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NRC-20-0068

10 CFR 50.71(e)
10 CFR 50.4(b)(6)
10 CFR 50.54(a)
10 CFR 50.59(d)(2)

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Enrico Fermi Atomic Power Plant, Unit No. 1
NRC Docket No. 50-16
NRC License No. DPR-9

Subject: Submittal of Biennial Review of the Fermi 1 Safety Analysis Report

Pursuant to 10 CFR 50.71(e) and 10 CFR 50.4(b)(6), DTE Electric Company (DTE) hereby submits the biennial review of the Fermi 1 Safety Analysis Report (F1SAR) for the period of November 2018 through October 2020.

In accordance with 10 CFR 50.71(e), the information provided in this submittal describes the plant configuration through October 2020. A review of the F1SAR was completed and determined that no content changes were made in the previous 48 months. However, the F1SAR was administratively incremented to Revision 10 in April 2019 and is enclosed. No changes to the content of the F1SAR were made; only the revision number and revision date were updated throughout the document.

In the enclosed F1SAR, the header references the "Fermi 1 License, Technical Specifications, and Safety Analysis Report," and the page numbering in the footer begins at page 17. These are the result of the F1SAR being stored as Appendix D to the Fermi 1 Manual in the Fermi document control process.

There were two changes related to the Quality Assurance (QA) Program during the period which did not involve reductions in commitment. These changes impacted the Fermi 1 Manual but did not impact the F1SAR QA Program description. One change altered the Review Committee's Audit Subcommittee membership listed in the Fermi 1 Manual to include all Review Committee members rather than specifying two individuals. The other change clarified the Fermi 1 Manual description of individuals conducting audits to state "one other Audit Subcommittee Member" rather than the generic "one other team member." There were no other changes to the Fermi 1 QA Program during the period.

There were no activities during the period that required a 10 CFR 50.59 evaluation.

No new commitments are being made in this submittal.

Should you have any questions or require additional information, please contact Mr. John F. Lacasse, Fermi 1 Custodian, at (734) 586-1912.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 25, 2020

Robert Craven, Executive Director – Nuclear Production, for
Eric Olson, Site Vice President

Enclosure: Enrico Fermi Atomic Power Plant, Unit 1 Fermi 1 Safety Analysis Report

cc: NRC Project Manager
Regional Administrator, Region III

Enclosure to
NRC-20-0068

Fermi 1 NRC Docket No. 50-16
Operating License No. DPR-9

Enrico Fermi Atomic Power Plant, Unit 1
Fermi 1 Safety Analysis Report

FERMI 1 MANUAL

APPENDIX D

FERMI 1 SAFETY ANALYSIS REPORT

Fermi 1 Safety Analysis Report
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SECTION 1: SUMMARY

The Enrico Fermi Atomic Power Plant, Unit 1 (Fermi 1) was a fast breeder reactor power plant cooled by sodium and operated at essentially atmospheric pressure. The reactor plant was designed for a maximum capability of 430 Mwt; however, the maximum reactor power with the first core loading (Core A) was 200 Mwt. The primary system was filled with sodium in December of 1960 and criticality was achieved in August 1963.

The reactor was tested at low power in its first couple years of operation. Power ascension testing above 1 Mwt commenced in December 1965, immediately following receipt of the high power operating license. In October 1966, during a power ascension, zirconium plates at the bottom of the reactor vessel became loose and blocked sodium coolant flow to some fuel subassemblies. Two subassemblies started to melt. Radiation monitors alarmed and the operators manually shut down the reactor. No abnormal releases to the environment occurred. Three years and nine months later, the cause had been determined, cleanup completed, fuel replaced, and Fermi 1 was restarted.

In 1972, the core was approaching the burnup limit. In November, 1972, the Power Reactor Development Company (PRDC) made the decision to decommission Fermi 1. The fuel and blanket subassemblies were shipped offsite in 1973. The non-radioactive secondary sodium system was drained and the sodium sent to Fike Chemical Company. The radioactive primary sodium was stored in storage tanks and in 55 gallon drums until the sodium was shipped offsite in 1984. Decommissioning of the Fermi 1 plant was originally completed in December of 1975. Based on current regulatory requirements, Fermi 1 is identified as being in a SAFSTOR status. The SAFSTOR license for Fermi 1 expires in 2025. In November 2000 the announcement was made that the last phase of SAFSTOR, deferred decontamination, would be initiated. In August 2011, the Nuclear Regulatory Commission (NRC) was notified that the facility would be returned to a passive SAFSTOR status after specific activities were completed.

The environmental assessment of potential radiological releases during SAFSTOR was performed for three main different postulated accidents: (1) the liquid waste tanks rupture causing an airborne release, (2) a liquid radwaste release into Lake Erie, and (3) a residual sodium airborne release to the environment. The results of the postulated radiological accidents were well below the MPC values in 10 CFR 20, Appendix B, Table II. Even the conservative evaluations performed for the postulated radiological accidents resulted in doses below the 100 mrem limit to members of the public per year per 10 CFR 20.1301. Based on the low potential radiological exposures, there is no need to take any further actions to protect the health and safety of the public during the SAFSTOR of Fermi 1.

Note that as decommissioning has progressed, the source term for some of the postulated accidents has decreased. For example, the liquid waste tanks, the primary system, and the reactor have been removed. The liquid has been evaporated and the remaining activity was contained in residual solids until it was shipped offsite. However, the postulated accidents are the design basis accidents and current and future evolutions have and are being compared to determine if the design basis accidents bound the planned activity. Therefore, the postulated accidents are not being revised, even though the specific accident described may no longer be possible.

SECTION 2: INTRODUCTION

This Fermi 1 Safety Analysis Report (F1SAR) is the licensing basis document for Fermi 1 in the permanently shutdown condition. Revision 0 was prepared in 1997 based on information in References 1 through 17 (see Section 9) and the results of an evaluation performed in 1997 on the status of Fermi 1. The references include information submitted to the NRC to support the issuance of the SAFSTOR license in 1989 that extended the Fermi 1 license to 2025. The accident analyses performed for the environmental assessment to support the SAFSTOR license were transferred to this document without update. In the interim period, additional radioactive decay has occurred, so the analyses are conservative. Additional accident analysis information has been added based on more recent assessments.

This Fermi 1 Safety Analysis Report meets the requirement of 10 CFR 50.71 (e)(4) as modified by the 1996 Decommissioning Rule. Included in this document are the Fermi 1 Quality Assurance Program and Fire Protection Program, which have been prepared commensurate with the remaining radiological risk posed by Fermi 1.

This document describes the current status of the facility, as well as providing some decommissioning history. It does not include the design basis of the systems when the reactor was operating. Some sketches and general building layout drawings are included. Detailed system drawings are not included because drawings were not maintained up-to-date during or following plant operation. The emphasis of the Fermi 1 Safety Analysis Report is on matters important to the SAFSTOR status of the facility.

SECTION 3: DESCRIPTION OF FERMI 1

3.1 DESCRIPTION OF THE PLANT

3.1.1 Plant Location

Fermi 1 is located on the same site as Fermi 2, within the same owner controlled area and outside the Fermi 2 protected area. The site is on the western shore of Lake Erie, Frenchtown Township, Monroe County, Michigan (Figure 3.1 and Figure 3.2). The plant is approximately 6 miles east-northeast of Monroe, Michigan; 30 miles southwest of downtown Detroit, Michigan; and 25 miles northeast of downtown Toledo, Ohio.

3.1.2 General Description of Plant

Fermi 1 was a 200 Mwt, sodium-cooled, fast breeder reactor that operated at essentially atmospheric pressure. The reactor plant was designed for 430 Mwt, however the maximum power with the first core design was 200 Mwt. The general layout of the plant at the time of operation is shown in Figure 3.3. Fermi 1 was last operated at low power in September 1972. Power Reactor Development Company (PRDC) decided to decommission the facility in November 1972. The effort was completed in December 1975 with the dismantling and shipping offsite of the radioactive fuel, mechanical components, and blanket subassemblies. Control of contaminated areas was established and a boundary (Figure 3.4) was put in place, with surveillances beginning in accordance with Technical Specifications. In 1989, an amendment to the Fermi 1 license reclassified the plant as being in SAFSTOR status based on regulations in effect at the time. In November 2000, the decision to conduct the last phase of SAFSTOR, deferred decontamination, was announced. In August 2011, the Nuclear Regulatory Commission (NRC) was notified that the facility would be returned to a passive SAFSTOR after specific activities were completed.

Figures 3.5 through 3.10 are sketches showing the reactor and some of the systems/components at the time of plant operation.

3.1.3 General Description of Buildings in the Fermi 1 Controlled Area

Refer to Figure 3.4 for relative locations of buildings.

3.1.3.1 Reactor Building

The Reactor Building is a cylindrical vertical steel vessel, 72 feet in diameter and 120 feet high with the lower 51 feet below finished grade elevation. The inside of the Reactor Building is divided into two regions by a 5-foot thick steel and concrete operating floor. The above floor region is normally accessible to personnel and houses the containment crane. The below floor region housed the reactor vessel and internals, the primary shield tank, the secondary shield, the intermediate heat exchangers, primary sodium pumps, the decay tanks, the primary sodium overflow tank and associated equipment and piping for the primary and secondary sodium coolant systems. Figure 3.8 shows the layout of the below floor region during plant operation. The Reactor Building is surrounded by an approximately 3 foot wide annulus that is located below floor level to a depth of about 3 feet below the concrete pedestal on which the steel Reactor Building stands. The annulus contains an access hole to the northwest sodium gallery, and four floor drains that drain into a collection tank and sump pump system in the basement of the Steam Generator Building.

3.1.3.2 Fuel and Repair Building (FARB)

The FARB, located approximately 100 feet north of the Reactor Building, is connected to the Reactor Building by a covered transport car track (trestle). The substructure of the FARB consists of heavy reinforced concrete walls and rests on bedrock. The superstructure consists of two different types of construction. The walls above the operating floor in the new fuel receiving and storage area and the irradiated fuel decay and cut-up pool areas are reinforced concrete. All other superstructure walls consist of structural steel with corrugated asbestos siding. The building contains a 75-ton overhead crane.

The FARB contained process cells, water-filled decay and cut-up pools, a new fuel handling and storage area, a central control room for fuel handling and waste system operations, and a transport car access area for the performance of fuel handling functions. Figure 3.9 shows the building layout during plant operation. Space was provided for a repair and cleaning facility for maintenance of contaminated equipment.

3.1.3.3 Health Physics Building

The Health Physics Building was dismantled and removed in 1980. The radioactive drain line to the FARB was previously plugged. Only the concrete base mat and the plugged, buried drain system remain.

3.1.3.4 Sodium Building

An underground concrete tunnel connects the Sodium Building and the Reactor Building annulus. The Sodium Building housed the equipment used for storing and purifying the primary sodium. The Sodium Building, Waste Gas Building, and Inert Gas Building formed one structural complex. Figure 3.10 shows the layout of the complex during operation. The building is divided into four sections. The storage tank room has 30-inch thick cast concrete walls, a 30-inch thick combination of pre-cast and poured concrete roof to provide shielding. The storage tank room contains the remaining portions of the three 15,000-gallon primary sodium storage tanks. The cold trap room contained a cold trap cell and the equipment required to determine and maintain the purity of the primary sodium. The sodium-potassium (NaK) room contained the ventilation equipment and the air-to-NaK heat exchanger equipment for cooling the cold trap. The valve control room contained the sodium service hand wheels and motors for the valves, electric panels for the induction heating for the piping, and the control panel.

3.1.3.5 Waste Gas Building

The Waste Gas Building housed the waste gas disposal system that removed waste gases from the plant by a process which included storage until the gases decayed to a suitable level, dilution below the maximum permissible concentration in air, and dispersion into the atmosphere through a stack. Piping, valves, and mechanical equipment were housed in chambers below grade; the holdup tanks were housed above grade in shielded cells of the building. Piping transported the waste gas to the FARB where it exited to the atmosphere via a waste gas stack. The holdup tank chambers are inside the Fermi 1 Controlled Area, while the below grade chamber and the grade level valve operating room are outside the Fermi 1 Controlled Area boundary. A person cannot enter the portion of the building inside the Fermi 1 Controlled Area from the portion outside the Fermi 1 Controlled Area.

3.1.3.6 Inert Gas Building

The Inert Gas Building housed the compressors, vapor trap, hold-up and vacuum tanks, valves, piping and other associated equipment for the purification and distribution of the argon cover gas system to the primary, secondary, and FARB cover gas systems.

3.1.3.7 Sodium Tunnel

A steel-lined tunnel runs from the northwest corner of the Reactor Building annulus to the cold trap room of the Sodium Building. Portions of the steel liner were removed during decontamination activities. This tunnel contained some of the primary sodium service system piping. Access to this tunnel is via one of two manholes between the cold trap room and trestleway or the cold trap room.

3.1.3.8 Ventilation Building

The Ventilation Building housed equipment for the Reactor Building ventilation system. The fence has been modified to be continuous past the east doors of the building.

3.1.3.9 Fission Product Detector (FPD) Building

This is a small building partly below ground level, to the east of the Reactor Building. The building contained the gaseous fission product detector and piping. The gaseous FPD monitored the fission product concentration to detect the failure of a fuel element. The FPD received primary argon cover gas samples from the reactor vessel and the No. 1 and No. 3 primary pump tanks. Access is through a manhole in the roof of the building.

3.1.3.10 East and West Sodium Gallery

The east and west sodium galleries consist of chambers, which held the secondary sodium lines. The east gallery supplied the No. 1 and 2 steam generators and the west gallery supplied the No. 3 steam generator. Access to the three east sodium gallery chambers and to the south compartment of the west sodium gallery chamber is via horizontal steel doors just above ground level. Access to the north compartment is via a tunnel from the Reactor Building annulus or a horizontal door.

3.1.4 General Description of Buildings Outside of Fermi 1 Controlled Area

The buildings outside of the Fermi 1 Controlled Area include the Steam Generator Building, the Turbine Building, the Control Building and the Office Building.

The Office Building is located at the front of the plant and directly connected to the Control Building, which connects to the Steam Generator Building and the Turbine Building. Other buildings associated with Fermi 1 are the Water Tower, the Potable Water Building, the General Service Water Building, and the Boilerhouse. The Boilerhouse was dismantled in 1999. Only the base mat and footings remain. As mentioned in Section 3.1.3.5, sections of the Waste Gas Building are also outside the Fermi 1 Controlled Area.

3.2 CURRENT PLANT STATUS

3.2.1 Primary System

With the exception of the reactor rotating shield plug and the primary sodium overflow tank the reactor and primary sodium system components in reactor building have been removed and shipped for disposal.

3.2.2 Primary Sodium Storage Tanks

The tanks were removed down to the lower section (belly) of the tanks and this portion remains.

3.2.3 Liquid Waste Disposal System

All potentially contaminated drains and sumps collect in the hot sump in the Fuel and Repair Building. The liquid waste systems housed in the FARB Pump Room, Waste Tank Room, and Dump Tank Room have been removed as part of the plant decommissioning. Currently, there are no operational capabilities for discharge. Discharges can be performed if monitored in accordance with the Technical Specifications. The capability to discharge liquid radioactive waste would have to be established and procedure prepared if discharges are required.

3.2.4 Electrical Supply

Power is supplied to Fermi 1 through the 120KV switchyard located south of Fermi 1. Three offsite power lines supply the switchyard. The switchyard provides power through the switchgear room in the Fermi 1 Turbine Building to the motor control center supplying, in part, loads in the Fermi 1 Controlled Area. The motor control center is located on the first floor of the Fermi 1 Control Building. A control battery located on the second floor of the Control Building provides DC power to Fermi 1.

3.2.5 Sodium

Sodium and NaK residues left following the bulk removal prior to 1984 were processed using a dry steam/wet steam and/or water method of removal. This moisture and sodium chemical reaction byproducts were sodium hydroxide, hydrogen and heat. The heat and hydrogen production was controlled by the reaction rate with the hydrogen being vented to the atmosphere. The sodium hydroxide was then neutralized by adding an acid thus creating a radioactive contaminated salt solution. This salt solution was shipped offsite or evaporated by heating and the resulting salt and sludge (with absorbent material added) were shipped off site as radioactive waste for disposal.

3.2.6 Auxiliary Fuel Storage Facility

The auxiliary fuel storage facility was sealed after CO_2 was added to passivate any residual sodium that may have dripped from the fuel storage pots. CO_2 is no longer being maintained on the auxiliary fuel storage facility since it has been opened and inspected and no residual sodium was found.

3.3 ACCESS CONTROL

3.3.1 Fermi 1 Controlled Area

The Fermi 1 Controlled Area, as shown in Figure 3.4, is enclosed by physical barriers to which access is controlled. The physical barriers shall be fences, natural obstacles, or manmade structures providing a resistance to penetration.

As a minimum, all points that are an integral part of the Fermi 1 Controlled Area boundary accessible by a gate or door shall be posted with a sign requiring authorized entry only. These access points may be locked for control but this is not a requirement.

Temporary modifications may be made to the Fermi 1 Controlled Area boundary shown in Figure 3.4 provided the boundary continues to meet the requirements of a physical barrier as described in this F1SAR and any access points meet the requirements of the F1SAR. Temporary modifications shall be removed when they are no longer needed or made permanent.

If work needs to be performed on the Fermi 1 Controlled Area fence or building walls making up part of the perimeter, such that the requirements for the boundary will not be met, personnel at the boundary shall control access. A method shall be devised to secure the affected area to prevent unauthorized access during periods when there are no personnel at the boundary controlling access.

3.3.2 Access Control

All points of access to the Fermi 1 Controlled Area shall be controlled. Personnel authorized in writing by the Custodian or Custodial Delegate and Fermi 2 Radiation Protection personnel assigned to the Fermi 2 Control Point shall have the authority to permit access by authorized personnel only. Authorized personnel, maintained as a composite list of names, who have unescorted access to the Fermi 1 Controlled Area shall be approved in writing by the Custodian or Custodial Delegate. Any individual escorted by such an authorized person is also authorized.

Written administrative procedures shall delineate the requirements associated with entry to and exit from the Fermi 1 Controlled Area and specific areas within the Fermi 1 Controlled Area to prevent unauthorized entries and to protect the safety and health of authorized personnel.

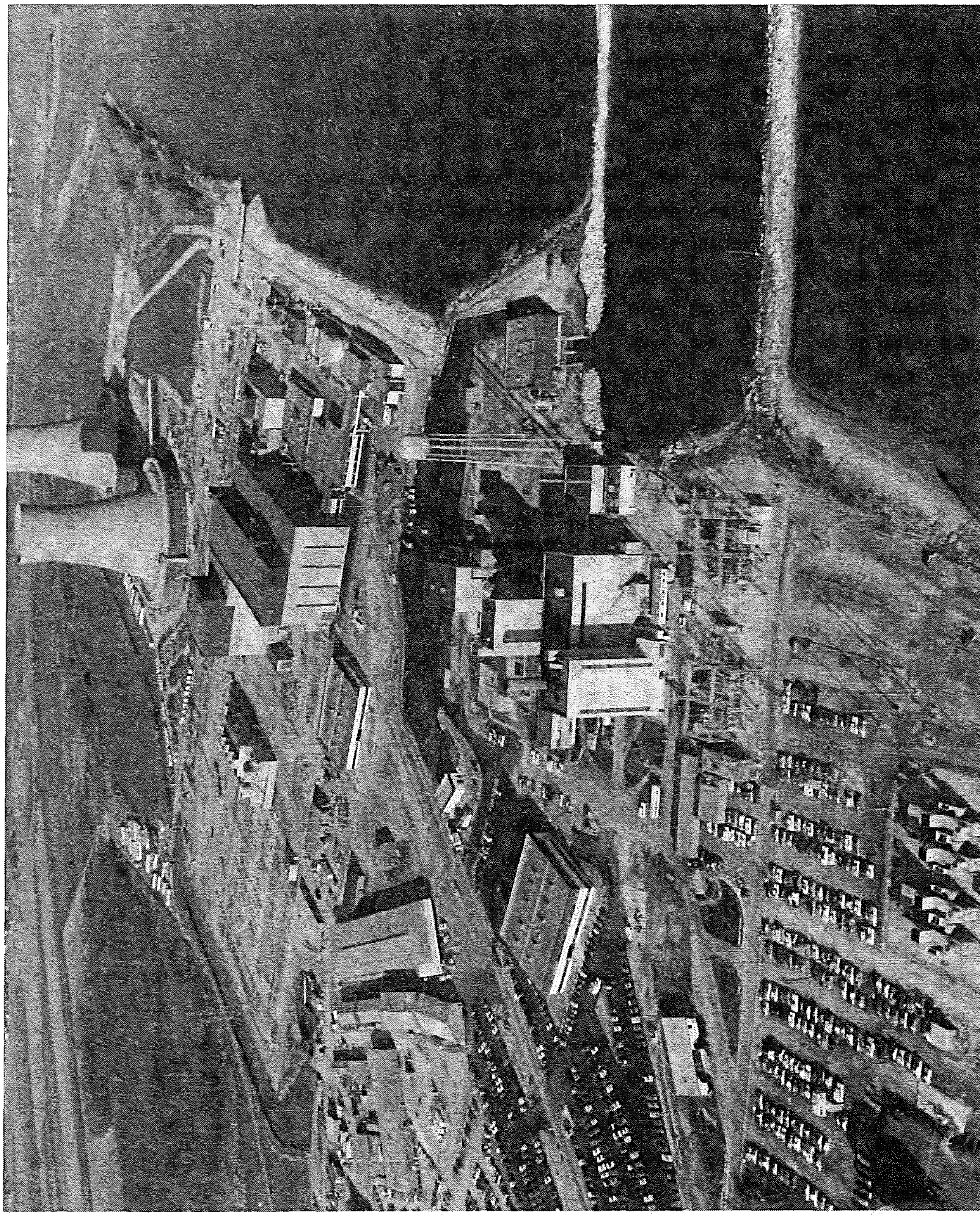


Figure 3.1 Aerial View of Enrico Fermi Units 1 and 2

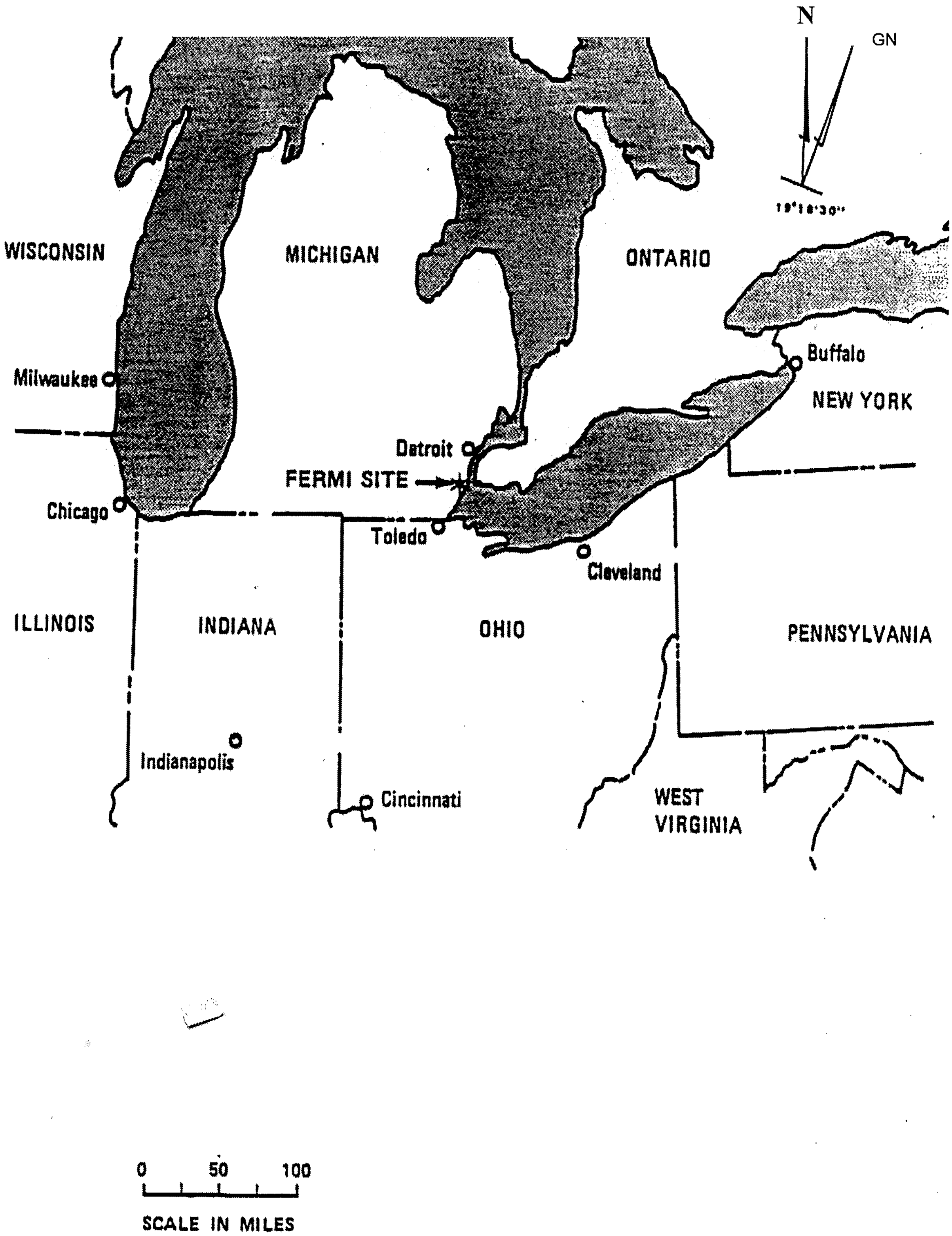
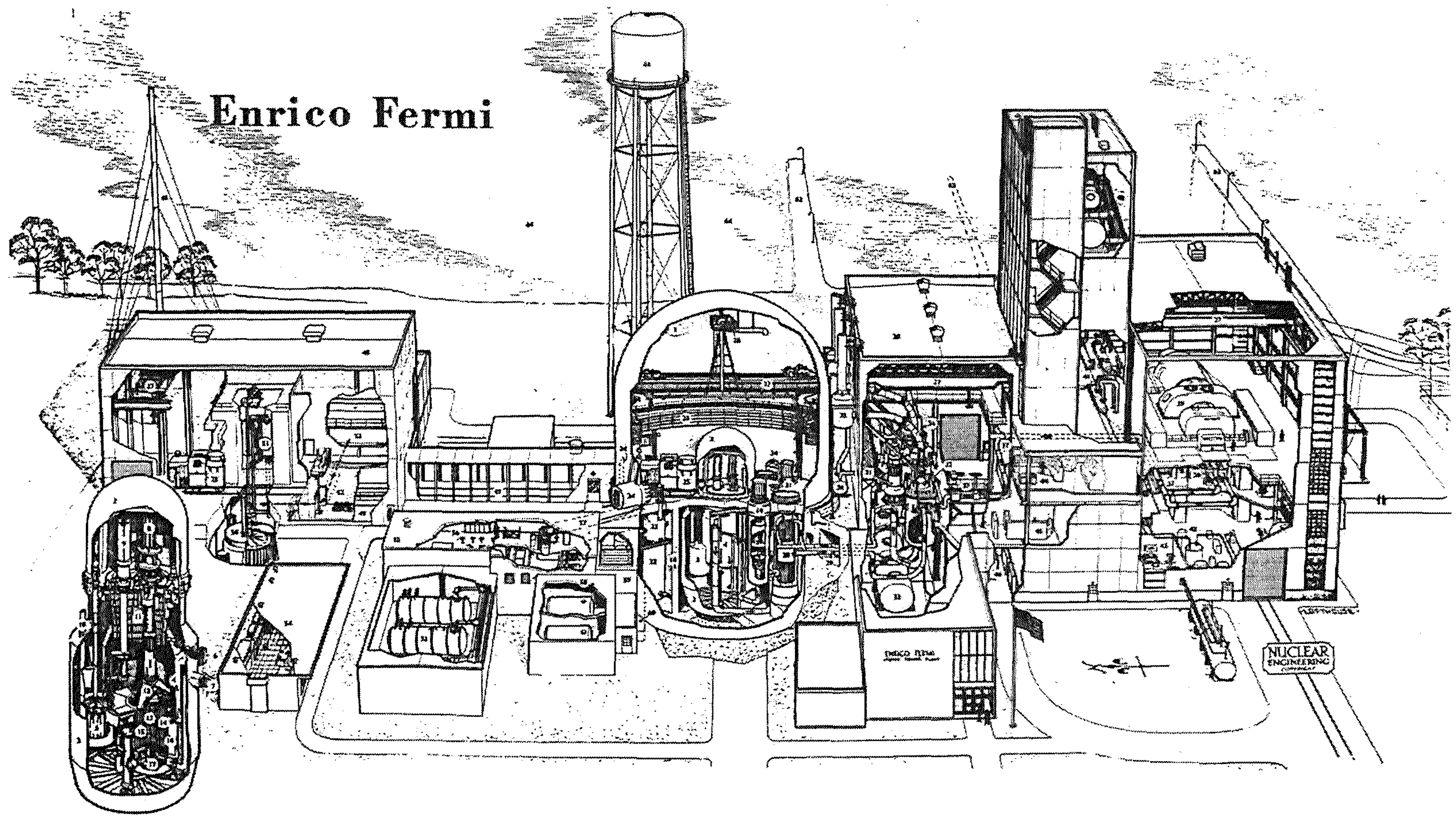


Figure 3.2 Site Location



1. GASTIGHT BUILDING
2. MACHINERY DOME
3. PRIMARY SHIELD TANK
4. REACTOR VESSEL
5. TRANSFER ROTOR
6. COOLANT OUTLET
7. COOLANT INLET
8. CONTROL ROD MECHANISM
9. OFFSET HANDLING MECHANISM
10. TRANSFER TUBE
11. ROTATING SHIELD PLUG
12. HOLD-DOWN ASSEMBLY
13. CORE
14. RADIAL BLANKET
15. AXIAL BLANKET
16. THERMAL SHIELD
17. MELT-DOWN PAN
18. SECONDARY SHIELD WALL
19. PRIMARY SODIUM
20. INTERMEDIATE HEAT EXCHANGERS
21. THROTTLE VALVES
22. PRIMARY SODIUM OVERFLOW TANK
23. OVERFLOW PUMPS
24. AIRLOCKS
25. CASK CAR (IN TWO POSITIONS)
26. CABLE GALLERIES
27. OVERHEAD CRANES
28. ATMOSPHERE CONDITIONING
29. SECONDARY SODIUM PIPING
30. STEAM GENERATING BUILDING
31. SECONDARY SODIUM PUMPS
32. STEAM GENERATORS
33. SODIUM STORAGE TANKS
34. SODIUM-WATER REACTION VENTS
35. SODIUM SEPARATOR UNITS
36. FEEDWATER DUMP TANK
37. MAIN STEAM LINE
38. MAIN STEAM STOP VALVES
39. TURBO-GENERATOR
40. STORAGE AND DE-AERATORS
41. L. P. HEATERS
42. WATER TREATMENT
43. WORKSHOP
44. MAIN CONTROL ROOM
45. REACTOR SIMULATOR
46. SWITCH ROOM
47. COVERED CAR TRACK
48. FUEL HANDLING BUILDING
49. REPAIR PIT
50. TRANSFER TANK ROTOR
51. CLEANING CHAMBER AND EQUIPMENT
52. CUT-UP POOL
53. DECAY POOL
54. HEALTH PHYSICS LABORATORY
55. SODIUM SERVICE BUILDING
56. SODIUM CONTROL ROOM
57. SODIUM TUNNEL
58. WASTE GAS BUILDING AND DECAY TANKS
59. INERT GAS BUILDING
60. INERT GAS TUNNEL
61. POTABLE WATER STORAGE TANK
62. PIERS
63. WATER INTAKE CHANNEL
64. LAKE ERIE
65. STACK

Figure 3.3 Cutaway View of Reactor Plant Layout

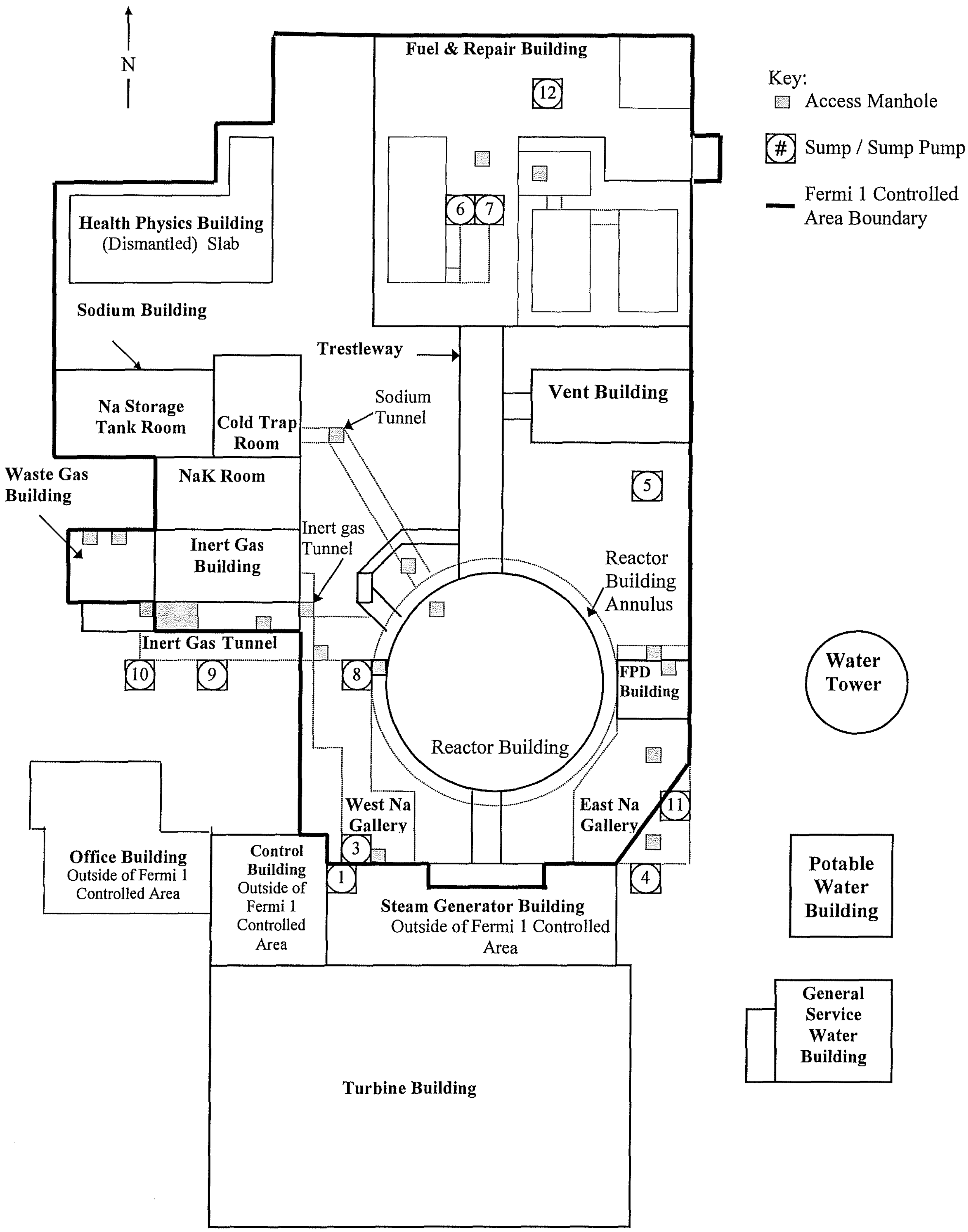


Figure 3.4 Fermi 1 Controlled Area

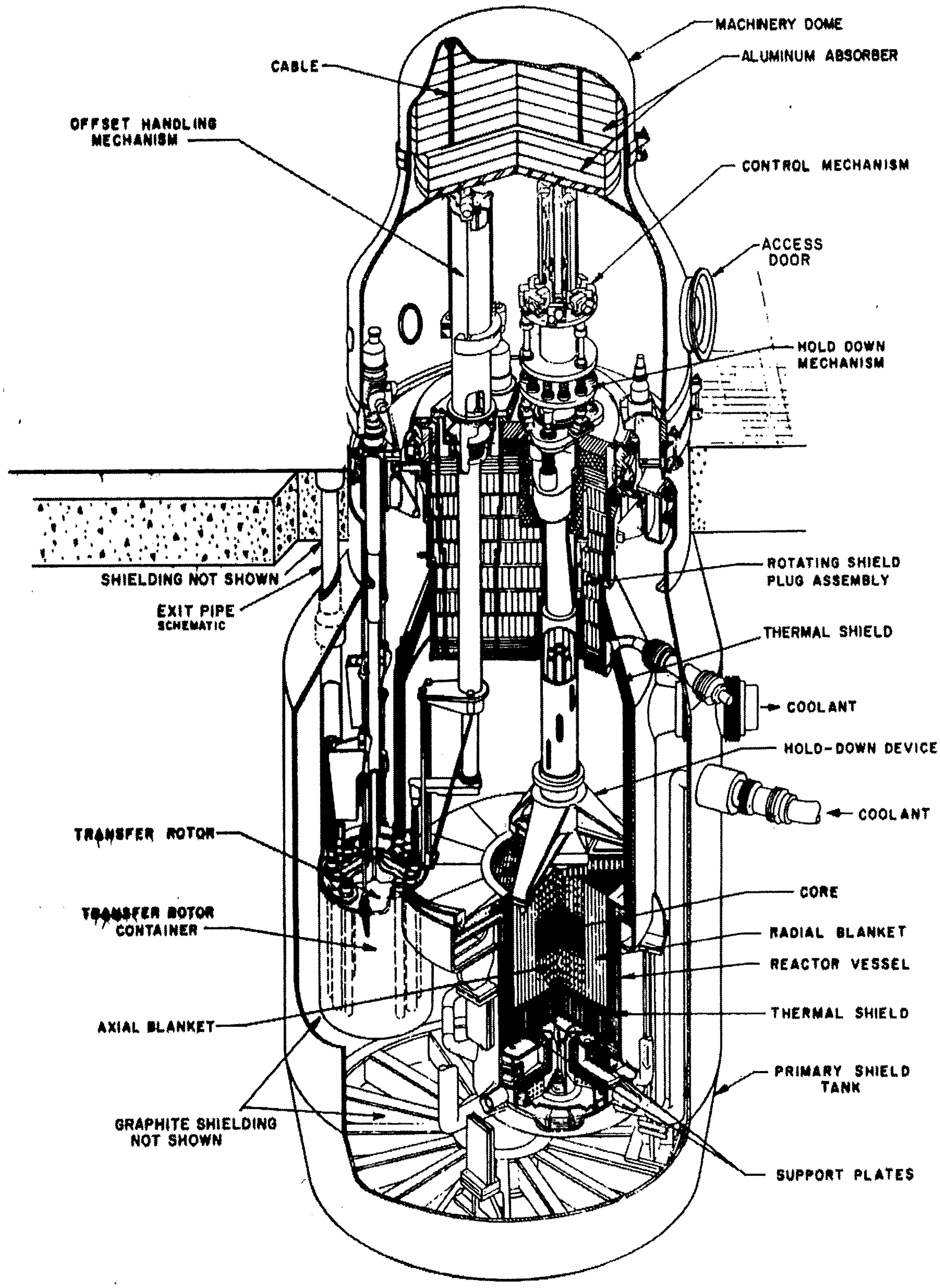


Figure 3.5 Perspective View of Reactor

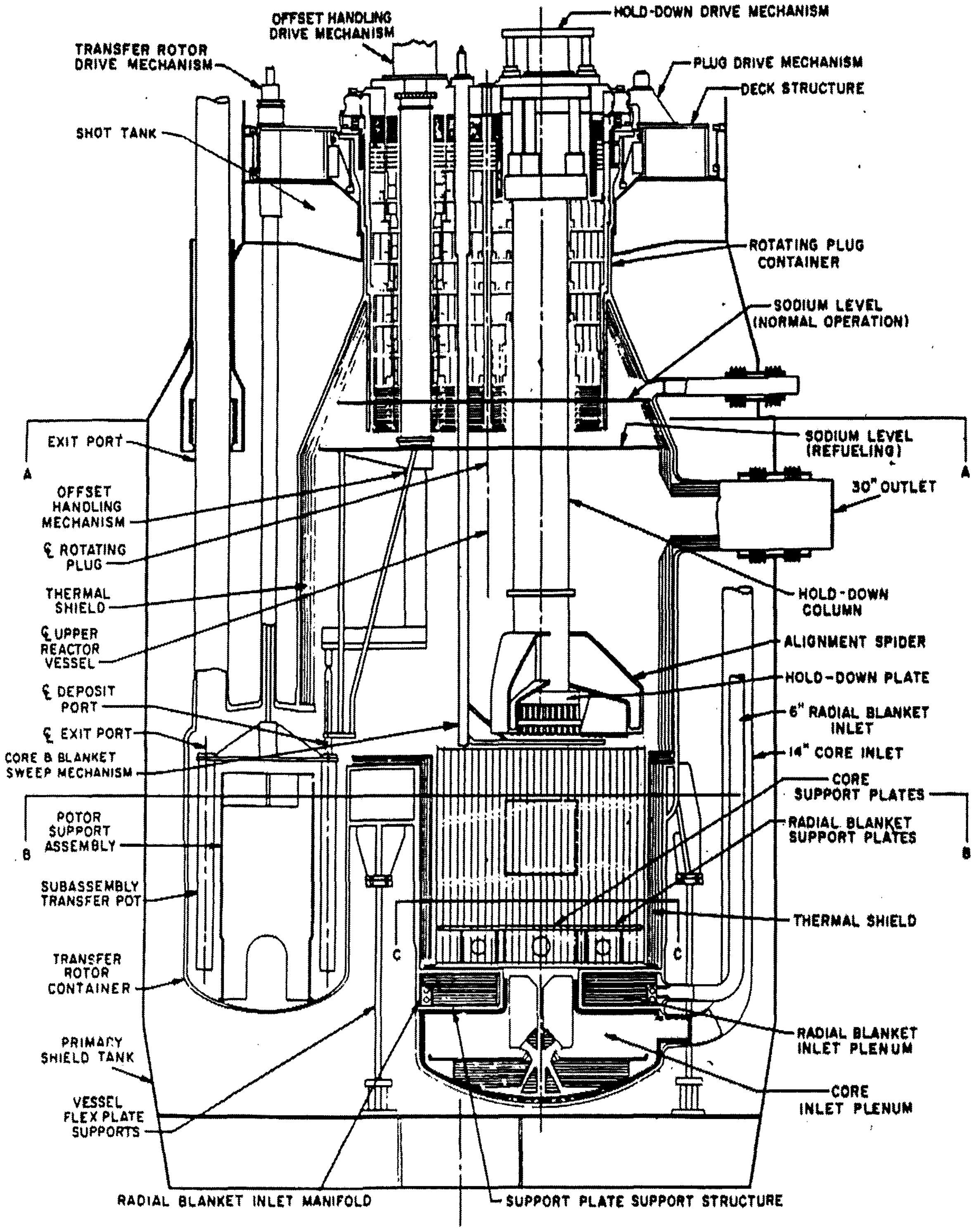


Figure 3.6 Reactor Vessel (Elevation)

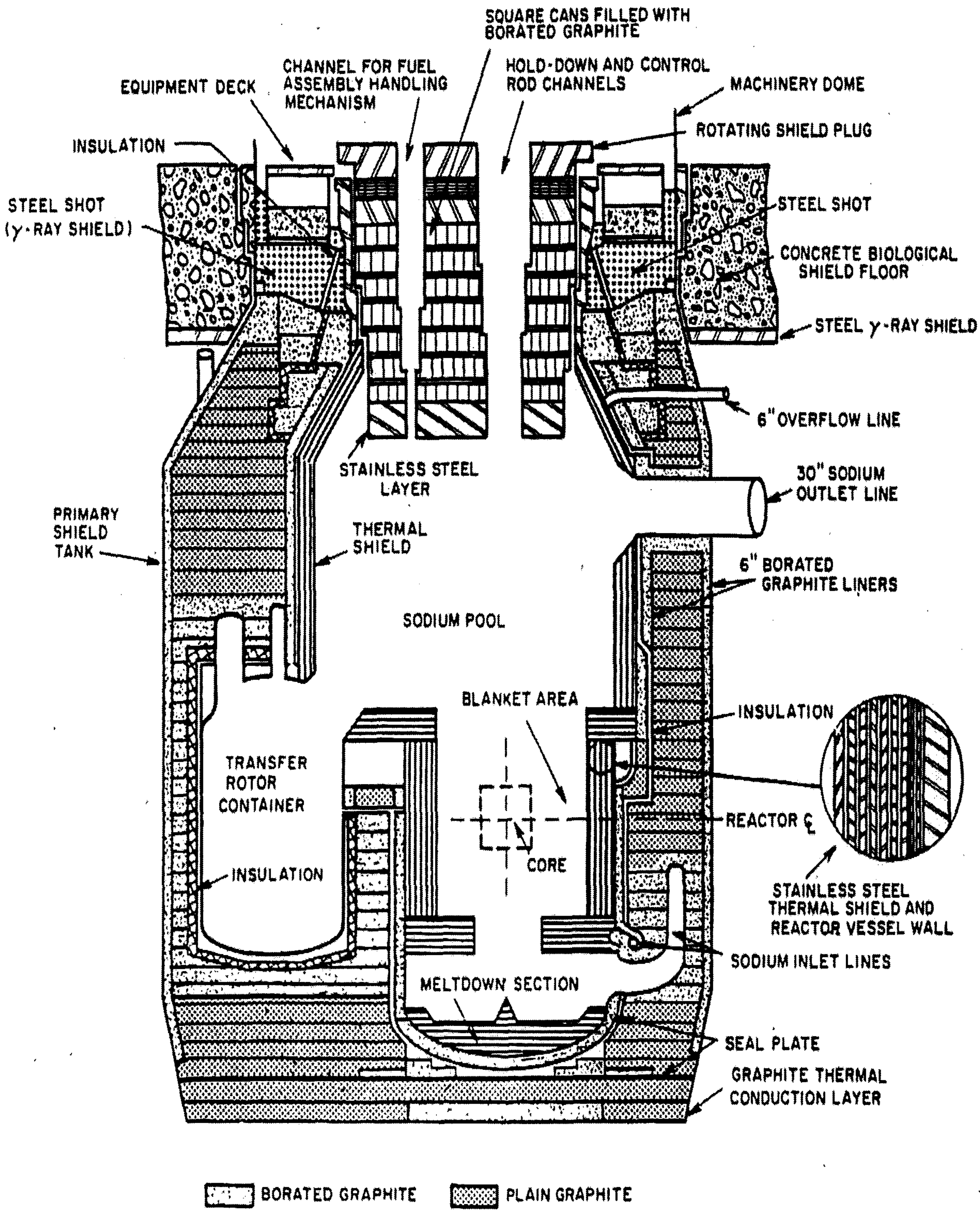


Figure 3.7 Primary Shield System

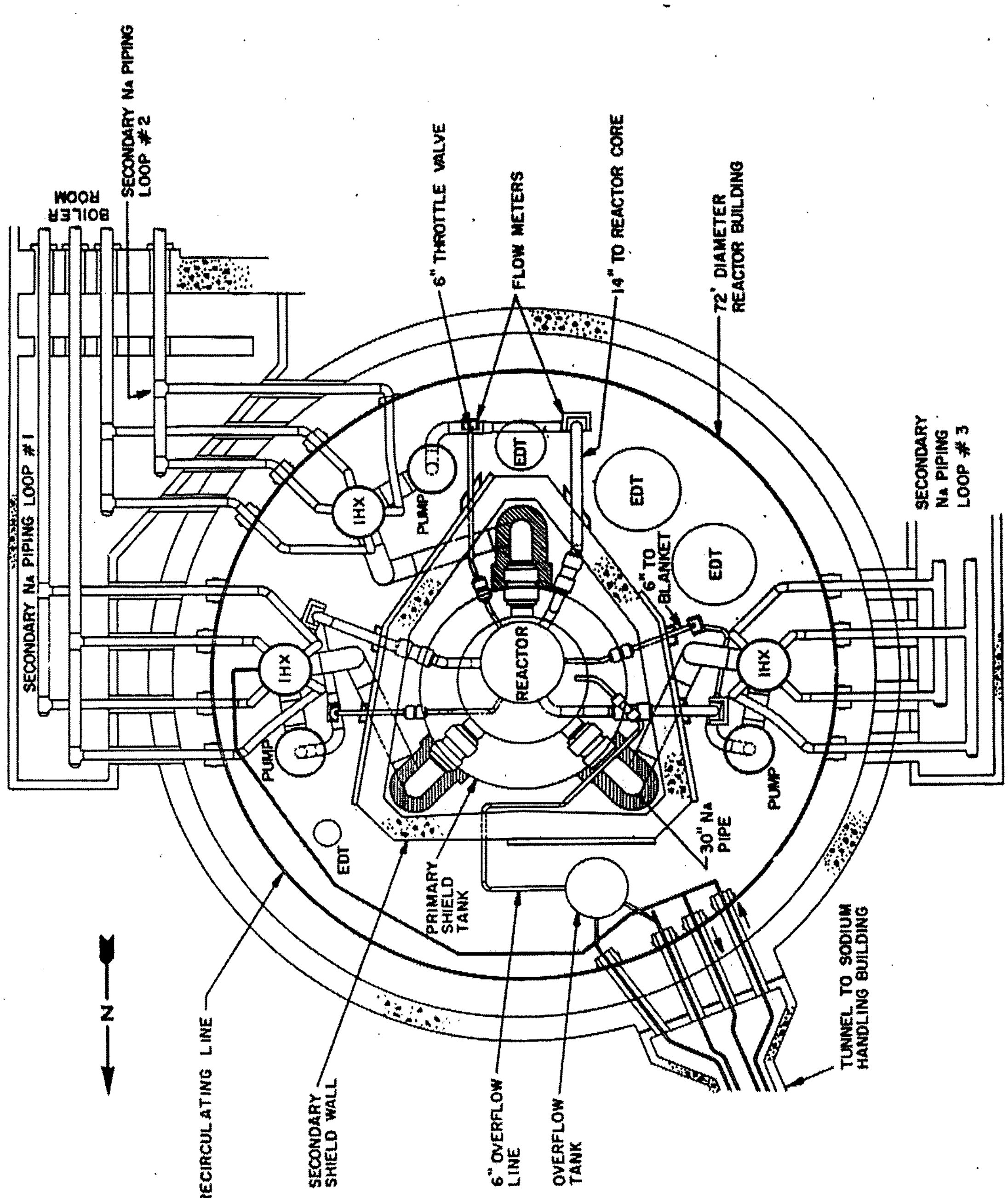


Figure 3.8 Plan View of Reactor Plant Below Operating Floor

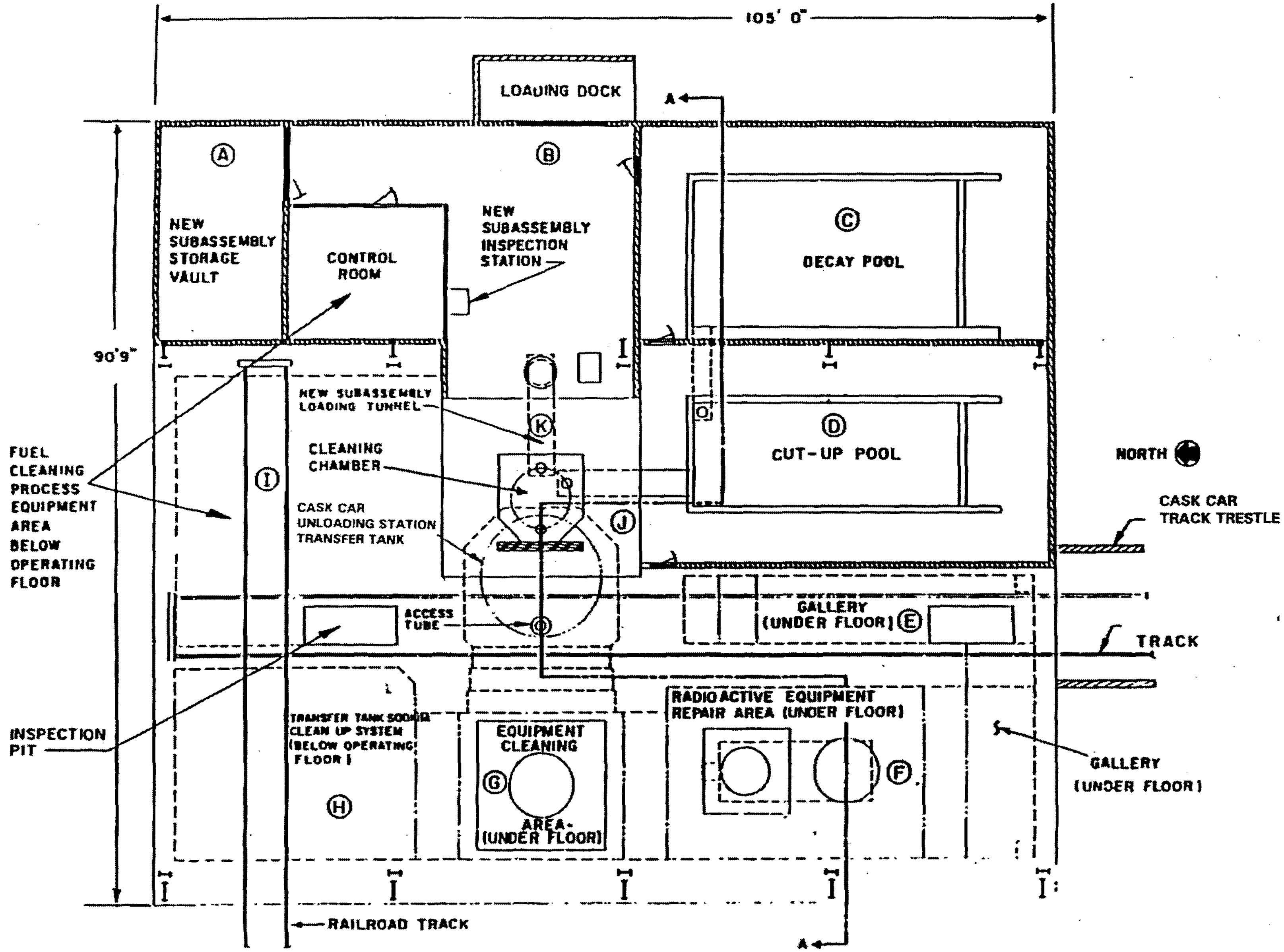
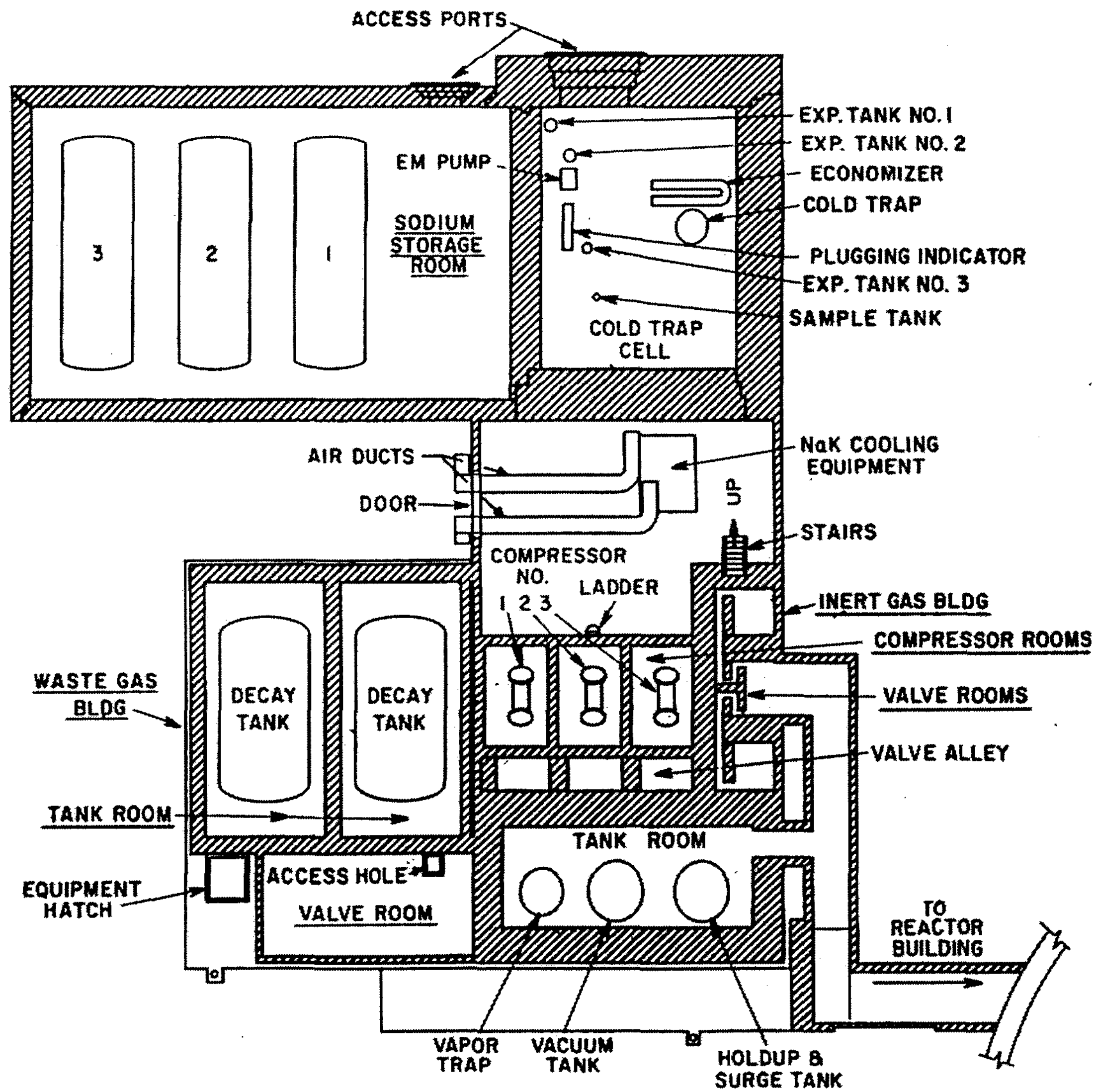


Figure 3.9 Fuel and Repair Building (Plan)



PLAN ABOVE ELEV. 583'

Figure 3.10 Sodium Service, Inert Gas, and Waste Gas Buildings

SECTION 4: RADIOLOGICAL CONDITIONS

4.1 TOTAL RADIONUCLIDE INVENTORY

4.1.1 Radionuclide Inventory

The inventory of radionuclides in the waste water was based on measurements of samples from the wastewater sump, tank dose rates and activity measurements for the final total discharge after the 1973 to 1975 decommissioning work. The 1986 total activity for ^{60}Co and ^{137}Cs was estimated at 6.0E+3 μCi each. This activity would decrease to 3.1E+1μCi for ^{60}Co and 2.4E+3 μCi for ^{137}Cs in forty years.

A review of liquid waste system water samples and smear analyses performed from 1989 through 1998 identified additional radionuclides in the liquid waste system. The combination of radionuclides varied in the different analyses, as did the ratio of radionuclides. The radionuclide inventory was not spread evenly and the data suggests that very localized deposits were present in areas of the liquid waste system. The following radionuclides were identified in one or more analyses from the sump and waste tanks:

^{3}H	^{137}Cs
^{14}C	^{238}Pu
^{55}Fe	$^{239/240}Pu$
^{60}Co	^{241}Am
^{63}Ni	^{242}Cm
^{90}Sr	$^{242/243}Cm$

During the 1983 sodium drumming operations, primary sodium samples were taken and analyzed for isotopic concentrations and activities. These results were used to perform total activity calculations for the remaining residual sodium in July 1986. The residual sodium isotopic activity was found to be 9.8E+02 μCi for ^{22}Na and 4.8E+3 μCi for the ^{137}Cs respectively. After 40 years, the activity would reduce to 2.5E-2 μCi and 2.0E+3 μCi, respectively. This amounts to 65% reduction in sodium activity.

In 1997, a sample was taken from a drum of sodium previously shipped offsite. The tritium content was 2.2E-4 μCi/g. Based on the 435 gallons of primary sodium residues estimated to remain, the primary sodium would contain 3.5E+2 μCi of tritium. A more conservative estimate based on interpolating from the higher tritium concentrations found in one sample of secondary sodium would be 4.4E-2 μCi/g, or 7.0E+4 μCi tritium in the primary sodium.

In 1998, samples of secondary sodium were analyzed for tritium. Tritium concentrations varied from 1E-2 μCi/g to less than minimum detectable.

During April 2006, in preparation for shipping waste water to an offsite disposal facility, a representative composite sample was obtained from two of the primary sodium storage tanks and sent for 10CFR61 analysis. A synopsis of the results of this analysis are as follows:

Isotope	Activity (μCi/liter)
Sr-89	2.71E-3
Sr-90	2.52E-2
H-3	1.04E-1
Cs-137	1.10E+0
Total Activity	1.23μCi/liter

The three primary storage tanks were almost full prior to either being processed or shipped offsite. The total activity in the three tanks when full was:

Sr-89:	0.46mCi
Sr-90:	4.3mCi
H-3:	18mCi
Cs-137:	190 mCi
Total	213mCi

Note that this section does not address the radionuclide inventory of internal system and component surface contamination or area contamination.

Amendment 12 to the Fermi 1 license permits additional byproduct material onsite for sample analysis, instrument calibration, or associated with radioactive apparatus, hardware, tools, and equipment. The cumulative quantity of the byproduct material must not exceed the criteria contained in 10 CFR 30.72, Schedule C.

4.2 RADIATION AND SURFACE CONTAMINATION LEVELS

4.2.1 Dose Rates

As indicated on the building maps, Figures 4.1 and 4.2, most of the general areas in the Reactor Building, the Fuel and Repair Building (FARB), and the Sodium Building were surveyed as part of the return to passive SAFSTOR effort performed in 2011/2012. The observed dose rates were typically < 0.1 mrem/hr with dose rates in a few areas as high as 8 mrem/hr. Table 4.1 summarizes the results of 1997 scoping surveys, as updated by the results of the return to passive SAFSTOR surveys.

From the 1997 scoping surveys dose rates in the Turbine Building, Office Building and portions of the Steam Generator Building were performed using a Ludlum 12S Micro-R instrument to verify that these areas were unaffected by the operation of Fermi 1. No dose rates in excess of normal background levels were observed.

Decommissioning activities have included removal of all the radioactive waste tanks in the FARB basement. Dose rates in the basement are now less than 0.1 mrem/hr in all areas.

The main source terms have also been removed from the Reactor Building.

4.2.2 Contaminated Areas

When the facility was returned to passive SAFSTOR, the remaining posted contaminated areas were the Cold Trap Room, Primary Sodium Storage Tank Room, FARB Hot Sump, Reactor Building Basement, Rotating Plug, and the Steam Cleaning Chamber. Additionally, some equipment is contaminated, e.g., the Auxiliary Fuel Storage Facility, remaining portions of the Primary Sodium Storage Tanks, Temporary Gaseous Effluent System internals, and some buried and embedded pipe. The postings may change over time.

4.3 FINAL STATUS SURVEYS

Final Status Surveys (FSS) were performed in some plant areas prior to the decision to return to passive SAFSTOR. The following areas were blocked off and access will continue to be controlled to preserve their FSS status:

- FARB Cold Trap Room
- New Fuel Storage Room
- Uranium Storage Room
- East and West Sodium Galleries
- Waste Gas Building Tank Rooms, Tunnel, Valve Gallery, and Basement
- Fission Product Detector Building
- Inert Gas Tank Rooms, Valve Pits, and Tunnel
- Decay Pool

Other areas which had been surveyed were deposted from being under FSS control due to the difficulty in controlling access during passive SAFSTOR. Data from the FSS surveys is being retained as records and will be available for use in the future. References 22 and 23 document reviews of FSS activity by NRC's contractor, ORISE, the Oak Ridge Institute for Science and Education.

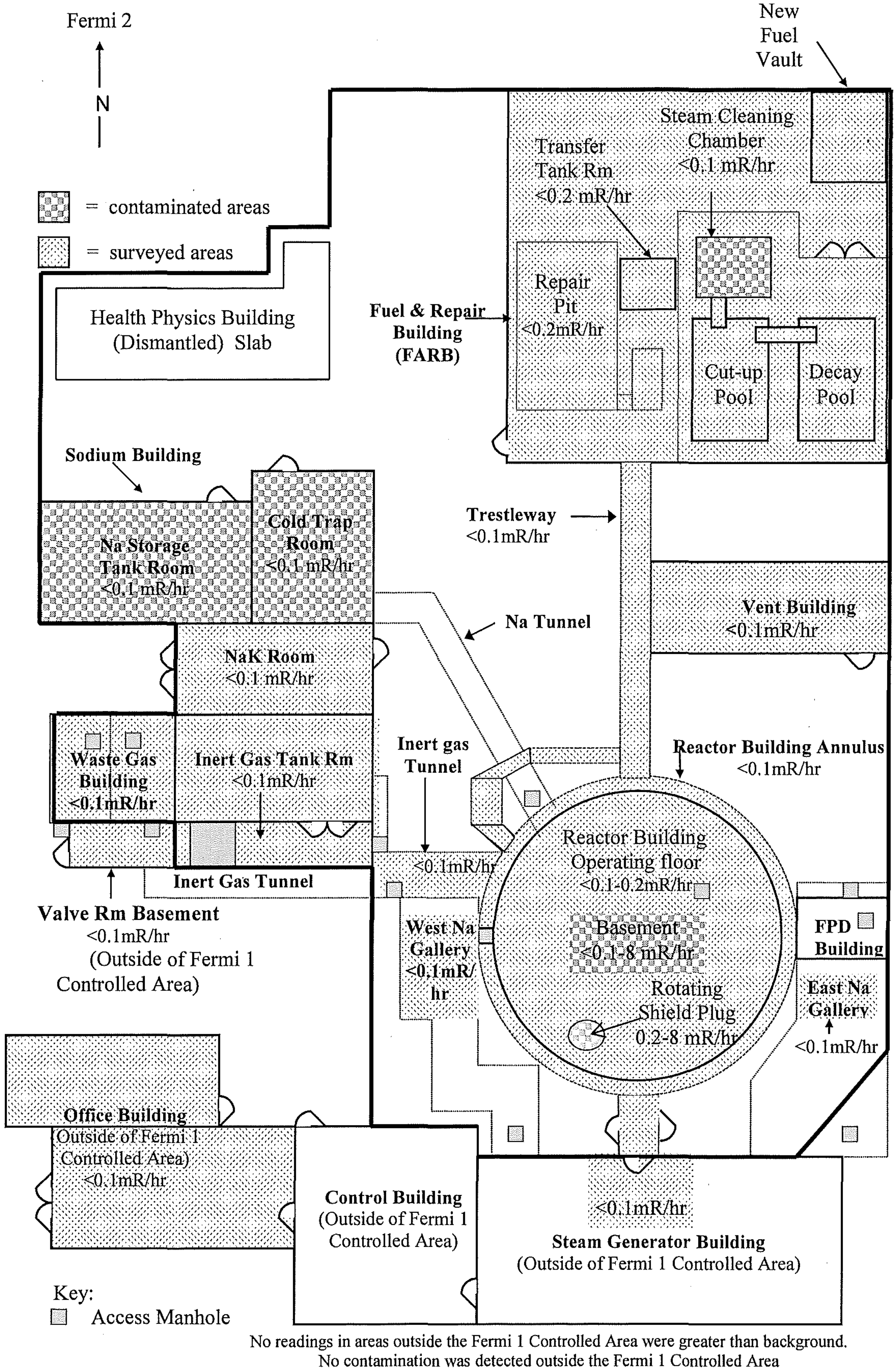


Figure 4.1 Fermi 1 Area Buildings

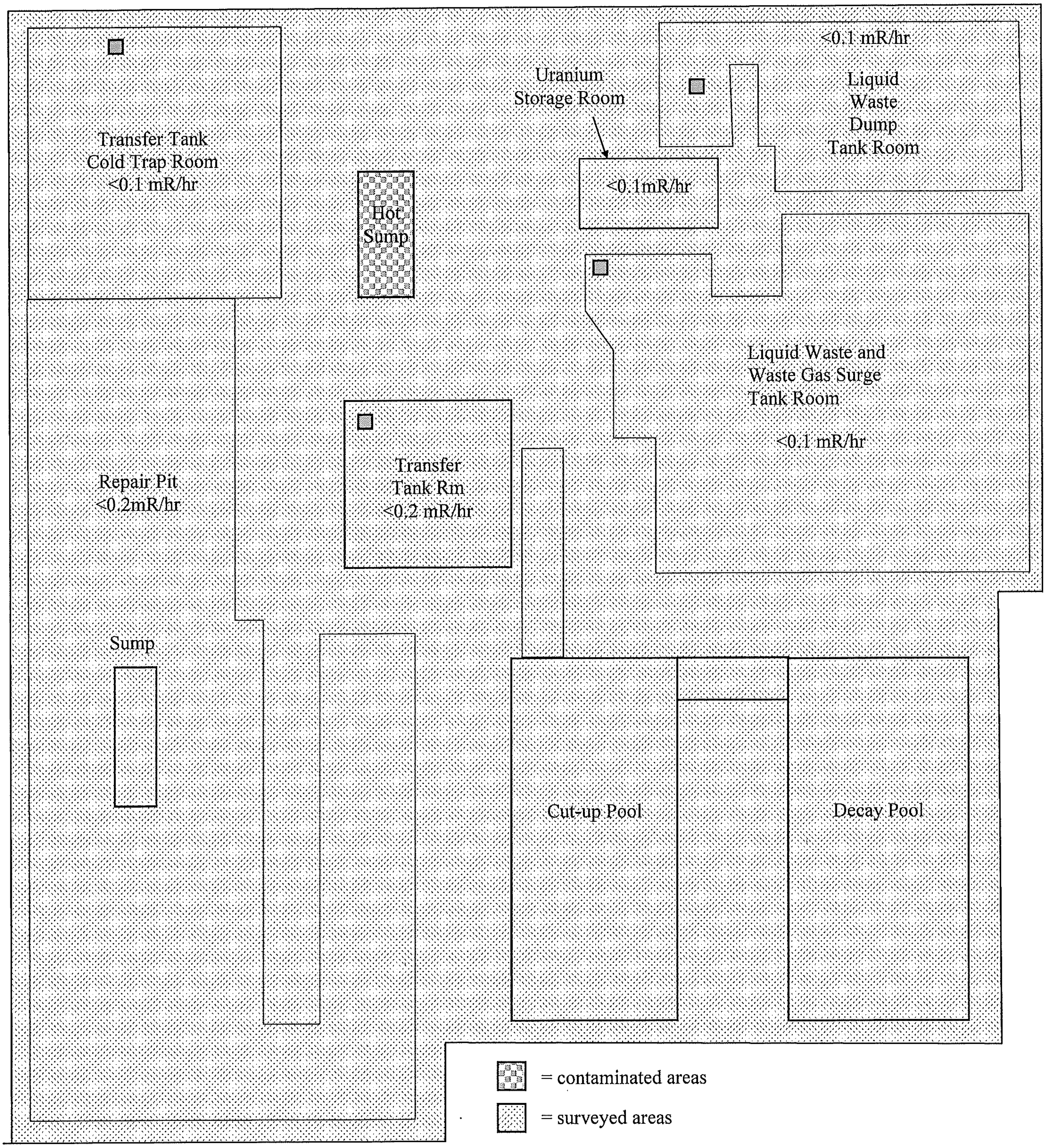


Figure 4.2 Fermi 1 FARB Basement

TABLE 4.1 SUMMARY OF RADIOLOGICAL SURVEY DATA

	GENERAL AREA DOSE RATES	CONTAMINATION LEVELS * dpm/100 cm^2
Reactor Building		
• Operating Floor	<0.1-0.2 mR/hr	<100-60K / <20
• Basement Elevations	<0.1-8 mR/hr	<100-20K /<20
• Annulus Area	<0.1 mR/hr	<100/ <20
Fuel and Repair Building		
• Steam Cleaning Chamber	<0.1 mR/hr	<500/<20
• Fuel Transfer Tank Room	<0.2 mR/hr	<500 / <20
• Uranium Storage Room	<0.1 mR/hr	<100 / <20
• #15 Liquid waste tank rm.	<0.1 mR/hr	<100 / <20
• #7,#8,#9 liquid waste tank rm.	<0.1 mR/hr	<100 / <20
• Liquid waste pump room	<0.1 mR/hr	<100 / <20
• Mezzanine area	<0.1 mR/hr	<100 / <20
• Decay pool room	<0.1 mR/hr	<200 / <20
• Cut-up pool room	<0.1 mR/hr	<200 / <20
• New Fuel transfer chute	<0.2 mR/hr	<500 / <20
• Transfer tank cold trap rm.	<0.1 mR/hr	<100 / <20
• Repair Pit	<0.2 mR/hr	<100 / <20
• 590' general walkways	<0.1 mR/hr	<100 / <20
• 576' general walkways	<0.1 mR/hr	<200 / <20
Sodium Building		
• Na storage tank room	<0.1mR/hr	<100-790 / <20
• Cold trap room	<0.1 mR/hr	<500/ <20
Waste Gas Building		
• Valve room	<0.1 mR/hr	<100 / <20
Inert Gas Building		
• Tank room	<0.1 mR/hr	<100 / <20
• Inert Gas Tunnel	<0.1 mR/hr	<100 / <20
Steam Generator Building		
• Annulus sump room	<0.1 mR/hr	<100 / <20
Office/Turbine Buildings		
• All elevations	<0.1 mR/hr	<100 / <20
Miscellaneous		
• Northeast Na gallery	<0.1 mR/hr	<100 / <20

* <100 / <20 means <100 dpm / 100 cm^2 beta-gamma and <20 dpm / 100 cm^2 alpha contamination

Note: Eberline RO-2, RO-20 and E-520, and Ludlum 12S survey meters were used for dose rate measurements. Eberline PAC-4G, Ludlum 177 and Tennelec LB5100 survey meters were used for contamination measurements

SECTION 5: SURVEILLANCE

5.1 SURVEYS

Two types of surveys are identified in the Fermi 1 Technical Specifications, environmental and radiological, in addition to periodic facility inspections and instrumentation testing.

For the environmental surveys, stations have been established where it is estimated that maximum concentrations of radioactive material discharged from the facility may occur. Environmental surveillance is not required until discharge of radiological liquid effluents has commenced; this is in compliance with Amendment No. 11 of the Possession-Only License No. DPR-9. The water and sediment sample points and frequency are contained in the Fermi 1 Technical Specifications.

Periodic radiation surveys are performed to check for the presence of gamma radiation and transferable contamination at the frequency specified in the Technical Specifications. Gamma radiation measurements using portable survey instruments and contamination checks using smears are made in the following areas:

> Reactor Building - Operating floor, breather pipe, sump pump serving Reactor Building annulus.
>
> Fuel and Repair Building - Pool area until decontamination of the pools is complete, operating floor access points to contamination areas.

5.2 INSPECTIONS AND TESTS

A weekly general walk-through and inspection of the Fermi 1 Facility, as described in EF1 Technical Specifications, is conducted. A monthly visual inspection of the Fermi 1 Facility is also performed. The monthly inspection consists of visual inspection of the fence, gates and exterior doors of the Fermi 1 Facility, and a visual water level check from the top access of all active sumps which serve the Fermi 1 Facility. All abnormal conditions observed are recorded and reported to the Custodian.

If liquid discharges were to resume, during periods when radioactive effluents are being discharged, the discharge radiation monitor is required to be checked with a source once a week and calibrated at least once every six months or before each discharge batch. The radiation monitor surveillances would be prepared if discharges were to be resumed.

SECTION 6: ADMINISTRATIVE CONTROLS

The DTE Electric Company (DTE), as the licensee for Fermi 1, has the responsibility for maintaining the License and Technical Specifications. Administrative controls have been established to ensure that management and administration of Fermi 1 is performed in a consistent manner that complies with regulatory requirements.

Responsibility for Fermi 1 is delegated through the line organization of the Site Vice President, Nuclear Generation. A Fermi 1 Review Committee functions to advise the Fermi 1 Custodian on all matters relating to nuclear safety and to review and approve procedures, design changes, Licensee Event Reports, and other activities.

6.1 ORGANIZATION AND RESPONSIBILITIES

6.1.1 Site Vice President, Nuclear Generation

The Site Vice President, Nuclear Generation is responsible for overall plant safety of DTE Electric Company nuclear power plants, including Fermi 1and Fermi 2.

6.1.2 Other Support

Fermi 2 and other DTE Energy organizations provide support for the Fermi 1 facility as needed.

6.1.3 Fermi 1 Custodian

The Fermi 1 Custodian or Custodial Delegates shall be responsible for directing all Fermi 1 activities, seeing that the activities are done in a safe manner and in compliance with the Technical Specifications, and reporting these activities to the NRC. Key responsibilities include:

- Coordinate, approve, and assign work done at the facility.
- Maintain the physical facility as defined by Technical Specification B.1, Figure B-1.
- Comply with the Technical Specifications; administrative controls; and local, state, and Federal Regulations.
- Plan, control, and monitor decommissioning activities.
- Assign duties to the Custodial Delegates and Custodial Agents as required.
- Control access to the Fermi 1 Controlled Area.
- Approve temporary changes to the Fermi 1 Manual.
- Review Fermi 1 Manual and design changes.
- Maintain records in accordance with the type and retention period stated in the Technical Specifications, Section F.8.

The Fermi 1 Custodian shall be approved in writing by the Site Vice President, Nuclear Generation. The Fermi 1 Custodian shall, as a minimum, have a basic understanding of surveillance and Health Physics procedures and the Fermi 1 Manual.

6.1.3.1 Custodial Delegates

Custodial Delegates shall act in the absence or on behalf of the Fermi 1 Custodian and shall assume such duties and responsibilities listed in Section 6.1.3 as required or assigned by the Fermi 1 Custodian. Custodial Delegates shall be appointed in writing.

6.1.3.2 Fermi 1 Health Physicist

The Fermi 1 Health Physicist or alternate Health Physicist shall review all procedures and limits involving the handling of radioactive materials. This individual shall be responsible for ensuring that all plant discharges and shipments are within the limitations set forth in the Code of Federal Regulations.

The Fermi 1 Health Physicist, or alternate, shall be appointed in writing by the Fermi 1 Custodian and shall have two years of specialized training in health physics or equivalent and three years work experience related to radiological health and safety.

6.1.3.3 Custodial Agents

Custodial Agents shall have unescorted access to the Fermi 1 Controlled Area to perform activities at Fermi 1. Custodial Agents shall be authorized in writing by the Fermi 1 Custodian or Custodial Delegates.

6.1.3.4 Health Physics Technician

A person who has received training in health physics techniques and procedures shall be on site and may direct health physics activities whenever radioactive materials are being moved. Qualifications are addressed in Section 6.2.2.

6.1.4 Title Changes

If personnel titles change without a change in Fermi 1 responsibilities, the Fermi 1 Safety Analysis Report revision may await the next planned review and update.

6.2 QUALITY ASSURANCE PROGRAM

6.2.1 Introduction

The purpose of the Fermi 1 Quality Assurance Program is to provide assurance that work is performed at the Fermi 1 nuclear facility in a quality manner. The Quality Assurance program provides such assurance through compliance with implementing documents and assurance that such documents are adequate, reviewed, and used. Adherence is required by all personnel working on the nuclear portion of the facility. Audits are performed of implementation to assure adherence to the program.

The program meets the requirement of 10 CFR 50.54(a). It has been established for the SAFSTOR condition, based on the condition, status, and history of the facility. Prior to the program's inception, there were administrative controls and review requirements established, but not a Quality Assurance Program. The Quality Assurance Program applies to work in that portion of the Fermi 1 facility that corresponds to the description of the facility in Section B.1 of the Fermi 1 Technical Specifications. Note that this Quality Assurance Program does not implement Appendix B of 10 CFR 50. There are no systems or components at Fermi 1 that are used to prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. Special attention is focused on assuring radiological surveys are performed by qualified personnel using calibrated instrumentation and that radiological calculations performed for decision making are reviewed.

The Fermi 1 Quality Assurance program will be revised in accordance with 10 CFR 50.54(a). Changes that reduce commitments in the program description previously accepted by the NRC will be submitted to the NRC and receive NRC approval prior to implementation.

If personnel titles change in the Quality Assurance program without a change in Fermi 1 responsibilities, the Quality Assurance program revision may await the next planned review and update.

6.2.2 Organization and Qualifications

The Site Vice President, Nuclear Generation is responsible for DTE Electric Company nuclear power facilities. The Fermi 1 Custodian is responsible for the Fermi 1 facility. Detail on organization structure, responsibilities, and qualifications are discussed in Section 6.1. Appointed Custodial Delegates can fulfill the responsibilities of the Fermi 1 Custodian. All Fermi 1 workers are responsible for the quality of their work. Fermi 1 workers may have concurrent responsibilities at Fermi 2 or elsewhere in the DTE Energy Company.

The Fermi 1 Health Physicist, or alternate, is responsible for reviewing procedures and limits involving the handling of radioactive materials at Fermi 1.

Radiation Protection (Health Physics) technicians at Fermi 1 are qualified in accordance with the Fermi 2 Radiation Protection Program for the tasks they perform. Such training and qualification is documented. Personnel shipping radioactive waste and/or hazardous waste receive appropriate training. Personnel performing activities, which per regulations require certification, will be qualified for such activities and such training and qualification documented.

The Fermi 1 Review Committee functions to advise the Fermi 1 Custodian on matters relating to nuclear safety. The appointment of the Chairman of the Fermi 1 Review Committee is approved by the Site Vice President, Nuclear Generation. This provides independence from the Fermi 1 Custodian. The Fermi 1 Review Committee is addressed in Section 6.3. Audit team leaders perform audits under the auspices of the Fermi 1 Review Committee.

6.2.3 Procedures

Procedures ensure that the requirements of the Technical Specifications are carried out in a proper and timely manner. They also serve as training and reference units for future Fermi 1 Custodians, Custodial Delegates and Custodial Agents. Administrative procedures include Custodial responsibilities and authority, Procedure Manual control, Custodial Delegate and Custodial Agent selection and function, reporting procedures and Fermi 1 Review Committee functions. In addition, there are appropriate technical procedures for details of inspections, surveillances and operation.

Per Fermi 1 Technical Specifications, procedures are required to be prepared and utilized for radiation control, and facility inspections. Fermi 1 procedures state that the Fermi 2 Radiation Protection Program is applicable to Fermi 1.

Fermi 1 procedures are reviewed and approved by the Fermi 1 Review Committee. The Fermi 1 Custodian may temporarily change a procedure by written document following a determination that the change does not constitute a significant increase in hazards associated with the facility.

The Fermi 2 Radiation Protection Program and Environmental Program apply to the entire site, including activities at Fermi 1. Procedures to implement these programs are typically controlled via the Fermi 2 procedure program. Some items specifically applicable to Fermi 1 are included in the Fermi 1 procedure manual.

6.2.4 Design Control

Design change documents are used to modify installed Fermi 1 systems in the Fermi 1 Controlled Area. Modifications to systems or components previously disconnected from the Fermi 1 current systems and/or abandoned may be performed with a design change or other work control document. Design change documents are maintained as records to preserve information on the configuration of the plant. Additionally, the Fermi 1 Safety Analysis Report will be updated at least once per 24 months to provide a current integrated description of the facility.

Design control and level of detail in design change documents are commensurate with the potential impact on quality and health and safety of the public. Design change documents are reviewed by the Fermi 1 Custodian, an engineer, and Fermi 1 Health Physicist, or their delegates, and approved by the Fermi 1 Review Committee.

6.2.5 Work Control

Repair, maintenance and modification of installed systems, structures and components shall be performed using a work control document. Approval to start work shall be noted on the document by the Fermi 1 Custodian or delegate. Any post-maintenance testing, inspection, and effects on Technical Specifications from equipment being removed from service applicable to the work activity shall be specified on the work control document.

Hold points may be inserted into a work control document which requires an independent check of data or performance of an inspection or activity by individuals specifically qualified for the activity or inspection. Work cannot proceed beyond a hold point unless the hold point activity is performed or the individual responsible for performing the hold point waives the hold point.

6.2.6 Document Control

The Fermi 1 Manual has been issued as a controlled document to a specified users list and as an electronic version in the Fermi 2 document control system. Procedures for use are obtained by copying from one of the controlled manuals or from the electronic version in the Fermi 2 document control system. When a procedure is revised, work in progress will be evaluated for impact and workers provided with an updated procedure, if needed. Copies of records are obtained from the Fermi 2 records management organization.

A change control process has been established which requires specific reviews for adequacy and approvals of change documents, such as procedure changes, design changes, and license changes. Revisions to approved change documents require the same review and approval process, with the exception of temporary changes to procedures, as addressed in Section 6.2.3. Procedures are reviewed by the Fermi 1 Health Physicist, Fermi 1 Custodian, and the Fermi 1 Review Committee. Typically, the Fermi 1 Review Committee approves the change documents.

In the future, as design changes are implemented, an appropriate drawing(s), as applicable and available, will be marked up and maintained in the Fermi 1 records files. Sketches may be used as an alternate.

6.2.7 Special Processes

Welding, heat treating, and non-destructive testing of inservice systems will be controlled and performed by qualified personnel in accordance with applicable standards. Non-destructive testing performed for information only purposes does not fall within the controls of this Quality Assurance Program, nor does cutting using welding equipment.

6.2.8 Measuring and Test Equipment

Measuring and test equipment (M & TE) used to perform Technical Specification surveillances shall be calibrated periodically. Instruments used to obtain radiation survey data or laboratory analysis for decision making or surveillance purposes shall be calibrated in accordance with manufacturer's recommended frequency or evaluation of past performance, but at least annually. If an instrument is found out of calibration, an evaluation shall be performed to determine the validity of previously made measurements. The M & TE found out of calibration will be clearly identified with a tag or other appropriate means and segregated from the calibrated equipment until recalibrated and properly tagged.

Computer programs used to process radiological data for final site survey purposes shall be verified and validated. Hand calculations for such purposes shall be reviewed.

6.2.9 Records

Records required by Fermi 1 Technical Specifications are maintained as Quality Assurance records for at least five years, or duration of the license, as specified in the Technical Specifications. These records include records required by 10 CFR 50.75(g). As-built drawings for Fermi 1 did not exist at the time 10 CFR 50.75(g) was issued, so as allowed by the regulation, other available information concerning areas and locations in which radioactive materials were stored and used were substituted. This alternate information currently includes a special list of where radioactive material was used, some drawings, and current design changes after implementation. Audit reports are also maintained as Quality Assurance records for at least five years.

The Quality Assurance records are maintained in Fermi 2 facilities for records and are retrievable.

6.2.10 Corrective Action

Significant conditions adverse to quality shall be documented, a cause analysis performed, and corrective action to prevent recurrence implemented. Conditions meeting the Technical Specification reportability criteria shall be considered significant conditions adverse to quality.

6.2.11 Review

The Fermi 1 Review Committee reviews performance at the Fermi 1 facility. Their reviews include procedures, design changes, license amendments, and 10 CFR 50.59 evaluations. See Section 6.3 for further discussion on the Fermi 1 Review Committee.

Audits of facility activities and Quality Assurance Program adherence will be performed at least two times per year. The purpose of the audits is to assess implementation of and verify compliance with the Quality Assurance Program and the Technical Specifications. Implementation of radiation protection control activities shall be covered at least once per year and will include radiation surveys and instrument calibration.

The individual or team performing the audit will be independent of line responsibility for Fermi 1. Review responsibilities (e.g., a Fermi 1 Review Committee member) are not considered line responsibilities for determination of independence. The audit team leader will be a certified audit team leader/lead auditor (per ANSI N45.2.23, NQA-1, or ISO-9000), or have at least two years Quality Assurance audit or management experience.

The audit team leader possesses stop work authority that can be used if the audit team observes an unsafe act or unsatisfactory work. The Fermi 1 Custodian is responsible for addressing discrepancies identified by audits and reporting to the Fermi 1 Review Committee actions taken to resolve discrepancies. If any discrepancies are disputed and cannot be resolved between the Fermi 1 Custodian and auditor, the issue and proposed solution shall be presented to the Fermi 1 Review Committee for resolution.

Significant conditions adverse to quality identified during an audit shall be processed via the corrective action program.

The audit scope and results shall be documented and presented to the Fermi 1 Review Committee and Fermi 1 Custodian.

Vendors providing 10 CFR 61 analysis services for Fermi 1 shall be evaluated at least triennially if such services have been provided. The evaluation may be by review of an audit covering similar services for another licensee.

Self-assessments may be used to assess adherence to regulations and management expectations for selected activities. Personnel performing self-assessments will be knowledgeable in the activities they are assessing.

6.3 FERMI 1 REVIEW COMMITTEE

The Fermi 1 Review Committee shall function to advise the Fermi 1 Custodian on all matters relating to nuclear safety.

The Fermi 1 Review Committee shall be responsible for review and approval of the following:

- Procedures for activities at the facility
- Annual report to the NRC
- Licensee Event Reports
- Design changes
- 10 CFR 50.59 Evaluations
- License Amendments, including Technical Specification changes
- Facility monitoring results

The Fermi 1 Review Committee meets at intervals not exceeding 13 months and prepares and distributes formal minutes of its meetings. The Chairman, Fermi 1 Custodian, or one of the Custodial Delegates, as required may call special meetings.

The Fermi 1 Review Committee is composed of five or more personnel from within the DTE Energy Company organization or consultants, at least three of whom have had two years or more of experience in a responsible position at an operating nuclear power facility and have had basic health physics training.

6.4 RADIATION PROTECTION PROGRAM

The Fermi 1 radiation protection practices are based on the Fermi 2 Radiation Protection Program which contains the procedures, practices, and training needed for an operating reactor. Fermi 1 specific procedures or applicable Fermi 2 procedures cover radiation protection activities at Fermi 1. Radiation protection technicians used at Fermi 1 meet the Fermi 2 qualification and training program requirements for tasks they perform.

Personnel entering the Fermi 1 Radiological Restricted Area shall use both dosimetry of legal record and secondary dosimetry. Those individuals who do not have Fermi 2 dosimetry shall make arrangements through the Fermi 2 Radiological Protection office for appropriate dosimetry. Visitors shall be properly escorted and shall be issued dosimetry, as required.

6.5 RADIOACTIVE MATERIAL PACKAGING AND TRANSPORTATION

In addition to the quality assurance requirements specified in Section 6.2 of the F1SAR, containers used for packaging and transportation of radioactive material within the scope of 10 CFR 71 shall be controlled in accordance with the NRC approved Fermi 2 Nuclear Quality Assurance Program, as contained in the relevant sections of Chapter 17 of the Fermi 2 Updated Final Safety Analysis Report (UFSAR). The use of the approved program will be in accordance with the conditions in the NRC Quality Assurance Program Approval for Radioactive Material Packages, and thereby in compliance with the quality assurance requirements of Subpart H of 10 CFR 71. No packages required to meet these requirements are expected to be used by Fermi 1.

SECTION 7: FIRE PROTECTION PROGRAM

The Fermi 1 Fire Protection Program consists of the following provisions:

- Fire extinguishers are located at selected areas within the facility. Most are dry chemical extinguishers. Fire extinguishers are checked periodically.
- In case of a fire at Fermi 1, the Fermi 2 fire brigade responds. Frenchtown Fire Department responds to fires requiring offsite assistance.
- Welding and other hot work is controlled by permit. Fire watches are appointed during hot work.
- The Fermi 2 Fire Protection System provides water to fire hydrants outside the Fermi 1 Controlled Area. An electric jockey pump, an electric fire pump, and a diesel driven fire pump are installed in the system. When the system is out of service, reliance is on the fire extinguishers and on the Frenchtown Fire Department's ability to pump from Lake Erie.

The fire hazards at Fermi 1 include:

- Office and record storage areas
- Residual oils located in plant equipment
- Propane tanks located outside of Fermi 1 buildings
- Equipment and material storage areas

SECTION 8: ENVIRONMENTAL ASSESSMENT

The SAFSTOR status of Fermi 1 will not cause a significant environmental impact. The Fermi 1 original decommissioning effort, preparation for storage, or phase one of SAFSTOR was completed in 1975. Since this involved dismantling and shipping the radioactive fuel, blanket assemblies, and mechanical components offsite, the highest potential for impact due to decommissioning has already occurred. In April 1989, under the new regulations with License Amendment No. 9, Fermi 1 officially entered the second SAFSTOR phase, storage. In November 2000, the announcement was made that the last phase of SAFSTOR, deferred decontamination, would be initiated. In August 2011, the NRC was notified of Detroit Edison's intent to return Fermi 1 to passive SAFSTOR (Reference 21).

On April 29, 1969, Detroit Edison filed an application with the AEC for a permit to construct Fermi 2; Construction Permit No. CPR-87 was issued on September 26, 1972 following reviews by the AEC staff, Advisory Committee on Reactor Safeguards, and public hearings dealing with environmental matters before an Atomic Safety and Licensing Board. The staff's conclusions were issued as a Final Environmental Statement (CP-FES) in July 1972. On April 4, 1975, Detroit Edison docketed the Environmental Report (ER-OL) in support of the application for an operating license. In August 1981, the NRC issued the "Final Environmental Statement Related to the Operation of Enrico Fermi Atomic Power Plant, Unit No. 2," NUREG-0769. The OL-FES presents assessments that supplement those described in the CP-FES. The report is written in accordance with 10 CFR 51, which implements the requirements of the National Environmental Policy Act of 1969 (NEPA).

As discussed in Section 3.1.1, Fermi 1 shares the 1120-acre site with Fermi 2. The environmental information presented in this section is mostly based on relevant information and studies presented in the Fermi 2 ER-OL, Updated Final Safety Analysis Report (UFSAR), and the NRC OL-FES. The environmental information is applicable since much of the data was collected at the time of decommissioning or after Fermi 1 was decommissioned. Information on personnel working at Fermi 1 has been updated.

Chapter 8 of the License Termination Plan (Reference 20) provided an update to the environmental assessment as associated with license termination activities. While more detail was provided in the License Termination Plan (LTP), the conclusions were similar to this assessment for the impacts discussed below. The NRC was asked to cease reviewing the LTP, with the exception of the groundwater evaluation, in Reference 21.

8.1 DISTRIBUTION OF ESTIMATED POPULATION

Table 8.1 represents the population data around the site.

8.2 NON-RADIOLOGICAL IMPACTS

The regional demography and land use, site water use, site ecology, geology and meteorology have not changed significantly since described in Section 2 of the Fermi 2 ER-OL and UFSAR.

8.2.1 Socioeconomic and Cultural Resources

Few personnel are required for maintenance of the facility in SAFSTOR to perform surveillances, rounds, maintenance, audits, and other activities. Some of the individuals performing work at Fermi 1 are employed by DTE Energy Company in other capacities. Specific decontamination activities will require additional resources, but the numbers will be small compared to the total number of site workers. Because of the relatively small number of people involved, there is virtually no impact on the community and traffic patterns.

8.2.2 Land Use

The SAFSTOR of the facility will not affect current land use onsite or offsite. In October 2008, Detroit Edison filed an application for a combined operating license for Fermi 3. The application addresses the Fermi 1 site.

8.2.3 Hydrology

The hydrology of the site and its environs has not changed significantly since the Fermi 2 ER-OL and UFSAR. It is not anticipated there will be any significant changes over the SAFSTOR period.

8.2.4 Water Use

While in SAFSTOR status, Fermi 1 uses water systems, such as potable water. Potable water also directly supports Fermi 2. Additional water will be used during the decontamination phase; however the quantity will be small when compared with Fermi 2. Liquids collected in the FARB sump system are mostly due to the intrusion of groundwater or rainwater. Currently, there is no active State of Michigan NPDES Permit covering the discharge of waste waters from the Fermi 1 facility. Storm and sanitary sewers associated with the Fermi 1 facility are connected to the Fermi 2 site storm and sanitary sewer systems.

8.2.5 Aquatic and Terrestrial Resources

The aquatic and terrestrial ecology of the site and its environs is presented in the Fermi 2 ER-OL and further discussed in the NRC OL-FES. No activities are currently anticipated that will impact the aquatic and terrestrial resources.

8.2.6 Unavoidable Impacts

Fermi 1 occupies a small restricted area of the Fermi site.

Some of the unrestricted portions of the Fermi 1 facility are effectively used by Fermi 2 such as:

- The potable water system supplies the potable water for the Fermi 2.
- The general service water intake structure for Fermi 2 is located on the Fermi 1 intake canal.
- The Fermi 1 switchyard provides one division of offsite power for Fermi 2.

8.2.7 Local Short -Term Uses Versus Long -Term Productivity

The site is presently being used for production of electricity by Fermi 2 and there are no plans for the site other than electrical power generation.

8.2.8 Commitment of Resources

The years of SAFSTOR from 1976 to 2000 did not involve commitment of a significant amount of resources above that required for dismantling. Initiation of radiological decontamination after 25 years of storage will not involve the commitment of a significant amount of resources, such as burial of radioactive waste, above those that would be committed for dismantling in 2025. The short-lived radionuclides have already decayed and the long-lived remaining radionuclides will not significantly decrease in the less than 25 years of SAFSTOR remaining, if dismantling were to be completed in 2025.

The majority of the remaining nuclear material was disposed of during radiological decontamination performed between 2001 – 2012. The passive SAFSTOR condition will not involve commitment of a significant amount of resources.

8.3 RADIOLOGICAL IMPACTS

Section 4 covers radiological conditions at Fermi 1. On July 23, 1986 Edison submitted supplemental information in response to NRC questions. Relevant information has been included in this section; for the detailed data see Reference 11.

- The occupational radiation exposure of workers involved in maintenance, surveillance, and decommissioning.
- The environmental impacts of releases of liquid and gaseous effluents.
- The impact of postulated accidents.

8.3.1 Personnel Dose History

The table below represents personnel exposure history from 1973 through 1985.

Fermi 1 Personnel Dose History, Personrem

YEAR	DOSE	YEAR	DOSE
1973	5.79	1980	0
1974	5.05	1981	0.011
1975	9.70	1982	0.166
1976	0.025	1983	0.285
1977	0.041	1984	0.020
1978	0.043	1985	0.110
1979	0.081		

The total cumulative dose received at Fermi 1 for the period 1973 through 1985 was 21.3 personrem.

Of the total cumulative dose, 20.5 personrem was recorded during the three year period (1973-1975) in which fuel, blanket equipment, cold trap components, and equipment contaminated in the cut-up, shipment, and clean-up operations were removed from the site.

Approximately 0.2 personrem was recorded during the interim six year period of surveillance and maintenance activities. (1976-1981).

Approximately 0.6 personrem was recorded during the last four year period (1982-1985) which includes the sodium drumming and shipment operations. Much of the dose received in 1985 (0.1 personrem) was from operation of a TLD calibration facility located in the Fuel and Repair Building (FARB), a Fermi 2 activity.

The total for all personnel exposures attributed to Fermi 1 recorded from 1986 through 1996 were lower than 10 mrem per year. From July 1996 through June 2002, total personnel exposure was 1.14 rem, the majority of which occurred during decommissioning activities. From July 2002 through June 2004, total personnel exposure, mainly from decommissioning activities, was 0.251 rem. During the period July 2004 through June 2008 total personnel exposure was 1.98 rem. During the period July 2008 through June 2010 total personnel exposure was 11.159 rem which reflects the work done to remove primary system components. From July 2010 through June 2012, the total personnel exposure was approximately 35 rem which included the reactor vessel removal.

8.3.2 Occupational Radiation Exposure Expected

Maintenance, repair, and surveillance operations over the passive SAFSTOR period is expected to average less than 0.01 person rem per year.

8.3.3 Releases of Radioactive Effluents

All releases of radioactive effluents will be made in accordance with the Fermi 1 Technical Specifications. The amount of such releases is inherently limited since no additional radioactive material is being produced at Fermi 1 and the amount which can be received onsite is limited by the Fermi 1 license.

The liquid and gaseous release systems used during plant operation are no longer functional. Temporary gaseous effluent systems were implemented in accordance with the Technical Specifications for active decommissioning. These are being secured for passive SAFSTOR. Prior to performing work potentially resulting in airborne effluents, the Technical Specification requirements will need to be implemented. Releases will not exceed the limits in 10 CFR 20, Appendix B, Table 2 on an instantaneous basis. Monitoring or sampling of gaseous radioactive effluents will be conducted at locations that will enable determination of an actual or conservative radioactive effluent release rate when activities that could result in airborne radioactive releases will be performed.

8.3.4 Shipment of Radioactive Materials

Shipments of radioactive materials will be made in accordance with applicable regulations and facility procedures. Waste shipments may be made to intermediate processors or directly to a disposal site.

8.4 POSTULATED RADIOLOGICAL ACCIDENTS

There are three main postulated radiological accidents that could occur during SAFSTOR. These are described in the following sections. Note that as decommissioning has progressed, the source term for some of the postulated accidents has decreased. For example, the liquid waste tanks have been removed as addressed in Section 3.2.3. With the exception of the reactor rotating shield plug and the primary sodium overflow tank the primary sodium system and the reactor have been removed. The liquids have been evaporated and the remaining activity was contained in residual solids which were shipped offsite. However, the following postulated accidents are the design basis accidents and current and future evolutions have and are being compared to determine if the design basis accidents bound the planned activity. Therefore, the postulated accidents are not being revised, even though the specific accident described may no longer be possible.

8.4.1 Liquid Releases

8.4.1.1 Liquid Waste Tank Rupture

It is assumed that two liquid waste tanks in the Fuel and Repair Building ruptured. For the analysis, it is assumed that the tanks contain a total of 7550 gallons of radioactive radwaste containing 6 mCi of ^{60}Co and 6 mCi of ^{137}Cs. This assumption is based on 1986 activity.

Scenario A: Airborne Release

Assumptions:

- Tanks rupture/malfunction and radioactive inventory is spilled on floor.
- 25% of the inventory is assumed to be released through a vent to the environment.

- Release occurs over a 2 hour period and an individual is exposed for the entire time at the exclusion area boundary (EAB).
- Dose factors from Regulatory Guide 1.109 and ICRP Publication 30 are used.
- X/Q = 1.55 E-5 sec/m^3 (Fermi 2 UFSAR, Chapter 15, Table 15A-2) 2 hour, 50th percentile value at Fermi 2 Exclusion Area Boundary (EAB) of 915 meters NW. This distance is conservative since the Fermi 1 EAB is approximately 1211 meters NW.
- Maximum Permissible Concentration (MPC) from 10 CFR 20, Appendix B, Table II. (Values used are based on regulations in existence in 1986)

Results:

Liquid Water Tank Source - Airborne Release

	Concentration µCi/ml			
Nuclide	In Tank	At EAB	MPC (air)	C/MPC*
^{60}Co	2.10 E-4	3.23 E-12	1 E-8	3.23 E-4
^{137}Cs	2.10 E-4	3.23 E-12	2 E-9	1.62 E-3

*C/MPC = ratio of EAB concentration to MPC

2 hour Dose at EAB, mrem

	Adult	Child
Whole Body	3.27 E-4	1.11 E-4
Lung*	4.46 E-3	5.29 E-3

*Lung is most critical organ.

A conservative evaluation was performed of the potential maximum offsite dose due to this event considering the additional radionuclides identified in one or more smear or sample analysis from the liquid waste system from 1989 - 1998. These radionuclides are addressed in Section 4.1.1. The conservatively estimated maximum dose was 0.82 mrem committed effective dose equivalent (CEDE) at the EAB. The methodology used differed in that values from the current 10 CFR 20 were used.

Scenario B: Liquid Release to Lake Erie

Assumptions:

- Since the liquid radwaste tanks were located in the basement of the FARB, minor cracking of the structure could occur in the event of an earthquake. The tanks could undergo stress cracking and leaking to allow fluid flow between the interior of the structure and the surrounding earth. Initially, liquid would be retained within the structure and diluted by inflowing ground water from the dolomite aquifer. There would also be a slow inflow of ground water and the water level inside the structure would rise until it reached the elevation of the piezometric level of the ground water. At that time the radioactive liquid may be diluted by as much as 10:1; however, no credit is taken for dilution via the influx of water.
- Tanks were approximately 450 ft. from the Lake Erie shoreline.
- Flow rate within the aquifer is 0.24 ft/day.
- Delay time in traveling from the tank to Lake Erie is 1875 days plus 40 days to move upward through till and lake bottom sediments, (Fermi 2 UFSAR, Section 15.7.3.2).
- Dilution factor of 77 at Monroe City Water intake (Fermi 2 UFSAR, Appendix 11A).
- Radioactivity decay with delay time is assumed.
- Individual consumed water, fish, and invertebrates for 24 hour period.
- Dose factors from Regulatory Guide 1.109.

- MPC from 10 CFR 20, Appendix B, Table II.

Results:

	Liquid Waste Tank Source - Monroe City Water Intake				
	Concentration, μCi/ml				
Nuclide	In Tank	Entering Lake	At Intake	MPC (water)	C/MPC*
^{60}Co	2.10 E-4	1.04 E-4	1.35 E-6	5.00 E-5	0.03
^{137}Cs	2.10 E-4	1.86 E-4	2.41 E-6	2.00 E-5	0.12

*C/MPC = ratio of concentration at intake to MPC.

	Ingestion Dose, mrem			
	Water	Fish	Invertebrate	Total
Adult Whole Body	0.36	29.90	2.38	32.64
Adult, Liver	0.53	30.30	3.62	34.45
Child, Whole Body	0.19	4.24	0.54	4.97
Child, Bone	1.10	29.90	3.68	34.68

A conservative evaluation was performed of the potential maximum water ingestion whole body dose due to this event considering the additional radionuclides identified in one or more smear or sample analysis from the liquid waste system from 1989 - 1998. These radionuclides are addressed in Section 4.1.1. The conservatively estimated maximum dose was 93 mrem CEDE. The methodology used differed in that values from the current 10 CFR 20 were used. Also, no radioactivity decay was assumed.

8.4.1.2 Release of Processing Liquid

The primary sodium storage tanks were used to store liquid from sodium processing activities. Section 4.1.1 identifies the activity content in the primary sodium storage tanks based on a 2006 composite sample. An analysis was performed of the consequences of an accident leading to the release of this liquid. It is bounded by the conservative evaluations performed for the liquid waste tank rupture, Scenarios A and B. It is being included here to document the analysis for reference due to the larger quantity of liquid storage compared to the waste tank rupture analysis.

Additionally, a more conservative evaluation was performed, assuming the activity concentration in the processing liquid is a factor of ten higher than the 2006 sample. This case was expected to bound the circumstances if processing liquid was produced of higher activity than the sample analyzed.

The assumption was made that the three primary sodium storage tanks were full, containing 45,000 gallons. This bounds the release of the processing liquid from other locations, such as a primary loop, reactor vessel, or overflow tank, since the capacity of each is less than 45,000 gallons.

The methodology used in the conservative evaluation of the liquid waste tank rupture was used in determining the consequences of the processing liquid release. The activity concentrations used were based on the 2006 sample analysis and a factor of ten higher than the sample analysis. Other assumptions were the same as used for the liquid waste tank rupture analysis, Scenarios A and B.

Scenario A: Processing Liquid Airborne Release

Result – Potential Maximum Offsite Dose at EAB

Nuclide	CEDE, mrem
Cs-137	1.2E-2

Sr-89	2.8E-5
Sr-90	8.8E-3
H-3	2.2E-6
Total	2.1E-2

The result of the conservative evaluation using ten times the stored processing liquid concentration was 0.21 mrem CEDE at the EAB.

In 2007, in preparation for reactor vessel work, 10CFR61 analyses were performed on 9 smears taken from the reactor vessel or components removed from the reactor vessel. The radionuclide mix was higher in Sr-90 than samples or smears from other locations. Accident release results were calculated based on a liquid and liquid airborne release of the activity calculated to be in the reactor processing fluid. The activity used was based on the smear analysis, assumption of amount of reactor surface contamination transferred to the liquid, estimation of reactor internal surface area, floodup volume after processing, sodium estimated to remain in the reactor vessel and its activity. Other assumptions used matched the assumptions in the release of processing liquid scenario.

The dose calculated from the airborne release scenario for a reactor processing liquid release was 0.86 mrem CEDE at the EAB.

Scenario B: Processing Liquid Release to Lake Erie

Result – Potential Maximum Water Ingestion Whole body Dose CEDE

Nuclide	CEDE
Cs-137	3.9 mrem
Sr-89	1.2E-3 mrem
Sr-90	1.8E-1 mrem
H-3	3.7E-4 mrem
Total	4.1 mrem

The result of the conservative evaluation of the potential maximum water ingestion whole body dose due to this event using ten times the stored processing liquid concentration was 41 mrem CEDE.

The result of the conservative analyses of the processing liquid release, (with increased factor of ten) for both the airborne release and liquid release were bounded by the conservative evaluations of the potential whole body dose due to the liquid waste tank rupture.

As discussed under Scenario A, accident dose calculations have been performed specifically for reactor processing fluid release due to the different activity analyses. The calculated dose was 41mrem CEDE.

8.4.2 Airborne Releases from Sodium

It was assumed that a fire or other catastrophic event resulted in the release to the environment of the residual primary sodium including the entire radionuclide inventory which contained a total of 0.98 mCi ^{22}Na and 4.84 mCi ^{137}Cs and possibly 70 mCi of tritium (Section 4.1).

Assumptions:

- 100% of inventory becomes airborne.
- Release occurs over a 2 hour period and individual is exposed for the entire time at the EAB.
- Dose factors from Regulatory Guide 1.109 and ICRP Publication 30.
- X/Q = 1.55 E-5 sec/m^3.
- MPC from 10 CFR 20, Appendix B, Table II.
- For tritium, 10 CFR 20, Appendix B, Table 2, Col. 1 was used for maximum effluent concentration.

Results:

	Airborne Release Concentration μCi/ml		
Nuclide	At EAB	MPC (air)	C/MPC*
^{22}Na	2.11 E-12	6 E-9	3.52 E-4
^{137}Cs	1.04 E-11	2 E-9	5.21 E-3
^{3}H	1.51 E-10	Max. Effluent Conc. 1 E-7	C/ Max. Effluent Conc. 1.5 E-3

*C/MPC = ratio of EAB concentration to MPC

	Adult Dose, mrem
Whole Body	1.3 E-3
Liver*	1.5 E-3

*Liver is most critical organ.

Assessment if Sodium Activity was Higher than Assumed:

Based on the activity in the processing liquid analyzed in 2006, it was possible that the activity in the remaining sodium was greater than assumed in this accident analysis.

No Na-22 was detected in the 2006 analysis of the processing liquid, but the total amount of Cs-137 in the processing liquid was 190 mCi, almost 40 times greater than the 4.84 mCi assumed to be in the primary sodium residues.

The analysis in Section 8.4.1.2, Scenario A, Processing Liquid Airborne Release, assumed 25% of the total activity in the liquid was released into the air over a two hour accident duration. The conservative evaluation assumed a factor of ten greater activity. For the Cs-137, for example, the conservative evaluation assumed an airborne release of 475 mCi, which is almost a factor of a hundred greater than the Cs-137 assumed to be in the total sodium residues remaining. Therefore, the Processing Liquid Airborne Release analysis bounded the postulated radiological consequences of the sodium accident, even if the activity contained in the sodium had been considerably higher than assumed in this analysis.

If the activity in the sodium assumed for this sodium accident was increased by a factor of one hundred, the dose at the EAB would still be calculated as less than 1 mrem using the same methodology as the original analysis, since the dose is proportional to the activity released.

Assessment if Reactor Contamination is Released with Reactor Sodium Activity:

As addressed in Section 8.4.1.2, smears were taken and analyzed from the reactor vessel and vessel components. The activity on the smears differed from analyses of other systems. Accident dose calculations were performed for a release of the liquid which will be made by processing of the reactor residual sodium. Currently, the airborne releases from sodium scenario assumes a fire or other catastrophic event results in the release to the environment of the residual primary sodium radionuclide inventory. The accident is non-mechanistic.

The assessment above covered the case if the activity of the sodium was greater than originally assumed. It does not specifically address the release of other primary system internal contamination with the sodium activity.

In considering the conditions before and after reactor sodium processing, there were situations where the activity from sodium and reactor contamination would not be in the liquid phase. Prior to processing sodium residues remained in the reactor and there was contamination on the internal vessel surfaces. Post-processing, some of the activity in the processing liquid was assumed to be deposited on the vessel internal surfaces when the liquid is pumped out. After processing, some of the contamination that was on the reactor vessel surfaces was assumed to be deposited on any filter used in the transfer line between the reactor and storage tanks, on ventilation system filters and processing system surfaces. The activity from the sodium and reactor contamination was assumed to be released if a non-mechanistic catastrophic event occurred dispersing the activity.

The main difference between this scenario and the reactor processing liquid release scenario addressed in Section 8.4.1.2, is that in this scenario the postulated release would be airborne, while in the postulated reactor processing liquid release, 100% of the activity is released as liquid to the ground and 25% of the activity becomes airborne. While in reality, some of the particulates would have been deposited on vessel walls, some in any filter(s), some on other surfaces, and some remain in the liquid transferred to the storage tanks, for this assessment, the activity was assumed to be released to the air. The activity was based on the reactor and reactor component smears, approximate internal surface area of the reactor vessel, the sodium estimated to remain in the reactor vessel, excluding the rotating plug, per the Retirement Report, and the sodium activity concentration from Section 4.1 increased by a factor of one hundred. The sodium estimated in the rotating plug was not included, since the graphite blocks and sodium surrounding them in the plug have been removed. The factor of one hundred increase assumed for sodium activity concentration covers both uncertainties in the amount of sodium and sodium activity concentration. Other than the amount of activity released, assumptions are the same as for the airborne release from sodium accident. Since the scenario is non-mechanistic, and no credit is taken for retention by building walls or ventilation system filtration, the results are independent of the location of the activity when the postulated release occurs.

The potential maximum offsite dose at the EAB would have been 3.4 mrem CEDE if the activity assumed to be in the processing liquid was released to air and 17 mrem CEDE if conservatively all the contamination assumed to be deposited on reactor internal surfaces were to be released.

8.4.3 Discussion

The liquid waste tank rupture, Scenarios A and B, and the releases from the residual sodium resulted in concentration levels that were well below the MPC values in 10 CFR 20, Appendix B, Table II for releases to unrestricted areas. Even the conservative evaluations performed for the liquid waste tank rupture, processing liquid release, and sodium accident, including the reactor contamination release, resulted in doses below the 100 mrem limit to members of the public per year per 10 CFR 20.1301.

The doses associated with the liquid waste tank rupture Scenario B, were below the limits at which precautionary measures would be taken for an accident-type release. The doses associated with the fish and invertebrates were the result of the concentration factors and the models in Regulatory Guide 1.109. In this Scenario, the radioactive liquid is released to the aquifer and groundwater. The results were extremely conservative since no credit was assumed for:

- Dilution from the initial influx of water into the FARB.
- Removal of suspended particulates by filtering action of the soil and clay.
- Removal of ionic forms through adsorption by the soil and clay.

The 1875 day travel time to the shoreline of Lake Erie provides ample time to sink wells, follow the progress to the lake, and take remedial action should it become necessary.

8.5 ALTERNATIVES CONSIDERED

Once a nuclear facility has reached the end of its useful life, it must be placed in a condition such that there is no unreasonable risk from the decommissioned facility to the health and safety of the public. Several alternatives are available: DECON, ENTOMB, and SAFSTOR. The no action alternative is not viable for Fermi 1 since it is already in a decommissioned state. The three alternatives are discussed below.

8.5.1 DECON

DECON is defined as immediately removing all radioactive materials to levels which are considered acceptable to permit the property to be released for unrestricted use. DECON is the only one of the decommissioning alternatives which leads to termination of the facility license and release of the facility and site for unrestricted use shortly after cessation of facility operations. DECON would involve the removal or decontamination of all equipment, structures, and those portions of the facility containing radioactivity. Although the fuel was removed from the Fermi 1 site, the reactor vessel, its internals and most of the sodium piping remained after the initial decommissioning.

Clearing the Fermi 1 site for unrestricted use was considered of little environmental value since Fermi 1 lies within the site boundary of Fermi 2 and could not be used for other purposes. A major effort would have been involved in the complete removal of the reactor vessel and its internals and the sodium piping. Because of size and induced radioactivity, this would have required the removal and cutup into sections of some of the various piping and equipment and shipment in commercially available licensed shipping casks to an offsite licensed burial site. This was considered undesirable due to personnel exposure to additional radioactivity.

This alternative was not considered preferable since little or no improvement would be realized in personnel exposure, land use, aesthetics, or value. This option is no longer available since DECON's definition includes immediate removal of radioactive materials. Final removal of radioactive materials falls within the last stage of SAFSTOR once the facility is placed into the safe storage phase of SAFSTOR.

8.5.2 ENTOMB

ENTOMB means to encase and maintain property in a strong and structurally long-lived material (e.g., concrete) to assure retention until radioactivity decays to a level acceptable for releasing the facility for unrestricted use. ENTOMB is intended for use where the residual radioactivity will decay to levels permitting unrestricted release of the facility within a reasonable time period of continued structural integrity of the entombing structure; approximately 100 years is considered to be consistent with recommended EPA policy on institutional control reliance for radioactivity containment.

Primary considerations for retiring the reactor and primary system were: (1) removal of all core and blanket fuel, (2) removal of sodium, (3) gastight seal of the primary system, and (4) passivation and maintenance of the entire primary sodium system with carbon dioxide. The reactor vessel was sealed within the primary shield tank and the outlying components were sealed directly, using the Reactor Building as an isolation structure against personnel access to the primary system.

The primary system was filled with nitrogen to which CO_2 was added to reduce the residual sodium deposits to inactive solids. The system was then sealed and maintained at slightly positive inert gas pressure to prevent the entrance of water or moisture and to minimize dispersal of any remaining radioactive material.

To ENTOMB the Fermi 1 facility at the present time would not result in any enhancements over the present decommissioned status. The reactor and primary system, which contained the majority of the radioactivity, were removed.

In the mid-1980's the ENTOMB option was not considered advantageous due to the long lived Nickel-63 and Niobium-94 in the reactor vessel.

8.5.3 SAFSTOR

SAFSTOR is defined in the NRC "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities", NUREG-0586, August 1988, as those activities required to place and maintain a radioactive facility in such condition that the risk to safety is within acceptable bounds and that the facility can be safely stored and subsequently decontaminated to levels which permit release of the facility for unrestricted use. SAFSTOR consists of three phases: (1) a short period of preparation for safe storage; (2) a variable safe storage period of continuing care consisting of security, surveillance, and maintenance; and (3) a short period of final decontamination (deferred decontamination).

Fermi 1 was decommissioned according to the NRC (AEC) rules and directives in effect at the time (Phase 1) and was considered as being left in a decommissioned state or Phase 2 (SAFSTOR). In accordance with the definition, Fermi 1 was maintained in SAFSTOR and a Preliminary Final Decommissioning Plan was prepared and submitted to the NRC (Reference 16).

In November 2000, the NRC was notified that radiological decommissioning activities were being resumed at Fermi 1 and the last phase of SAFSTOR, deferred decontamination, was being initiated (Reference 19). A License Termination Plan was submitted to the NRC in Reference 20 in accordance with 10 CFR 50.82. Detroit Edison notified the NRC in August 2011 (Reference 21) of the decision to return to passive SAFSTOR after specific decommissioning activities, including reactor removal, were completed.

8.6 CONCLUSIONS

SAFSTOR was determined to be the most viable decommissioning alternative for Fermi 1. The three phases provided a viable choice of activities that could be explored and selected in conjunction with evolving decommissioning and radioactive waste burial issues. DECON would result in little improvement over SAFSTOR, and ENTOMB was not a viable choice because of the presence of long-lived radioisotopes.

TABLE 8.1

DISTRIBUTION OF 2010 POPULATION IN EMERGENCY PLANNING ZONE RINGS AND SECTORS, MONROE AND WAYNE COUNTIES, MICHIGAN

	Ring (One-Mile)										
Sector	1	2	3	4	5	6	7	8	9	10	Total
A	0	273	308	185	277	282	1063	3588	5416	6746	22557
B	0	43	4	56	20	361	1068	1492	976	4798	8818
C	0	436	171	0	0	0	0	0	0	0	607
D	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0
H	0	0	0	0	0	0	0	0	0	0	0
J	0	807	35	0	0	0	0	0	0	0	842
K	17	708	0	0	0	0	0	0	0	0	725
L	0	272	0	0	617	2	0	322	95	1528	3127
M	0	97	809	2136	1632	1168	3287	10147	10892	9427	39990
N	0	78	283	286	333	867	1100	1600	1093	727	6463
P	24	0	63	52	195	3320	862	561	609	546	6239
Q	0	251	689	345	1073	318	1301	357	908	3740	9420
R	3	25	646	284	78	179	231	761	967	1114	4555
Total	24	2990	3008	3344	4225	6497	8912	18828	20956	28626	103343*

* Includes persons who live outside the ten mile boundary but are included in the EPZ for protective action decision implementation.

SECTION 9: REFERENCES

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7. "Decommissioned Enrico Fermi Unit 1 Reactor and Associated Building and Equipment, Administrative and Surveillance Procedures", Revision 1, July 1980.

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10. Detroit Edison Letter, NE-85-0714, dated May 17, 1985.

11. Detroit Edison Letter, VP-86-0092, dated July 23, 1986.

12. Detroit Edison Letter, VP-86-0118, dated September 15, 1986.

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23. ORISE Revised Final Report No. 2: Independent Confirmatory Survey Summary and Results for the Enrico Fermi Atomic Power Plant, Unit 1, Newport, Michigan (Docket No. 50-16, RFTA 10-004) DCN 2018-SR-02-1, dated October 27, 2011.