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Richard M. Kessel
Chairman

December 29, 1990

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Attention: Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

Re: Decommissioning Plan of the Long Island Power Authority for the Shoreham Nuclear Power Station (Docket No. 50-322)

Gentlemen:

As you know, on June 28, 1990, the Long Island Power Authority ("LIPA") and the Long Island Lighting Company ("LILCO") jointly applied for an amendment to the Nuclear Regulatory Commission ("NRC") license for the Shoreham Nuclear Power Station ("Shoreham") to allow transfer of the facility and the license (in a non-operating status) to LIPA. As explained in that application, LIPA will not operate Shoreham as a nuclear facility. Instead, LIPA initially will maintain Shoreham in a defueled, non-operating condition and then will decommission Shoreham pursuant to an NRC-approved decommissioning plan.

By this letter, LIPA, as the prospective Shoreham licensee responsible for Shoreham decommissioning, transmits to the NRC five copies of the following documents for NRC review and approval:

: LIPA's Shoreham Decommissioning Plan, as contemplated by 10 CFR § 50.82(a); and

: LIPA's Supplement to Environmental Report (Decommissioning) ("Environmental Supplement"), as contemplated by 10 CFR § 51.53(b).

An additional 45 copies of these documents will be transmitted separately to the NRC.

LIPA is authorized to state that LILCO has reviewed the Decommissioning Plan and Environmental Supplement and consents to their submission on the docket.

The Decommissioning Plan and Environmental Supplement have been prepared by LIPA with the assistance of the New York Power Authority ("NYPA"), Bechtel Power Corporation and Bechtel Associates Professional Corporation (collectively "Bechtel"), and other contractors identified in the Decommissioning Plan. NYPA serves as LIPA's principal contractor for the decommissioning of Shoreham. Bechtel is providing conceptual and detailed engineering services for decommissioning. In addition, LIPA has consulted extensively with LILCO concerning the Decommissioning Plan.

As detailed in the Decommissioning Plan and the Environmental Supplement, LIPA intends to decommission Shoreham by means of the DECON alternative. Decommissioning by the DECON alternative will be safe and cost effective and is particularly appropriate in light of the limited operating history and low levels of radiological contamination at Shoreham. The Environmental Supplement demonstrates that decommissioning Shoreham using the DECON alternative will have no significant environmental impacts and, in fact, will confer an environmental benefit by achieving release of the Shoreham site for unrestricted use in the near future.

LIPA respectfully requests that the NRC proceed expeditiously in its review and approval of the Decommissioning Plan. In view of the limited operation and low level of radioactivity at Shoreham, the NRC should be able to review and approve the Decommissioning Plan in substantially less time than required for a plant that has operated at full power for an extended period of time. Moreover, given the very substantial costs involved in maintaining Shoreham pending initiation of actual decommissioning, it is critical that the NRC give prompt review and approval not only to the Decommissioning Plan, but also to LILCO's January 5, 1990 request to amend Shoreham's NRC license to a possession-only license (POL) or other defueled license and to LIPA's and LILCO's joint License Transfer application filed on June 28, 1990. LILCO presently is expending approximately $150 million per year to own and maintain Shoreham consistent with expressed NRC policies, an amount that ultimately is borne by Long Island ratepayers. Such expenditures for a plant that will never operate strongly counsel expeditious NRC action on the POL application, the License Transfer application and the Decommissioning Plan.

In this regard, while the Decommissioning Plan assumes that the NRC will approve the License Transfer application on July 1, 1991 and the Decommissioning Plan on October 1, 1991, LIPA would be prepared to receive the Shoreham license and to commence decommissioning in advance of those dates.

LIPA, together with NYPA, Bechtel, LILCO, and other contractors, is prepared to work cooperatively with the NRC Staff to facilitate consideration of the Decommissioning Plan, the Environmental Supplement and the License Transfer application. LIPA would be pleased to meet at the NRC's convenience at a technical or management level to discuss these matters.

Very truly yours,

Richard M. Kessel

cc: William Catacosinos

Enclosures

LONG ISLAND POWER AUTHORITY

SHOREHAM NUCLEAR POWER STATION

NRC Docket No. 50 - 322

SUPPLEMENT TO ENVIRONMENTAL REPORT (DECOMMISSIONING)

DECEMBER 1990

Supplement To Environmental Report (Decommissioning)

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LIST OF ACRONYMS AND DEFINITIONS

BWR	-	Boiling Water Reactor
CRD	-	Control Rod Drive
DAW	-	Dry Active Waste
DOL	-	Defueled Operating License
DOT	-	United States Department of Transportation
EAB	-	Exclusion Area Boundary
EPA	-	United States Environmental Protection Agency
EPP	-	Environmental Protection Plan
ER-OLS	-	Environmental Report -- Operating License Stage
ESEERCO	-	Empire State Electric Energy Research Corporation
FCAF	-	Federal Consistency Assessment Form
HEPA	-	High Efficiency Particulate Air
LILCO	-	Long Island Lighting Company
LIPA	-	Long Island Power Authority
LLRW	-	Low Level Radioactive Waste
LPG	-	Liquid Propane Gas
LSA	-	Low Specific Activity
MWe	-	Megawatts Electric
NESHAPS	-	National Emission Standards For Hazardous Air Pollutants
NRC	-	United States Nuclear Regulatory Commission
NRC GEIS	-	NRC Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities

NSSS	-	Nuclear Steam Supply System
NYDOS	-	New York State Department of State
NYPA	-	New York Power Authority
NYPSC	-	New York Public Service Commission
NYSDEC	-	New York State Department of Environmental Conservation
ODCM	-	Off-Site Dose Calculation Manual
OSHA	-	Occupational Safety and Health Administration
PAG	-	Protective Action Guide
POL	-	Possession-Only License
QA	-	Quality Assurance
RPV	-	Reactor Pressure Vessel
SE & SC	-	Soil Erosion and Sediment Control
Shoreham	-	Shoreham Nuclear Power Station
SPCC	-	Spill Prevention Control and Counter- measure
SPDES	-	State Pollutant Discharge Elimination System
USAR	-	Updated Safety Analysis Report

Section 1. Supplement to Environmental Report (Decommissioning)

1.0 INTRODUCTION AND SUMMARY

1.1 PURPOSE

This "Supplement to Environmental Report (Decommissioning)" is submitted by the Long Island Power Authority (LIPA) to the Nuclear Regulatory Commission (NRC) to present an evaluation of the environmental impacts resulting from the decommissioning of the Shoreham Nuclear Power Station (Shoreham). This report has been prepared as a Supplement to Shoreham's Environmental Report -- Operating License Stage (ER-OLS)[1] in accordance with 10 CFR 51.53(b) and the guidance in the NRC's final decommissioning rule.[2] This Supplement accompanies LIPA's Decommissioning Plan for Shoreham,[3] which is simultaneously being submitted to the NRC.

The decommissioning alternative selected for Shoreham and evaluated in this Supplement is the DECON alternative as described in NRC guidance.[2] The analyses presented in this Supplement establish that the DECON decommissioning of Shoreham can be accomplished with no significant environmental impacts and that the limited impacts which may occur are well within the limits identified by the NRC in its Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (NRC GEIS).[4] Accordingly, in connection with the NRC's review of the proposed Decommissioning Plan, an environmental assessment would be appropriate, leading to a finding of no significant environmental impacts.

1.2 BACKGROUND

1.2.1 Information about LIPA

LIPA is a corporate municipal instrumentality and a political subdivision of the State of New York. LIPA was created by a New York State statute, the LIPA Act.[5] LIPA is empowered to assess the needs for gas and electric power on Long Island and to acquire, construct, maintain and operate such generating and transmission facilities as it deems desirable in order to maintain an adequate electric and gas supply on Long Island. LIPA is also specifically authorized by the LIPA Act to acquire the Shoreham plant. Upon such acquisition, LIPA is required to close and decommission the plant as a nuclear facility and to investigate and develop non-nuclear alternative uses, if any, for the plant.

On February 28, 1989, Governor Cuomo, representing the State of New York, and the Long Island Lighting Company (LILCO), the present Shoreham licensee, entered into a Settlement Agreement [6] under which LILCO agreed not to operate

the Shoreham plant and to transfer the license and certain areas and buildings of the Shoreham site to LIPA. Thereafter, on April 14, 1989, LIPA and LILCO entered into an Asset Transfer Agreement[7] under which LILCO reiterated its agreement never to operate the Shoreham plant and to transfer it to LIPA. The Settlement Agreement and the Asset Transfer Agreement (hereinafter referred to collectively as the "Settlement") have been approved by the Board of Directors and shareholders of LILCO, the Board of Trustees of LIPA and the State of New York Public Service Commission. The Settlement became effective on June 28, 1989, when LILCO's shareholders voted to approve it.

The Settlement establishes the basic framework pursuant to which the Shoreham plant will be transferred to LIPA, and LIPA will subsequently decommission the Shoreham plant. In addition, LIPA and LILCO have also entered into a Site Cooperation and Reimbursement Agreement (Site Agreement).[8] The Site Agreement, among other things, describes: the cooperative efforts between LIPA and LILCO in connection with the license transfer, maintenance and decommissioning of the Shoreham plant; LILCO's agreement to make LILCO employees available after the license transfer to continue to work on Shoreham-related matters to the extent feasible; and LILCO's agreement to fund the Shoreham plant's maintenance and decommissioning. The Site Agreement was executed on January 24, 1990, and is fully in effect.

LIPA has also entered into a Management Services Agreement[9] with the New York Power Authority (NYPA). Under the Management Services Agreement, NYPA is providing technical and management services to LIPA with respect to the maintenance and decommissioning of the Shoreham plant.

On June 28, 1990, LIPA and LILCO jointly submitted a license transfer amendment request[10] to the NRC requesting that LILCO's Shoreham license be amended to authorize transfer to LIPA. Upon the NRC's approval of the license transfer amendment request, LIPA will be responsible for carrying out the safe and orderly maintenance and decommissioning of the Shoreham plant, acting then as the plant owner and licensee.

This Supplement reflects earlier environmental analyses prepared by LIPA. On November 1, 1990, LIPA issued a Final Generic Environmental Impact Statement regarding the selection and implementation of the DECON decommissioning alternative at Shoreham in compliance with the requirements of the New York State Environmental Quality Review Act.[11]

Section 1. Supplement to Environmental Report (Decommissioning)

This Supplement is submitted to the NRC by LIPA as the prospective Shoreham licensee with ultimate responsibility for Shoreham's decommissioning. LIPA was assisted in the preparation of this Supplement by NYPA, LILCO, Bechtel Power Corporation and Bechtel Associates Professional Corporation.

1.2.2 Facility Status

The Shoreham plant is located in the Town of Brookhaven, Suffolk County, New York, about 50 miles east of New York City on the north shore of Long Island. The Shoreham plant occupies about 80 acres of an approximate 500 acre site owned by LILCO. In addition to the plant, the site contains two combustion turbine generation facilities and two diesel generation facilities.

A description of the site and its environs is given in Section 2. For comprehensive descriptions of the site and its environs, reference is made to the ER-OLS[1], the Updated Safety Analysis Report (USAR) [12] and reports filed with the NRC such as semi-annual effluent and environmental monitoring reports.[13,14]

On April 21, 1989, the NRC granted a license (NPF-82) authorizing LILCO to operate the Shoreham plant at full power. In light of the Settlement, however, LILCO has never operated the Shoreham plant at full power. In fact, LILCO commenced defueling the Shoreham plant shortly after LILCO's shareholders voted to approve the Settlement and completed that task on August 9, 1989. The Shoreham plant has remained in a defueled state since that time.

The Shoreham plant was tested by LILCO only briefly at low (under 5%) power. Due to this limited operating history, the radioactive contamination at Shoreham is quite limited. Aside from the nuclear fuel which presently is stored in the spent fuel storage pool, LIPA estimates that the total radioactive inventory at Shoreham is about 602 Curies. All but about 3 milliCuries of this is confined to the reactor pressure vessel (RPV) and internal RPV components, primarily the shroud, the upper core support structure and the instrument dry tubes. All but approximately 50 milliCuries of the RPV activity is neutron induced activity contained within the metal crystalline structure. The remainder is deposited within the material surface oxide film as surface contamination. The foregoing radiological estimate is based upon a comprehensive radiological survey[15] of the facility performed by LILCO in 1990 to determine the extent of contamination and the radiation levels in Shoreham's contaminated systems and structures. Further data on the facility's radiological status are presented in Section 2.5.

At the present time, the Shoreham plant still holds a full-power operating license, although by Confirmatory Order dated March 29, 1990, the license was modified such that LILCO may not load fuel into the vessel without the NRC's prior approval.[16] At the present time, LILCO has requested the NRC to amend Shoreham's license further to a defueled operating license (DOL) or possession-only license (POL)[17] and it is such a DOL or POL which LIPA expects to be transferred to LIPA pursuant to the license transfer amendment request.

1.3 SELECTION OF THE DECON DECOMMISSIONING ALTERNATIVE

1.3.1 Decommissioning Terminology

The NRC has described three main alternatives for decommissioning nuclear facilities. These are identified as: DECON, SAFSTOR and ENTOMB.[4] DECON is the method in which the equipment, structures and portions of a facility and site containing radioactive contaminants or activated materials are removed or decontaminated to a level that permits the site to be released for unrestricted use shortly after cessation of operations. SAFSTOR is the method in which the nuclear facility is placed in a condition that allows the facility to be safely maintained for some interim SAFSTOR period, and then decontaminated or disposed of after the SAFSTOR period. ENTOMB is the method in which radioactive contaminants are encased in a structurally competent material such as concrete. The entombed structure is appropriately maintained and placed under continued surveillance until the radioactivity decays to a level permitting unrestricted release of the property.

1.3.2 Selection of DECON

LIPA proposes to decommission Shoreham using the DECON alternative and will be prepared to commence implementation of its DECON Decommissioning Plan promptly after receipt of NRC approval. A number of factors support the selection of the DECON alternative:

- Using DECON, the radioactive contamination at the Shoreham plant will be reduced in the near future using commercially available methods for decontamination and/or dismantlement and disposal of radioactive portions of the plant, thus eliminating a potential health, safety and environmental risk, and releasing the site for unrestricted use. The use of DECON decommissioning will maximize LIPA's flexibility in selecting uses for the Shoreham site in the relatively near

future and in carrying out its statutory mandate.

- The DECON decommissioning of the Shoreham plant will permit the use of personnel who are knowledgeable about the Shoreham plant and its operating history. If the decommissioning of the Shoreham plant were deferred (as would be the case if SAFSTOR or ENTOMB were used), there would be increased likelihood that personnel unfamiliar with the plant would have a major role in its decommissioning, perhaps increasing costs and the likelihood of inadvertent exposures to radioactivity due to their lack of familiarity with the plant.

- Due to the limited radioactive contamination of the Shoreham plant, DECON decommissioning can be accomplished with no significant impacts from radiation exposure to the decommissioning workers and with minimal risk of any radiation exposure to the public.

- DECON decommissioning will eliminate the need for long term monitoring, security, surveillance and maintenance of the Shoreham plant and the costs associated therewith.

- DECON decommissioning of the Shoreham plant is not expected to be any more expensive than deferred decommissioning. In fact, DECON decommissioning should prove to be less expensive than deferred decommissioning, given the uncertainties related to costs of maintaining the plant over a long period and the uncertainties associated with predicting future waste disposal costs.

- No significant environmental impacts are expected to result from the DECON decommissioning of the Shoreham plant. While certain impacts have been identified -- such as potential worker exposure to radioactivity and the need to transport and dispose of radioactive waste -- these impacts are expected to be minimal for the Shoreham plant. Further, the mitigation measures described hereafter will further reduce the level of these potential impacts.

LIPA has determined that there are no preferable alternatives to DECON decommissioning of the Shoreham plant.

There is no alternative of "no action," i.e., maintaining the Shoreham plant in a shut down condition in compliance with NRC regulations but without proceeding to decommissioning. LIPA is obligated under the LIPA Act to decommission Shoreham once it becomes the owner of the plant. NRC regulations similarly make clear that once it is decided that a plant will no longer be operated, it must be decommissioned. Finally, it is not appropriate to incur the substantial costs associated with maintaining the Shoreham plant in its current condition.

The deferred decommissioning alternatives -- SAFSTOR and ENTOMB -- are not preferable to DECON decommissioning. Deferred decommissioning would result in minimal benefits when compared to DECON decommissioning. Deferred decommissioning is beneficial primarily in instances where the licensee wishes to avoid the disruption of another nuclear facility at the site, or where it is judged to be beneficial to allow a period of radioactive decay prior to actual implementation of decommissioning activities in order to reduce worker exposures to radioactivity. For the Shoreham plant, neither of these conditions exists: the site has no other nuclear facility; and radioactivity levels at the Shoreham plant are already sufficiently low to ensure that worker exposure to radiation during decommissioning will be low.

Further, deferred decommissioning would result in the continued presence of radioactive contamination at the Shoreham site for a prolonged period of time, making it more difficult to use portions of the Shoreham site for other purposes (and perhaps even precluding use of portions of the site for a period of time), and creating the need for long-term security, surveillance, monitoring and maintenance of the plant to ensure no inadvertent exposures to radiation. In addition, deferred decommissioning would mean that in the future, the actual decommissioning activities would likely be undertaken by personnel who are less familiar with the Shoreham plant, meaning that more time and training would be required.

1.4 ENVIRONMENTAL IMPACTS OF DECON DECOMMISSIONING

The DECON decommissioning of the Shoreham plant will be accomplished with no significant environmental impacts. This result is not surprising, since the NRC in the NRC GEIS considered the various tasks associated with the decommissioning of a nuclear power plant that had operated at full power for a long period of time (30 years), and concluded that the decommissioning of such

plants can be carried out without any significant environmental impacts. It is therefore reasonable to conclude that the decommissioning of the Shoreham plant, which operated for only the equivalent of two full power days, can be carried out without any significant environmental impacts. LIPA has not identified any site-specific factors pertaining to the Shoreham plant which would alter the conclusion of the NRC GEIS or indicate that any significant environmental impacts would result from Shoreham decommissioning activities.

As discussed in detail in Section 4.0, the non-radiological environmental impacts from Shoreham's DECON decommissioning are temporary and are not significant. Principal environmental effects are slight increases in noise levels in the immediate vicinity of the site, truck traffic to and from the site for hauling equipment and wastes, and the possibility of some dredging of the intake canal if the spent fuel is moved by barge.

Fuel movement would not constitute part of decommissioning, since under NRC guidance[2] the disposition of spent fuel is outside the scope of decommissioning. In any event, however, dredging, if it were to occur, would result in no significant environmental impacts, due particularly to the fact that any dredging would occur in an area which has been dredged previously. Finally, no significant socioeconomic impacts or impacts to local cultural, terrestrial or aquatic resources have been identified.

The principal radiation exposure impact is the estimated collective dose to decommissioning workers: about 190 person-rem for the proposed DECON alternative. This exposure is not considered to be a significant impact. By way of comparison, this is much less than the average annual occupational exposure from an operating boiling water reactor (BWR), reported to be about 430 person-rem (1989 average for all operating U.S. BWRs)[18] or 469 person-rem (for the reference BWR).[4]

The largest occupational risk associated with decommissioning the Shoreham plant is related to the risk of industrial accidents in carrying out the DECON decommissioning. No significant impacts are expected. Again, by way of comparison, the level of effort and the associated risk to carry out DECON decommissioning will be much less than for the original construction of the facility, which required on the order of 10 million construction person-hours.

Radiation exposures to off-site individuals from both postulated accidents and expected conditions are estimated to be insignificant. The maximum exposures to an individual from the most severe postulated accident are 1.08 millirem whole

body and 93.9 millirem to the skin. These are 0.11% and 1.9%, respectively, of the Environmental Protection Agency (EPA) Protective Action Guide (PAG) levels for protection of the public from accidents at nuclear facilities. The 50-year whole body and organ (lung) doses to the maximum exposed off-site individual from expected airborne releases due to decommissioning operations are 1.82×10^{-5} millirem and 2.03×10^{-4} millirem, respectively. Both of these are very small fractions (less than 0.0004% and 0.0014%, respectively) of the annual dose levels established by the NRC in 10 CFR Part 50, Appendix I as design guides for maintaining off-site exposures from routine releases of radioactive materials as low as reasonably achievable (ALARA).

Doses due to the release of radionuclides in liquid effluents have not been estimated for Shoreham decommissioning because these will be negligible in comparison to those permitted under the Shoreham full-power Technical Specifications.

Finally, no significant impacts are expected from the disposal/burial of Shoreham's low level radioactive waste. The total volume of Shoreham low level waste which may need to be disposed of has been conservatively estimated at about 79,300 cubic feet. In fact, the actual volume is expected to be far less, since the 79,300 cubic feet estimate assumes that all contaminated systems and the RPV and its internals will be sent to a burial facility. It is expected that many of these portions may be decontaminated to below the proposed release criteria (such criteria are described in Section 4.2 of the Decommissioning Plan) and thus will not need to be sent to a burial facility. In addition, LIPA will further reduce the volume of wastes by utilizing volume reduction techniques.

LIPA believes that given the relatively low level of contamination of the Shoreham wastes and their small volume (particularly compared to a reference BWR after 30 years of operation), it should be possible to dispose of such wastes off-site in a prompt manner during DECON decommissioning. However, if for any reason some portion of these wastes needs to be stored temporarily on-site, adequate space exists and no significant environmental impacts are anticipated.

Despite the fact that no significant environmental impacts are expected from Shoreham's DECON decommissioning, LIPA will take steps to ensure that even insignificant impacts are minimized. Thus, in addition to complying with applicable

regulations, such as those of the NRC (e.g., 10 CFR Parts 20, 61 and 71) and the Department of Transportation (DOT) (49 CFR), LIPA will also take certain additional measures:

- LIPA will implement a Soil Erosion and Sediment Control (SE&SC) Plan to ensure that site activities do not affect the water quality of surrounding areas.

- LIPA will implement a Spill Prevention Control and Countermeasure (SPCC) Plan to ensure that fuels, oils, chemicals and other potentially harmful substances will be stored and handled in a safe and secure manner.

- LIPA will minimize air quality impacts through a variety of means, including assurance that work areas will be paved or covered with gravel, and through implementation of other dust control measures.

- LIPA will implement a waste management program to minimize the generation of waste and to control the spread of contamination.

- LIPA will implement a fire and industrial safety program.

1.5 REFERENCES

1. Long Island Lighting Company, "Applicant's Environmental Report, Operating License Stage - Shoreham Nuclear Power Station Unit 1," Docket No. 50-322, Rev. 4, October 1979.

2. Final Rule, "General Requirements for Decommissioning Nuclear Facilities," 53 Fed. Reg. 24018 (1988).

3. Long Island Power Authority, Shoreham Nuclear Power Station, Decommissioning Plan, Docket No. 50-322, December 1990.

4. U.S. Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0386, August 1988.

5. Long Island Power Authority Act, New York Public Authorities Law Section 1020, et seq. (McKinney Supp. 1990).

6. Settlement Agreement -- LILCO Issues, dated February 28, 1989.

7. Amended and Restated Asset Transfer Agreement, between LILCO and LIPA dated as of June 16, 1988, as Amended and Restated as of April 14, 1989.

8. Site Cooperation and Reimbursement Agreement by and between LILCO and LIPA, dated January 24, 1990.

9. Management Services Agreement between LIPA and NYPA, dated January 24, 1990.

10. "Joint Application of Long Island Lighting Company and Long Island Power Authority for License Amendment to Authorize Transfer of Shoreham," Docket No. 50-322, License No. NPF-82, June 28, 1990.

11. Long Island Power Authority, "Final Generic Environmental Impact Statement for the Decommissioning of the Shoreham Nuclear Power Station," November 1990.

12. Long Island Lighting Company, "Updated Safety Analysis Report - Shoreham Nuclear Power Station," Docket, No. 50-322, Revision 3, June 1990.

13. Long Island Lighting Company, "Semiannual Radioactive Effluent Release Report Shoreham Nuclear Power Station - Unit 1," Docket No. 50-322, February 28, 1990.

14. Long Island Lighting Company, "Shoreham Nuclear Power Station Operational Radiological Environmental Monitoring Program - Annual Report: January 1 to December 31, 1989," April 1990.

15. Long Island Lighting Company, "Shoreham Nuclear Power Station Site Characterization Program Final Report," May 1990; Addendum 1, June 1990; Addendum 2, August 1990.

16. "Confirmatory Order Modifying License (Effective Immediately)," Docket No. 50-322, License No. NPF-82, March 29, 1990, 55 Fed. Reg. 12258 (April 5, 1990).

17. Long Island Lighting Company, "License Change Application, Operating License NPF-82, Shoreham Nuclear Power Station," Docket 50-322, transmitted to the NRC via SNRC-1664, January 5, 1990.

18. Inside NRC, Volume 11, McGraw-Hill, Inc., August 13, 1990.

2.0 DESCRIPTION OF THE SITE, FACILITY AND LOCAL ENVIRONMENT

2.1 SITE DESCRIPTION

2.1.1 Site Location and Description

The information presented in this Supplement updates LILCO's previous ER-OLS.[1]

The Shoreham site is located in the Town of Brookhaven, Suffolk County, New York, on the north shore of Long Island as shown on the General Location Map (Figure 2.1-1). The site is approximately 50 miles east of the La Guardia Airport.[2] The developed portion of the Shoreham site, which includes the Shoreham plant structures, comprises 80 acres, and is located within a larger parcel of about 500 acres which is entirely owned by LILCO. The approximate 500 acre parcel is bounded on the north by Long Island Sound and on the east by the Wading River marshland. It is bounded on the west by a parcel of approximately 420 acres known as the Shoreham West property, also owned by LILCO, and on the south by highway Route 25A. The 500 acre Shoreham site property is divided across its midsection by North Country Road which branches off Route 25A about three miles west of the site and rejoins Route 25A about three miles east of the site. The road is about 1,500 feet from the Shoreham Reactor Building at its closest point.[1] Figure 2.1-2 shows the Shoreham site plan and the location of the Reactor Building and other major facilities on the developed portion of the site. Approximately 18 acres of the site's developed area will be used during decommissioning and are referred to as the Project Area. Eleven of these acres will be transferred to LIPA as set forth in the Asset Transfer Agreement.[3]

The site is hilly, varying from beach level at Long Island Sound to elevation 200 feet midway between North Country Road and the southern border of the site. Except for the developed portions, the site is mostly wooded with wetlands along the east and west boundaries extending as much as 1,300 feet from the shore.[1]

The nearest location accessible to the public is approximately 600 feet NE of the Reactor Building and along Wading River Creek east of the east plant access road (New Beach Road). This area is within the site property, but is accessible from the Riverhead Town beach. A parking lot used by Brookhaven Town residents for access to a small section of Brookhaven Town beach located north of the Shoreham site lies to the immediate northeast of the Shoreham controlled area fence. The nearest accessible location on property not controlled by LILCO is a nature conservancy which adjoins the Shoreham site to the east about 1100 feet from the Reactor Building. The nearest residence is located on the beach about 1500 feet NE of the Reactor Building.[4]

2.1.2 Population Distribution

The area within 10 miles of the site is comprised of parts of three Suffolk County towns: Brookhaven, Riverhead and Southampton.[2] It should be noted that towns in New York State are political subdivisions of counties similar to townships in many other states. Table 2.1-1 provides current population data for communities which lie within a 10 mile radius of Shoreham. These are reported in the 1990 LILCO Long Island population survey.[5] The current estimated total population within a 10 mile radius of Shoreham is 148,040 (derived from the 1990 LILCO survey). This is consistent with the 10 mile projected 1990 population contained in Shoreham's USAR[2] of 145,382. Current populations of the four communities in the immediate vicinity of the site are about 10 per cent less than the 1990 projections contained in the ER-OLS.[1]

2.1.3 Uses of Adjacent Lands and Waters

A survey of land use in the vicinity of Shoreham has been conducted annually since 1978[4] in support of LILCO's environmental monitoring program. These surveys include location of nearest residences, vegetable gardens and dairy animals within the 16 compass land sectors surrounding the Shoreham plant. Data from the most recent survey are used in the assessment of impacts from Shoreham's decommissioning.

The past decade has seen an increase in land devoted to residential use in the vicinity of the site and in the greater Suffolk County region. This is evidenced by a population increase of about 140 % within a 10 mile radius of Shoreham between 1970 and 1990. In the four communities nearest Shoreham, a 187% increase occurred over the same period. This is based on data from the LILCO 1990 Long Island Population Survey.[5]

Land use patterns have not undergone significant changes in the immediate vicinity of the site since Shoreham's construction. However, new residential development has occurred along Valentine Road to the southwest of the site and along North Country Road on both the east and west approaches to the site. This is generally low density development with lot sizes of one half acre or greater. It is estimated that between 15 and 20 new residences have been constructed within one quarter mile of the site boundaries during the 1980's. However, several neighboring sections along North Country Road remain unimproved, i.e., wooded or grassy with no residences or other structures.

A combustion turbine generator known as the Brookhaven Combustion Turbine facility was added by LILCO to the adjacent Shoreham West property in 1989. This parcel was previously zoned for industrial use by the Town of Brookhaven, and thus, this addition was consistent with the planned land use. The facility,

comprised of several turbine generators with a total capacity of 240 megawatts, occupies about 15 acres of the 420 acre property.

2.2 GENERAL FACILITY DESCRIPTION

As described in the USAR,[2] the plant consists of a BWR nuclear steam supply system (NSSS) and a turbine generator, both furnished by the General Electric Company. The balance of the plant was designed by the Stone & Webster Engineering Corporation. The plant was designed to provide a gross electrical output of 849 megawatts electric.

The principal buildings and structures at the Shoreham site include the following:

1. the Reactor Building, which houses the RPV and associated auxiliary and safety systems, the primary containment structure, the biological shield, the spent fuel storage pool and the fuel handling equipment;

2. the Turbine Building, which houses the turbine-generator, condenser and associated systems;

3. the Control Building, which houses several rooms with safety systems, and the Control Room from where plant operations are conducted;

4. the Radwaste Building, which houses the solid and liquid radioactive waste treatment systems;

5. the Screenwell Building, which allows the plant to draw water from the Long Island Sound to supply the condenser with cooling water and contains the necessary pumps and filters required by the circulating water system; and

6. the Office and Service Building and Office Building annex, which house the office space for the managerial and clerical staff and the Technical Support Center; and

7. the Security Building, which houses plant security operations.

In addition to the nuclear generating facility, the site contains a peak power gas turbine facility, an internal combustion peak power generator and an emergency diesel generator. These facilities are not part of the licensed facility.

2.3 OPERATING HISTORY

The Shoreham plant achieved initial criticality in February 1985. Low power testing commenced in July 1985. The plant was tested intermittently at power levels not exceeding 5% of full power for approximately two years. The Shoreham plant has

not operated since June 1987. This operating history corresponds to approximately two effective full power days average fuel burnup.[6]

2.4 CURRENT FACILITY STATUS

The Shoreham plant is, overall, unchanged from the description in the USAR.[2] The fuel was removed from the reactor core in August 1989 and placed in the spent fuel storage pool. Staffing has been reduced significantly from the level required to support the facility during power operations, and application has been made to the NRC to reduce facility security and surveillance requirements to levels commensurate with a non-operating defueled reactor.[7] However, as discussed in LILCO's Defueled Safety Analysis Report,[8] security, surveillance, fire protection, radiation protection, safety, emergency preparedness and safeguards measures for the reactor fuel are still required and will be met as long as the fuel remains on site.

LILCO has evaluated and is planning to implement early in 1991 a "soft" chemical decontamination program to decontaminate five of the nine contaminated plant systems discussed in Section 2.5.1.2 below. LILCO has selected a technique that has been used at operating nuclear plants, a process which can be used without causing irreversible damage or degradation to the plant equipment. In addition, LILCO is using the existing Shoreham plant staff to manually decontaminate various areas of the plant including the suppression pool and reactor head cavity. It is anticipated that there will be several benefits to LIPA resulting from LILCO's decontamination program, including the possible reduction in the overall scope of decommissioning and dismantlement (i.e., under the assumption that levels of contamination in plant systems and structures can be reduced below acceptable criteria for unrestricted access to the site). Such decontamination efforts are being closely monitored by LIPA and will be factored into LIPA's detailed engineering and planning activities for decommissioning.

2.5 FACILITY CHARACTERIZATION

2.5.1 Radiological Characterization of Facilities and Equipment

Estimates of plant radionuclide inventories have been determined for the RPV and associated internals and plant systems and structures as a result of LILCO's site characterization program completed in May 1990.[9] Surface contamination and radiation levels of RPV components, plant systems and structures were obtained from radiation and contamination survey measurements. In-situ activation of the RPV and components were calculated using the ORIGEN code, the RADCOR code and Shoreham's fuel power history, and then adjusted to measured values for certain components.

2.5.1.1 Reactor Pressure Vessel

Table 2.5-1 shows the calculated in-situ activation product inventory of the RPV and its components as of July 1990. The total calculated inventory of 602 Curies is comprised of over 97% Fe-55 and Co-60 and trace amounts of other radionuclides. The core shroud, top guide plate and SRM/IRM dry tubes contain over 96% of the activated nuclide inventory.

2.5.1.2 Plant Systems

Nine plant systems (or portions thereof) were found to contain surface radioactivity contamination in excess of levels specified in NRC criteria for unrestricted release of materials following decommissioning (Regulatory Guide 1.86).[10] These are:

- Control Rod Drive
- Process Sampling
- Core Spray
- Residual Heat Removal
- Reactor Water Cleanup
- Liquid Radwaste
- Fuel Pool Cleanup
- Condensate Demineralizer
- Reactor Recirculation

Table 2.5-2 summarizes estimated surface contamination levels for the above systems. The activity is comprised of predominantly Co-60, with other trace radionuclides. Ratios of fixed to removable contamination are comparable to those for the RPV. The total radioactivity content of the surface contamination in the nine systems is estimated to be approximately 3.3 milliCuries.[9]

2.5.1.3 Structural Contamination

Radioactive surface contamination in excess of Regulatory Guide 1.86 criteria was found on surfaces in the following structures and areas:

- Dryer-Separator Pool
- Reactor Head Cavity
- Primary Containment
- Radwaste Laydown Area
- Equipment/Floor Drains and Sumps

The total activity of the surface contamination in these structures and areas of the plant is estimated to be less than one milliCurie.[9] Most of the activity is in the reactor head cavity and in a small number of building floor sumps. Table 2.5-3 provides a summary of structure surface contamination levels as of May 1990.

The spent fuel storage pool is assumed to be contaminated in excess of Regulatory Guide 1.86 criteria, but was not included in the recent facility characterization measurements as it contains the no change fuel, and could not be drained for contamination surveys.

2.5.1.4 Facility Radiation Dose Rate Levels

Dose rates throughout the facility are very low compared to normal plant operating levels and the reference BWR. General area dose rates are less than 0.5 mrem/hr.

2.5.2 Radiological Characterization of Site and Environs

2.5.2.1 Site Characterization

Data for the radiological characterization of Shoreham's outdoor areas were obtained from LILCO's Radiological Environmental Monitoring Program.[4] These measurements of radioactivity in air, precipitation, ground water and soil, and of direct radiation disclose no radioactivity above background levels.

2.5.2.2 Environmental Characterization

Shoreham's Radiological Environmental Monitoring Program reports the results of comprehensive measurements of radioactivity concentrations in terrestrial, aquatic and atmospheric media as well as direct radiation in the vicinity of Shoreham.[4] These measurements extend to a 20 mile radius from the site. In addition, measurements of plant radioactive effluents are reported semi-annually.[11]

The environmental monitoring program has reported concentrations above detection limits for several man-made radionuclides in soil and surface water in the Shoreham vicinity (H-3, Sr-90, Cs-137) during the 1985-90 period. Kr-85 has been reported above detectable levels in air samples as well. However, none of these nuclides detected in environmental samples have been detected in Shoreham effluents. The levels are consistent with those associated with world-wide fallout from weapons testing and the Chernobyl accident, and are not attributable to Shoreham's operations.

Radionuclides due to Shoreham's operation during the 1985-87 time period have been detected in liquid effluents but at concentrations well below regulatory limits. For example, during the fourth quarter of 1989, about 10 microCuries (total activity) were reported to have been released in liquid effluents.[11] This activity was contained in 5 million liters total volume of water released from the plant during the period. The level of activity concentration is a factor of about 10,000,000 below the applicable release limit in Shoreham's license. No airborne or gaseous activity was measured in plant air exhausted to the environment during 1989 or 1990.[11]

2.5.3 Facility Hazardous Waste and Industrial Materials

An inventory of materials present at Shoreham in April 1990 is contained in Table 2.5-4. These materials include fuel oil, acid and caustic chemicals used in support of Shoreham's operations and stored in bulk quantities on site. No "mixed waste" (i.e., waste containing both hazardous materials and radioactive materials) exists at Shoreham.

Five material spills, none of which involved radioactive materials, have occurred since plant operations were initiated in 1985. Four of the incidents involved No. 2 fuel oil. The quantities spilled ranged from one to 500 gallons. In the fifth incident, 30 gallons of lube oil were spilled. In all instances, the spills were promptly cleaned up and reported to the appropriate regulatory agency.[9]

2.6 REFERENCES

1. Long Island Lighting Company, "Applicant's Environmental Report, Operating License Stage - Shoreham Nuclear Power Station Unit 1," Docket No. 50-322, Revision 4, October 1979.

2. Long Island Lighting Company, "Updated Safety Analysis Report - Shoreham Nuclear Power Station," Docket No. 50-322, Revision 3, June 1990.

3. "Amended and Restated Asset Transfer Agreement," between LIPA and LILCO, dated as of June 16, 1988, and amended and restated as of April 14, 1989.

4. Long Island Lighting Company "Shoreham Nuclear Power Station Operational Radiological Environmental Monitoring Program - Annual Report January 1 to December 31, 1989," April 1990.

5. Long Island Lighting Company, "Population Survey 1990," June 1990.

6. Long Island Lighting Company, Nuclear Engineering Division, Calculation No. C-RPD-476, "Shoreham Nuclear Power Station Core Thermal Power after Startup Testing," Revision 0, November 21, 1988.

7. Long Island Lighting Company, "License Change Application, Operating License NPF-82, Shoreham Nuclear Power Station Unit 1, Docket No. 50-322" January 5, 1990.

8. Long Island Lighting Company, "The Shoreham Nuclear Power Station Defueled Safety Analysis Report," Attachment 3 to SNRC-1664 from W.E. Steiger to the NRC, January 5, 1990.

9. Long Island Lighting Company, "Shoreham Nuclear Power Station Site Characterization Program Final Report," May 1990; Addendum 1, June 1990; Addendum 2, August 1990.

10. U. S. Nuclear Regulatory Commission, Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Power Reactors," June 1974.

11. Long Island Lighting Company, "Semiannual Radioactive Effluent Release Report, Shoreham Nuclear Power Station - Unit 1 Docket No. 50-332," February 27, 1990.

Table 2.1-1

Population of Communities in the Vicinity of Shoreham

Community	Distance (miles)[1]	70 Census	80 Census	90 Estimated
Shoreham	2.2 W	524	555	595
East Shoreham	1.0 SW	2046	3817	4312
Ridge	5.0 SW	2335	8977	12204
Manorville	8.7 SSE	1602	6548	9410
Yaphank	9.0 SSW	2210	3020	6295
Brookhaven Lab	5.9 S	343	2057	205
Gordon Heights	8.0 SSW	1307	1590	2195
Middle Island	6.7 SW	2620	5703	8894
Coram	9.3 SW	6875	24752	31089
Rocky Point	3.[illegible] WSW	3734	7012	7997
Sound Beach	5.[illegible]	4878	8071	9060
Miller Place	6.7 W[illegible]	4413	7877	9401
Mt. Sinai	9.1 W	2157	6591	9116
Port Jefferson	11.0 W	5795	6731	7873
Pt. Jefferson St.	11.7 WSW	14808	17009	18485
Wading River	1.0 SW	2768	4405	4935
Calverton-Roanoke	7.0 SE	3832	4952	5974
Totals		62247	117815	148040

Note:

1. Miles from community or town center to Shoreham. From Geogrophia Map Co. Inc., "Geogrophia, Street Atlas of Suffolk County Long Island, New York", 1987.

Table 2.5-1

Estimated Radionuclide Inventory in the RPV, Internals and Biological Shield Wall[1]

Component	Activity, Curies (2)							
	H-3	C-14	Fe-55	Co-60	Ni-59	Ni-63	(3) Others	Total Curies
Core Shroud	0.0381	0.0043	118.6620	47.3915	0.0283	3.9020	-	170.0263
Jet Pumps	0.0018	0.0002	5.5189	2.2041	0.0013	0.1815	-	7.9077
Top Guide Plate	0.0744	0.0084	232.1502	93.6200	0.0553	7.6298	0.2349	333.7731
Core Support	0.0017	0.0002	5.2119	2.0816	0.0012	0.1714	-	7.4680
Spray Header	-	-	0.0010	0.0004	-	-	-	0.0015
SRM/IRM Dry Tubes	-	0.0023	50.7000	21.4000	0.0107	1.55	1.7600	75.4230
CRD Guide Tubes	-	0.0002	3.9600	1.6800	0.0008	0.121	0.1370	5.9000
Mirror Insulation	-	-	0.1304	0.0521	-	0.0043	-	0.1868
Vessel Cladding	-	-	0.0921	0.0368	-	0.0030	-	0.1319
Vessel Wall	0.0002	-	0.3272	0.0114	-	0.0004	0.0133	0.3525
Biological Shield	0.0099	-	0.3805	0.0100	-	0.0006		0.4010
Total by Isotope:	0.1261	0.0156	417.1342	168.4878	0.0977	13.5641	2.1452	601.5708
Percent of Total:	0.02%	0.00%	69.34%	28.01%	0.02%	2.25%	0.36%	

Note:

(1) Calculated neutron induced activities as of July 1990.

(2) The activities of the core shroud, top guide plate, SRM/IRM dry tubes, and CRD guide tubes have been normalized to exposure rate measurements. Normalization has not been performed for any other component.

(3) Includes Mn-54 for the dry tubes and guide tubes. For other components, include isotopes with less than 0.01% contribution to total activity.

Table 2.5-2

System Contamination Results

Systems	Average Surface Contamination dpm/100cm^2	Estimated Total Surface Activity uci
Reactor Recirculation	14,000	250
Control Rod Drive	8,000	300
Residual Heat Removal	12,000	430
Core Spray	47,000	720
Liquid Radwaste	2,400	160
Reactor Water Cleanup	28,000	620
Fuel Pool Cleanup	26,000	790
Condensate Demineralizer	6,000	26
Process Sampling	12,000	23

Table 2.5-3

STRUCTURAL CONTAMINATION RESULTS

Structure	Average Total Surface Contamination (DPM/100 cm^2)	Maximum Total Surface Contamination (DPM/100 cm^2)
Primary Containment	<1,000	3,000
Contaminated Equipment/ Floor Drains and Sumps	5,000	11,000
Dryer/Separator [1] Storage Pool	<1,000	2,000
Reactor Head Cavity	9,000	78,000
Spent Fuel Storage Pool [2]		
Radwaste Laydown Area	11,000	55,000

(1) At time of site characterization, there were several inches of water in the pool. Values shown are for pool walls.

(2) The Spent Fuel Storage Pool and Spent Fuel Storage Racks are assumed to be contaminated in excess of Regulatory Guide 1.86 limits.

Table 2.5-4

Hazardous Material Inventory at Shoreham Site

TANK IDENTIFICATION NO.	DESCRIPTION	QUANTITY	
1N52-TK-094	Caustic Measuring Tank	50% Sodiurn Hydroxide	1050 gal
1N52-TK-095	Acid Measuring Tank	93% Sulfuric Acid	1050 gal
1N52-TK-035	Concentrated Acid Storage Tank	93% Sulfuric Acid	5076 gal
1N52-TK-036	Concentrated Caustic Storage Tank	50% Sodium Hydroxide	5076 gal
1N52-TK-149	Waste Neutralizing Tank	Acid/Caustic (pH 2.0 to 12.0)	25000 gal
1W23-TK-208	Sodium Hypochlorite Tank	12.5% Sodium Hypochlorite	20000 gal
1M43-TK-033	Diesel Fire Pump-Fuel Oil Day Tk	#2 Fuel Oil	275 gal
1M41-TK-081A	Aux Boiler Fuel Oil Storage Tanks	#2 Fuel Oil	38000 gal
1M41-TK-081B	Aux Boiler Fuel Oil Storage Tanks	#2 Fuel Oil	38000 gal
1M43-TK-153	Phosphate Storage Tank	Sodium Phosphate	130 gal
1R43-TK-132A	DG 101 Fuel Oil Storage Tank	#2 Fuel Oil	42000 gal
1R43-TK-132B	DG 102 Fuel Oil Storage Tank	#2 Fuel Oil	42000 gal
1R43-TK-132C	DG 103 Fuel Oil Storage Tank	#2 Fuel Oil	42000 gal
1R43-TK-135A	DG 101 Fuel Oil Day Tank	#2 Fuel Oil	250 gal
1R43-TK-135B	DG 102 Fuel Oil Day Tank	#2 Fuel Oil	250 gal
1R43-TK-135C	DG 103 Fuel Oil Day Tank	#2 Fuel Oil	250 gal
1M43-TK-076	CO_2 Storage Tank	CO_2	125 ton


Bridgeport
CONNECTICUT
Stamford
NEW YORK
LONG
NEW JERSEY
Mt. Vernon
Port Jefferson
Northport
Huntington
Bronx
LaGUARDIA AIRPORT
Manhattan
Hicksville
SUFFOLK COUNTY
NASSAU COUNTY
MacARTHUR AIRPORT
Central Islip
Queens
New York
SOUTH
BAY
GREAT
JFK INTERNATIONAL AIRPORT
Brooklyn
FIRE ISLAND NATIONAL
AT
0
5
SCALE - MILE

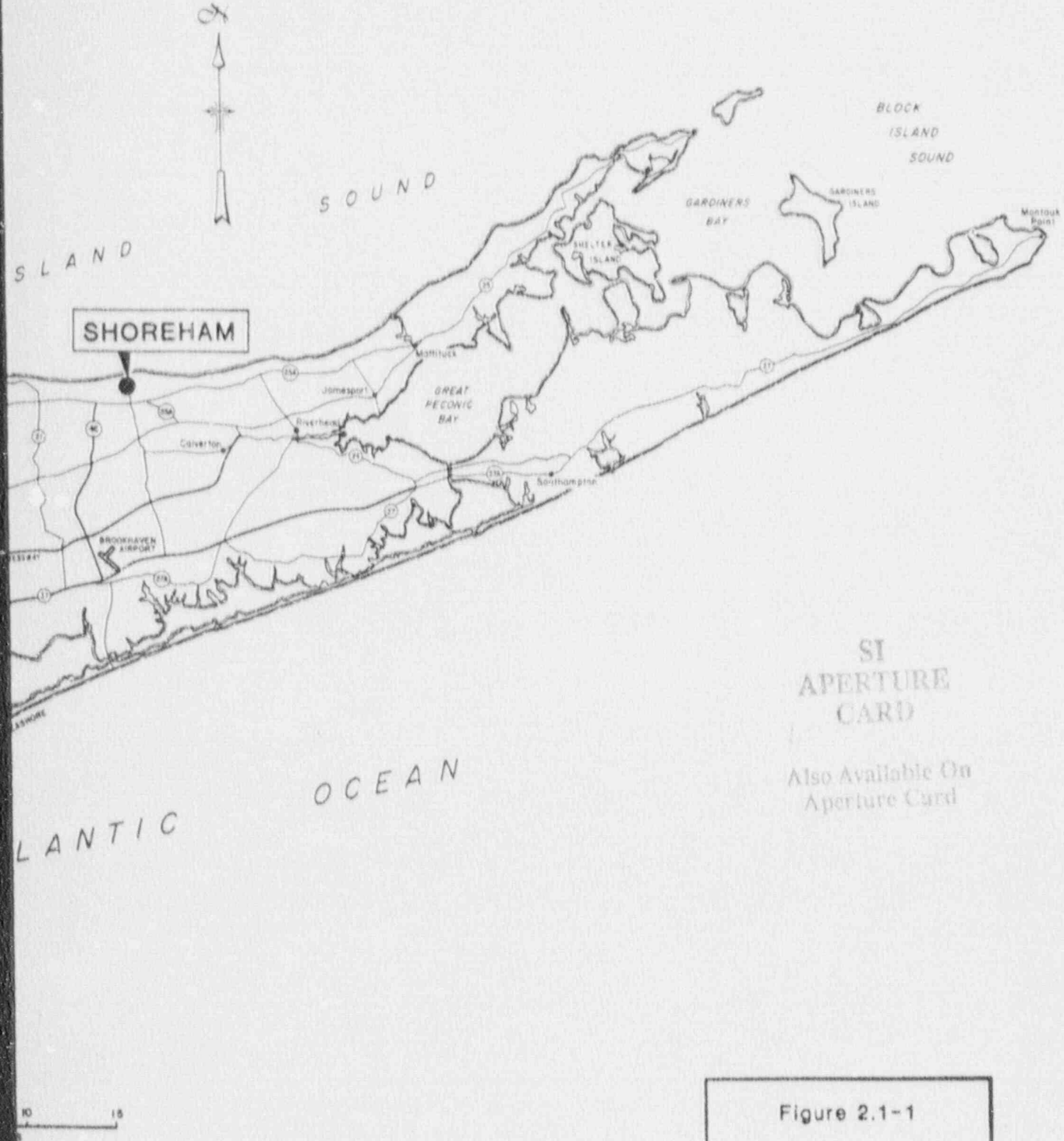
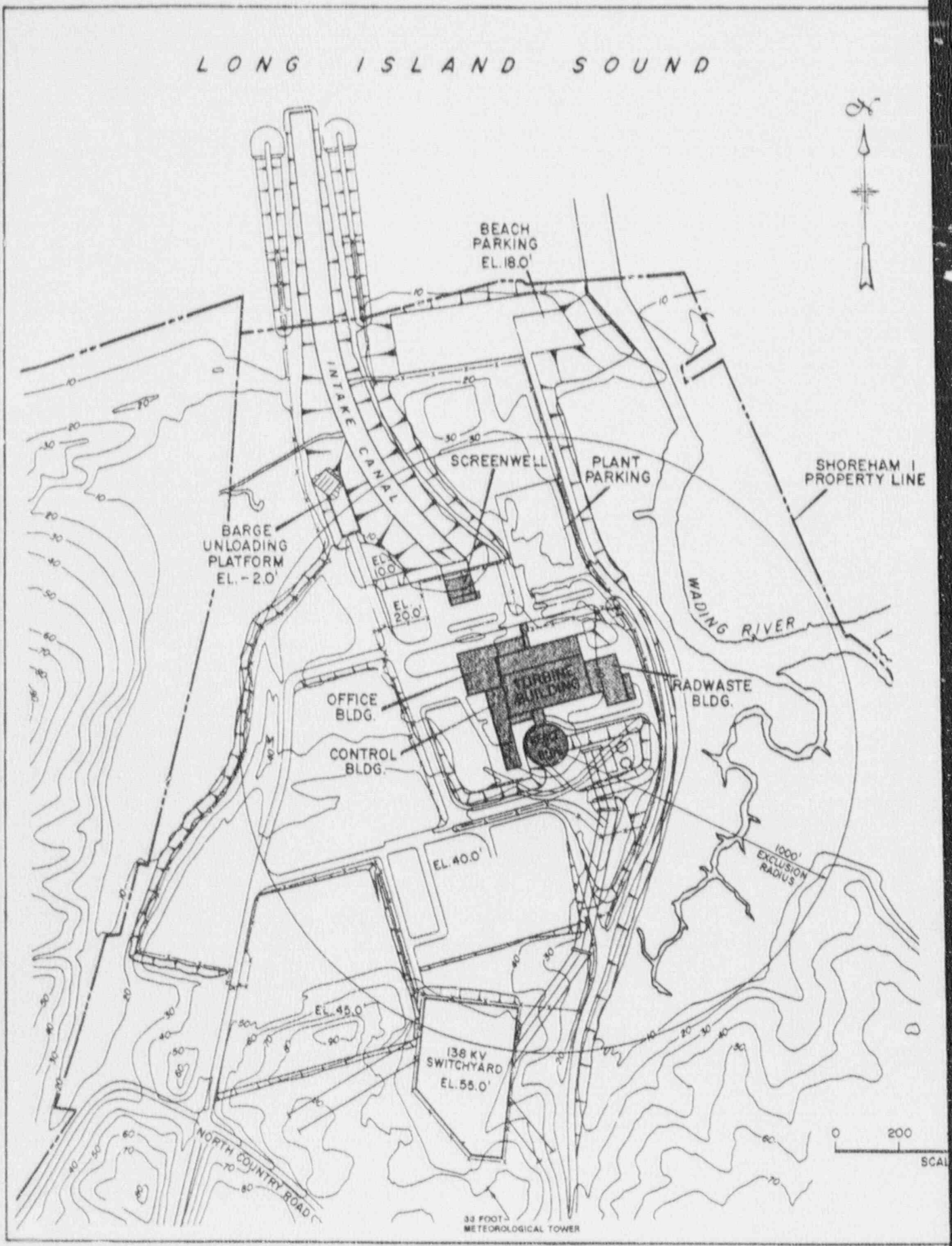
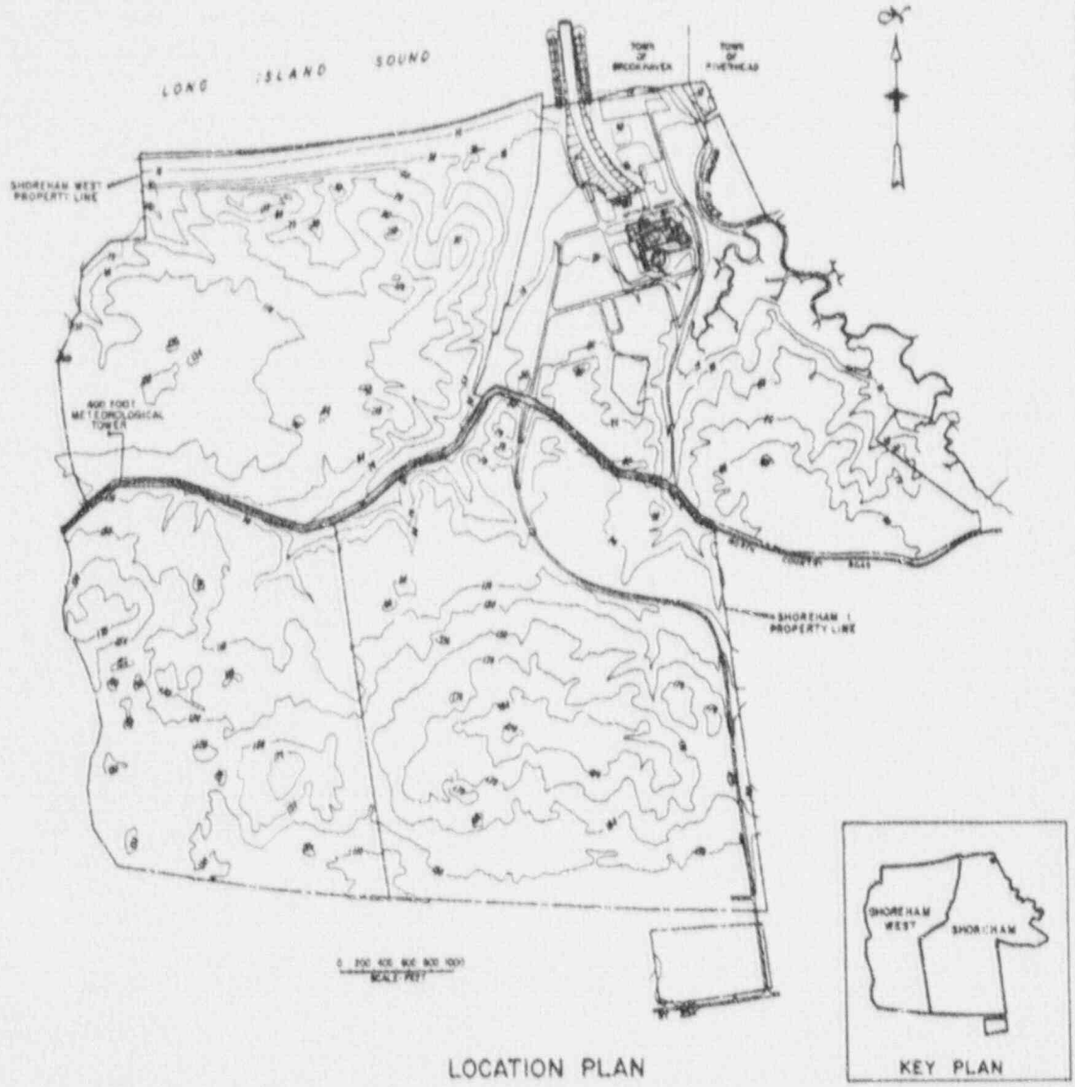


Figure 2.1-1

GENERAL
LOCATION MAP


LONG ISLAND SOUND
BEACH PARKING EL. 18.0'
INTAKE CANAL
SCREENWELL
PLANT PARKING
SHOREHAM I PROPERTY LINE
BARGE UNLOADING PLATFORM EL. -2.0'
EL. 10.0'
EL. 20.0'
WADING RIVER
TURBINE BUILDING
RADWASTE BLDG.
OFFICE BLDG.
CONTROL BLDG.
EL. 40.0'
1000' EXCLUSION RADIUS
EL. 45.0'
138 KV SWITCHYARD EL. 55.0'
NORTH COUNTRY ROAD
0
200
SCAL
33 FOOT METEOROLOGICAL TOWER



LOCATION PLAN

KEY PLAN

Figure 2.1-2

OPERATION SITE
AND LOCATION PLAN
WITH EXISTING
TOPOGRAPHIC CONTOURS

400 600 800
E-FEET

Section 3. Supplement To Environmental Report (Decommissioning)

3.0 DECOMMISSIONING ALTERNATIVES AND ACTIVITIES

This Section describes the decommissioning alternatives available to LIPA, and the activities associated with the selected alternative, DECON. It also provides an evaluation of the available alternatives and discusses why DECON was selected.

3.1 DECON DECOMMISSIONING ALTERNATIVE

LIPA has selected the DECON alternative for the decommissioning of the Shoreham plant. The DECON alternative which is reflected as LIPA's selected alternative throughout this Supplement is defined by the NRC as follows:

> DECON is the alternative in which the equipment, structures, and portions of the facility and site containing radioactive contaminants are removed or decontaminated to a level that permits the property to be released for unrestricted use shortly after cessation of operations. [1]

The basis for selection of DECON over the other potentially available alternatives, SAFSTOR and ENTOMB, includes a number of key factors. First, the limited power history of the Shoreham plant and the low levels of contamination and activation support the use of DECON. Given the limited amount and extent of contamination and activation, DECON will be much easier to implement at Shoreham than at other plants with more substantial operating histories, based on a review of the NRC's generic evaluation of BWR decommissioning.[2] Second, by use of DECON, the existing radiation hazards at the Shoreham plant can be eliminated in the near term, releasing the site for alternative uses. This will maximize flexibility in selecting future uses for the site. Third, the selection of the DECON alternative will enable LIPA to use existing LILCO personnel, familiar with the Shoreham plant and its operation, to perform many of the decommissioning activities. Particularly because of the relative ease with which DECON can be implemented at the Shoreham plant and the other advantages described, the other decommissioning alternatives, SAFSTOR or ENTOMB, are not preferable.

LIPA intends to decontaminate and dismantle Shoreham's plant systems, components and structures to the extent necessary to assure the removal of the Shoreham plant irrevocably from service as a nuclear generating facility and to permit release of the facility for unrestricted use. LIPA is contemplating the use of a wide range of decontamination and dismantlement techniques to achieve this objective.

The following is a more detailed description of the decommissioning activities planned at the Shoreham plant.

Section 3. Supplement To Environmental Report (Decommissioning)

The major activities to be performed during Shoreham's decommissioning have been divided into the following work categories:

1. System and Structure Decontamination and Dismantlement;
2. Segmentation of the Reactor Pressure Vessel and Internals;
3. Radwaste Management;
4. Area Cleanup and Decontamination; and
5. Final Radiation Survey.

3.1.1 System and Structure Decontamination and Dismantlement

LIPA intends to decontaminate and dismantle Shoreham's plant systems and structures to the extent necessary to permit release of the facility for unrestricted use. LIPA is contemplating the use of a wide range of decontamination and dismantlement techniques to achieve this objective.

Decontamination techniques to be employed by LIPA are consistent with those used routinely throughout the nuclear industry. In-situ chemical decontamination, ultra-high pressure water lancing, abrasive grit blasting and a variety of manual techniques are all expected to be used by LIPA during the course of Shoreham's decommissioning. In addition, LIPA is closely evaluating the off-site decontamination services discussed in Section 6.

LIPA is also evaluating industry accepted and field proven processes for the dismantlement of Shoreham's plant systems and structures. Such techniques will range from simple, manually operated power bandsaws used to sever small bore piping through more sophisticated techniques such as diamond wire saw cutting which will be used to sever the large bore piping connections to the RPV. The selected options, as well as LIPA's continued evaluation of available technology, will reflect careful consideration of the radiological aspects associated with their intended application.

3.1.2 Segmentation of the Reactor Pressure Vessel and Internals

Radiological characterization of the Shoreham site has revealed that the majority of radioactive material resulting from the plant's limited period of operation is contained within the RPV internals. The RPV and internals will be decontaminated

to the extent practicable, and contaminated portions will then be segmented, packaged and shipped for off-site disposal as described in Section 6.0.

Segmentation of the more highly activated reactor internals will be performed using underwater, semi-automatic plasma arc and metal disintegration machining equipment. The RPV shell will be severed into ring sections using the diamond wire saw. The ring sections will then be cut into pieces appropriately sized to permit their safe and efficient handling, packaging and shipping using either the diamond wire saw or some thermal cutting technique.

3.1.3 Radwaste Management

LIPA has estimated that approximately 79,300 cubic feet of radwaste will be generated as a result of Shoreham's decommissioning. Section 6.0 describes LIPA's plans for processing, packaging, shipping and disposing of Shoreham's radwaste in accordance with applicable federal and state regulations. As described in Section 7.0 of the Decommissioning Plan, radwaste-related activities will be governed by LIPA's Quality Assurance (QA) program.

Volume reduction is a key aspect of LIPA's plan for managing Shoreham's radwaste. Through an aggressive campaign of decontamination, waste segregation and other industry-proven waste processing techniques, LIPA anticipates that Shoreham's radwaste can be consolidated so that only a relatively small portion of the 79,300 cubic feet estimate will require disposal at a licensed radwaste burial facility.

3.1.4 Area Cleanup and Decontamination

Precautions will be taken to preclude the spread of contamination to the vast majority of plant areas which are presently clean. However, various areas throughout the plant which are affected by the decontamination and dismantlement activities will be surveyed and decontaminated, as required, following the completion of decommissioning activities.

3.1.5 Final Radiation Survey

A final radiation survey (i.e., termination survey) will be conducted on all suspected and known contaminated or activated structures, systems, components, equipment, on-site grounds and adjacent environs upon completion of the decontamination and dismantlement activities. The final survey will demonstrate that the site meets the criteria for unrestricted release.

The survey will involve an evaluation of the site, the development of a sampling program, and the controls to be used over virtually all aspects of the survey to assure valid results. The site will be divided into survey blocks and characterized. Specific media to be sampled will be determined, and the methods of sampling will be evaluated. Instrumentation appropriate to detecting gamma or beta-gamma radiation in and on various media will be used. Limitations of processes and instruments will be evaluated. Laboratory analysis will incorporate statistical methods in their evaluations, and all data will be taken, collected, processed, analyzed, stored, retrieved and interpreted under LIPA's QA program.

3.1.6 Schedule

The entire decommissioning effort is expected to take 27 months from approval of the Decommissioning Plan by the NRC through completion of LIPA's decommissioning activities. It is expected to require an average of about 590 people, including craft labor, staff and management.

3.2 OTHER ALTERNATIVES

By definition, decommissioning is the removal of a nuclear facility safely from service and the reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license. The potential decommissioning alternatives to DECON are SAFSTOR and ENTOMB. The following is a description of these alternatives and an evaluation of their suitability for the Shoreham plant. The "no action" alternative is also discussed.

3.2.1 SAFSTOR

SAFSTOR is an alternative in which the nuclear facility is prepared and maintained in a condition that allows the nuclear facility to be safely stored for a period of years and subsequently decontaminated to levels that permit release of the site for unrestricted use. SAFSTOR consists of 1) a short period of preparation for safe storage (up to 2 years after final reactor shutdown); 2) a variable safe storage period of continuing care consisting of security, surveillance and maintenance (up to 60 years after final shutdown depending on the type of facility); and 3) a short period of deferred decontamination. SAFSTOR also requires, among other things, modifications to the facility to ensure the security of the buildings against intruders and to ens containment of radioactive or toxic material. Several subcategories of SAFSTOR are possible:

1. Custodial SAFSTOR requires a minimum cleanup and decontamination effort initially, followed by a period of continuing

care with the active systems (principally the ventilation system) kept in-service throughout the storage period. Full-time on-site surveillance by operating personnel and security forces is required to carry out radiation monitoring, to maintain the equipment and to prevent accidental or deliberate intrusion into the facility or the dispersal of radioactivity beyond the confines of the facility.

2. Passive SAFSTOR requires a more comprehensive cleanup and decontamination effort initially, sufficient to permit deactivation of the ventilation systems during the continuing care period. The structures are secured and electronic surveillance is provided to detect accidental or deliberate intrusion. Periodic monitoring and maintenance of the integrity of the structures is required.

3. Hardened SAFSTOR requires comprehensive cleanup and decontamination and the construction of barriers around areas containing significant quantities of radioactivity. These barriers must be of sufficient strength to make accidental intrusion impossible and deliberate intrusion extremely difficult. Surveillance requirements are limited to detection of attack upon the barriers maintenance of the integrity of the structures and to infrequent monitoring.

All categories of SAFSTOR require some positive action at the conclusion of the period of continuing care to release the property for unrestricted use and terminate the license for the possession of radioactive materials. Depending on the nature of the nuclear facility and its operating history, the necessary action can range from a radiation survey that demonstrates that the radioactivity has decayed and the property is releasable, to dismantlement and removal of residual radioactive materials. These latter actions, whatever their magnitude, are generically identified as deferred decontamination.

SAFSTOR is used as a means to satisfy the requirements for protection of the public while minimizing the initial commitments of time, money, occupational radiation exposure and waste disposal space. In addition, SAFSTOR may have some advantage where there are other operational nuclear facilities at the same site and may also become necessary in situations where there is a shortage of radioactive waste disposal space off-site. Also, in highly contaminated facilities and/or facilities with large amounts of activation products, there is the potential for incurring larger occupational radiation exposures if DECON decommissioning is performed immediately after shutdown. However, as a result of decay of this radioactive material during a SAFSTOR period, reductions in personnel exposure and reduction in the volume of radioactive material for disposal may be achieved

by deferring major decontamination efforts for a number of years.

Under SAFSTOR, the reduced initial effort (and cost) of the preparation of safe storage is negated by the need for continuing surveillance and physical security to ensure the protection of the public. Maintenance of the facility's structures and an ongoing program of environmental surveillance are also necessary. The duration of the storage and surveillance and dismantlement period would be expected to last about 50 years for Shoreham.

At the end of the period of safe storage, several activities will remain to be performed before the facility can be released for unrestricted use. In most cases, radioactivity in some systems and areas within the facility will still be above levels acceptable for unrestricted release of the facility, necessitating the removal, packaging and disposal of selected materials at a licensed disposal site.

Deferred decontamination involves disassembly, removal and transport of the materials containing the radioactivity to a disposal site. Further action following termination of the NRC license and release for unrestricted use, such as disassembly of the various non-radioactive systems and use or demolition of the buildings, would be optional.

A major disadvantage of SAFSTOR is the potential unavailability of personnel familiar with the facility at the time of deferred decontamination. More time and training to familiarize new personnel with the plant would be needed. Other significant disadvantages include the fact that all or portions of the site remain unusable for an extended time period. The uncertainties concerning future regulatory requirements and the continuing need and cost of maintenance, security and surveillance.

Under normal circumstances where a plant has operated at full power for many years, SAFSTOR, by allowing a period of radioactive decay, could lead to a significant reduction in radiation exposure to decommissioning workers. The Shoreham plant, however, is considerably different from the facilities which are decommissioned at the end of their planned life. The contamination and activation of systems, structures and components at the Shoreham plant resulting from low power testing for a limited period of time, while necessitating some decontamination and dismantlement, did not result in radiological conditions comparable to the conditions at the normal end of reactor life. At Shoreham, radiation levels are already quite low, resulting in the ability to carry out DECON decommissioning without significant radiation exposures. Thus, the major advantage of SAFSTOR over DECON is not applicable to the Shoreham plant.

In short, there is no significant benefit from the SAFSTOR alternative in the case of the Shoreham plant and there are significant disadvantages.

3.2.2 ENTOMB

ENTOMB would involve the complete isolation of radioactive materials from the environment by means of massive concrete and metal barriers until the radioactive materials have decayed to levels which permit unrestricted release of the facility. These barriers must prevent the escape of radioactive materials and prevent deliberate or inadvertent intrusion. The length of time the integrity of the entombing structure must be maintained depends on the inventory of radioactive nuclides present.

ENTOMB for a BWR plant would typically be limited to the containment because its unique structure inherently lends itself to entombment and because it contains most of the radioactive materials in the facility. Other buildings associated with a reactor must be decommissioned by another method such as DECON. It is possible, however, to move some radioactive components from other buildings to the containment and ENTOMB them there, rather then shipping them off-site.

Two approaches to ENTOMB are possible. In the first approach, the RPV internals and their long lived isotopes are entombed, along with other radioactive material. This results in less cost and radiation dose because the RPV and its internals will not have to be removed, dismantled and transported to a waste repository. It will also, however, result in the requirement for a continuing NRC license and surveillance for an indefinite period of time because of the presence of the long-lived isotopes.

In the second approach, the RPV internals, with their long lived isotopes, are removed, dismantled and transported to a radioactive waste repository. This results in more cost and radiation exposure, but offers the possibility that surveillance and the NRC license could be terminated at some earlier time, thereby releasing the entire facility for unrestricted use. At the outset, a careful inventory of radioactivity would need to be made to ensure that only relatively short-lived isotopes were present.

In both ENTOMB approaches, as much solid radioactive material from the entire facility as can be accommodated is sealed within the containment. All openings to the exterior of the containment are sealed. Radioactive material outside the containment is removed which permits release of the remainder of the facility for unrestricted use. Radioactive materials not entombed would have to be packaged and transported to a disposal site.

In appropriate circumstances, the advantage of ENTOMB is the reduction of occupational and public exposure to radiation compared to DECON. Its advantage over SAFSTOR is that little surveillance is required, and less land is required for the disposal of contaminated waste material. However, these advantages in the case of the Shoreham plant are minimal due to the already low level of contamination and limited waste volume. ENTOMB on the other hand is disadvantageous because the long term integrity of the entombing structure must be assured; further, the ENTOMB alternative limits use of portions of the site.

3.2.3 No Action

The "no action" alternative, i.e., maintaining Shoreham in a shut down condition while complying with NRC requirements but not proceeding with decommissioning, is not a feasible alternative. Once a nuclear plant owner decides to cease operation, the plant must be decommissioned. NRC decommissioning regulations mandate the preparation of a decommissioning plan within 2 years of the date that a nuclear facility ceases operation. 10 CFR 50.82(a). The "no action" alternative was rejected in the NRC GEIS.[1] In addition, New York law requires LIPA to decommission the Shoreham plant. Pub. Auth. Law 1020-h(9). Further, it would be wasteful of ratepayer money to continue to incur costs to maintain Shoreham when LIPA will never operate the facility.

3.3 COMPARISON OF ALTERNATIVES

The preceding discussion reveals that the DECON alternative is the preferable alternative available to LIPA. As noted, "no action" is not an available alternative and the chief reason for selecting SAFSTOR or ENTOMB, reducing potential radiation exposures by allowing a period of radioactive decay, is of limited applicability to the Shoreham plant since radiation levels are already low. Moreover, because of the low levels of contamination and activation, the volume of low level radioactive waste will be much smaller than predicted for a plant which is at the end of its normal operating life.[2] This considerably reduces the impacts associated with the commitment of land area for disposal of low level radioactive waste.

Thus, by use of DECON, the radioactive contamination at the Shoreham plant can be eliminated in the relatively near term, releasing the site for alternative unrestricted uses. This will maximize flexibility in selecting future uses for the site. DECON will also allow LIPA, to use personnel familiar with Shoreham and its operation during decommissioning.

DECON decommissioning of the Shoreham plant is not expected to be any more

expensive than deferred decommissioning. In fact, DECON decommissioning should prove to be less expensive than deferred decommissioning, given the uncertainties related to costs of maintaining the plant over a long period, the uncertainties associated with predicting future waste disposal costs and uncertainties about future regulatory requirements.

3.4 REFERENCES

1. U.S. Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement of Decommissioning of Nuclear Facilities," NUREG-0586, August 1988.

2. H. D. Oak, et al., "Technology, Safety, and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," (prepared for the Nuclear Regulatory Commission by Pacific Northwest Laboratory), NUREG/CR-0672, June 1980; Addendum 1, July 1983; Addendum 2, September 1984; and Addendum 3, July 1988.

4.0 ENVIRONMENTAL IMPACTS

In accordance with 10 CFR 51.53(b), this Supplement presents new information or significant environmental changes associated with the implementation of the selected DECON decommissioning alternative. This material, therefore, updates LILCO's previous ER-OLS. As such, the Supplement does not reiterate the extensive discussion of the site's flora and fauna found in the ER-OLS.

This section discusses potential environmental impacts of decommissioning activities on the local site surroundings and the regional economy. It is based upon the Decommissioning Plan,[1] a supporting engineering study,[2] a generic environmental analysis performed by LIPA under New York's State Environmental Quality Review Act,[3] the NRC GEIS,[4] and available descriptions of the current environmental and socioeconomic characteristics of the site and vicinity and the eastern Long Island region. The discussion focuses on the selected alternative, DECON.

4.1 SOCIOECONOMIC AND CULTURAL RESOURCES

The existing setting for discussion of impacts on socioeconomic and cultural resources is described in Section 2.0. Impacts of the decommissioning are considered in terms of potential effects on regional population growth and distribution, recreation, historic and archaeological resources and aesthetics. No significant impacts resulting from Shoreham's decommissioning have been identified.

4.1.1 Socioeconomic Impacts

Decommissioning is expected to be completed over a 27 month period and to employ an average of 590 persons annually, with a peak work force of approximately 650 (this includes management, support staff and contractor personnel). The temporary nature of the project and the limited work force support the conclusion that no significant demographic shifts will result from the decommissioning.

Similarly, decommissioning activities are not expected to have any significant effects on the regional economy, due to the limited size of the decommissioning work force and the short (2 to 3 years) decommissioning schedule.

It is anticipated that a significant portion of LIPA's decommissioning staff will be carried over from LILCO's existing site work force. There are approximately 400 people employed by LILCO at the plant, including engineers, technicians and clerical staff. It should be noted that the Shoreham property is not being abandoned, and that other activities on the property will continue to be performed following Shoreham's decommissioning. LILCO owns and operates several internal combustion power generating facilities at the Shoreham site, totalling over

300 megawatts. These facilities supply electric power to the east end of Long Island and provide reserve for peak electrical demands.

It is probable that most construction workers will be drawn from regional Long Island labor pools. The total construction work force of Long Island in 1990 consists of approximately 50,000 persons. Although contractors may bring in specially skilled technicians to perform certain tasks, it is expected that much of the decommissioning labor force would be drawn from Long Island.

Decommissioning is not expected to have a significant impact on regional or local employment and unemployment rates, whether the work force is drawn from the Long Island population or from outside of the area. For comparison, the construction of Shoreham employed a maximum of 3,700 workers, and the plant would require a staff of about 760 permanent workers if it were in operation. Operating nuclear power plants employ approximately 1,000 people during routine maintenance outages. Relative to these employment levels, the decommissioning workforce at Shoreham will be small. Due to the specialized nature of the task, and the small labor force required, no significant impacts are anticipated on local or regional Long Island labor markets or demand for services.

Decommissioning will not place any significant additional demands on community services. Water supply exists on-site from wells with state and possibly local permits. Sewage treatment also occurs on-site under a state permit. Security services and fire prevention are provided under NRC guidelines. Fire protection support for the Shoreham site is maintained under a mutual assistance agreement between the site and the Wading River Fire District and this will continue to be in effect during the decommissioning period.

The surrounding communities have sufficient housing capacity to absorb any demands for short-term housing. The number of workers required to decommission the plant is less than the number required for plant operation, and is well below the level already experienced during construction of the facility. Therefore, the influx of decommissioning workers will not present an unprecedented short-term population increase.

4.1.2 Cultural Resources

Impacts to cultural resources are considered in terms of potential effects on regional population growth and distribution; community services; transportation facilities; land use; recreation; historic and archaeological resources; and aesthetics. No significant impacts are expected.

4.1.2.1 Demographics

As discussed earlier in Section 4.1.1, no significant demographic shifts will result from the decommissioning.

4.1.2.2 Community Services

Decommissioning Shoreham will not place any significant additional demands on community services such as fire and police protection, water supplies, sewage treatment services and solid waste disposal. Water supply, sewage treatment and security services all exist on-site. Construction debris will not be disposed of on-site; it will be hauled and disposed of by a private contractor as is currently being performed.

4.1.2.3 Transportation Facilities

Commuting workers and construction vehicles required for decommissioning will use existing LILCO site access roads and parking areas. As parking and access to the Shoreham site were originally designed for the peak construction workforce of 3,700 and the operating staff of the plant, the transportation facilities already in place are more than adequate to meet the demands presented by the temporary decommissioning workforce; those demands will present no significant impacts on local traffic. Average daily traffic counts on Route 25A, the William Floyd Parkway Extension, and Route 495 currently range from about 12,800 to 25,900 along the major site access route.[5] The additional commuter vehicles spread over three shifts will not constitute a significant increase over existing traffic flow. Rather, commuter traffic to Shoreham will be similar to the existing LILCO traffic.

The existing LILCO access road extends from the site to Route 25A, near the terminus of the William Floyd Parkway Extension. All truck traffic from the site will use this access road, thereby avoiding residential streets in East Shoreham and Wading River and funnelling traffic directly to major highways. All waste removal vehicles will comply with existing state and federal regulations regarding the transportation of hazardous and radioactive materials. It is estimated that approximately 80 truckloads of low-level radioactive waste will result from the decommissioning. These truck movements will be distributed over the duration of Shoreham's decommissioning schedule. A plan will be developed upon completion of final engineering and planning that will include a final determination of transportation methods, routes and material quantities.

4.1.2.4 Land Use

No significant negative impacts on land use are anticipated as a result of Shoreham's decommissioning. LIPA will own approximately eleven acres of the original Shoreham site. To the contrary, decommissioning will free land from current restriction, thereby resulting in a net enhancement of the environment.

Most of the activities associated with decommissioning, with the exception of radioactive waste disposal, will take place within the 18 acre Project Area. Because previously disturbed land is available for laydown within the Shoreham site, no

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Most of the activities associated with decommissioning, with the exception of radioactive waste disposal, will take place within the 18 acre Project Area. Because previously disturbed land is available for laydown within the Shoreham site, no

impacts to undisturbed areas on-site or off-site are expected. Existing recreational, conservation and residential areas adjacent to the Shoreham site, and public access to unused portions of the site, will also be unaffected. No significant changes in rates of residential or industrial development of land are expected to occur because of Shoreham's decommissioning.

DECON decommissioning would allow the adaptation or modification of plant structures for industrial or administrative use, or for dismantling of the existing structures for other land uses. The DECON option would maximize flexibility in selecting uses for the entire Shoreham site in the relatively near future. With the DECON method, no limitations will be placed on land use development in the Project Area or on adjacent lands.

The Shoreham site is included within the established boundary of the New York State Coastal Zone Management Program. A Federal Consistency Assessment Form (FCAF) discussing potential DECON decommissioning effects on the coastal zone will be submitted to the New York State Department of State (NYDOS), Coastal Zone Management Program. The FCAF will support LIPA's certification that Shoreham DECON decommissioning will not hinder achieving any of the New York State coastal policies encoded at 19 NYCRR 600.5, and that in fact it should enhance them.

It may prove to be necessary to dredge the intake canal to facilitate removal of the spent fuel. Any intake canal dredging will be performed in accordance with Army Corps of Engineer's dredging regulations, and other applicable regulatory requirements regarding water quality certifications and tidal wetlands, including those administered by the NYDOS. Since the intake canal has been dredged in the past by LILCO (most recently in the winter of 1988-89), LIPA expects, based on current information, that any further dredging would involve no impacts not previously found to be permissible and consistent with New York coastal policies.[1] If dredging is found to be necessary, LIPA will obtain any necessary authorizations and will ensure that it is carried out in a manner that minimizes impacts.

4.1.2.5 Recreational Resources

The decommissioning of the Shoreham plant is expected to result in no significant impacts to any recreational or conservation areas in the vicinity of the site. Wading River Marsh will be protected from all decommissioning activities through

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[1] The 1988-89 dredging by LILCO was to a depth sufficient to allow clearance by an ocean going barge. However, sediment which has accumulated since then may require some additional dredging to allow barge clearance. This is a matter which will be investigated further in the future via depth measurement prior to shipment in order to determine whether additional dredging actually will be required.

the application of Erosion and Sediment Control and Spill Prevention Control and Countermeasure Plans. These plans and other mitigation measures planned by LIPA are described in Reference 3. Both Shoreham Beach and Wading River Beach will continue to be open to the public throughout decommissioning as will St. Joseph's Villa and the interpretative trails in Wading Creek Marsh.

4.1.2.6 Historical and Archaeological Resources

No impacts to archaeological or historic sites will occur as a result of decommissioning the Shoreham plant. Decommissioning activities will be confined to the improved portion of the Shoreham site which was cleared, filled, graded and paved during the original construction of the facility. No decommissioning work is expected to occur on undisturbed lands. The trucking route to and from the Shoreham plant does not pass any historic sites, as described below.

According to the historic resources listed on the National Register of Historic Places for the Town of Brookhaven, neither the project site, nor any site within a one-half mile radius of the project site, contains any currently listed historic sites.[6]

During original construction, no archaeologically significant material was discovered or reported at the site.[7]

4.2 WATER RESOURCES

4.2.1 Aquatic Ecology Study

This section discusses the aquatic data collected in the vicinity of Shoreham during a 12 year period beginning in 1977 and ending in December 1988. The aquatic ecology study was intended to continue until initial plant operation and to be then converted to an operational monitoring program.[8] The study was discontinued in 1989.

The study's objective was to characterize and quantify the vicinity's aquatic ecosystem. This would provide baseline information to evaluate subsequent effects of plant operation on the aquatic environment. This study was carried out in accordance with the scope of work published in the ER-OLS and the NRC's Final Environmental Statement for the Shoreham station. Study results were reported approximately annually.

The 1988 report,[8] the last full year of the study, discussed the following major disciplines: water quality/chemistry, macrobenthos, biofouling monitoring, megabenthos, ichthyoplankton, and fisheries. Samples were collected on a regular basis from Long Island Sound within a 3 to 4 mile radius of the Shoreham site. The primary goal of the report was to present the composition of communities and population levels of dominant species. They are viewed from the

perspective of time (by month, season and year) and from the perspective of spatial distribution, such as offshore vs. nearshore and diffuser vs. control localities. Another goal was to quantify the natural variability in community composition and population densities.

4.2.2 Decommissioning Impacts

Decommissioning activities will occur primarily within existing buildings and parking lots and should therefore result in no adverse impacts on water resources. The waters of Long Island Sound and Wading River Marsh will not be impacted by Shoreham's decommissioning. Specific measures, such as implementation of an SE & SC Plan[3] will be taken to ensure that runoff from the parking and laydown areas will be controlled and directed to temporary settling basins. Discharges from these or other locations will be monitored for compliance with the site's State Pollutant Discharge Elimination System (SPDES) Permit.

The current LILCO SPCC Plan details specific measures for all storage and handling of fuels. LIPA will follow, and modify, if required, the measures outlined in the SPCC Plan. Chemicals and other hazardous substances are stored by LILCO in a facility approved under Suffolk County Article 12 regulations.[9] The intent of Article 12 is to safeguard Suffolk County water resources by controlling or abating pollution from existing toxic waste or hazardous material sources and from new sources.

Removal of the fuel from the Reactor Building will have no adverse effect on an aquatic resources of the area. However, if barge transport is chosen to ship the fuel, there may be some minor impacts. This is because, for reasons already discussed in Section 4.1.2.4, it may be necessary to dredge the intake canal to accommodate an ocean-going barge. No significant impacts are expected to the littoral zone or the immediate marine environment.

4.3 WATER USE

Decommissioning of Shoreham will not place any additional demands on plant services such as water supplies and sewage treatment services. These water supply and sewage disposal systems all already exist on-site. Wells exist under New York State Department of Environmental Conservation (NYSDEC) Permit Nos. 36836, 36837 and 36838. Therefore, no new systems need to be developed or expanded.

A ground water monitoring program was established at the site in 1986 to assess the effects (if any) of Shoreham's operations on ground water quality. Shoreham's Facility Operating License No. NPF-82, Appendix B - Environmental Protection Plan (EPP), required LILCO to establish this ground water monitoring program when the plant began operating above 5% power. Shoreham has three station supply wells

that are used for plant make-up and domestic use. LILCO's ground water monitoring program was intended to demonstrate that the plant's operation would not adversely impact offsite private water supplies either due to excessive drawdown or saltwater intrusion. The NRC reviewed and approved this monitoring program in March 1986. The EPP will be adapted for use by LIPA during decommissioning.

The NRC-approved ground water monitoring program consists of three monitoring wells and a control well. The wells were installed during the first quarter of 1986. The monitoring wells were located approximately 400 feet to the south - southwest (M-1), 900 feet to the south (M-2) and 2,100 feet to the north (M-3) of the plant's supply wells (S-36836, 36837 and 36838). The control well (C-1) is 1,500 feet to the southwest of the supply wells. Figure 4.3-1 illustrates the locations of the monitoring wells.

LILCO began monitoring these wells prior to operation above 5% power, even though the program was not required, to provide technician training in sampling procedures and to establish background data below 5% operation. Samples were taken quarterly at wells M1, M2 and C1 and monthly at well M3. Samples were analyzed for chlorides, Ph and conductivity. The monitoring program was halted in June 1989 after LILCO's shareholders approved the Settlement. The monitoring program did not uncover any adverse impacts on groundwater due to Shoreham's limited operation.

The primary water use attributed to decommissioning operations will be for the maintenance of the work force. As discussed previously, an average of 590 persons annually and a peak force of 650 persons over a 27 month period will be required. The decommissioning phase will coincide with a net decrease in site demands due to the decrease in plant staff in the post operating period. The peak decommissioning work force is significantly less than for the plant construction and operational phases. Some consumptive water use is expected for dust control and possibly for equipment cooling. This will be considerably less than the water use which occurred during plant construction. On this basis, no additional site water supply or sewage disposal capacity is required to support the decommissioning.

Water use for personnel and for operation of the combustion generating facilities will continue at a level reduced from that experienced during Shoreham's operating period.

The Wading River Marsh is a state listed significant habitat, and is designated as potentially significant for wildlife. During the decommissioning, the SE&SC and SPCC Plans[3] will be implemented to prevent any indirect impacts to the marsh.

4.4 TERRESTRIAL RESOURCES

Decommissioning is not expected to impact the site's vegetation or wildlife. Since decommissioning will occur on developed areas of the site, no indigenous vegetation will be removed from the site during decommissioning.

The proposed action is consistent with the land use projections in the Brookhaven Town 1987 Master Plan. The plan shows that the site and surrounding LILCO owned properties are zoned for industrial use.[10]

4.5 WILDLIFE, ENDANGERED AND THREATENED SPECIES

Decommissioning is not expected to adversely impact any of the New York State listed endangered, threatened and special concern species, none of which were recorded at the site or surrounding environs, during or since the original construction of the facility.[7] However, several threatened and endangered plant species listed on the State National Inventory Program database are thought to be present in the vicinity of the Shoreham site. Although the exact location of these occurrences is not known, a recent survey indicates that there is little possibility that the previously disturbed 18 acre Project Area supports any of these plants. Furthermore, the Project Area is covered with structures, asphalt and gravel.

No natural habitat which harbors sensitive species exists on land areas directly involved with decommissioning activities. Noise and other activity associated with decommissioning activities are not expected to have significant impacts on wildlife species in the surrounding non-developed areas.

No marine wildlife will suffer significant impacts as a result of any necessary grading and filling in the vicinity of the cooling water intake canal. Any required temporary filling will be in accordance with Army Corps of Engineers and other applicable permit requirements, which normally account for minimizing impacts to marine fauna.

4.6 NOISE AND AESTHETICS

Noise will be generated from possible outdoor decommissioning activity and operation of equipment transport and waste hauling trucks. Sound level estimates for decommissioning activities were made utilizing methods described in the Empire State Electric Energy Research Corporation (ESEERCO) Power Plant Construction Noise Guide.[11]

The major equipment and expected sound levels are listed in the table below:

Equipment	Sound Level [Db(A)] at 50 Feet
Diesel engines (250 hp)	85
Concrete truck	84
Bulldozer	83
Cherry picker	83
Engine driven air compressor	74
Welding machines	73
Truck Crane (intermittent - for unloading major equipment)	82
Flatbed and other trucks (delivery)	84
Hand-held tools (grinders, etc.)	80
Compactors	82

Hearing protection is required for on-site personnel in the vicinity of such equipment. Off-site personnel or fauna are not expected to be adversely affected as sound pressure will be significantly attenuated over the distance from the equipment to off-site locations. The sound pressure level generated by a noise source decreases with increasing distance from the source due to sound wave divergence, absorption by ground cover and shielding by intervening structures.[12]

The nearest residence is located approximately 1,500 feet from the Reactor Building in the community of Wading River. It was conservatively estimated by the LILCO Environmental Engineering Division, using standard noise level estimation techniques, that the anticipated sound level at this distance during peak operations will be 62 Db(A).

Wading River (in the Town of Riverhead) has no applicable noise level standards, but the Brookhaven Town noise code limits noise level at the receiving property line to 65 Db(A) during the day, and to 50 Db(A) at night and on weekends.[13]

Decommissioning activities will generate higher than normal (but intermittent and temporary) utilization of roads for heavy equipment, trucks and tractor trailers. These vehicles will access the site from Route 25A via the LILCO owned site access road (not North Country Road). Thus, the noise impact of heavy equipment traffic on the neighboring community will be negligible.

Visual impacts from decommissioning activities are expected to be minor. No land clearing is anticipated and no further access development will be necessary, since the necessary access roads, parking areas and lay down areas currently exist. Decommissioning visual impacts will be limited because the work will be shielded from view by existing site structures. The major portion of the work is confined to the interiors of the existing buildings. Since the major structures will remain in

place after decommissioning, the overall appearance of the Shoreham facility will remain virtually unchanged.

4.7 LOCAL SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The short-term use of the Project Area by local workers and site staff is not expected to increase significantly or adversely affect the productivity of the local socioeconomic structure of Shoreham-Wading River.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resources which may be committed as part of the decommissioning of the Shoreham plant include, but may not be limited to, the following:

- Fossil Fuel
- Steel
- Concrete
- Land Use
- Timber
- Asphalt
- Electricity

Fossil fuel will be required to provide space heating and cooling of buildings at the site during decommissioning, and to operate machinery and motor vehicles. It will be stored in and supplied from existing on-site storage facilities.

Minor amounts of steel, concrete and timber may be committed for decommissioning activities. In addition, asphalt may be required to upgrade Old Beach Road for spent fuel transport to the barge loading area (if barge transport is used).

Electricity will be committed for operation of power equipment necessary for decommissioning. This will be supplied by LILCO generating facilities through existing transmission lines. Disposal (i.e., burial) of approximately 79,300 cubic feet of radioactive wastes (without volume reduction) from the RPV and radioactive systems represents a potentially irreversible and irretrievable commitment of resources (burial site capacity and land use).

4.9 UNAVOIDABLE ENVIRONMENTAL IMPACTS

DECON decommissioning may have several minor but unavoidable impacts. If Old Beach Road is upgraded, there may be a minimal amount of soil erosion as a result of the removal of "weedy" vegetative cover or old road surface. For a short period of time, soil may be exposed and subjected to the elements. Utilizing generally accepted engineering and re-grading practices, these potential short-term soil erosion effects will be minimized.

Unavoidable short-term aesthetic impacts include the temporary presence of construction equipment and the ocean barge (if barge transport is used).

A local short-term deterioration of air quality due to construction vehicle emissions and dust may be unavoidable. Minor emissions of fugitive dust would be the only observable impact of decommissioning on existing air quality. The use of excavation equipment and equipment movement on unpaved areas are primarily responsible for generating dust emissions. However, much of the Project Area is paved or covered with structures or gravel. Application of water as a dust suppressant is a technique that can be employed if necessary. Dust emissions can further be limited by covering exposed areas, storage piles, etc. when not being used. Once the preparation phases are complete, dust emissions would be expected to decline significantly.

Construction traffic is also a factor which can contribute to fugitive dust. Such emissions generated during the project are expected to be relatively minor. Minimizing speed and vehicle traffic in unpaved areas would serve to reduce dust emissions.

Noise associated with DECON decommissioning is also short-term and unavoidable, although such impacts should be minor as discussed in Section 4.6. Further, most of the decommissioning activities will be performed indoors.

Any filling or dredging to provide access for a barge will, if necessary, be minor. However, some benthic organisms, such as molusks, tube worms, etc., may be buried. This impact is considered minor and short-term.

Lastly, non-radioactive demolition waste material will be generated. This material will be generated by the removal of structures inside the Reactor Building and Radwaste Building to gain access and clearance for removal of radioactive components. Concrete reinforcing steel material can be removed and recycled as scrap steel. A fraction of the concrete matrix and soil-gravel debris volume can be recovered and recycled for clean construction-fill. The remainder will be disposed of in a landfill approved for disposal of commercial wastes.

4.10 REFERENCES

1. Long Island Power Authority, "Shoreham Nuclear Power Station Decommissioning Plan," December 1990.

2. Stone and Webster Engineering Corp., "Shoreham Nuclear Power Station Reactor Pressure Vessel Disposition Alternatives," May 1990.

3. Long Island Power Authority, "Final Generic Environmental Impact Statement for the Decommissioning of the Shoreham Nuclear Power Station," November 1990.

4. U.S. Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, August 1988.

5. Suffolk County Department of Public Works, "Traffic Volume Maps," 1978 as amended.

6. Brookhaven Historic District Advisory Committee, "National Register of Historic Places for the Town of Brookhaven" (undated).

7. Long Island Lighting Company, "Applicant's Environmental Report, Operating License Stage - Shoreham Nuclear Power Station Unit 1," Docket 50-322, Revision 4, October 1979.

8. Long Island Lighting Company, "Shoreham Nuclear Power Station Aquatic Ecology Study" (1977 to 1988).

9. County of Suffolk New York, "Suffolk County Sanitary Code, Article 12 - Toxic and Hazardous Materials Storage and Handling Controls," as amended.

10. Town of Brookhaven, New York, "Zoning Code and Official Zoning Map," Brookhaven, NY, 1987 as amended.

11. Bolt, Beranek, and Newman Inc., "Empire State Electric Research Corporation Power Plant Construction Noise Guide," Report No. 3321, 1977.

12. John G. Rau and David C. Wooten, "Environmental Impact Analysis Handbook," Mc Graw-Hill Inc., New York 1980.

13. Town of Brookhaven, "Chapter 50, Code of the Town of Brookhaven - Noise Control," Brookhaven, NY.

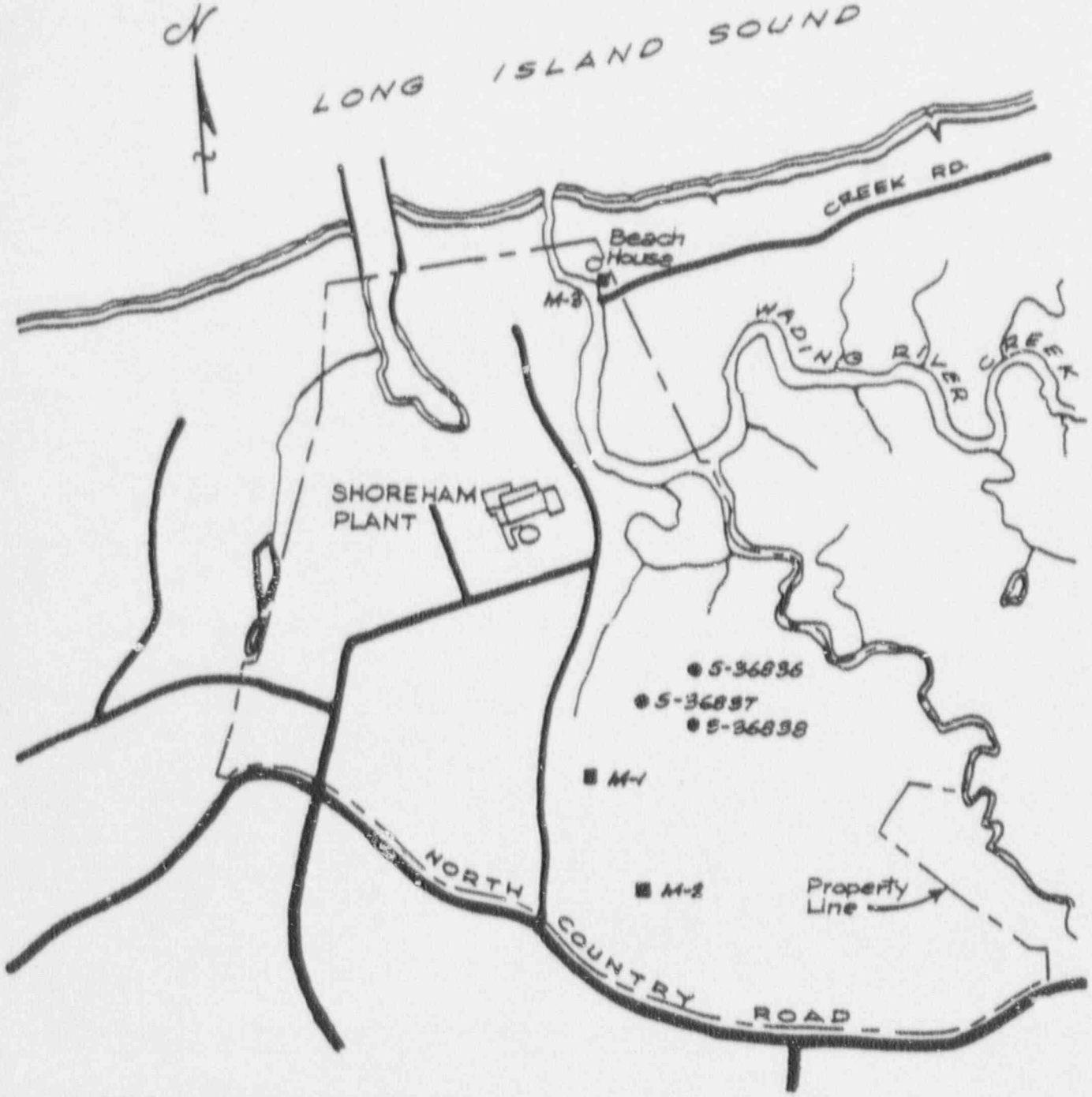

FIGURE 4.3-1

GROUNDWATER MONITORING PROGRAM

5.0 RADIATION EXPOSURE IMPACTS

This Section addresses the radiation exposure to workers and the public resulting from the DECON decommissioning of the Shoreham plant. Both routine decommissioning activities and postulated accidents are discussed. The estimates presented show that there will be no significant environmental impacts associated with radiation exposure.

5.1 WORKER RADIATION EXPOSURE FROM DECON DECOMMISSIONING

It is estimated that the planned DECON alternative will result in a collective dose of 180 person-rem to personnel performing decommissioning work. The dose estimate is based on task breakdowns, labor estimates and dose rates from conceptual planning and engineering studies, including References 1, 2 and 3. The task dose estimates utilize a combination of calculated and measured exposure rates and prospective stay times. Each task collective dose estimate assumes an effective overall average exposure rate for the entire task. It is assumed that the dose rates are generally spatially uniform in the work areas and are due primarily to Co-60 gamma radiation.

The major contributor to personnel exposure is the segmentation and removal of the RPV, estimated to result in about 158 person-rem. Other decontamination and dismantling of systems and structures and onsite handling and packaging of radioactive waste are estimated to result in an additional radiation exposure of about 22 person-rem. Estimates for these and the other tasks are conservative, not taking into account the effect of about two years radioactive decay before the decommissioning activities take place and not taking credit for exposure reduction measures which will be implemented as part of the radiation protection and ALARA programs which will be in effect.

The transportation of the Shoreham plant decommissioning waste to a low level radioactive waste disposal facility would result in low levels of exposure to the transportation workers. It is conservatively estimated that an additional exposure of about 10 person-rem to the transportation workers would result from about 80 truck shipments. These estimates conservatively assume the maximum allowable Department of Transportation (DOT) dose rate limits during transport.

5.2 MEASURES TO MAINTAIN WORKER EXPOSURE ALARA

Personnel radiation protection during Shoreham decommissioning activities will be provided by a comprehensive framework of policies, organizational responsibilities and procedures for radiation protection adapted from those originally developed for the operation of the Shoreham plant. A radiation protection program will also

be implemented for decommissioning which draws upon the above, the extensive industry experience base in plant modification work in radiological environments and experience from other recent decommissioning and dismantling projects. LIPA's radiation protection program is further described in the Shoreham Decommissioning Plan.[1]

ALARA reviews and exposure reduction techniques, such as shielding, decontamination and process and administrative controls applied to decommissioning work tasks, will be used to help further reduce personnel radiation exposure. Refined dose estimates will be prepared in conjunction with development of detailed engineering and work procedures. These estimates will be used to prioritize exposure reduction efforts focusing on tasks with the greatest potential for reduction in individual and collective personnel doses.

Specific measures contemplated for dose reduction during the segmentation and removal of the RPV include decontamination, installation of temporary shielding, use of remotely operated equipment and underwater cutting. Other measures such as mockup training for workers on high exposure tasks, sequencing of tasks, use of video communication and remote monitoring equipment will also be applied as appropriate to reduce personnel exposure time in radiation fields.

The program to protect workers will ensure that exposures to individuals from internal and external radiation will be ALARA and below the limits in 10 CFR 20.[4] Workers will receive training in decommissioning project radiation protection requirements and procedures. A dedicated radiation protection staff will perform monitoring of work areas, maintain radiation area access controls, provide personnel dosimetry and administer a radiation work permit system which establishes specific personnel protection requirements for work tasks. Dose tracking will be performed to monitor individual and collective dose accumulations as the work proceeds.

5.3 OFF-SITE RADIATION EXPOSURE FROM PLANNED DECOMMISSIONING ACTIVITIES

The NRC GEIS[5] has determined that potential radiation exposure to persons living in the vicinity during the end-of-life DECON decommissioning of a large BWR should be negligible. Because of Shoreham's limited operation and low level of radioactive contamination, the radiation exposure to people living in the vicinity during Shoreham decommissioning is expected to be well within this analysis for the reference BWR, and therefore likewise expected to be negligible. Nevertheless, a conservative analysis has been performed which provides an upper bound estimate of exposures to the public.

5.3.1 Exposure Pathways

As was done in the NRC GEIS[5] and its technology basis study,[6] doses to off-site individuals have been estimated due to the airborne release of radioactive materials during decommissioning activities. Doses due to the release of radionuclides in liquid effluents have not been estimated because the sources and potential liquid release paths will be extremely limited in comparison to those in existence during Shoreham's operation and post shutdown periods. These releases were extremely low. For example, total liquid releases reported for the second half of 1989 were a factor of 10^5 below Shoreham's operating license Technical Specification limits for the last half of 1989.[7] It is anticipated that prior to the start of decommissioning by LIPA, the plant liquid radwaste system will be decontaminated by LILCO. The liquid radwaste system will be isolated from decommissioning activities during decommissioning to prevent contamination. All potentially contaminated liquids generated will be collected, monitored and, if necessary, processed by mobile radwaste processing systems. All resulting effluents will be monitored and maintained within limits established for the post operation period.[8]

Dose calculation methods and exposure pathways utilized in the analysis of off-site exposures during decommissioning are similar to those in Shoreham's Off-site Dose Calculation Manual (ODCM).[9] Exposure pathways considered are:

- o Inhalation of radionuclides
- o Standing on contaminated ground
- o Ingestion of leafy fresh and stored vegetables
- o Drinking milk

Inhalation rates and other usage factors in the calculations are taken from the ODCM.[9] Doses due to the pathways are calculated for individuals at the nearest locations for each pathway identified in the ODCM.

5.3.2 Radionuclide Releases

The BWR decommissioning technology study[6] estimated the airborne radioactive releases during DECON decommissioning of an end-of-life reference BWR plant. This study estimated plant radioactive material inventories, contamination levels and dose rates throughout the reference BWR facility, and based on these, estimated releases which could occur during each step of the decommissioning process.

Similarly, airborne releases for the DECON decommissioning of Shoreham have been estimated. This information was developed in two parts: a) estimated airborne releases due to RPV segmentation activities in the Reactor Building;[10]

and b) estimated airborne releases due to all other Shoreham decommissioning activities.[11] The results of these airborne release estimates are provided in Table 5.3-1. The total amount of radioactive materials estimated to be released during Shoreham decommissioning is less than 5 percent of the total estimated releases for decommissioning of the reference BWR using the immediate dismantlement approach.

5.3.3 Estimated Exposures to Maximum Exposed Individuals

Estimated doses to maximum exposed individuals are given in Table 5.3-2. Doses are reported for the critical age group for the whole body and for each organ. Doses are calculated as 50-year committed dose equivalents in accord with approved models and assumptions for calculation of doses from routine power effluent releases.[12] The calculated maximum whole body dose is 1.82×10^{-5} millirem to a child. The calculated maximum organ dose is 2.03×10^{-4} millirem to the lung of a teenager. These 50-year doses are compared to the annual exposure limits in the 10 CFR 50 Appendix I design objectives.[13] As can be seen in Table 5.3-2, the calculated maximum whole body and organ doses are only very small fractions (less than 0.0004% and 0.002%, respectively) of the Appendix I annual exposure limits.

5.3.4 Population Doses From Decommissioning Activities

The collective whole body dose from planned decommissioning activities to the population living within 50 miles of Shoreham is conservatively estimated to be 5.34×10^{-2} person-rem.[10,11] This estimate is based on the 1990 summer population (and its distribution) and atmospheric dispersion factors reported in Shoreham's USAR.[14]

5.3.5 Population Dose From Waste Transportation

The radiation exposure to the public from the transportation of the Shoreham plant decommissioning waste to a low level radioactive waste disposal facility was also conservatively estimated. The estimate used NUREG/CR-0672 assumptions [6] such as the location of maximum exposed individual and population density. The population dose from transportation was conservatively estimated to be 0.7 person-rem.

5.4 RADIATION EXPOSURE IMPACTS OF POTENTIAL ACCIDENTS

Various potential accidents which might occur during decommissioning have been examined. These include on-site accidents and accidents during transport of radioactive wastes which could occur off the Shoreham site. The analysis of these postulated accidents used conservative approaches in determining the quantities

of radionuclides released, the transport of the released materials and in the calculation of doses. Further details of the analyses are contained in the Shoreham Decommissioning Plan.[1]

The accident analyses described in the Decommissioning Plan are listed below; other accident scenarios postulated would be enveloped by these events:

- o Waste Container Drop
- o Combustible Waste Fire
- o Contaminated Sweeping Compound Fire
- o Vacuum Filter-Bag Rupture
- o Oxyacetylene Explosion
- o Explosion of Liquid Propane Gas Leaked from a Front End Loader
- o Contamination Control Envelope Rupture
- o Fuel Damage Accident
- o Effects of Natural Catastrophes
- o Breach of Physical Security Measures

The on-site accident analyses results are provided in Table 5.4-1, and show that no significant exposures to members of the public would result from on-site accidents. The highest calculated doses were 1.08 millirem whole body and 93.9 millirem to the skin of the maximum exposed individual located at the site exclusion area boundary (EAB) during the worst-case postulated fuel damage accident. All other accidents analyzed yield exposures approximately 7300 times lower for whole body doses and 3400 times lower for organ doses.

The limiting calculated doses to individuals resulting from the decommissioning accidents are also compared in Table 5.4-1 to the doses published by the EPA for determining when to take protective actions in the event of an accident involving exposure of members of the public.[15] PAGs are given as ranges: 1 to 5 rem to the whole body and 5 to 25 rem to the thyroid of an individual. (Note: the critical organs for postulated Shoreham decommissioning accident doses are the lung and, in one case, the skin. Comparison is made to the EPA thyroid dose PAG because it is considered to be representative of organ dose guidance.) The highest doses calculated for postulated Shoreham decommissioning accidents are less than 0.11% and 1.9% of the EPA PAG lower whole body and organ limits, respectively.

Low level radioactive wastes from Shoreham decommissioning will be packaged in accordance with applicable NRC and DOT requirements, and shipped by truck to licensed low level radioactive waste disposal facilities. Evaluation of postulated accidents involving truck transportation of radioactive wastes packaged in accordance with these criteria can be found in Reference 6. These evaluations

would be representative of the range of postulated accidental impacts from shipment of Shoreham decommissioning waste materials.

The impacts of even the most severe radioactive waste transport accident, as evaluated in Reference 6, are a small fraction of the EPA PAGs.

Table 5.4-2 provides a comparison of off-site releases for postulated Shoreham decommissioning accident scenarios to the NRC's analysis of the reference BWR. In all comparable scenarios, the projected releases from postulated decommissioning accidents at Shoreham are below the reference BWR cases. The only postulated event where the reference BWR release estimates could be exceeded is again the highly conservative worst-case fuel damage accident, the consequences of which are still small fractions of the EPA PAGs as noted above. Based on the above, it is concluded that there are no significant radiological consequences to the general public nor to the workers from postulated credible accidents during the planned decommissioning operations at Shoreham.

The accident analyses demonstrate that no adverse public health and safety or environmental impacts are expected from accidents which might occur during Shoreham's decommissioning operations.

Furthermore, doses from postulated Shoreham decommissioning accidents are also considerably smaller than those associated with accidents postulated to occur during the licensed full power operation of Shoreham. On this basis, it is concluded that postulated decommissioning accidents at Shoreham would not involve any significant radiological consequences and no significant environmental impacts.

5.5 REFERENCES

1. Long Island Power Authority, "Shoreham Nuclear Power Station Decommissioning Plan," December 1990.

2. Stone and Webster Engineering Corp., "Shoreham Nuclear Power Station Reactor Pressure Vessel Disposition Alternatives," May 1990.

3. Long Island Lighting Company, "Shoreham Nuclear Power Station Site Characterization Program, Final Report," May 1990; Addendum 1, June 1990; Addendum 2, August 1990.

4. Code of Federal Regulations, Title 10 Part 20, "Standards for Protection Against Radiation."

5. U. S. Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, August 1988.

6. U. S. Nuclear Regulatory Commission, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672, June 1980.

7. Long Island Lighting Company, "Semiannual Radioactive Effluent Release Report, Shoreham Nuclear Power Station - Unit 1," Docket No. 50-322, February 27, 1990.

8. Revised Technical Specifications to Replace those of Attachment 2 to SNRC-1664," transmitted via LILCO letter SNRC-1752 from John D. Leonard, Jr. to U.S. Nuclear Regulatory Commission, August 30, 1990.

9. Long Island Lighting Company, "Offsite Dose Calculation Manual Shoreham Nuclear Power Station - Unit No. 1," Revision 16, July 1990.

10. Bechtel Calculation No. 900-139, "Normal Releases For Shoreham Decommissioning," December 20, 1990.

11. Long Island Lighting Company, Nuclear Engineering Dept. Calculation, CCI No. 036612, "Off-Site Dose Estimates During Dismantlement Decommissioning of Shoreham," September 1990.

12. U. S. Nuclear Regulatory Commission, Regulatory Guide 1.109, "Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance With 10 CFR Part 50, Appendix I," Revision 1, October 1977.

13. Code of Federal Regulations Title 10 Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low As Is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents."

14. Long Island Lighting Company, "Updated Safety Analysis Report - Shoreham Nuclear Power Station,",Docket No. 50-322 Revision 3, June 1990.

15. U. S. Environmental Protection Agency, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," EPA-520/-75-001, September 1975.

Table 5.3-1

Airborne Radionuclide Releases From Shoreham Decommissioning

Nuclide	Curies Released: RPV Segmentation	Curies Released: Other Activities	Curies Released: Total
Co-60	1.28 E-4	2.02 E-4	3.30 E-4
Mn-54	0.00 E-0	5.48 E-6	5.48 E-6
Fe-55	3.11 E-4	8.85 E-6	3.20 E-4
Ni-63	9.61 E-6	2.92 E-7	9.90 E-6
H-3	1.24 E-4	0.00 E-0	1.24 E-4
C-14	2.48 E-5	0.00 E-0	2.48 E-5
Ni-59	6.50 E-8	0.00 E-0	6.50 E-8
			8.14 E-4

Table 5.3-2

Maximum Off-Site Individual Doses Due to Decommissioning

Age Group	Organ	50-year Dose (mrem)	10CFR50 App. I Design Guide (mrem/yr)
Child	Total Body	1.82 E-5	5
Child	Bone	5.41 E-5	15
Child	Thyroid	6.32 E-7	15
Teen	Lung	2.03 E-4	15
Adult	GI-LLI	2.44 E-5	15

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Table 5.4-1

Accident Dose Comparisons

Accident Type (On-site Accidents Only)	Whole Body[1] EAB Dose To Maximum Individual (mrem)	Percent of EPA PAG Lower Dose Limit (1 rem)	Organ EAB Dose to Critical Organ of An Individual (mrem)	Percent of EPA PAG Lower Dose Limit (5 rem)
Waste Container Drop	6.48 E-5	6.48 E-6	3.36 E-3	6.72 E-5
Combustible Waste Fire	8.04 E-12	8.04 E-13	1.63 E-9	3.26 E-11
Contaminated Sweeping Compond Fire	5.10 E-11	5.10 E-12	1.03 E-8	2.06 E-10
Vacuum Filter-Bag Rupture	5.36 E-8	5.36 E-9	1.09 E-5	2.18 E-7
Oxyacetylene Explosion	5.70 E-9	5.70 E-10	1.16 E-6	2.32 E-8
LPG Explosion a) with waste container rupture	1.48 E-4	1.48 E-5	7.76 E-3	1.55 E-4
b) without waste container rupture	1.36 E-4	1.36 E-5	2.76 E-2	5.52 E-4
Contamination Control Envelope Rupture	1.79 E-5	1.79 E-6	1.25 E-3	2.50 E-5
Fuel Damage Accident	1.08 E-0	1.08 E-1	9.39 E+1	1.88 E-0

[1] Whole body dose as used here is the sum of whole body air submersion dose and whole body inhalation dose (actually, dose commitment).

Table 5.4-2

Accident Release Comparisons

Accident Type (On-site Accidents Only)	Calculated Off-site Release From Shoreham (Curies)[1]	Calculated Off-site Release From the Reference BWR (Curies)[2]
Waste Container Drop	3.00 E-4	Not Evaluated
Combustible Waste Fire	4.96 E-12	6.0 E-9
Contaminated Sweeping Compound Fire	3.15 E-11	1.1 E-6
Vacuum Filter-Bag Rupture	3.31 E-8	9.5 E-4
Oxyacetylene Explosion	3.52 E-9	1.2 E-4
LPG Explosion a) with waste container	6.84 E-4	Not Evaluated
b) without waste container rupture	8.40 E-5	8.6 E-3
Contamination Control Envelope Rupture	3.01 E-5	1.4 E-4
Fuel Damage Accident	1.50 E+3	Not Evaluated

Notes: 1) See applicable accident descriptions for assumed radionuclide compositions.

2) Radionuclide compositions for releases from the reference BWR are identified in Appendix E of Reference 6.

6.0 WASTE DISPOSAL

6.1 RADIOACTIVE WASTES

Radioactive waste expected to be generated during decommissioning of the Shoreham plant will consist of portions of the Reactor Pressure Vessel (RPV) and its internal components, the spent fuel racks and appurtenances, sumps and floor drains, piping and equipment associated with the various contaminated systems, and any process waste and Dry Active Waste (DAW) generated during the decontamination and dismantling process.

Table 6.1-1 presents the estimated maximum burial volumes of the waste by structure or system, with the total activity, average gross concentrations and 10 CFR 61[1] waste classification shown for each.

The estimated total burial volume of the waste is 79,300 cubic feet. This is an unprocessed volume; it is expected that significant volume reduction can be achieved by sending metallic waste to a licensed decontamination and volume reduction vendor. Furthermore, it is expected that some systems will be releasable for unrestricted use as a result of planned decontamination efforts described earlier. The waste contains approximately 602 Curies, almost all of which is due to activation of the RPV internals. All radioactive waste is expected to be Class A waste, the lowest hazard category as defined in 10 CFR 61.[1]

No unusual waste such as mixed waste or contaminated asbestos is expected to be produced during decommissioning. Radioactive wastes containing chelates may be produced during decontamination activities. Procedures will be implemented to ensure that burial site requirements for chelates are met.

Radioactive wastes generated during decommissioning will be processed as necessary using temporary systems supplied by experienced vendors. These temporary systems may include portable ventilation systems with High Efficiency Particulate Air (HEPA) filtration for airborne contamination, portable demineralizers for liquid waste processing and compactors for volume reduction of dry active waste.

It is LIPA's intent to ship contaminated and activated segments to a licensed processing facility for further decontamination, volume reduction and possible reuse as shielding material. All radioactive waste will be packaged and shipped in accordance with approved procedures and applicable regulations.

As a result of decommissioning activities, the following radioactive waste will be generated:

(1) The contaminated or activated portions of the RPV and its internals will be segmented and packaged in approved shipping containers. In order to minimize the volume of waste resulting from RPV segmentation, LIPA is planning to employ one or a combination of the following: (a) chemical decontamination, (b) ultra-high pressure water blasting; and (c) abrasive grit decontamination. Depending on the results of RPV decontamination, those portions of the RPV and internals which after being surveyed meet the surface contamination release criteria in Regualtory Guide 1.86 and the 5 uR/hr at 1 meter criteria for activated components, will be declared clean and released for unrestricted use. Thus, through an aggressive campaign of decontamination, radiological surveys, and material segregation, LIPA will attempt to release for unrestricted use the majority of the reactor vessel shell which is singularly the largest element of solid radwaste that is listed in Table 6.1-1.Those portions which do not meet the release criteria will either be: 1) packaged and shipped to an off-site vendor for further processing (i.e., volume reduction) or (2) packaged and shipped directly for disposal to a licensed burial facility.

(2) System piping and components, which do not meet release criteria after decontamination will be dismantled. The dismantled piping and components, including all contaminated three inch diameter and smaller piping, will be sent to a decontamination and volume reduction facility to reduce the overall waste volumes, or will be packaged and shipped to a licensed burial facility.

(3) Activated or contaminated concrete rubble and dust are not expected to be produced during the decommissioning of the Shoreham plant. Should any such waste be generated, it will be packaged as low specific activity (LSA) material in approved shipping containers and shipped to a licensed burial facility.

(4) Dry Active Waste (DAW) consisting of contaminated paper, plastic, coveralls, etc. will be packaged as LSA material in approved shipping containers. DAW will be compacted at the Shoreham plant or shipped non-compacted to an offsite vendor for volume reduction and packaging. When feasible, DAW will be used to fill void space in other radwaste shipping containers.

(5) Any contaminated liquid waste generated by decommissioning and dismantling of the Shoreham plant systems, components, and structures will be processed by a temporary processing system in accordance with an approved Process Control Program. Vendor supplied portable, temporary liquid radwaste equipment will be used to process this waste resulting from Shoreham's decommissioning. The waste resulting from the temporary processing system(s) will be dewatered in high integrity containers or solidified and shipped in approved containers to a licensed burial facility.

Although not specifically considered part of decommissioning, fuel disposal activities will be carefully integrated into the overall plan for decommissioning the Shoreham plant. As discussed earlier, the spent fuel which is the only high level radioactive waste on-site, was last irradiated on June 6, 1987 and is stored in the spent fuel storage pool. LIPA is considering three options for the of the Shoreham spent fuel: (1) reprocessing; and (2) transfer of the fuel to another licensed utility; and (3) on-site storage. Reprocessing entails the transfer of the fuel from the spent fuel storage pool to licensed casks which would then be shipped off-site to a licensed reprocessing facility. LIPA is considering two overseas vendors offering reprocessing services who have provided bids to LIPA. The latter option involves a similar scope of Shoreham plant activities, followed by cask shipment to another domestic licensee.

On-site storage is considered an option of last resort because it would not yield the desired result of removing all radioactive material from the Shoreham site.

The NRC has addressed the transport of spent fuel in its Generic Environmental Impact Statement [2] on handling and transport of spent fuel and concluded that spent fuel transport would not result in any significant adverse environmental impacts. If selected, the reprocessing option will potentially require dredging of the intake canal for barge loading of the spent fuel. This is discussed further in Section 4.0.

6.2 NON-RADIOACTIVE WASTE

LIPA does not anticipate that the decommissioning activities would generate any asbestos waste. If generated, any uncontaminated asbestos requiring disposal will be packaged in drums or double lined plastic such that it is non-dispersible, and shipped to an approved asbestos disposal facility. Asbestos disposal will be managed in compliance with Occupational Safety & Health Administration (OSHA), EPA, and NYSDEC regulations. In addition, all non-radioactive solid waste (ie.,

construction and demolition debris) and hazardous waste generated by Shoreham decommissioning activities will be managed and disposed of in accordance with EPA and NYSDEC regulations.

6.3 LOW LEVEL WASTE DISPOSAL OPTIONS

At the present time, Shoreham has access to the existing facilities (Barnwell, South Carolina; Beatty, Nevada; and Hanford, Washington). These sites may remain available for use until 1993. It is presently expected that the State of New York will not have a permanent LLRW disposal facility in operation by January 1993. Assuming that the permanent State facility is not available by January 1993, a number of storage and disposal alternatives have been and continue to be considered.

First, it bears noting that any delay in the availability of the permanent New York facility, and not a permanent unavailability of a State of New York disposal facility. While it is not certain when a permanent LLRW disposal facility will be operational in New York, there is every reason to believe that the State will in the future have such a permanent facility. In this regard, the State of New York has developed an Interim Management Plan for LLRW, which includes onsite temporary LLRW storage, as well as temporary offsite storage of such wastes at several sites within the State. The Governor has certified that the Interim Management Plan will be capable of handling all of New York's LLRW generated after December 1992.

Second, LIPA has explored and will continue to explore LLRW offsite disposal and storage options. LIPA will explore whether other States which develop LLRW disposal facilities are amenable to accepting some or all of Shoreham's LLRW. LIPA will also explore whether temporary offsite storage facilities are available, such as at another reactor site. Particularly, given the relatively small amount of Shoreham LLRW expected to require disposal, LIPA believes that there may be a number of offsite storage or disposal options available. Despite the current unlikelihood that the States of South Carolina, Nevada and Washington will accept New York LLRW after 1992, LIPA will continue to explore that possibility as well. Thus, it should not be assumed that Shoreham's wastes will have to remain onsite, if, as expected, New York's permanent LLRW disposal facility is not available in January 1993.

However, if it is decided that interim onsite storage of Shoreham's LLRW is the best alternative, space exists at Shoreham for this purpose. LLRW is currently stored at the Shoreham plant at several locations, including the Radwaste Building. It is also possible to store LLRW in a new building which could be built for this

purpose in accordance with the guidelines provided by the NRC in Appendix A to Standard Review Plan Section 11.4, "Design Guidance for Temporary Onsite Storage of Low-Level Radioactive Waste."

6.4 REFERENCES

1. Code of Federal Regulations Title 10 Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

2. U.S. Nuclear Regulatory Commission, Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel", NUREG - 0575, 1979.

Table 6.1-1

Estimated Radioactive Waste Data for Shoreham Decommissioning[1]

Component/ System	Burial Volume(ft^3)	Total Activity(Ci)[2]	Average Gross Concentration	10 CFR 61 Waste Class
RPV and Internals	16,500	601.17	1.28	A
Reactor Recirc	6,000	2.45E-4	1.44E-6	A
Control Rod Drive	500[2]	3.00E-4	2.12E-5	A
Residual Heat Removal	15,100	4.30E-4	1.01E-6	A
Core Spray	1,600	7.19E-4	1.59E-5	A
Reactor Water Cleanup	9,200	6.16E-4	2.36E-6	A
Fuel Pool Cleanup	2,500	7.86E-4	1.11E-5	A
Condensate Demineralizer	2,000	2.62E-5	4.69E-7	A
Process Sampling System	300	2.29E-5	2.69E-6	A
Spent Fuel Rack and Appurtenances	8,300	5.65E-4	2.40E-6	A
Process Waste & DAW	7,700	negligible	unknown, assumed negligible	A
Demineralizer Resins/Filters	3,200	negligible	unknown, assumed negligible	A
Liquid Radwaste	6,000	1.60E-4	9.14E-7	A
Mirror Insulation	400	negligible	negligible	A
TOTALS	79,300	601.17		

Note:

(1) As of March - April 1990, except for the RPV and Internals which are as of July 1990.

(2) Does not include control blades or control rod drives.

7.0 STATUS OF COMPLIANCE WITH PERMIT REQUIREMENTS

7.1 FEDERAL REQUIREMENTS

The planned decommissioning activities that may be subject to federal regulations, permits, licenses, notifications or approvals include:

- Initiation of decommissioning
- Handling, packaging and shipment of radioactive waste
- Worker radiation protection
- Handling and removal of asbestos
- Disposal of solid and hazardous wastes
- Dredging the intake canal (for possible irradiated fuel transportation)

The majority of these activities are governed by regulations issued by the NRC in Title 10 of the Code of Federal Regulations. Applicable Title 10 regulations are:

Part 50[1]	as it relates to continued possession of the plant
Part 20[2]	for protection against radiation
Parts 30[3] & 40[14]	for possession of radioactive materials (authority to possess these materials would be subsumed under the Part 50 license)
Part 51[5]	for environmental protection
Part 61[6]	for disposal of radioactive waste
Part 71[7]	(and 49 CFR Parts 171 through 174[8]) for packaging and transportation of radioactive waste
Parts 70[9] & 73[10]	for possession of special nuclear material and physical protection of the facility (if the fuel is in the facility during decommissioning)

LIPA's Decommissioning Plan is also subject to prior NRC review and approval. Following NRC approval, decommissioning will proceed under the conditions established by an order issued by the NRC.

OSHA regulates worker health and safety protection during decommissioning under 29 CFR Part 1910 and 1926 regulations pertaining to construction activities[11]. These regulations include requirements for respiratory protection (non-radiological), hearing protection, illumination, scaffold safety, crane and rigging safety, and fire protection. Asbestos handling and removal falls under regulations in 29 CFR Parts 1910 and 1926 and EPA regulations in 40 CFR Part 61, Subpart

M[12]. Should asbestos be involved in any decommissioning activity it will be handled in accordance with these regulations.

7.2 OTHER REQUIREMENTS

Permits, approvals and notifications from several state agencies and possibly local agencies may be required for safety and environmental protection purposes. Some of these relate to specific decommissioning activities and others are for existing Shoreham facilities and ongoing activities which are necessary to support decommissioning. Decommissioning activities and related site operations which may fall under state and local jurisdiction include:

- Solid and hazardous waste disposal
- Asbestos removal
- Asbestos disposal
- Industrial safety of personnel
- Fuel oil storage
- Chemical bulk storage
- Plant service water wells
- SPDES Permit
- Dredging

Shoreham's decommissioning activities will comply, as necessary, with applicable state and local environmental requirements.

7.0 REFERENCES

1. Code of Federal Regulations, Title 10 Part 50, "Domestic Licensing of Production and Utilization Facilities."

2. Code of Federal Regulations, Title 10 Part 20, "Standards for Protection Against Radiation."

3. Code of Federal Regulations, Title 10 Part 30, "Rules of General Appl. ability to Domestic Licensing of Byproduct Material."

4. Code of Federal Regulations, Title 10 Part 40, "Domestic Licensing of Source Material."

5. Code of Federal Regulations, Title 10 Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

6. Code of Federal Regulations, Title 10 Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

7. Code of Federal Regulations, Title 10 Part 71, "Packaging and Transportation of Radioactive Material."

8. Code of Federal Regulations, Title 49, "Transportation," Parts 171-174.

9. Code of Federal Regulations, Title 10 Part 70, "Domestic Licensing of Special Nuclear Material."

10. Code of Federal Regulations, Title 10 Part 73, "Physical Protection of Plants and Materials."

11. Code of Federal Regulations, Title 29 Parts 1910 and 1926, "Occupational Safety and Health Administration."

12. Code of Federal Regulations, Title 40 Part 61, Appendix C Subpart M, Environmental Protection Agency, "National Emission Standards for Hazardous Air Pollutants" (NESHAPS).