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DESIGN FEATURES

## 5.0 DESIGN FEATURES

### 5.1 SITE (LOCATION)

~~EXCLUSION AREA~~

The Davis-Besse Nuclear Power Station, Unit Number 1, site is located on Lake Erie in Ottawa County, Ohio, approximately six miles northeast from Oak Harbor, Ohio and 21 miles east from Toledo, Ohio. The exclusion area boundary has a minimum radius of 2400 feet from the center of the plant.

~~5.1.1 The exclusion area is shown on Figure 5.1-1.~~

~~LOW POPULATION ZONE~~

~~5.1.2 The low population zone is shown on Figure 5.1-2.~~

~~SITE BOUNDARY~~

~~5.1.3 The UNRESTRICTED AREA and SITE BOUNDARY for radioactive liquid effluents is shown on Figure 5.1-3. The UNRESTRICTED AREA and SITE BOUNDARY for radioactive gaseous effluents is shown on Figure 5.1-4.~~

### 5.2 ~~CONTAINMENT~~ Deleted

CONFIGURATION

5.2.1 The containment structure is comprised of a steel containment vessel, having the shape of a right circular cylinder with a hemispherical dome and ellipisodal bottom, surrounded by a reinforced concrete shield building.

5.2.1.1 CONTAINMENT VESSEL

a. Nominal inside diameter = 130 feet.

b. Nominal inside height = 285.5 feet.

c. Net free volume = $2.834 \times 10^6$ cubic feet.

d. Nominal thickness of vessel walls - 1 1/2 inches.

e. Nominal thickness of vessel dome - 13/16 inches.

f. Nominal thickness of vessel bottom - 1 1/2 inches.

5.2.1.2 SHIELD BUILDING

a. Minimum annular space = 4.5 feet.
b. Annulus nominal volume = 678,700 cubic feet.
c. Nominal outside height (measured from top of foundation base to the top of the dome) = 279.5 feet.
d. Nominal inside diameter = 139.25 feet.
e. Cylinder wall minimum thickness = 2.5 feet.
f. Dome minimum thickness = 2.0 feet.
g. Dome inside radius = 125.29 feet.

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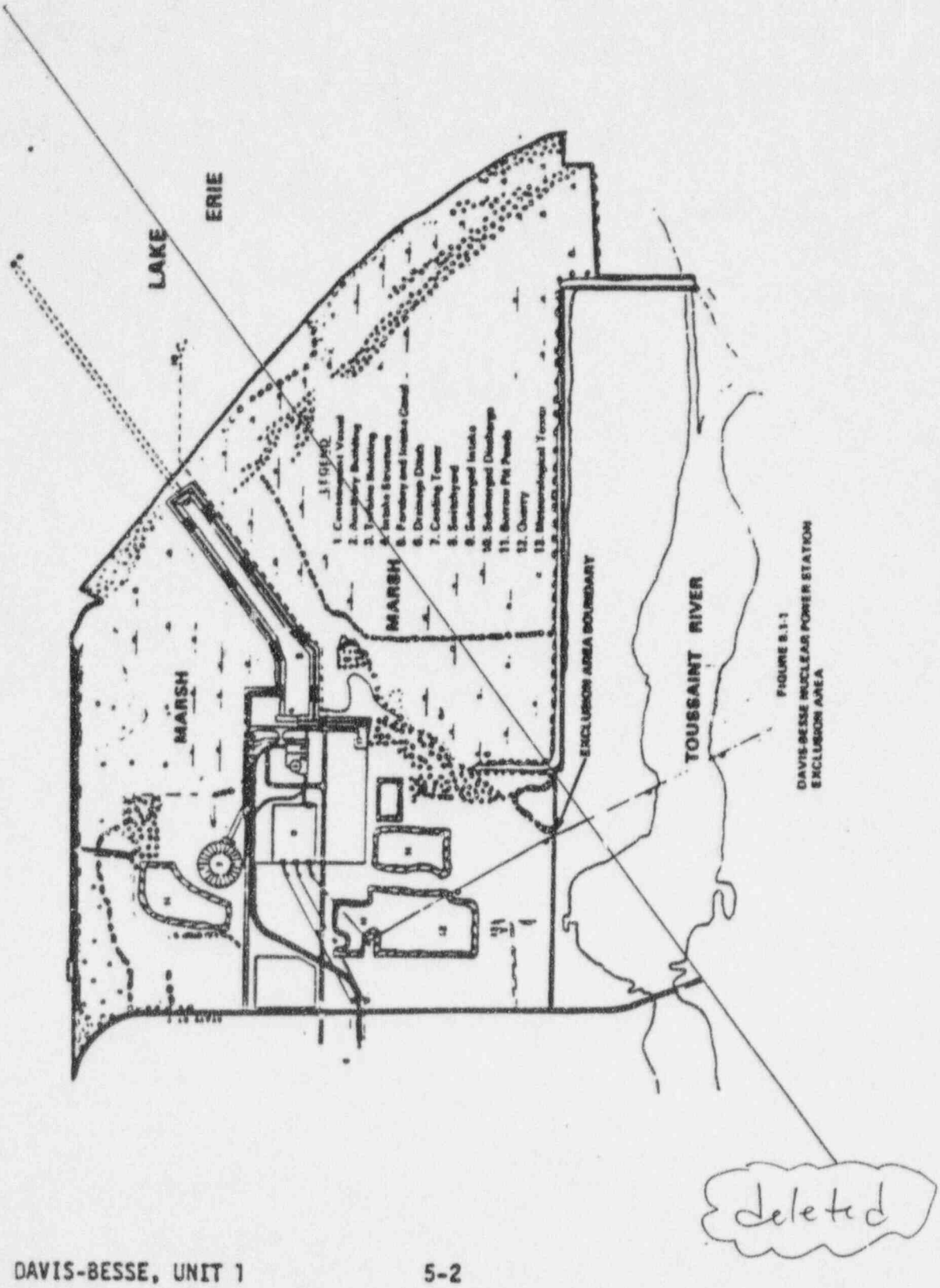
LAKE ERIE
MARSH
MARSH
TOUSSAINT RIVER
EXCLUSION AREA BOUNDARY
DAVIS-BESSE NUCLEAR POWER STATION
EXCLUSION AREA

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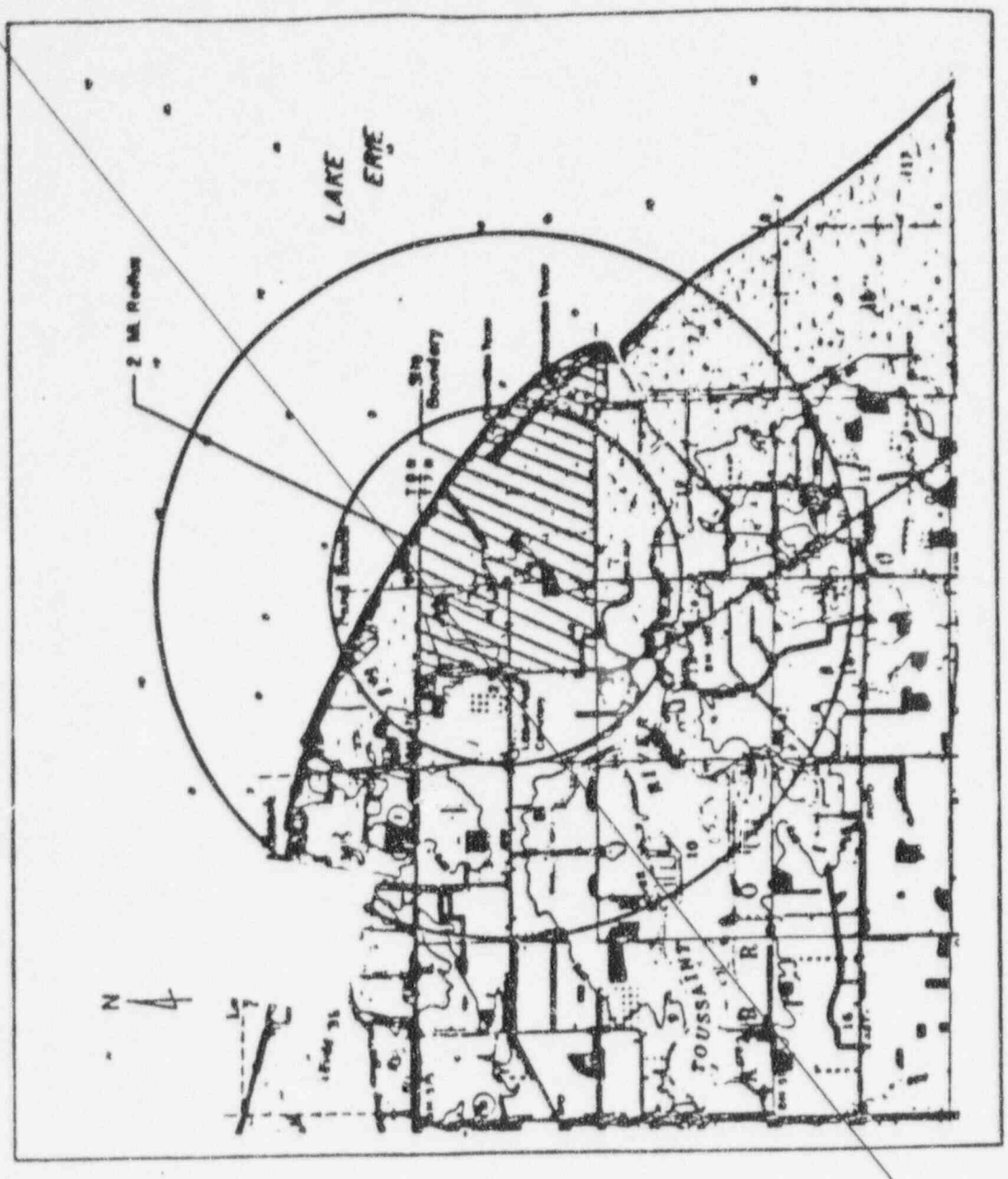


DAVIS-BESSE NUCLEAR POWER STATION
LOW POPULATION ZONE
FIGURE 5.1-2

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~~DESIGN PRESSURE AND TEMPERATURE~~

~~5.2.2 The reactor containment building is designed and shall be maintained for a maximum internal pressure of 40 psig and a temperature of 264°F.~~

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 177 fuel assemblies. Each assembly shall consist of a matrix of zircaloy or ZIRLO clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide ($UO_2$) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with ~~NRC~~ approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in non-limiting core regions.

CONTROL RODS

5.3.2 The reactor core shall contain 53 safety and regulating control rod assemblies ~~(which may be either standard or extended life control rod assemblies)~~ and 8 axial power shaping rod (APSR) assemblies. ~~Standard control rods shall contain a nominal 134 inches of absorber material. The extended life control rods shall contain a nominal 139 inches of absorber material.~~ The nominal values of absorber material for the safety and regulating control rods shall be 80 percent silver, 15 percent indium, and 5 percent cadmium. ~~Standard control rods and APSRs shall be clad with stainless steel tubing. The extended life control rods shall be clad with Inconel. The APSRs shall contain a nominal 63 inches of absorber material at their lower ends.~~ The absorber material for the APSRs shall be 100 percent Inconel.

5.4 ~~REACTOR COOLANT SYSTEM~~ Deleted

~~DESIGN PRESSURE AND TEMPERATURE~~

~~5.4.1 The reactor coolant system is designed and shall be maintained:~~

~~a. In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to applicable Surveillance Requirements.~~

~~b. For a pressure of 2500 psig, and~~

~~c. For a temperature of 650°F, except for the pressurizer and pressurizer surge line which is 670°F.~~

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DESIGN FEATURES

~~VOLUME~~

~~5.4.2 The total water and steam volume of the reactor coolant system is 12,110 ± 200 cubic feet at a nominal $T_{avg}$ of 525°F.~~

5.5 ~~METEOROLOGICAL TOWER LOCATION~~ Deleted

~~5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.~~

5.6 FUEL STORAGE

CRITICALITY 5.6.1

5.6.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. A $K_{eff}$ equivalent to less than or equal to 0.95 when flooded with unborated water, which includes a conservative allowance of 1% delta k/k for calculation uncertainty.

b. A rectangular array of stainless steel cells spaced 12 31/32 inches on centers in one direction and 13 3/16 inches on centers in the other direction. Fuel assemblies stored in the spent fuel pool shall be placed in a stainless steel cell of 0.125 inches nominal thickness or in a failed fuel container.

c. Fuel assemblies stored in the spent fuel pool in accordance with Technical Specification 3.9.13.

5.6.1.2 The new fuel storage racks are designed and shall be maintained with:

a. A $K_{eff}$ equivalent to less than or equal to 0.95 when flooded with unborated water, which includes a conservative allowance of 1% delta k/k for uncertainties as described in Section 9.1 of the USAR.

b. A $K_{eff}$ equivalent to less than or equal to 0.98 when immersed in a hydrogenous "mist" of such a density that provides optimum moderation (i.e., highest value of $K_{eff}$), which includes a conservative allowance of 1% delta k/k for uncertainties as described in Section 9.1 of the USAR.

c. A nominal 21 inch center-to-center distance between fuel assemblies placed in the storage racks.

d. Fuel assemblies having a maximum initial enrichment of 5.0 weight percent uranium-235.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below 9 feet above the top of the fuel storage racks.

CAPACITY

5.6.3 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 735 fuel assemblies.

5.7 ~~COMPONENT CYCLIC OR TRANSIENT LIMIT~~ Deleted

~~5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limit of Table 5.7-1.~~

TABLE 5.7-1

COMPONENT CYCLIC OR TRANSIENT LIMITS

| Component or System | Cycle or Transient Limit | Design Cycle or Trans |
|---|---|---|
| 1. Reactor Coolant System | 240 Heatup and Cooldown Cycles | 70°F to 557°F<br>557°F to 70°F |
| 2. Reactor Coolant System | 160 Step Load Reduction Cycles (Resulting from turbine trip) | 100% to 8% RTP* |
| 3. Reactor Coolant System | 150 Step Load Reduction Cycles (Resulting from electrical load rejection) | 100% to 8% RTP* |
| 4. Reactor Coolant System | 40 Reactor Trip Cycles (Resulting from loss of electric power to all RC pumps) | Reactor Trip |
| 5. Reactor Coolant System | 160 Reactor Trip Cycles (Resulting from turbine trip without automatic control action) | Reactor Trip |
| 6. Reactor Coolant System | 40 Reactor Trip Cycles (Resulting from rod withdrawal accident) | Reactor Trip |
| 7. Once Through Steam Generator | 88 Reactor Trip Cycles (Resulting from complete loss of all main feedwater) | Reactor Trip |
| 8. Once Through Steam Generator | 40 Reactor Trip Cycles (Resulting from loss of station power) | Reactor Trip |
| 9. Once Through Steam Generator | 20 Reactor Trip Cycles (Resulting from loss of feedwater to one steam generator) | Reactor Trip |

*RATED THERMAL POWER

Deleted

TABLE 5.7-1 (Continued)

| Component or System | Cycle or Transient Limit | Design Cycle or Transient |
|---|---|---|
| 10. Once Through Steam Generator | 10 Reactor Trip Cycles (Resulting from stuck open turbine bypass valve) | Reactor Trip |
| 11. Reactor Coolant System | 40 Rapid Depressurization | 2200 psig to 300 psig in one hour |
| 12. Reactor Coolant System | 20 Change of Flow Cycles | Loss of one or more RC pumps |
| 13. Reactor Coolant System | 20 Hydrostatic Test | Pressurized to ≥ 3125 psig |
| 14. Once Through Steam Generator | 35 Hydrostatic Tests | Pressurized to ≥ 1312.5 psig |
| 15. Reactor Coolant System | 40 Test Transients | High Pressure Injection Test |
| 16. Reactor Coolant System | 240 Test Transients | Core Flooding Check Valve Test |

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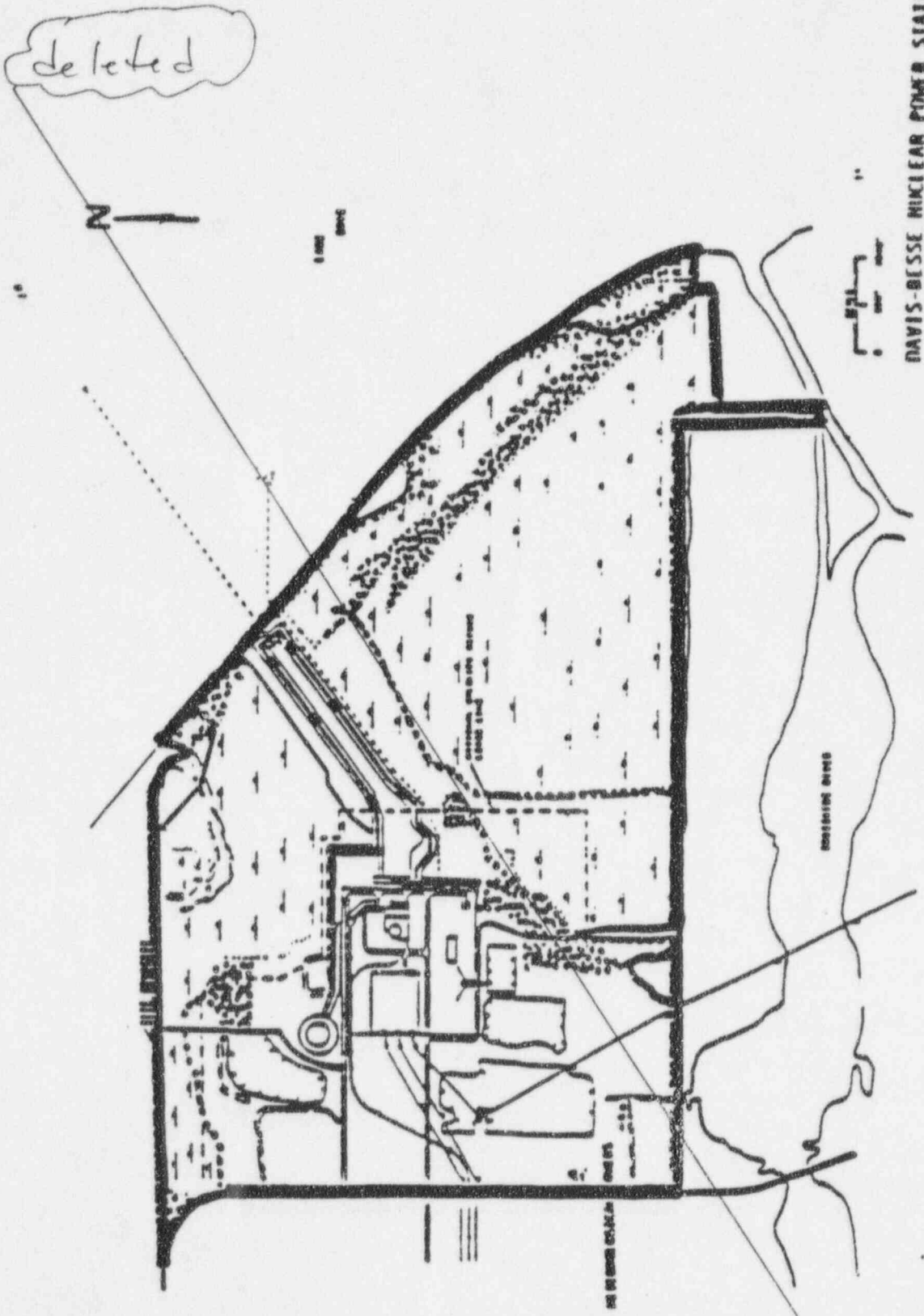
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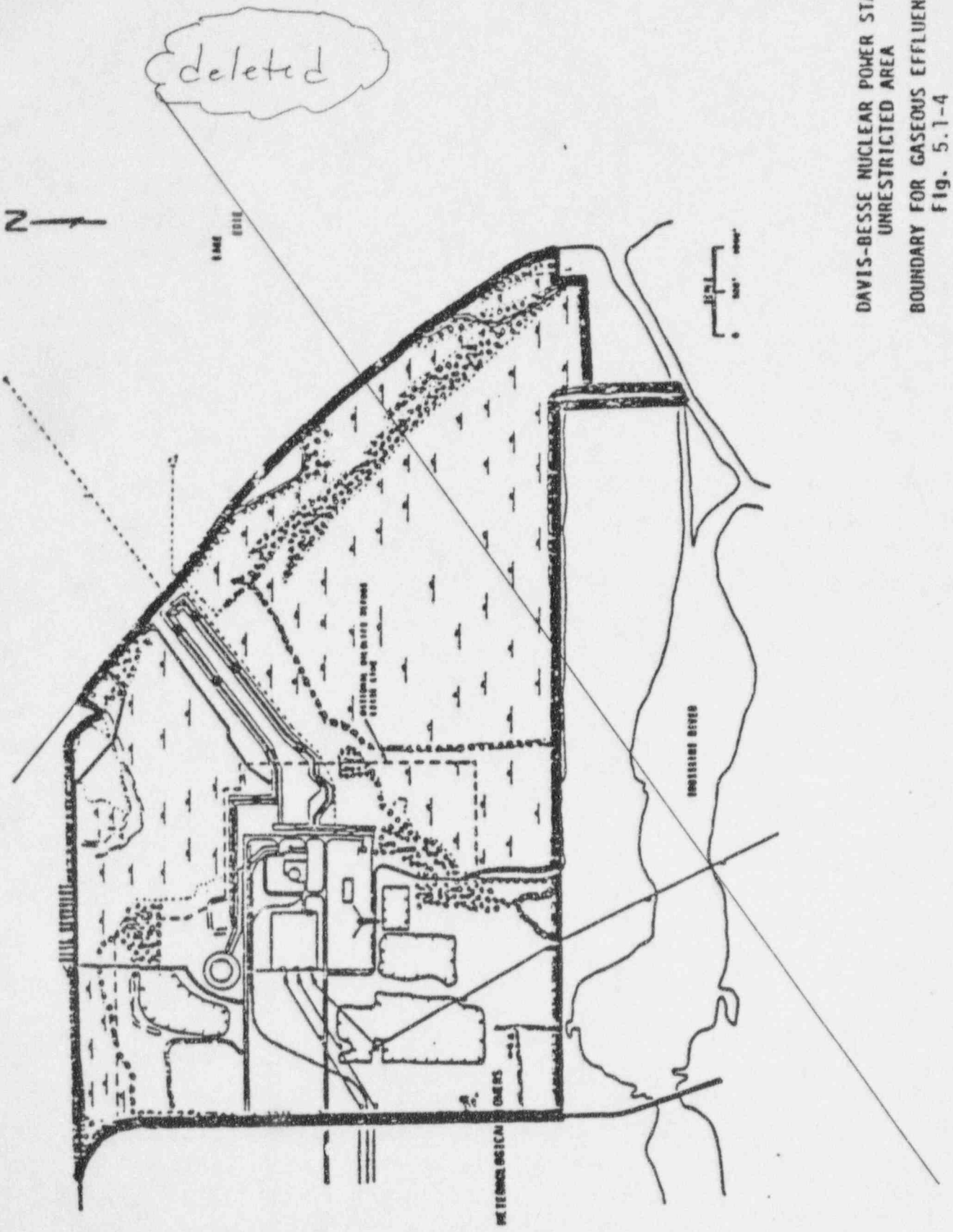
DAVIS-BESSE NUCLEAR POWER STATION
UNRESTRICTED AREA
BOUNDARY FOR LIQUID EFFLUENTS




DAVIS-BESSE NUCLEAR POWER STATION
UNRESTRICTED AREA
BOUNDARY FOR GASEOUS EFFLUENTS
Fig. 5.1-4

Proposed

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and

Technical Specification 5.0

Pages 5-1 and 5-2



INDEX

5.0 DESIGN FEATURES

5.1 Site Location

The Davis-Besse Nuclear Power Station, Unit Number 1, site is located on Lake Erie in Ottawa County, Ohio, approximately six miles northeast from Oak Harbor, Ohio and 21 miles east from Toledo, Ohio. The exclusion area boundary has a minimum radius of 2400 feet from the center of the plant.

5.2 (Deleted)

5.3 Reactor Core

5.3.1 Fuel Assemblies

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5.4 (Deleted)

5.5 (Deleted)

5.6 Fuel Storage

5.6.1 Criticality

5.6.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. A $K_{eff}$ equivalent to less than or equal to 0.95 when flooded with unborated water, which includes a conservative allowance of 1% delta k/k for calculation uncertainty.

(continued)





5.0 DESIGN FEATURES

5.6 Fuel Storage (continued)

b. A rectangular array of stainless steel cells spaced 12 31/32 inches on centers in one direction and 13 3/16 inches on centers in the other direction. Fuel assemblies stored in the spent fuel pool shall be placed in a stainless steel cell of 0.125 inches nominal thickness or in a failed fuel container.

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5.6.2 Drainage

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5.6.3 Capacity

The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 735 fuel assemblies.

5.7 (Deleted)