunton River.

In addition to potential dredging-related impacts, pipeline construction could directly affect aquatic resources present in the waterbodies crossed by the project. An inadvertent chemical or fuel spill in or near a waterbody could release contaminants, which could adversely affect fish and other aquatic organisms. Implementation of our Procedures and Weaver's Cove Energy's SPCC Plan would minimize the potential for adverse impacts on aquatic resources.

As mentioned above, Weaver's Cove Energy may withdraw water from the Taunton River for hydrostatic testing of the LNG tank and pipelines. If so, the intake pipe would be set at a depth of 5 feet below MLLW and would be fitted with a fine mesh screen to minimize potential entrainment and impingement of aquatic organisms. As such, we believe that hydrostatic test water withdrawal would not result in adverse impacts on aquatic species.

Operational impacts of the LNG terminal would be associated primarily with the LNG ships and could include entrainment or impingement of fish during water withdrawals for ship ballast and impacts from increased turbidity generated by prop wash during ship transit. Based on available ichthyoplankton density data and the maximum anticipated ballast water intake of 14 million gallons per LNG ship, we estimate that the number of fish eggs or larvae that could be affected by water withdrawals by LNG ships could be 12,349,970 eggs and 1,900,000 larvae annually depending on the time of year and the distribution of ichthyoplankton within the water column in relation to the ballast water intakes. Based on survival rates for eggs and larvae adopted from studies conducted for the Brayton Point Power Plant, we estimate that the entrainment of impingement of eggs and larvae could result in the annual loss of about 3,325 age-1 equivalent fish, of which about 86 percent would be winter flounder.

Previous studies in the Boston Harbor indicate that sediments resuspended by ship currents, including LNG ships, settle back to the substrate within a short period of time after being transported relatively short distances. Based on these studies, we expect there would be minimal impact from elevated TSS levels on most pelagic fish eggs and larvae because TSS concentrations shall return to background conditions within 1 hour or less of ship passage. The measured widths of the resuspended sediment plumes in the Boston Harbor studies suggest that the plumes would generally remain within the Taunton River navigation channel and the remobilized sediments would likely have limited impacts on demersal fish eggs and larvae outside this channel.

The potential introduction of invasive species is another possible effect of LNG shipping. Several factors, however, mitigate the potential for LNG ships to introduce invasive species to the project area, including but not limited to the fact that the LNG ships would not discharge ballast water into Mount Hope Bay or the Taunton River. We also note that under a new international convention adopted by the International Maritime Organization the LNG ships would have to carry a Ballast Water Record Book and carry out ballast water management procedures to a specified standard. The Coast Guard has also developed *Mandatory Practices for All Vessels with Ballast Tanks on All Waters of the United States*. Moreover, in February 2005, the Ballast Water Management Act of 2005 was introduced to Congress to amend the Non-indigenous Aquatic Nuisance Prevention and Control Act to establish vessel ballast water management requirements.

NOAA Fisheries reported that the Taunton River and Mount Hope Bay have been designated as EFH for 14 federally managed species including: windowpane flounder, winter flounder, red hake, Atlantic mackerel, black sea bass, bluefish, scup, Atlantic herring, scup, and summer flounder. The draft EIS included an EFH Assessment as necessary for compliance with the MSA. This analysis is also included in this final EIS. As a result of our analysis as presented in the EFH Assessment, we have concluded that dredging associated with the proposed project could affect water column, benthic substrate, and man-made structure EFH in the project area. Activities within the Taunton River and Mount Hope Bay also have the potential to affect anadromous fish and shellfish resources, two primary prey groups for managed fish species. Without revisions to the current proposed dredging program, impacts on managed species as a result of benthic habitat destruction and alteration could include direct and indirect impacts on winter flounder spawning habitat during the flounder spawning period. The draft EIS was sent to NOAA Fisheries along with a letter that initiated consultation under the MSA. Based on its review of the EFH Assessment included in the draft EIS, NOAA Fisheries provided conservation recommendations to further avoid, minimize, and mitigate adverse effects on EFH, including:

- prohibiting in-water silt-producing activities between January 15 and May 31 of any year to protect winter flounder spawning and juvenile development;

- requiring mitigation to offset permanent loss of winter flounder spawning and juvenile development habitat resulting from expansion of the turning basin; and

- requiring mitigation to offset the placement of fill within intertidal, salt marsh, and subtidal areas during site development.

We agree with these conservation recommendations and believe additional measures would be necessary to mitigate for benthic habitat destruction and alteration, including direct and indirect impacts on winter flounder spawning habitat. For this reason, we have recommended that Weaver's Cove Energy avoid in-water, silt disturbing construction activities during the winter flounder spawning period (January 15 through May 31), develop a mitigation plan in consultation with federal and state agencies to offset permanent loss of winter flounder spawning and juvenile habitat, and continue developing its proposed wetland mitigation plan to compensate for permanent impacts on wetlands, including intertidal and subtidal habitats.

Threatened and Endangered Species

The FWS reported that one federally listed species under its jurisdiction, the bald eagle, could potentially occur near the proposed project. NOAA Fisheries identified four additional federally listed endangered or threatened turtle species that could potentially occur in the general vicinity of the proposed project. We have determined that the project would have no effect on the bald eagle and is not likely to adversely affect the four turtle species.

In its comments on the draft EIS for another nearby project (*i.e.,* the KeySpan LNG Facility Upgrade Project), NOAA Fisheries stated that an increase in vessel traffic in Narragansett Bay could potentially affect federally listed marine mammals as a result of vessel strikes. Of particular concern is the North Atlantic right whale. NOAA Fisheries has developed a Strategy to Reduce Ship Strikes of Right Whales, which is not yet finalized, but would establish speed restrictions within 20 to 30 miles of the approaches in specific areas. In addition, the Coast Guard has been coordinating with NOAA Fisheries on various measures to reduce vessel strikes. We have determined that these measures are important for the protection of right whales from ship strikes, but because the proposed rule has not yet been finalized or implemented, we have recommended that Weaver's Cove Energy coordinate with NOAA Fisheries to determine appropriate speed and seasonal restrictions or other applicable measures to avoid or minimize impacts on right whales and to file the results of that coordination with the Secretary of the Commission. With the adherence to restrictions developed through coordination with NOAA Fisheries, we conclude that the project is not likely to adversely affect North Atlantic right whale (or other federally listed species) and are requesting NOAA Fisheries' concurrence with this finding.

The draft EIS (which served as a Biological Assessment) was sent to the NOAA Fisheries along with a letter that initiated consultation under section 7 of the ESA. We have not yet received a concurrence letter from the NOAA Fisheries on our determinations.

Land Use, Recreation, and Visual Resources

The LNG terminal would be developed on 73 acres of industrially zoned private property (consisting of a 55-acre southern parcel and an 18-acre northern parcel) that Weaver's Cove Energy has an option to purchase from Fall River Marine, L.L.C., who is the current landowner. The 55-acre

southern parcel of the LNG terminal site is in a designated port area, which was previously used as a petroleum products storage and distribution facility from the 1920s to the 1990s.

Construction of the proposed LNG terminal facilities would disturb about 69.3 acres of the 73-acre site. Following construction, about 54.3 acres of the site would be retained as industrial/developed land. The remainder of the land during operation of the LNG terminal would consist of 15.0 acres of open land, 1.0 acre of forest land, and 2.7 acres of wetland.

The proposed maintenance and improvement dredging of the federal navigation channel and turning basin would disturb approximately 191 acres of the bed of the Taunton River and Mount Hope Bay. The existing federal channel and a portion of the east channel would be permanently deepened to 37 feet. The existing turning basin would be permanently enlarged and deepened to 41 feet.

Of the 3.6 miles of the Northern Pipeline route, about 3.5 miles (97 percent) would be constructed within or adjacent to an existing utility or transportation right-of-way. The remaining 0.1 mile (3 percent) would be constructed on newly created right-of-way located at the northern end of the pipeline route. Of the 2.5 miles of the Western Pipeline route, about 1.8 miles (72 percent) would be constructed adjacent to or within existing utility rights-of-way. The remaining 0.7 mile (28 percent) would be constructed on newly created right-of-way. In addition to the construction right-of-way, Weaver's Cove Energy has identified two temporary extra workspaces and one pipe storage yard that would be used to support construction activities. Weaver's Cove Energy also proposes to construct two meter and regulation stations, one at the end of the Northern Pipeline (MP 3.6) and one at the end of the Western Pipeline (MP 2.5) where each interconnects with the Algonquin pipeline system. Construction of the pipeline facilities would disturb a total of about 65.5 acres of land. Open land would be the primary land use affected by construction of the pipeline facilities totaling about 51.5 acres (79 percent). The remaining land uses that would be disturbed consist of 5.5 acres (8 percent) of forest land, 5.1 acres (8 percent) of open water, and 3.4 acres (5 percent) of industrial/commercial land.

There are several existing plans, policies, designations, and guidelines that have been established for land use development in the project area by state, regional, and local entities. In general, although the mayor and city councilors of Fall River have expressed opposition to the project, we have found that the Weaver's Cove LNG Project would be consistent with these plans, policies, designations, and guidelines. The Weaver's Cove LNG Project is subject to a Federal Coastal Zone Consistency Review because it would: 1) involve activities within the coastal zones of Massachusetts and Rhode Island; and 2) require several federal permits and approvals. Weaver's Cove Energy has not yet completed the process for the federal consistency certification with either the OCZM or CRMC, but would need to demonstrate consistency with each state's CZMP and obtain concurrence of consistency from both agencies prior to the FERC approving the start of any construction.

Approximately 12,000 people living in 5,100 housing units are located within 1 mile of the proposed LNG storage tank. Of the 5,100 housing units, approximately 1,200 units are located within 0.5 mile of the proposed LNG storage tank. Potential impacts on nearby residential and commercial areas during operation of the LNG terminal include increased visibility of aboveground structures associated with the facility, increased traffic, changes in air quality, and safety hazards. Weaver's Cove Energy's proposed construction work area for the pipeline facilities (i.e., construction right-of-way and temporary extra workspaces) would be located within 50 feet of 35 residential dwellings (i.e., homes or condominium units). Of the 35 residences, 14 are located along the Northern Pipeline route and 21 are located along the Western Pipeline route. Weaver's Cove Energy would implement several measures to minimize construction-related impacts on residences and other structures located within 50 feet of the construction right-of-way, including the preparation of site-specific residential construction mitigation plans.

The southern parcel of the LNG terminal site was used as a petroleum product storage and distribution terminal between the 1920s and 1990s. Historical operations at the site resulted in contamination of soil and groundwater by petroleum products. The proposed pipeline facilities would cross two hazardous waste or contaminated site. Weaver's Cove Energy's proposed mitigation and our recommended measures would minimize impact resulting from the disturbance of contaminated soils and groundwater at the LNG terminal and along the pipeline route.

We have determined that project would not have a substantial adverse affect on the Taunton River's potential designation as a Wild and Scenic River, although we have not yet received a concurrence letter from the U.S. Department of the Interior on our determination.

Overall, construction and operation of the project facilities are not expected to significantly affect recreational activities in the project area. Recreational boaters might experience temporary impacts as a result of human activity and noise associated with construction of the proposed marine facilities and pipeline across the Taunton River, but these impacts would be temporary and localized to the area of construction. Weaver's Cove Energy would develop a Navigation Work Plan in consultation with the COE, Coast Guard, local harbor masters, and the Northeast Marine Pilots Association. The Navigation Work Plan would include measures to ensure the safe passage of waterborne transportation and recreational use of the waterway during construction activities.

Operation of the LNG terminal would not affect recreational boating during periods between LNG deliveries. However, recreational ships and boats, fishermen, and others engaged in marine-based activities could be affected by the safety and security zones that would be imposed by the Coast Guard during periods when an LNG ship is in transit to or berthed at the LNG terminal. Many recreational boats shall be able to go around the LNG ships at points in the river that are sufficiently wide for them to be outside of the security zone. In locations were the waterway is narrow, a recreational craft attempting to travel in the opposite direction of an LNG ship may experience a delay, however, because the safety and security zone would be a moving zone around the ship, such delays would be temporary. We estimate that delays of up to 60 minutes may result depending on the travel speed of the LNG ship. For boaters near or upstream of the facility, an additional 60 minute delay may be experienced while the LNG ship is berthed or turned. Weaver's Cove Energy would be in regular contact with the Coast Guard and other waterway users to ensure that the arrivals of the LNG ships are coordinated with other ship traffic to minimize disruption on waterway users. The Coast Guard would routinely provide Notice to Mariners prior to the arrival and departure of LNG ships as the Coast Guard currently does for LPG vessels and for other activities. In addition, Weaver's Cove Energy has indicated that it would be willing to consider limiting LNG ship transits during peak weekend hours and using early morning periods, subject to tidal conditions. With the agreement of the Coast Guard and pilots, Weaver's Cove Energy would also explore the possibility of eventually using nighttime transits for the LNG ships to minimize impacts on recreational boating.

The most prominent visual feature of the proposed LNG terminal would be the LNG storage tank and the proposed landform (the top of the tank would be at an elevation of about 220 feet above MSL). Due to the terrain and density of the area, the tank and landform would be highly visible from a number of locations in Fall River and Somerset. Because of the limited potential for screening, the visual impacts associated with the LNG terminal would be unavoidable; however, Weaver's Cove Energy would use the dredged material to construct a landform north and east of the tank to provide some visual screening of the facility from locations to the east and northeast. Following construction, portions of the site that are not covered by buildings, roads, gravel, or other hard surfaces would be restored and revegetated. Weaver's Cove Energy would also implement a landscape design plan that would include various plantings. In addition to the site itself, the LNG ships would temporarily affect the visual landscape while in transit and docked at the LNG terminal.

The proposed meter and regulation stations would be located in areas that are relatively remote from residences and are not expected to have a significant impact on visual resources. Construction of the pipelines, however, would reduce visual screening adjacent to some residences. We analyzed route variations or other measures to minimize the impact on the residences most likely to be affected by the loss of visual screening. Weaver's Cove Energy has agreed to incorporate two of these route variations along the Northern Pipeline route into the proposed route to avoid or minimize impacts on visual resources.

Socioeconomics

Construction and operation of the project would have short- and long-term socioeconomic impacts. Construction of the project would result in a temporary increase in population, traffic, and demand for temporary housing and public services. Due to the temporary and limited nature of these impacts, they are not considered significant. Construction and operation of the project would have a beneficial impact on local tax revenues and economies.

There is concern about the potential for bridge closures to result in significant traffic delays. During the Coast Guard's recent security workshops, workshop participants determined that it would not be necessary to close the bridges (except for the Brightman Street Bridge, which would be "closed" to road traffic every time any large ship passes) unless the threat condition or current intelligence raises a concern about security issues. While bridge closures are one of the many tools available to the Coast Guard, other alternatives to a complete bridge closure under consideration include closing the outboard lanes only, placing law enforcement officials on the bridge at strategic locations, or employing technology that provides suitable security alternatives. If bridge closings would be needed, Weaver's Cove Energy would adjust ship transit plans to prevent the simultaneous closings of the Braga and Brightman Street Bridges. To address potential bridge closings, Weaver's Cove Energy has stated that it would develop a Traffic Management Program in consultation with the MassHighway, Rhode Island DOT, Coast Guard, Massachusetts state police, and other local authorities if it receives approval for the project.

The operation of the proposed LNG terminal and associated facilities is not expected to have a major impact on most public services since it would not result in the construction of new public roads, extensive new sewer or water systems, or significant changes in local population levels. There is however a concern that an incident at the LNG terminal could exceed the current response capacity of the Fall River fire and police departments. Weaver's Cove Energy would coordinate with local fire departments to develop an emergency response plan to be used in the event of an incident at the LNG terminal. Weaver's Cove Energy would coordinate with local fire departments to develop an emergency response plan to be used in the event of an incident. Weaver's Cove Energy has also indicated that it would be willing to provide funding for the local emergency response services and stated that it would be willing to cover the costs of security in Fall River at a level similar to what the existing Distrigas LNG facility has been providing to the City of Everett, where it is located.

Based on several general and site-specific studies, as well as the fact that the proposed terminal would be located at an existing industrially zoned property that was previously used as a petroleum products storage and distribution facility, we concluded that the project would be unlikely to have a negative impact on property values in the surrounding area.

Potential impacts of the project would not have a disproportionately high or adverse effect on the environmental justice communities near the proposed LNG terminal and navigation channel.

Cultural Resources

Weaver's Cove Energy conducted aboveground cultural resources surveys of the LNG terminal and pipeline facilities, and their respective viewsheds. The surveys documented seven resources that are listed in or recommended eligible for listing in the NRHP within the viewshed of the LNG terminal (Wm. B. Canedy House, Border City Mills, Sagamore Mills No. 1 & 3, the Montaup Power Plant, the Lower North Main Street area, St. John's Cemetery, and Riverside Avenue South area). The surveys also documented a historic cemetery (Winslow Burial Ground) located near the proposed meter and regulation station at the terminus of the Northern Pipeline, but outside its viewshed. The Massachusetts SHPO has not commented on the results of the aboveground surveys, but has requested additional information on the Winslow Burial Ground.

Weaver's Cove Energy conducted terrestrial archaeological reconnaissance surveys of the LNG terminal and pipeline facilities. No archaeological sites were identified as a result of the reconnaissance surveys. The LNG terminal was characterized as having a low archaeological sensitivity, and no additional testing of this area was recommended. Portions of the Northern and Western Pipelines were assessed as having moderate to high archaeological sensitivities, and an intensive (locational) survey of these areas was recommended. The Massachusetts SHPO concurred with these results and recommendations.

Weaver's Cove Energy subsequently filed corrected alignment sheets for the Northern Pipeline, updating the route between MP 3.0 and its terminus, and revising the location of the meter and regulation station at the terminus of the pipeline. Based on the new route, Weaver's Cove Energy identified additional archaeologically sensitive areas along the Northern Pipeline route, and an intensive (locational) survey of these areas was recommended.

Weaver's Cove Energy next conducted an intensive (locational) survey along the archaeologically sensitive segments of the Northern and Western Pipeline routes, and a terrestrial reconnaissance survey of newly identified route variations and temporary and additional temporary workspace locations along the Northern Pipeline. The intensive (locational) survey identified two sites (the Head of Cove 2 and Barnaby Swamp 2 sites) along the Northern Pipeline and two sites (the Wetland 3 Find Spot and the Slade Farmstead and Cemetery) along the Western Pipeline. Weaver's Cove Energy found that the Head of Cove 2 Site and Wetland 3 Find Spot lacked research potential, and no additional testing of these sites was recommended. Weaver's Cove Energy also found that the Barnaby Swamp 2 Site and the Slade Farmstead and Cemetery may contain intact archeological deposits. The Massachusetts SHPO concurred with these results, and recommended site examination archaeological surveys of the Barnaby Swamp 2 Site and the Slade Farmstead and Cemetery.

The reconnaissance survey of the route variations and temporary and additional temporary workspace locations along the Northern Pipeline identified approximately 1.5 miles of pipeline corridor in archaeologically sensitive areas. An intensive (locational) survey of this high sensitivity area was recommended. The Massachusetts SHPO concurred with the survey results and recommendation.

Weaver's Cove Energy subsequently conducted the recommended intensive (locational) survey along the Northern Pipeline, a supplemental intensive (locational) survey of a route variation along the Western Pipeline, and site examination surveys at the Barnaby Swamp 2 Site and Slade Farmstead and Cemetery. As a result of the intensive (locational) surveys, five new sites (the CSX#1, CSX#2, ISP#1, ISP#2, and Taunton River Marsh sites) were identified along the Northern Pipeline, and no sites were identified along the Western Pipeline; Weaver's Cove Energy characterized all five sites as not significant. In addition, based on the results of the site examination surveys, Weaver's Cove Energy recommended the Barnaby Swamp 2 and Slade Farmstead sites as not eligible for listing in the NRHP.

The Massachusetts SHPO did not concur with the results of these surveys. The SHPO concluded that the five new sites identified during the intensive (locational) survey may possess research potential, and recommended site examination archaeological surveys at each site. The SHPO assessed the Barnaby Swamp 2 Site as eligible for listing in the NRHP, and recommended either archaeological site examination to better define site context and research potential, or archaeological data recovery at this site. The SHPO assessed the Slade Farmstead and Cemetery as eligible for listing in the NRHP, but concluded that the project would have no adverse effect on this site. The SHPO also requested avoidance plans for those portions of the Barnaby Swamp 2 and Slade Farmstead sites located outside the project APE.

Lastly, Weaver's Cove Energy conducted underwater archaeological reconnaissance surveys of the turning basin at the LNG terminal and the Western Pipeline from MP 0.0 to 0.5. No submerged cultural resources were identified as a result of this work, and no additional testing of the surveyed areas was recommended. Both the Massachusetts SHPO and BUAR concurred with these results and recommendations.

Weaver's Cove Energy needs to provide the SHPO with the requested information on the Winslow Burial Ground, conduct the recommended site examination surveys, and prepare avoidance or data recovery plans, as appropriate. Weaver's Cove Energy also needs to file all outstanding survey reports, evaluation reports, and avoidance or treatment plans, and the SHPO's comments on the reports and plans. Therefore, we have recommended that Weaver's Cove Energy defer construction until these tasks are completed, and any additional required survey reports or treatment plans, and the SHPO's comments on the reports and plans, are filed with the Commission for review and approval by the Director of OEP.

Air Quality and Noise

Construction and operation of the proposed LNG terminal and pipelines would result in air emissions, including fugitive dust, onshore and offshore construction equipment tailpipe emissions, LNG truck and ship emissions, and water/glycol heater emissions. The fugitive dust and tailpipe emissions during construction activities would be temporary, intermittent, and vary in location over time. These emissions would not result in a long term impact on air quality. The emissions would be minimized using the application of water for dust suppression during construction and by operating construction equipment on an as-needed basis. To further minimize air quality impacts during construction, we have recommended that Weaver's Cove Energy use transportation grade or better diesel fuel in all construction equipment.

The primary pollutants emitted during operation of the LNG terminal would be nitrogen oxides and carbon monoxide. The operational air emissions from the LNG terminal would be minimized by using ultra dry low NO_x water/glycol heaters and would meet the federal and state air emission requirements by implementing best available control technology and undergoing an air plan approval process through the DEP. The operational air emissions from the LNG terminal, including the facility stationary sources and LNG trucks and ships, would not exceed an ambient air quality standard. To address potential odor issues related to the dredged material, we have recommended that Weaver's Cove Energy prepare a nuisance odor complaint and abatement plan for implementation during the dredging operations.

Noise receptors in the immediate vicinity of construction activities would experience an increase in noise levels. In most areas, the increase in noise would be localized, temporary, and limited primarily to daylight hours. Noise associated with dredging operations, however, could occur up to 24 hours a day for a period of three years. To address this impact, we have recommended that Weaver's Cove Energy

prepare a noise mitigation plan that would ensure that the dredging and stabilization operations do not contribute more than 55 dBA L_{dn} to the ambient noise level at any NSA. The predicted operational noise from the LNG terminal would be below FERC's 55 dBA L_{dn} criterion at the nearest NSAs and in compliance with Massachusetts noise regulations. We have recommended that noise surveys be conducted after the LNG terminal is in service to ensure that the LNG operates in compliance with these guidelines.

Reliability and Safety

We evaluated the safety of both the proposed LNG import terminal facility and the related LNG vessel transit through Narragansett Bay to Fall River. With respect to the onshore facility, we completed a cryogenic design and technical review of the proposed terminal design and safety systems. Several areas of concern were noted and specific recommendations to be addressed prior to construction have been identified. We evaluated the thermal radiation and flammable vapor dispersion exclusion zones of the proposed LNG terminal. The analysis found that no excluded uses were within the exclusion zones, although a small section of the 1,600 British thermal unit per feet squared per hour (Btu/hr-ft^2) zone would extend off the property and we have recommended that Weaver's Cove Energy demonstrate legal control over this area, or secure a waiver, before we allow any construction.

Thermal radiation and flammable vapor hazard distances were also calculated for an accident or an attack on an LNG vessel. For 2.5-meter and 3-meter diameter holes in an LNG cargo tank, we estimated distances to range from 4,340 to 4,810 feet for a thermal radiation level of 1,600 Btu/hr-ft^2, the level which is hazardous to unprotected persons located outdoors. However, the evaluation of safety is more than an exercise in calculating the consequences of worst case scenarios. Rather, it is a determination of the acceptability of risk which considers: the probability of events; the effect of mitigation; and the consequences of events. Based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the Coast Guard and the local pilots, the likelihood of a cargo containment failure and subsequent LNG spill from a vessel casualty – collision, grounding, or allision – is highly unlikely. For similar reasons, an accident involving the onshore LNG import terminal or LNG trucking from the terminal is unlikely to affect the public. As a result, the risk to the public from accidental causes shall be considered negligible.

Unlike accidental causes, historical experience provides little guidance in estimating the probability of a terrorist attack on an LNG vessel or onshore storage facility. For a new LNG import terminal proposal, having a large volume of energy transported and stored near populated areas, the perceived threat of a terrorist attack is a primary concern of the local population and requires that resources be directed to mitigate possible attack paths. While the risks associated with the transportation of any hazardous cargo can never be entirely eliminated, they can be managed.

Several commentors have expressed the concern that local communities would have to bear some of the costs of ensuring the security of the LNG facility and the LNG vessel while in transit and unloading at the dock. As a result of its recently completed security workshops, the Coast Guard has identified a robust security plan that requires significant Coast Guard, public, and private resources that would be necessary to implement security measures. To meet its anticipated security responsibilities, the Coast Guard has initiated a formal proposal for additional resources through its internal budgeting process for inclusion in the 2006 appropriations bill. A determination on that proposal is pending. Weaver's Cove Energy has committed to providing funding for direct transit-related security costs; the potential costs to the states and local communities have not been estimated. As an indication of these costs, another proposed LNG import terminal near Providence, Rhode Island (KeySpan LNG, L.L.C.'s KeySpan LNG Facility Upgrade Project) estimated state and local security costs for its LNG deliveries at $40,000 to $50,000 per vessel port call. In addition to these direct transit-related state and local security costs, there

may be a need to fund additional capital costs associated with security and emergency response, such as equipment and personnel. Therefore, we have recommended that Weaver's Cove Energy provide a comprehensive plan identifying the mechanisms for funding all project-specific security and emergency response/management costs that would be imposed on state agencies and local communities, including capital costs.

Alternatives

We evaluated the alternatives of no action or postponed action, system alternatives, alternative LNG terminal sites, LNG terminal layout alternatives, pipeline route alternatives, and dredging/dredge disposal alternatives. While the no action or postponed action alternative would eliminate the environmental impacts identified in this EIS, the project objectives of providing LNG tanker discharge services to LNG suppliers and providing a new source of natural gas and LNG deliveries to the New England market would not be met.

Given the no action or postponed action alternative could also lead to the development of other natural gas infrastructure projects, we also considered existing or proposed LNG facilities and natural gas pipelines as alternative systems that could be used to meet the objectives of the Weaver's Cove LNG Project. This included consideration of existing and proposed facilities (including two new offshore LNG import terminals) within and outside of the New England region. At this time, it is not possible to foresee which (if any) of the LNG import projects proposed in the New England region will move forward and be constructed. Regardless, when considered independently, none of the LNG import projects in the region would be capable of serving as an alternative to the Weaver's Cove LNG Project. In any event, we expect that new pipelines or proposals to modify existing pipelines will continue to increase the capacity of existing systems delivering natural gas to the New England region. This will allow access to new or growing sources of natural gas outside of the region, including new LNG import terminals that will likely be constructed outside of the region (e.g., Canadian LNG facilities). Nevertheless, projects outside of the region would not be able to meet all of the objectives stated for the Weaver's Cove LNG Project. When considered together, however, several of the projects in or outside of the region could meet many of the project objectives. As discussed in the EIS, construction or expansion of alternative natural gas infrastructure facilities would result in specific environmental impacts that would be less than, similar to, or greater than those associated with the Weaver's Cove LNG Project.

We considered alternative locations for an LNG import terminal in the New England region, and determined that there are no alternative LNG terminal sites at onshore locations that are reasonable and/or would be environmentally preferable to the proposed project. Difficulties associated with identifying suitable locations in the New England region include finding property available for industrial development in an area accessible to LNG ships where there would be fewer environmental impacts.

One of the site alternatives that was identified during the EIS scoping process and received several specific comments in response to the draft EIS is located at Brayton Point in Somerset, Massachusetts. This site includes a number of potential environmental and economic advantages compared to the proposed site. Even the disadvantages of LNG trucking or dredging at this site could conceivably be managed depending on the specific design of an LNG facility. However, an LNG terminal at Brayton Point can only be considered conceptually and may never be a practicable and feasible alternative for the Weaver's Cove LNG Project because the property was recently purchased by Dominion. Because of this new ownership of the property, it would appear that Weaver's Cove Energy cannot reasonably pursue developing an LNG terminal at this location.

To minimize potential visual and wetland impacts, we also considered alternative LNG terminal layouts. We concluded that reducing the size, profile, and/or location of the LNG tank, while still

maintaining the project storage capacities, could not be reasonably achieved. Additionally, we considered an alternative site layout that would not include the landform created by the disposal of dredged materials on the LNG terminal site.

Our alternatives analysis included the evaluation of alternative pipeline routes that would allow delivery of natural gas to the Algonquin natural gas pipeline system. Because of the limited capacity of the Algonquin system laterals, no single pipeline from the LNG terminal would be able to accommodate the project volumes. Alternative pipeline routes to the east and south of the LNG terminal would both result in greater environmental impacts than either the Northern or Western Pipeline. To avoid or minimize environmental impacts from construction of the pipelines, we also examined route variations to the proposed pipelines.

We determined that construction of the Northern Pipeline would remove buffer vegetation between the railroad and the river, which could result in direct and indirect impacts on the Taunton River and bordering salt marsh (i.e., increase risk of sedimentation). As an alternative, we recommended in the draft EIS that Weaver's Cove Energy adopt a minor route variation on the east side of the CSX railroad between MP 0.26 and 0.55 to increase the distance between the construction right-of-way and the river. We also recommended in the draft EIS that Weaver's Cove Energy adopt or evaluate the feasibility of minor route variations between MPs 0.68 and 0.91 and between MPs 1.89 and 2.43 of the Northern Pipeline route to increase the distance between the construction right-of-way and residential structures. In its comments on the draft EIS, Weaver's Cove Energy agreed to adopt our recommended route variations along the Northern Pipeline route as part of its proposed pipeline route. Based on additional discussions with the Fall River Country Club, Weaver's Cove Energy suggested expanding the variation we recommended between MPs 1.89 and 2.43 to include the area between MPs 1.58 and 2.43 to minimize impacts on operation of the golf course. We agree that the modified variation between MPs 1.58 and 1.89 is environmentally preferable to the corresponding segment of the original route.

In the draft EIS, we recommended that Weaver's Cove Energy evaluate the feasibility of a realignment between MPs 1.5 and 1.9 of the Western Pipeline route to minimize visual impacts on residences along Jaffrey Street. In response to this request, Weaver's Cove Energy made adjustments to permanent easements and temporary workspaces to mitigate potential effects on stone walls and trees that are on those properties impacted by the proposed route. We believe these modifications would adequately minimize residential impacts along Jaffrey Street by avoiding vegetation clearing which currently screens the transmission lines. Weaver's Cove Energy's development of site-specific residential plans would include measures to further minimize residential impacts along this segment.

Finally, we reported on dredging and dredge disposal alternatives that might avoid or minimize impacts associated with dredging up to about 2.6 million cubic yards of sediment from the Mount Hope Bay/Taunton River federal navigation channel and turning basin. Alternatives requiring less dredging would not be able to safely accommodate LNG ships. Additionally, we summarized disposal alternatives including offsite upland reuse, offsite upland disposal (landfill or dewatering), offshore disposal, confined aquatic disposal cells, confined disposal facilities, and island/habitat creation. Based on consultations with other agencies, we analyzed the impact of restricting dredging during times of the year when sensitive aquatic organisms (e.g., winter flounder, anadromous species) could be adversely affected and we considered offshore disposal of dredged materials in more detail. Based on the new/existing Brightman Street Bridge construction delays, we believe that our recommended time-of-year restriction to avoid dredging from January 15 to May 31 to minimize impacts on winter flounder would not impact the in-service date of the project or necessitate offshore disposal. Additionally, we believe that the offshore disposal alternative would be environmentally acceptable if the assessment of contaminants in the materials demonstrates that a significant volume of sediments are suitable for offshore disposal. However, we have also determined that offshore disposal of suitable dredged material is not without

impacts and is not clearly environmentally preferable to Weaver's Cove Energy's proposed reuse of the dredged material as general site fill at the LNG terminal site. This conclusion assumes that Weaver's Cove Energy is able to resolve the regulatory and legal disputes of its proposed sediment reuse plan at the LNG terminal site.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission issues any authorization for the proposed project, we recommend that the Commission's Order include measures 1 through 76. We believe that these measures would further mitigate the environmental impacts associated with construction and operation of the proposed project.

1. Weaver's Cove Energy shall follow the construction procedures and mitigation measures described in its application, supplemental filings (including responses to staff data requests), and as identified in the environmental impact statement (EIS), unless modified by the Federal Energy Regulatory Commission's (FERC or Commission) Order. Weaver's Cove Energy must:

    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary of the Commission (Secretary);
    b. justify each modification relative to site-specific conditions;
    c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
    d. receive approval in writing from the Director of the Office of Energy Projects (OEP) **before using that modification**.

2. For pipeline facilities, the Director of OEP has delegation authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the project. This authority shall allow:

    a. the modification of conditions of the Commission's Order; and
    b. the design and implementation of any additional measures deemed necessary (including stop work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from project construction and operation.

3. For LNG facilities, the Director of OEP has delegated authority to take all steps necessary to ensure the protection of life, health, property, and the environment during construction and operation of the project. This authority shall include:

    a. stop-work authority and authority to cease operation; and
    b. the design and implementation of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of this Order.

4. **Prior to any construction**, Weaver's Cove Energy shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, environmental inspectors (EIs), and contractor personnel will be informed of the EI's authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs before becoming involved with construction and restoration activities.

5. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets, and shall include the staff's recommended facility locations. **As soon as they are available, and before the start of construction**, Weaver's Cove Energy shall file with the

Secretary revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by this Order. All requests for modifications of environmental conditions of this Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

6. Weaver's Cove Energy shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, pipe storage yards, new access roads, and other areas that will be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction** in or near that area.

   This requirement does not apply to route variations recommended herein or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;
   b. implementation of endangered, threatened, or special concern species mitigation measures;
   c. recommendations by state regulatory authorities; and
   d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

7. **At least 60 days before the start of construction,** Weaver's Cove Energy shall file an initial Implementation Plan with the Secretary for the review and written approval by the Director of OEP describing how Weaver's Cove Energy will implement the mitigation measures required by this Order. Weaver's Cove Energy must file revisions to the plan as schedules change. The plan shall identify:

   a. how Weaver's Cove Energy will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
   b. the number of EIs assigned per spread, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;
   c. company personnel, including EIs and contractors, who will receive copies of the appropriate material;
   d. what training and instructions Weaver's Cove Energy will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);
   e. the company personnel (if known) and specific portion of Weaver's Cove Energy's organization having responsibility for compliance;

f. the procedures (including use of contract penalties) Weaver's Cove Energy will follow if noncompliance occurs; and

g. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

   i. the completion of all required surveys and reports;
   ii. the mitigation training of onsite personnel;
   iii. the start of construction; and
   iv. the start and completion of restoration.

8. Weaver's Cove Energy shall develop and implement an environmental complaint resolution procedure. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the project and restoration of the right-of-way. **Prior to construction,** Weaver's Cove Energy shall mail the complaint resolution procedures to each landowner whose property would be crossed by the project.

   a. In its letter to affected landowners, Weaver's Cove Energy shall:

      i. provide a contact that the landowners shall call first with their concerns; the letter shall indicate how soon a landowner shall expect a response;
      ii. instruct the landowners that, if they are not satisfied with the response, they shall call Weaver's Cove Energy's hotline; the letter shall indicate how soon to expect a response; and
      iii. instruct the landowner that, if they are still not satisfied with the response from Weaver's Cove Energy, they shall contact the Commission's Enforcement Hotline at (888) 889-8030.

   b. In addition, Weaver's Cove Energy shall include in its weekly status report a copy of a table that contains the following information for each problem/concern:

      i. the date of the call;
      ii. the identification number from the certified alignment sheets of the affected property;
      iii. the description of the problem/concern; and
      iv. an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.

9. Weaver's Cove Energy shall employ a team of EIs. The EIs shall be:

   a. responsible for monitoring and ensuring compliance with all mitigation measures required by this Order and other grants, permits, certificates, or other authorizing documents;
   b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;
   c. empowered to order correction of acts that violate the environmental conditions of this Order, and any other authorizing document;
   d. a full-time position, separate from all other activity inspectors;

e. responsible for documenting compliance with the environmental conditions of this Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and
f. responsible for maintaining status reports.

10. Weaver's Cove Energy shall file updated status reports prepared by the EI with the Secretary on a weekly basis until all construction and restoration activities are complete. On request, these status reports shall also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

    a. the current construction status of the project, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;
    b. a listing of all problems encountered and each instance of noncompliance observed by the environmental inspector(s) during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);
    c. corrective actions implemented in response to all instances of noncompliance, and their cost;
    d. the effectiveness of all corrective actions implemented;
    e. a description of any landowner/resident complaints which may relate to compliance with the requirements of this Order, and measures taken to satisfy their concerns; and
    f. copies of any correspondence received by Weaver's Cove Energy from other federal, state, or local permitting agencies concerning instances of noncompliance, and Weaver's Cove Energy's response.

11. Weaver's Cove Energy must receive written authorization from the Director of OEP before commencing service of the project. Such authorization will only be granted following a determination that rehabilitation and restoration of the right-of-way is proceeding satisfactorily.

12. **Within 30 days of placing the certificated facilities in service**, Weaver's Cove Energy shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or
    b. identifying which of the certificate conditions Weaver's Cove Energy has complied with or will comply with. This statement shall also identify any areas along the right-of-way where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

13. Weaver's Cove Energy shall develop a site-specific plan for construction of the adopted River Street Variation that includes a description of any special construction techniques that would be used (e.g., stove-pipe or drag-section techniques) and other steps taken to minimize impacts on local residences and commercial facilities. This plan shall be filed with the Secretary for review and approval by the Director of OEP **prior to construction**. (p. 3-58)[1]

14. Weaver's Cove Energy shall prepare final engineering design plans ensuring the stability of all site grades and the waterfront walls and file these plans with the Secretary **prior to construction**. (p. 4-10)

[1] The numbers at the end of a recommended measure are the pages on which the measure appears in the EIS.

15. Weaver's Cove Energy shall prepare a plan for the discovery and management of contaminated soils and groundwater. This plan shall comply with applicable state and federal regulations and shall provide for management of contaminants at known sites and include procedures for the identification and management of unknown contaminants in other locations. The plan shall be filed with the Secretary for review and approval by the Director of OEP **prior to construction**. (p. 4-14)

16. Weaver's Cove Energy shall consult with the COE regarding the appropriate method(s) for dredging and managing the sediment from the immediate vicinity of turning basin core 10. Weaver's Cove Energy shall file copies of all correspondence and any final plan for managing dredged sediment associated with core TB-10 with the Secretary for review and approval by the Director of OEP **prior to dredging**. (p. 4-33)

17. Weaver's Cove Energy shall provide all appropriate grading plans, cross section drawings, and risk assessments required to demonstrate the degree of isolation provided by the upland reuse of stabilized dredged materials. The required documentation shall be filed with the Secretary for review and approval by the Director of OEP **prior to construction**. (p. 4-45)

18. Weaver's Cove Energy shall file documentation with the Secretary **prior to construction** to verify that placement of the stabilized dredged material on the LNG terminal site is consistent with the Massachusetts Contingency Plan (MCP). If Weaver's Cove Energy is unable to verify the consistency of the proposed use of the sediment with the MCP, it shall file a revised sediment placement plan that identifies alternative location(s) for use of the sediments. The alternative use plan, if necessary, shall be developed in consultation with the relevant agencies and include a detailed assessment of the environmental impacts associated with the alternative locations(s) and demonstrate that the alternative location(s) are in compliance with applicable regulations. Weaver's Cove Energy shall file the plan, if necessary, with the Secretary for review and approval by the Director of OEP **prior to construction**. (p. 4-50)

19. Weaver's Cove Energy shall consult with the COE and NOAA Fisheries regarding mitigation of wetlands as well as intertidal and subtidal habitats and shall file with the Secretary the results of these consultations and the COE-approved Wetland Mitigation Plan **prior to construction**. (p. 4-89)

20. Weaver's Cove Energy shall complete the coordination with applicable federal and state resource agencies regarding development and funding of mitigation measures to offset impacts on quahogs resulting from dredging of the turning basin and file the results of that coordination, including copies of agency approval, with Secretary **prior to dredging**. (p. 4-99)

21. Weaver's Cove Energy shall modify its proposed dredging program and pipeline construction plans within the Taunton River to prohibit any silt-disturbing construction activities during the winter flounder spawning period (January 15 through May 31). In addition, Weaver's Cove Energy shall continue to consult with federal and state agencies and develop a mitigation plan to offset permanent loss of winter flounder spawning and juvenile development habitat resulting from expansion of the turning basin. The revised dredging plan and the winter flounder habitat mitigation plan shall be filed with the Secretary **prior to dredging**. (p. 4-106)

22. Weaver's Cove Energy shall coordinate with NOAA Fisheries to determine appropriate speed and seasonal restrictions, or other applicable measures, to avoid or minimize impacts on right whales. Results of the coordination, including a discussion of restrictions to be implemented, shall be filed with the Secretary, **prior to commencing operation of the LNG terminal**. (p. 4-126)

23. Weaver's Cove Energy shall file with the Secretary **prior to construction** documentation of concurrence from the Office of Coastal Zone Management that the project is consistent with the Massachusetts Coastal Zone Management Program Plan. (p. 4-150)

24. Weaver's Cove Energy shall file with the Secretary **prior to construction** documentation of concurrence from the Coastal Resources Management Council that the project is consistent with the Rhode Island Coastal Resources Management Program. (p. 4-158)

25. **Prior to construction**, Weaver's Cove Energy shall file with the Secretary documentation of concurrence from the U.S. Department of the Interior that the project would not have a substantial adverse affect on the Taunton River's potential designation as a Wild and Scenic River (WSR) and that the project would be consistent with the Wild and Scenic River Act if the Taunton River were designated a Wild and Scenic River. (p. 4-168)

26. Weaver's Cove Energy shall prepare a landscaping plan showing how the northern and southern parcels of the LNG terminal site would be restored and revegetated. The plan shall include the locations and descriptions of specific measures and plantings to screen views of the LNG facilities from nearby residences. The landscaping plan shall be filed with the Secretary for review and written approval by the Director of OEP **prior to construction**. (p. 4-173)

27. Weaver's Cove Energy shall file with the Secretary for the review and written approval of the Director of OEP **prior to construction**, a visual screening plan developed in consultation with and approved by Somerset Power, L.L.C. that includes measures to replace screening vegetation removed from the temporary construction right-of-way between MPs 0.49 and 0.54 of the Western Pipeline route. (p. 4-176)

28. Weaver's Cove Energy shall defer construction of the LNG terminal and Northern and Western Pipelines and associated aboveground facilities **until**:

    a. Weaver's Cove Energy provides the SHPO with the appropriate plans, drawings, and photographic simulations for the meter station and pipeyard in relation to the Winslow Burial Ground, and provides the SHPO's comments on this information;

    b. Weaver's Cove Energy conducts the recommended site examination surveys at the CSX#1, CSX#2, ISP#1, ISP#2, and the Taunton River Marsh sites, and files with the Secretary the evaluation reports and the SHPO's comments on the reports;

    c. Weaver's Cove Energy conducts additional site examination at the Barnaby Swamp 2 Site, and files with the Secretary the report and the SHPO's comments on the report;

    d. Weaver's Cove Energy files with the Secretary an avoidance plan for the Slade Farmstead and Cemetery and the SHPO's comments on the plan;

    e. Weaver's Cove Energy files with the Secretary and the SHPO any additional required survey and evaluation reports, and any required treatment or avoidance plans, and the SHPO's comments on all reports and plans; and

    f. The Director of OEP reviews and approves all cultural resources reports and plans, and notifies Weaver's Cove Energy 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**." (p. 4-206)

29. Weaver's Cove Energy shall use transportation grade (0.05 weight percent sulfur) or better diesel fuel in all construction equipment, including dredging equipment, for the proposed project and evaluate the feasibility of using catalysts and diesel particulate filters on this equipment and placing idling limits on the construction vehicles to further reduce particulate matter less than 10 microns in diameter, carbon monoxide, and volatile organic compound emissions. (p. 4-217)

30. Weaver's Cove Energy shall develop a nuisance odor complaint and abatement plan to investigate and address complaints related to odor emissions from the dewatered and stabilized dredged sediments. The plan shall include procedures for adjacent landowners to contact a Weaver's Cove Energy representative regarding objectionable odors, a process for investigating and addressing the complaints, and a description of mitigative measures that would be implemented to abate the problem. The nuisance odor complaint and abatement plan shall be filed with the Secretary **prior to construction**. In addition, Weaver's Cove Energy shall include any odor complaints in the weekly status reports filed with the FERC. The report shall include a discussion of how odor complaints were resolved. (p. 4-220)

31. Weaver's Cove Energy shall prepare a noise mitigation plan to ensure that the dredging, offloading, and stabilization operations do not contribute more than 55 decibels of the A-weighted scale (dBA) day-night sound level (L_{dn}) to the ambient noise level at any noise sensitive area (NSA) and file the plan with the Secretary **prior to construction**. (p. 4-226)

32. Weaver's Cove Energy shall make all reasonable efforts to assure its predicted noise levels from the LNG terminal are not exceeded at the NSAs and file noise surveys showing this with the Secretary no later than 60 days after placing the LNG terminal in service. However, if the noise attributable to the operation of the LNG terminal exceeds 55 dBA L_{dn} at an NSA or the noise increase exceeds 10 dBA sound level that is exceeded more than 90 percent of the time (L_{90}) at an NSA, Weaver's Cove Energy shall file a report on what changes are needed and shall install additional noise controls to meet the level within 1 year of the in-service date. Weaver's Cove Energy shall confirm compliance with these requirements by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls. (p. 4-229)

The following measures apply to the LNG terminal design and construction details. Information pertaining to these specific recommendations 33 through 61, unless otherwise noted, shall be filed with the Secretary for review and 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. This information shall be submitted a minimum of 30 days before approval to proceed is required.

33. Weaver's Cove Energy shall examine provisions to retain any vapor produced along the transfer line trenches and other areas serving to direct LNG spills to associated impoundments. Measures to be considered may include, but are not limited to: vapor fencing, intermediate sump locations, or trench surface area reduction. Weaver's Cove Energy shall file final drawings, including cross sections, and specifications for these measures with the Secretary **at least 30 days prior to initial site preparation** for review and approval by the Director of OEP. (p. 4-251)

34. Weaver's Cove Energy shall develop emergency evacuation routes for the areas along the route of the LNG vessel transit in conjunction with the local emergency and town officials and file the

routes with the Secretary for review and approval by the Director of OEP prior to **initial site preparation**. (p. 4-258)

35. Weaver's Cove Energy shall provide a technical review of its facility design that:

    a. Identifies all combustion/ventilation air intake equipment and the distance(s) to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids, and flammable gases).

    b. Demonstrates that these areas would be adequately covered by hazard detection devices and indicate how these devices would isolate or shutdown any combustion equipment whose continued operation could add to or sustain an emergency. Fired heaters shall be shut down in the event of an LNG spill, or presence of a flammable vapor cloud.

    Weaver's Cove Energy shall file this review **prior to initial site preparation**. (p. 4-233)

36. **Prior to initial site preparation**, Weaver's Cove Energy shall provide documentation, or a limited waiver, on how the LNG tank would meet NFPA 59A table 2-2.4.1, which requires the distance from the edge of the impoundment to the property line, to be not less than 0.7 times the container diameter. The separation distance from the LNG tank impoundment wall to the property boundaries on the southwestern area of the site where the proposed plant property line abuts the shoreline of the Taunton River does not appear to meet the 0.7 criteria. (p. 4-233)

37. **Prior to initial site preparation**, Weaver's Cove Energy shall file a firewater system design that provides for fire water flow to be maintained for a minimum of two hours, in accordance with code requirements. The fire water tank shall be automatically filled from the city mains supply and the city mains pressure continuously monitored and alarmed at low pressure. As an alternative, river water may be evaluated for use in the firewater system. (p. 4-233)

38. The portion of the planned retaining wall on the riverbank, which is opposite the tanks, shall be designed to ensure the stability of the LNG storage tank in a Safe Shutdown Earthquake (SSE) event. A slope stability analysis shall be conducted in order to ascertain the adequacy of the proposed retaining wall structures. The LNG tank shall be designed to withstand the SSE event as required by 49 CFR Part 193 and NFPA 59A (2001). All other structures shall be designed to withstand the effects of an Operating Basis Earthquake, as required by 49 CFR Part 193 and NFPA 59A (2001), and, further, the condition of these structures shall not adversely affect the stability and integrity of the tank in the SSE event. **Prior to initial site preparation**, Weaver's Cove Energy shall file the results of the hydraulic test and stone column field test, and the final LNG storage tank design for seismic review and approval by the Director of OEP. (p. 4-233)

39. Weaver's Cove Energy shall revise the design of the impoundment sump to accommodate a design spill from the LNG storage tank in-tank pump discharge header with five pumps operating at maximum capacity. **At least 30 days prior to initial site preparation**, Weaver's Cove Energy shall submit revised calculations showing the 1,600 Btu/ft^2-hr exclusion zone for the altered impoundment sump would meet the requirements of Title 49 CFR Part 193. (p. 4-248)

40. Weaver's Cove Energy shall provide evidence of its ability to exercise control over the activities that occur within the portions of the thermal exclusion zones that fall outside the site property line. Alternatively, Weaver's Cove Energy may apply to the Department of Transportation for approval of a waiver, from its Title 49 CFR Part 193 regulation, that specifies what alternative mitigation measures or plan Weaver's Cove Energy may provide that would afford an equal or

greater level of thermal radiation protection as the requirement for control over activities within the modeled exclusion zones. Weaver's Cove Energy shall file this evidence or waiver **prior to initial site preparation**. (p. 4-249)

41. Weaver's Cove Energy shall revise the design of the impoundment sump to accommodate a design spill from the LNG storage tank in-tank pump discharge header with five pumps operating at maximum capacity. **At least 30 days prior to initial site preparation**, Weaver's Cove Energy shall submit revised calculations demonstrating that the flammable vapor dispersion exclusion zone for the altered impoundment sump would meet the requirements of Title 49 CFR Part 193. (p. 4-251)

42. Weaver's Cove Energy shall provide a comprehensive 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 shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. This plan shall be filed with the Secretary **prior to initial site preparation** for review and approval by the Director of OEP. (p. 4-274)

43. The **final design** shall include a re-evaluation of the use of butterfly valves for high pressure isolation. (p. 4-234)

44. The **final design** of the hazard detection equipment shall include redundancy and fault detection and fault alarm monitoring in all potentially hazardous areas and enclosures. (p. 4-234)

45. The **final design** of the hazard detection equipment shall provide flammable gas and UV/IR hazard detectors with local instrument status indication as an additional safety feature. (p. 4-234)

46. The **final design** shall include a boil-off gas flow measurement system for the LNG storage tank. (p. 4-234)

47. The **final design** shall include a reliable measurement system to monitor deflections during the hydraulic test. At a minimum, this system shall include two slope indicator ducts which bisect the tank in mutually perpendicular directions, monitoring points at the terminals of these ducts, and other monitoring points along the perimeter of the concrete shell, so that sag, warping, tilt, and settlement can be monitored. Tolerances for sag, tilt, and shell warping shall meet or exceed the limits specified by the tank manufacturer. (p. 4-234)

48. The **final design** of the LNG tank carbon steel piping support plates and connections to piping supports shall provide adequate corrosion protection. Provisions for corrosion monitoring and maintenance of carbon steel attachments shall be included in the design and maintenance procedures. (p. 4-234)

49. The **final design** of the LNG pumps shall include discharge flow measurement for minimum flow recycle control. (p. 4-234)

50. The **final design** shall include provisions to ensure that hot glycol/water circulation is operable at all times when LNG is present in the LNG booster pump discharge piping or when the temperature in the LNG inlet channel to any vaporizer is below 0° F. (p. 4-234)

51. The **final design** shall include detection instrumentation and shut down procedures for vaporizer tube leak, shell side overpressure, or bursting disc failure. (p. 4-234)

52. The **final design** shall include temperature measurement of the vaporizer common discharge header which shall alarm the low temperature condition. (p. 4-234)

53. The **final design** shall include provisions to recover boil-off gas, under all conditions, in the event that the send out vaporization system is not in operation. (p. 4-234)

54. The **final design** shall include automatic isolation valves at the suction and discharge of screw compressors and reciprocating boil-off compressors. (p. 4-235)

55. The **final design** shall ensure that air gaps are 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 shall vent to a safe location and be equipped with a leak detection device that: would continuously monitor for the presence of a flammable fluid; would alarm the hazardous condition; and would shutdown the appropriate systems. (p. 4-235)

56. The **final design** of the relief vent stacks shall include Resistance Temperature Detectors capable of measuring low and high temperature. (p. 4-235)

57. The **final design** shall ensure that dry nitrogen be supplied for purging cold systems. (p. 4-235)

58. The **final design** shall include safeguards to protect above ground fire water piping, including post indicator valves, from inadvertent damage. (p. 4-235)

59. The **final design** shall include a fire protection evaluation carried out in accordance with the requirements of NFPA 59A, chapter 9.1.2. (p. 4-235)

60. The **final design** shall include procedures for offsite contractors' responsibilities, restrictions, limitations, and supervision of the contractors by Weaver's Cove Energy staff. (p. 4-235)

61. Security personnel requirements for prior to and during LNG vessel unloading shall be filed **prior to commissioning.** (p. 4-235)

62. Operation and maintenance procedures and manuals, as well as emergency plans, emergency evacuation plan, and safety procedure manuals, shall be filed **prior to commissioning**. (p. 4-235)

63. The contingency plan for failure of the outer LNG tank containment shall be filed **prior to commissioning**. (p. 4-235)

64. Copies of the Coast Guard security plan, vessel operation plan, and emergency response plan shall be provided to the FERC staff **prior to commissioning**. (p. 4-235)

65. Weaver's Cove Energy shall coordinate with the Coast Guard to define the responsibilities of Weaver's Cove Energy's security staff in supplementing other security personnel and in protecting the LNG ships and terminal **prior to commissioning**. (p. 4-257)

66. A copy of the criteria for horizontal and rotational movement of the inner vessel for use during and after cool down shall be filed **prior to commissioning**. (p. 4-235)

67. Weaver's Cove Energy shall develop an Emergency Response Plan (including evacuation) and coordinate procedures with local emergency planning groups, fire departments, state and local law enforcement, and appropriate federal agencies**. This plan shall 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;
d. evacuation routes for residents along the route of the LNG vessel transit;
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 Emergency Response Plan shall be filed with the Secretary for review and approval by the Director of OEP **prior to commencement of service**. Weaver's Cove Energy shall notify FERC staff of all meetings in advance and shall report progress on its Emergency Response Plan at 6-month intervals starting at the commencement of construction. (p. 4-258)

68. The FERC staff shall be notified of any proposed revisions to the security plan and physical security of the facility **prior to commencement of service**. (p. 4-235)

69. Progress on the construction of the LNG terminal shall be reported in monthly reports filed with the Secretary. Details shall include a summary of activities, problems encountered and remedial actions taken. Problems of significant magnitude shall be reported to the FERC within 24 hours. (p. 4-235)

The following measures apply throughout the operation life of the LNG facility.

70. The facility shall be subject to regular FERC staff technical reviews and site inspections on at least a **biennial** basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Weaver's Cove Energy shall 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. Weaver's Cove Energy shall also provide 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 annual report. (p. 4-236)

71. Weaver's Cove Energy shall file **semi-annual** operational reports 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 shall 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 boil-off rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall 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 shall 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. (p. 4-236)

72. In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, Weaver's Cove Energy shall notify the Commission **within 24 hours** and shall specify the procedures for corrective action. (p. 4-236)

73. Weaver's Cove Energy shall make a foundation elevation survey of the LNG tank on an annual basis. (p. 4-236)

74. Weaver's Cove Energy shall report to FERC staff any significant non-scheduled events, including safety-related incidents (i.e., LNG or natural gas releases, fires, explosions, mechanical failures, unusual overpressurization, and major injuries) **and security-related incidents (i.e., attempts to enter site, suspicious activities) within 24 hours of the event.** In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. This notification practice shall 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 for five minutes or more 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 safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes gas or LNG;
l. safety-related incidents to LNG vessels occurring 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, FERC staff would determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports shall include investigation results and recommendations to minimize a reoccurrence of the incident. (p. 4-236)

75. Weaver's Cove Energy shall **annually** review its waterway suitability assessment for the project; update the assessment to reflect changing conditions; provide the updated assessment to the cognizant Captain of the Port/Federal Maritime Security Coordinator for review and validation; and provide a copy to the FERC staff. (p. 4-269)

76. Any security plans shall make allowance to have at least one of the Braga and Brightman Street bridges remain open during the passage of LNG vessels through the federal navigation channel in the Taunton River and that consideration be given to scheduling bridge closures to avoid peak traffic periods. (p. 4-271)