# 1981 ENVIRONMENTAL MONITORING REPORT

PALISADES NUCLEAR PLANT

CONSUMERS POWER COMPANY

A. RADIOLOGICAL

1. Introduction

The data obtained by analysis of samples, taken during 1981, has been evaluated to determine if any increases in radioactivity levels in the environment are attributable to plant operation. A summary of the data is presented in Table A-1. Figure A-1 and Table A-2 provide the locations of the sampling stations. Statistical analyses of the data show that there has been no detectable increase in radioactivity levels of environmental media that can be attributed to plant effluents.

2. Discussion and Interpretation of Results

(a) Air Samples

Statistical analyses (at $p < 0.05$) of the air particulate sampling results do not indicate a significant difference in gross beta concentrations between the indicator and background stations, with the exception that some of the background stations being higher than the indicator station.

No significant iodine-131 activity was observed above the minimum detectable level. This is consistent with expected results based on actual plant effluents and site meteorology.

(b) Lake Water

Although statistical analyses for the total year do not indicate significant differences for tritium in plant discharge vs intake samples, data for the months of September and November do indicate higher tritium levels in discharge samples for those same months. Measured releases, based on samples taken from tanks prior to release for these months indicated release of 80.75 Ci tritium in September and 58.3 Ci tritium in November. These amounts account for the observed concentrations in discharge samples to within 30%. In addition, gross beta in discharge during the second half of 1981 was statistically higher (by approximately 30%) than inlet samples. This observation is consistent with the quantities of radioactivity actually released during this interval.

(c) Drinking Water

Monthly composite samples of treated and untreated South Haven municipal water indicate only background activity. Gross beta activity ranged from less than 1 to 5 pCi/ℓ. Tritium activity (treated water only) ranged from 240 to 700 pCi/ℓ.

(d) Well Water

Monthly grab samples of three sampling locations showed concentrations ranging from 1 pCi/ℓ to 9 pCi/ℓ. The gross beta concentrations at location SP was statistically higher than the other two locations at $p < 0.05$, however, when SP is compared with previous years' results, no significant difference is identified.

(e) Milk

Strontium-90 and Cesium-137 were the only radionuclides detectable in milk samples collected during the year. Concentrations of these two isotopes are consistent with concurrent background. Although one milk location was statistically higher than the others at $p < 0.05$ for Sr-90, the mean level in milk for that location was not higher than the mean for all other locations. In this case, the paired t test used for the statistical evaluation was influenced primarily by the tightness of the distribution of values about the mean at this location and a similar distribution about the lower mean observed at the control location. The Chinese nuclear detonation # 25 in late 1980 is considered to be the cause of the statistical fluctuations observed in this instance.

(f) Sediment and Crops

Radioactivity in lake bottom sediment and crop samples collected throughout the year is consistent with previous years' data.

(g) Gamma Dose

Thermoluminescent dosimeters are used to monitor the levels of gamma radiation in the vicinity of the site. Two time intervals indicated significant differences in radiation levels between indicator and control locations. The differences occurred in January and June, 1981, but were caused by background stations which indicated dose rates lower than shielded controls. Therefore, it appears that variation in background levels, rather than enhancement of indicator location radiation levels, were responsible for the sample population differences.

3. Sampling Summary

For each media sampled, Table A-3 lists the sampling locations and the total number of samples collected. A listing of the highest, lowest and average concentrations for the sampling location with the highest average concentration is presented in Table A-4.

4. Environmental Dose Estimates

Levels of radioactive materials in environmental media do not indicate the likelihood of public exposure in excess of 5% of those that would result from continuous exposure to the concentration values listed in Appendix B, Table II, 10CFR20.

TABLE A-1

Environmental Radiological Monitoring Program Summary
Palisades Nuclear Plant, Docket DPR-20
Van Buren County, Michigan, January 1, 1980 to December 31, 1980

| Medium or Pathway Sampled (Unit of Measurement) | Analysis and Total Number of Analyses Performed | | Lower Limit of Detection(a) LLD | All Indicator Locations Mean(b) Range(b) | Location With Highest Annual Mean Name Distance & Direction | Mean(b) Range(b) | All Control Locations Mean(b) Range(b) | Nonroutine Reported Measurements(c) |
|---|---|---|---|---|---|---|---|---|
| Air (pCi/m³) | Gross Beta | 616 | 0.01 | .13 (462/464) (.01-.51) | GR (55 Mi NNE) | .16 (51/52) (.04-.61) | .15 (150/152) (.02-.66) | None |
| | I-131 | 616 | 0.02 | <LLD | - | | <LLD | None |
| Lake Water (pCi/l) | Gross Alpha | 24 | 1.0 | 0.9 (5/12) (0.7-1.0) | Plant Intake | 1.2 (5/12) (0.9-2.0) | 1.2 (5/12) (0.9-2.0) | None |
| | Gross Beta | 24 | 1.0 | 3.5 (12/12) (2-5) | Plant Discharge | 3.5 (12/12) (2-5) | 2.4 (12/12) (2-3) | None |
| | Tritium(e) | 24 | 100.0 | 10,650 (10/12) (220-66,000) | Plant Discharge | 10,650 (12/12) (220-66,000) | 378 (10/12) (100-800) | None |
| Drinking Water (pCi/l) | Gross Beta | 24 | 1.0 | 2.95 (20/24) (2-5) | S Haven Treated 5 Miles N | 3.1 (10/12) (2-5) | None | None |
| | Tritium | 12 | 100.0 | 382 (10/12) (240-700) | S Haven Treated 5 Miles N | 382 (10/12) (240-700) | None | None |
| Well Water (pCi/l) | Gross Beta | 36 | 1.0 | 3.1 (25/36) (1-9) | State Park 1 Mile N | 4.7 (10/12) (2-9) | None | None |
| Milk (pCi/l) | I-131 | 34 | .5 | <LLD | - | - | <LLD | None |
| | Sr-89 | 34 | 5.0 | <LLD | - | - | <LLD | None |
| | Sr-90 | 34 | 1.0 | 4.9 (30/33) (1-18) | GM (5 Miles SE) | 7.7 (9/9) (2-18) | 5.0 (1/1) (5-0) | None |
| | Cs-137 | 34 | 1.0 | 5.1 (23/33) (2-12) | GM (5 Miles SE) | 7.1 (8/9) (2-12) | <LLD | None |
| | Other | 34 | 1.0 | <LLD | - | - | <LLD | None |
| Gamma Exposure(d) (mR/Month) | TLD (Monthly) | 260 | 1.0 | 11.3 (224/226) (1.9-33.5) | GM (5 Miles SE) | 12.7 (12/12) (3.9-33.5) | 11.3 (36/36) (4.9-24.1) | None |
| (mR/Quarter) | TLD (Quarterly) | 85 | 1.0 | 16.0 (73/73) (7.8-34.4) | PR (3 Miles E) | 20.2 (4/4) (14.6-27.6) | 16.7 (12/12) (12.0-25.7) | None |
| Crops (pCi/g Wet) | Gross Beta | 17 | 1.0 | 1.6 (16/17) (0.9-2.7) | JS 3.5 Miles ESE | 1.8 (9/9) (1.0-2.7) | None | None |
| | Sr-89 | 17 | 0.025 | <LLD | - | - | None | None |
| | Sr-90 | 17 | 0.005 | 0.025 (12/17) (0.006-0.053) | PR (3 Miles E) | 0.036 (2/4) (0.019-0.053) | None | None |
| | Cs-137 | 17 | 0.08 | 0.08 (1/17) (0.08-0.08) | PR (3 Miles E) | 0.08 (1-17) (0.08-0.08) | None | None |
| | Other Gamma | 17 | 0.1 | <LLD | - | - | None | None |

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| Medium or Pathway Sampled (Unit of Measurement) | Analysis and Total Number of Analyses Performed | | Lower Limit of Detection(a) LLD | All Indicator Locations Mean(b) Range(b) | Location With Highest Annual Mean Name, Distance & Direction | Mean(b) Range(b) | All Control Locations Mean (b) Range (b) | Nonroutine Reported Measurements(c) |
|---|---|---|---|---|---|---|---|---|
| Sediment (pCi/g Dry) | Gross Beta | 8 | 1.0 | 4.3 (4/6) (2-8) | ½ Mi N of Disch | 8.0 (1/2) (8-0) | 2 (1/2) (2.0-2.0) | None |
| | Sr-89 | 8 | 0.025 | <LLD | - | - | <LLD | None |
| | Sr-90 | 8 | 0.005(f) | .007 (1/6) (.007-.007) | ½ Mi N of Disch | .007 (1/6) (.007-.007) | 0.07 (1/2) (0.07-0.07) | None |
| | Cs-137 | 8 | 0.08 | .09 (1/6) (0.09-0.09) | Plant Discharge | .009 (1/2) (0.09-0.09) | <LLD | None |
| | Other Gamma | 8 | 0.1 | <LLD | - | - | <LLD | None |

(a)Nominal lower limit of detection (LLD) as defined in HASL-300 (Rev 8/73), Pages D-08-01, 02 and 03.

(b)Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses.

(c)Nonroutine reported measurements are defined in the Palisades Technical Specifications, Section 6.9.3.2.

(d)Includes transit dose which averages approximately 6.4 mR per round trip.

(e)See Paragraph 2b.

(f)A few samples had LLD 0.005 due to low chemical yield.

TABLE A-2

Sampling Locations
Palisades Nuclear Plant

| Station | Code | Location | Sample | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Air Particulates | Air Iodine | Lake Water | Well Water | Milk | Crops | Sediment | TLD |
| 1 | ST | Palisades Nuclear Plant | X | X | X | X | | | X | X |
| 2 | TH | Tower Hill Farms<br>RR 3, Coloma, Michigan<br>5 Miles SSE | X | X | | | | X | | X |
| 3 | GM | Glenn Miller<br>RR 1, Covert, Michigan<br>5 Miles SE | X | X | | | X | X | | X |
| 4 | JS | Jerry Sarno<br>RR 1, Covert, Michigan<br>3-1/2 Miles ESE | X | X | | | | X | | X |
| 5 | PR | Paul Rude<br>RR 1, Covert, Michigan<br>3 Miles E | X | X | | | | X | | X |
| 6 | RB | Richard Bus<br>RR 3, South Haven, MI<br>4-3/4 Miles NE | X | X | | | | X | | X |
| 7 | SD | Sherman Dairy<br>South Haven, Michigan<br>7-1/2 Miles NNE | X | X | | | | | | X |
| 7A | SDF | Sherman Dairy Farm<br>South Haven, Michigan<br>8 Miles NNE | | | | | X | | | |
| 8 | SP | State Park, 1 Mile N | X | X | | X | | | | X |
| 9 | TP | Covert Township Park<br>1-1/2 Miles S | X | X | | X | | | | X |
| 10 | GR | Grand Rapids, Michigan<br>55 Miles NNE | X | X | | | | | | X |
| 11 | KZ | Kalamazoo, Michigan<br>35 Miles E | X | X | | | | | | X |
| 12 | DG | Dowagiac, Michigan<br>30 Miles SSE | X | X | | | | | | X |
| | SH | South Haven, Michigan | | | X | | | X | | |
| | AK | 5 miles N<br>Alan Karr<br>RR 2, Covert, Michigan<br>5-1/2 Miles ESE | | | | | X | | | |

TABLE A-3

PALISADES NUCLEAR PLANT
JANUARY 1, 1981 TO DECEMBER 31, 1981
SAMPLING AND ANALYSIS SUMMARY

| Medium | Description | Location | Number of Samples Collected | Type of Analysis | Frequency of Analysis |
|---|---|---|---|---|---|
| Air | Continuous at Approx 1 CFM | All | 616 | Gross Beta, I-131 | Weekly |
| Lake Water | 1 Gallon Composite | Intake, Discharge | 24 | Gross Beta, Gross Alpha, Tritium | Monthly |
| Drinking Water | 1 Gallon Composite | South Haven | 24 | Gross Beta, Tritium | Monthly |
| Well Water | 1 Gallon Grab | Site, TP, SP | 36 | Gross Beta | Monthly |
| Milk | 1 Gallon Grab | SDF, GM, AK | 34 | I-131, Sr-89 and Sr-90, Cs-137 Isotopic | Monthly |
| Gamma Dose | Continuous | All | 262<br>85 | TLD Dose | Monthly<br>Quarterly |
| Crops | Grab | JS, PR, RB | 17 | Gross Beta, Isotopic, SR-89 and SR-90, CS-137 | When Available |
| Sediment | Grab | Discharge, N & S Site Boundary 5 Miles North | 8 | Gross Beta, Isotopic, Sr-89 and Sr-90, CS-137 | When Available |

TABLE A-4

High, Low and Average Concentrations for Highest Average Sampling Location
Palisades Nuclear Plant
January 1, 1980 to December 31, 1980

| Medium | Type of Analysis(1) | Location | High | Low | Average(6) |
|---|---|---|---|---|---|
| Air | Gross Beta | GR (55 Mi NNE) | .61 pCi/m³ | .04 pCi/m³ | 24.4 pCi/m³ |
| | I-131 | All | <LLD | <LLD | <LLD |
| Lake Water | Gross Beta | Plant Discharge | 5 pCi/l | 2 pCi/l | 3.5 pCi/l |
| | Gross Alpha | Plant Intake | 2.0 pCi/l | <LLD | 1.2 pCi/l(2) |
| | Tritium | Plant Intake | 66,000 pCi/l | 220 pCi/l | 10,650 pCi/l |
| Drinking Water | Gross Beta | South Haven Raw | 5 pCi/l | <LLD | 3.1 pCi/l |
| | Tritium(5) | South Haven Treated | 700 pCi/l | <LLD | 382 pCi/l |
| Well Water | Gross Beta | State Park | 9 pCi/l | <LLD | 4.7 pCi/l |
| Milk | I-131 | All | <LLD | <LLD | <LLD |
| | Sr-89 | All | <LLD | <LLD | <LLD |
| | Sr-90 | GM (5 Mi SE) | 18 pCi/l | 2 pCi/l | 7.7 pCi/l |
| | Cs-137 | GM (5 Mi SE) | 12 pCi/l | <1 pCi/l(8) | 7.1 pCi/l |
| | Other Gamma | All | <LLD | <LLD | <LLD |
| Gamma Dose(7) | TLD (Monthly) | GM (5 Mi SE) | 33.5 mR/Mo | 3.9 mR/Mo | 12.7 mR/Mo |
| | TLD (Quarterly) | PR (3 Mi E) | 27.6 mR/Qtr | 14.6 mR/Qtr | 17.7 mR/Qtr |
| Crops(3) | Gross Beta | JS (3.5 Mi ESE) | 2.7 pCi/g | 1.0 pCi/g | 1.8 pCi/g |
| | Sr-89 | All | <LLD | <LLD | <LLD |
| | Sr-90 | PR (3 Mi E) | 0.053 pCi/g | <LLD | 0.08 pCi/g |
| | Cs-137 | PR (3 Mi E) | 0.08 pCi/g | <LLD | 0.036 pCi/g |
| | Other Gamma | All | <LLD | <LLD | <LLD |
| Sediment(4) | Gross Beta | ½ Mi N of Discharge | 8 pCi/g | <LLD | 8 pCi/g |
| | Sr-89 | All | <LLD | <LLD | <LLD |
| | Sr-90 | ½ Mi N of Discharge | 0.007 pCi/g | <LLD | 0.007 pCi/g |
| | Cs-137 | E (Plant Discharge) | 0.09 pCi/g | <LLD | 0.08 pCi/g |
| | Other Gamma | All | <LLD | <LLD | <LLD |

(1)Minimum detectable level (MDL) = air, gross beta 0.01 pCi/m³, I-131 0.02 pCi/m³; water, gross beta 1.0 pCi/l, gross alpha 1.0 pCi/l, H-3 100 pCi/l; milk, I-131 0.5 pCi/l, Sr-89 5.0 pCi/l, gamma isotopic 1.0 pCi/l; crops and sediment, gross beta 1.0 pCi/g, Sr-89 0.025 pCi/g, Sr-90 0.00[illegible] pCi/g, gamma isotopic 0.05 pCi/g; some samples may have higher MDLs due to sample size, shipping delays or statistical phenomena.

(2)Numerous samples contained less than LLD; therefore, this average may not be meaningful.

(3)Samples collected monthly in season.

(4)Two samples per location.

(5)Tritium analysis performed on South Haven treated only.

(6)Only samples greater than LLD included in average.

(7)Includes transit dose which averages approximately 6.4 mR/round trip.

(8)Lower sensitivity due to low chemical yield.

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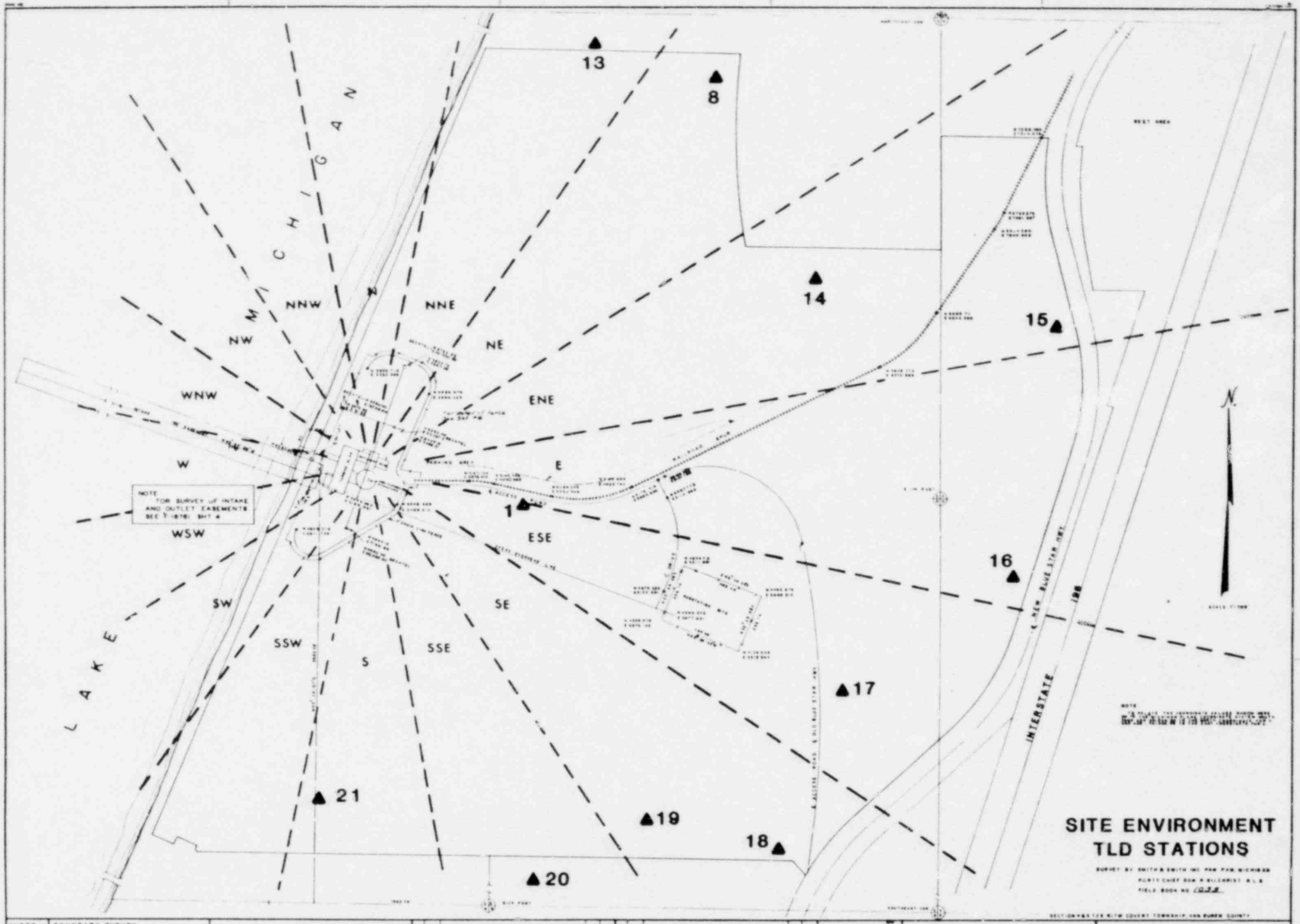
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NOTE
FOR SURVEY OF INTAKE AND OUTLET EASEMENTS SEE T-1676 SHT 4
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SURVEY BY SMITH & SMITH INC FOR PAR MICHIGAN
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JACKSON, MICHIGAN
PALISADES PLANT
SITE DEVELOPMENT
1" = 800'
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