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June 17, 1982

Mr. Paul O'Connor  
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U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Subject: Dresden Station Unit 2  
SEP Topic: II-1.C, Potential Hazards Due  
to Nearby Industrial, Transportation, &  
Military Facilities

NRC Docket 50-237

Reference: (a) T.J. Rausch letter to P. O'Connor dated  
December 8, 1981; Subject: Final  
Commitments on SEP Reductions

Mr. O'Connor:

Reference (a) provided a first draft Safety Assessment Report (SAR) on the above topic with assessments for 12 types of design basis hazards excluding the effects of hazards from industrial facilities and aircraft pending additional information. Enclosed is Attachment 1 which provides the final Safety Assessment Report of all 12 potential design basis hazards including the assessments of hazards due to industrial facilities and aircraft.

To address hazard type 1, Industrial Facilities, companies within 5 miles of the Dresden Station had to be contacted for information. There are 18 industrial companies. Four of these companies were not contacted because their function precludes them from consideration as a source of hazard. Of the remaining 14, one because it is a new facility of Exxon Corporation could not be contacted for specific information; 2 companies did not respond to our questionnaire, and 11 provided the requested information. Item 1 of Table 1 is limited to data from these 11 companies.

Please address any questions you may have concerning this matter to this office.

A035

8206250255 820617  
PDR ADOCK 05000237  
P PDR

One (1) signed original and forty (40) copies of this transmittal have been provided for your use.

Very truly yours,



T.J Rausch  
Nuclear Licensing Administrator  
Boiling Water Reactors

SPP/ji  
2003D

Attachment

cc: RIII Resident Inspector, Dresden  
Gregg Cwalina, SEP Integrated  
Assessment Project Manager (w/attach.)

NRC Docket 50-237

Attachment 1

Final Draft Safety Assessment Report

SEP Topic II-1.C:

Potential Hazards Due to Nearby  
Industrial, Transportation, &  
Military Facilities

Dresden Nuclear Power Station - Unit 2  
Commonwealth Edison Company

June, 1982

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1. INTRODUCTION

The objective of this study is to identify and evaluate potential accidents which may occur at Dresden Station - Unit 2 as a result of activities at nearby industrial, transportation, and military facilities. The evaluation was performed in accordance with the guidelines of NRC Standard Review Plans (SRP's) 2.2.1-2.2.2, 2.2.3, and 3.5.1.6. Figure 1, which is based on Reference 2, shows the locations of these facilities in relation to the Dresden site.

Table 1 summarizes the assessments for 12 types of hazards posed by nearby industrial, transportation, and military facilities. It is determined that the potential effects of hazards 1 through 12 will not result in a design basis event for Dresden Unit 2.

There are 18 industrial companies within 5 miles of Dresden Station. The evaluation reported here for industrial facilities is limited to 11 of these 18 companies. Of the seven companies not considered in the evaluation, four were disregarded because their functions are not expected to involve explosive or flammable materials; two facilities did not respond to our request for information; and one is a new facility related to EXXON Corporation whose source of information could not be contacted.

## 2. HAZARDS FROM EXPLOSION

### 2.1 Industrial Facilities

Industries within five miles of the plant and the products they handle are listed in Table 2. Figure 1 shows the locations of a representative sample of industrial sites in the vicinity of Dresden. According to Reference 37, none of the industries listed in Table 1 is licensed to store or use solid explosives (TNT, dynamite, tetryl, etc.). Based on available information, the following industries process, store, or transport flammable and/or explosive substances:

- Reichhold Chemical Company
- Northern Illinois Gas Company
- ARMAK Chemicals
- Durkee SCM Chemicals
- Hydro-Carbon Transportation Incorporated
- Mobil Chemical Company
- Mobil Oil Corporation

Reichhold Chemical Company is located 1.6 miles west of the plant. The largest amount of flammable and/or explosive substances stored on-site is a 1.5 million gallon tank of benzene (Ref. 29). Benzene is transported to the site by barges with a maximum capacity of 400,000 gallons. Based on RG. 1.91, the safe standoff distance for a 400,000-gallon barge of benzene is 1.63 miles. Since the loading and unloading point of the plant is 1.6 miles from the Dresden site, and since hazards from transportation on waterways have been ruled out (see Section 3), it is concluded that the transportation of benzene to Reichhold Chemical Company does not pose a design basis hazard to the Dresden 2 station.

The safe standoff distance for the 1.5 million gallon tank of benzene at Reichhold Chemical is 2.5 miles, which exceeds the 1.6 mile separation distance. However, the tank is vented to prevent the formation of an explosive vapor-air mixture.

The Northern Illinois Gas Company plant near the Dresden site mainly produces supplemental natural gas (SNG) from petroleum products. According to Reference 8, the existing SNG plant is capable of producing four million cubic feet of gas per hour; however, the plant is virtually non-operational at this time.

ARMAK Industrial Chemical Division is located 3.6 miles from the plant. According to Reference 33, flammable and/or explosive materials are not stored or used in quantities of 100,000 gallons or more at the plant. Based on RG 1.91, the overpressure generated by the explosion of 100,000 gallons of any hydrocarbon is less than 1.0 psi at a distance of 3.6 miles. Therefore, this plant presents no hazard to Dresden Station.

The Durkee SCM facility located 3.2 miles northeast of the Dresden plant produces edible oil. Based on Reference 34, 1,000,000 cubic feet of liquid hydrogen is stored in a single tank at the Durkee site. Using a hydrogen equivalency factor of 5.9 to calculate the equivalent weight of TNT, it was found that the corresponding safe standoff distance for which the detonation overpressure does not exceed 1.0 psi is 2.6 miles. Since the distance between Durkee and Dresden is greater than 2.6 miles, the stored hydrogen does not present a hazard to the plant.

Hydro-Carbon Transportation, Inc. operates an aboveground propane storage/underground ethane storage facility four miles from the plant (Ref. 12). The propane tanks are equipped with 250 psi pressure relief valves; the maximum capacity of any tank is 90,000 gallons. Based on RG 1.91, it was found that the corresponding safe standoff distance for which the overpressure does not exceed 1.0 psi is 0.8 mile. Since the separation distance is greater than 0.8 mile, the propane storage facility does not present a hazard to plant safety.

The Mobil Chemical site stores styrene monomer; this is the only flammable material stored in large quantities. The largest amount of styrene monomer stored in a tank or transported in a barge is 1,200,000 gallons (Ref. 5). Present plans for expansion include the installation of a 3,000,000 gallon styrene tank on the site. Using the approach for hydrocarbons given in RG 1.91, it was found that the safe standoff distance for which the overpressure caused by the simultaneous detonation of 3,000,000 gallons of styrene will not exceed 1.0 psi is 3.23 miles. Since the site is 4.1 miles from the plant, an accidental explosion at the existing or expanded storage facility does not present a hazard to the plant.

Mobil Oil Company's refinery is located on Interstate 55 approximately 4.5 miles northeast of Dresden Station. Although the refinery stores various petroleum products typical of such a facility, Mobil Oil Company has stated that information on the types and quantities of products stored is confidential and may not be released to any party without the prior written consent of the company. However, based on the information provided informally by Mobil Oil, it is concluded that a sufficient separation distance (based on RG 1.91) exists for all petroleum products stored at the facility, with one exception. The standoff distance for this product slightly exceeds the available separation distance; however, the stored product has a high flash point, which eventually rules out the possibility of an explosion hazard from this source at a distance of 4.5 miles.

Data provided by the following industries indicate that they do not process, store, or transport flammable and/or explosive materials:

GE BWR Training Center & Spent Fuel Storage  
A. P. Green (Reference 30)  
Alumax Mill Products (Reference 32)  
Airco Industrial Gases (References 31)

Responses to our inquiries from these industries show that no solid explosives (TNT, dynamite, tetryl, etc.) are stored or used at their sites.

Responses to our request for information on flammable and/or explosive substances were not provided by the following two industries:

Northern Petrochemical Company  
(Northern Petrochemical Dock)  
Dow Chemical Company  
(Dow Chemical Dock)

The industries that responded to our request for information indicated that they have no plans for expansion, except for Mobil Chemical Company, whose expansion plans were described above and found to pose no hazard to plant safety.

It has also been determined that EXXON Corporation owns a facility located approximately 3.9 miles east northeast of Dresden Station. However, it has not been possible to establish the function of this facility or the type of materials stored there at this time.

## 2.2 Highway Transportation

As shown in Figure 1, the major highways within five miles of the plant are Interstate 55, four miles east of the plant, and US Route 6, 1.9 miles north of the plant. The nearest secondary (country) road is Collins (or Goose Lake) Road, approximately 0.5 mile south of the plant. The heaviest traffic is on Interstate 55, with a 24-hour annual average of 13,700 cars (Ref. 1). Collins Road has only light traffic and would not be used by heavy trucks carrying explosive materials.

The worst event postulated according to RG 1.91 is the explosion of a truck carrying 40,000 lbs of TNT on the nearest road. It was found that the corresponding safe standoff distance for which blast overpressure does not exceed 1.0 psi is 1660 ft. Since the closest road is more than 1660 ft from the Category I structures of the plant, the transport of explosive materials on nearby roads does not present a hazard to plant safety.



### 2.3 Railway Transportation

There are three railroads within five miles of the plant. The Elgin, Joliet, & Eastern Railroad is approximately 1.5 miles west of and provides spur access to the plant. The Atchison, Topeka, & Santa Fe and the Gulf, Mobil, & Ohio Railroads are approximately 3.9 miles southeast of the plant and carry explosive materials to and from the Joliet Army Ammunition Plant. The Chicago, Rock Island, & Pacific Railroad is 3.7 miles northwest of the plant.

An accident postulated in RG 1.91 is the simultaneous explosion of three boxcar-loads of TNT (396,000 lbs) on the nearest railroad. It was found that the corresponding safe standoff distance for which blast overpressure will not exceed 1.0 psi is 0.63 mile. Since the nearest railroad is more than 0.63 mile from the Category I structures of the plant, the transport of explosive materials on nearby railroads does not present a hazard to plant safety.

### 2.4 Waterway Transportation

The major rivers within five miles of the plant are the Illinois River, the Des Plaines River, and the Kankakee River. The Kankakee River joins the DesPlaines River east of the plant to form the Illinois River, which extends along the north boundary of the site. The closest navigational channel is on the Illinois River, located approximately 0.5 mile north of the plant. The closest river lock is the Dresden Island Lock, approximately one mile northwest of the plant.

The river traffic passing by the site consists mainly of cargo barges. Based on Reference 6, no TNT is shipped on the Illinois River near the plant site. Reference 11 lists the commodities that passed through the Dresden Island Lock over a periods of six years. These consisted mainly of coal, petroleum, steel, sludge, and agricultural products. A review of the materials passing by the site area indicates that the worst event would be the explosion of an "empty" petroleum barge (one containing the vapors of the previous cargo) on the river 0.5 miles from the plant. For such an explosion to occur, it is assumed that the "empty" tank contains an adequate vapor-air mixture and that a proper detonating stimulus is applied to this mixture. Under these assumptions, the fuel vapor mass contained in a jumbo size (300'x50'x12') tank would be approximately 1,000 lbs. The corresponding distance at which the blast overpressure attenuates to 1.0 psi is approximately 600 ft, as determined using RG 1.91. Conservatism in these calculations include the consideration of the largest volume tank and the use of a TNT equivalency factor of 240% for the mixture. Since the closest Category I structure (crib house) is more than 600 ft from the Illinois River, empty fuel barges do not present a hazard to plant safety.

## 2.5 Military Facilities

The Joliet Army Ammunition Plant, whose nearest boundary is approximately four miles east of Dresden Station, is used for storage of explosive materials from other installations, transported by way of the Santa Fe and the Illinois Central Gulf Railroads (Ref. 1). Based on Reference 7, no explosive materials are stored within one mile of the eastern property line of the ammunition plant. Thus, the distance from Dresden Station to the storage area of the ammunition plant exceeds five miles. At this distance, an accidental explosion at the Joliet Army Ammunition Plant will not affect Dresden Station.

## 2.6 Pipelines

Table 7 summarizes the size, operating pressure, and nearest distance for pipelines located within five miles of the plant (Refs. 1, 8, 12, 16, and 17). The potential for a postulated accidental leak or rupture and consequent explosion have been evaluated for pipelines in the vicinity of the plant. The first six pipelines listed in Table 7 pose the greatest potential hazard to the plant. The locations of these lines in relation to the Dresden site are shown in Figure 2. The other pipelines listed in Table 7 do not pose significant hazards to the plant because their diameters are smaller and they are more than two miles from the plant.

Because of the proximity of the six pipelines to the Dresden safety-related structures, it is not possible to conclude that the peak overpressure would not exceed 1 psi. Therefore, the probability of exposure to pressure in excess of 1 psi was estimated, per RG 1.91.

The method of analysis used to calculate this probability follows the guidelines of the study presented in Ref. 14. Briefly, the factors included in this analysis were the break size and location, the gas release rate following the break, the plume rise and dispersion of the gas cloud under various meteorological conditions, the time from rupture to ignition, and the possibility of deflagration and explosion of the gas cloud. Conservatism was ensured in determining the size of the resulting gas cloud by assuming 200% ruptures (i.e., double-ended flow), with the pipeline operating at maximum capacity.

The flow rate from a ruptured pipe vs. the time from the start of gas release was obtained by prorating the previously calculated flow rate for a 22-inch diameter pipeline. The flow rate for the 22-inch pipeline was computed using the GASUS computer program (Ref. 15) for pipeline transients.

This flow rate was proportionately increased for the areas and pressures of the pipes being analyzed. Independent calculation of steady state flow rates were made to validate the calculated flow rates.

It was found that as a result of a rupture anywhere on the six gas pipelines within five miles of the plant, the probability of exceeding 1 psi blast overpressure is approximately  $6.2 \times 10^{-6}$  per year. If the release rate were computed for each pipeline using the GASUS program, lower release rates and lower probabilities of damage to the plant would have been obtained.

3. HAZARDS FROM VAPOR CLOUDS AND FIRES

Barge shipments of flammable and/or potentially explosive liquefied gases on the DesPlaines and Illinois Rivers may result in the formation of vapor clouds with consequent fire and/or explosion.

The Dresden safety-related structures are not at a safe distance from the river to support the conclusion that the 1 psi peak overpressure will not be exceeded if an accident occurs in the vicinity of the plant. Since the safe distance criterion is not satisfied, RG 1.91 requires that the probability of exposure to pressure in excess of 1 psi be estimated.

The method of analysis used to calculate this probability is presented in Reference 9. The input information required to perform the analysis consists of traffic, casualty, and spill statistics for the Illinois River. These statistics are presented in Tables 3 and 4. Where the casualty and spill statistics available for the Illinois River were not sufficient, statistics from western rivers were used in the evaluation. The probability of exposure to fire/explosion from liquefied gas traffic on the river near the Dresden plant is calculated to be  $4.0 \times 10^{-7}$  per year. Based on this low probability, it is concluded that plant safety will not be affected by liquefied gas shipments on the Illinois, DesPlaines, and Kankakee Rivers.

4. HAZARDS FROM TOXIC CHEMICALS

The evaluation of potential hazards to the plant from nearby sources of toxic chemicals which would affect control room habitability resulting from design basis accidents (DBAs) was reviewed under TMI Item III.D.3.4, "Control Room Habitability," to assure compliance with 10CFR50, Appendix A, "General Design Criteria for Nuclear Power Plants, "Criterion 19, "Control Room" (Reference 38).

5. HAZARDS FROM COLLISION WITH THE INTAKE STRUCTURE

Cooling water for Units 2 & 3 is provided through intake canals from the DesPlaines and Kankakee Rivers, and from an existing cooling lake. There is no commercial or recreational water traffic on the cooling lake. Thus, there is no potential for collision of vessels with the intake canals of the cooling lake. The crib house is approximately 2,000 ft. from the navigational channels. Thus, there is no potential for collision of the river traffic with the crib house.

An event which has been postulated is the collision of a barge on the river with the intake canal, causing failure of the canal. Since water would be available from the cooling lake, this type of failure would not adversely affect plant safety.

6. HAZARD FROM LIQUID SPILLS

The accidental release of corrosive, coagulant, or cryogenic liquids into the DesPlaines, Kankakee, or Illinois River near the site is not a potential hazard to plant safety, because the essential service water system is supplied by the cooling lake. The potential intake of highly polluted water from the rivers as a result of a major spill is highly improbable for the following reasons:

1. Cooling water is drawn from the river only when needed to replace water lost due to evaporation or circulation.
2. The river water is tested daily to detect any potential releases of corrosive, coagulant, or cryogenic liquids.
3. According to Reference 2, the Illinois, DesPlaines, and Kankakee Rivers in the vicinity of the plant were reclassified in 1972 as "Public and Food Processing Supplies," which implies that the upstream pollution is continuously abated by pollution control activities.

## 7. HAZARDS FROM AIRCRAFT

### 7.1. Airports

The airports within 10 miles of the plant and the data required for hazard analysis on these airports are given in Table 5 (Ref. 22 and 23).

Using the guidelines given in SRP 3.5.1.6, it was found that an evaluation of the probability of aircraft impact was required for Fromm, Morris, and Joliet Airports and for Adelman Airstrip.

O'Hare International Airport has the heaviest traffic and is outside the 10-mile radius. According to available maps, O'Hare is 46 miles north-northeast of the plant and had 734,555 operations in the 1980 fiscal year (Ref. 4). The projected number of operations at this airport for the year 2010 is calculated as 1,183,000, based on Reference 13. This level of operation is lower than the 2,116,000 operations per year calculated using the  $1000 d^2$  criterion given in SRP 3.5.1.6, where  $d$  is the distance from the plant in miles.

The probability per year of an aircraft crashing into the safety-related structures of Unit 2,  $P_A$ , is calculated using the methodology described in Reference 19:

$$P_A = \sum_{i=1}^L \sum_{j=1}^M \sum_{k=1}^K N_{ijk} A_{jk} R_{jk} D_k \quad (\text{EQ.1})$$

where

$L$  = number of flight paths affecting the plant

$M$  = number of different types of aircraft using the airport

$K$  = number of aircraft maneuvers - i.e., landings or takeoffs

$N_{ijk}$  = number of landings or takeoffs per year by the  $j^{\text{th}}$  aircraft along the  $i^{\text{th}}$  flight path

$A_{jk}$  = effective plant area, in square miles, for the  $j^{\text{th}}$  aircraft in the  $k^{\text{th}}$  maneuver

$R_{jk}$  = accident rate for the  $j^{\text{th}}$  aircraft for the  $k^{\text{th}}$  maneuver

$D_k$  = distribution function characterizing the location of a crash relative to the runway being used, per square miles

The pertinent data for the probability calculation are given in Tables 5 and 6.

Since the nearby airports are used mostly by small aircraft, the number of different types of aircraft  $M$  was assumed to be equal to 1 for each airport. This is a conservative assumption because the accident rate per operation for small aircraft is higher than that for large aircraft.

The number of landings and takeoffs at Fromm and Adelman are taken to be equally distributed along the two possible flight paths at each airport. The Morris and Joliet Airport Managers (References 25 and 26) stated that about 25% or fewer of the operations are on the turf runway, and 75% on the asphalt runway at the airports. Furthermore, the Joliet turf runway handles only 5-10% of the total landing operations in the NE direction. Therefore to obtain a more realistic distribution of the traffic along the possible flight path, the number of landings and takeoffs shown in Table 6 for Morris and Joliet Airports was proportioned according to the ratios given above.

The effective area of the plant includes the actual plan area of the safety-related and non safety-related buildings housing safety-related equipment, a 45° shadow area to account for aircraft descent trajectories, and a 100-ft. long skid area to account for aircraft crashing in front of the plant and skidding into these buildings. The effective area varies with the type of aircraft and flight path. For conservatism, the maximum effective area was used in the calculations; this area was found to correspond to the north to south flight path, and its value when all three units are considered was calculated as 0.01684 square miles. The buildings considered in calculating the effective area are the reactor, turbine, and HPCI buildings of units 1, 2, and 3; the crib hours of Units 2 & 3, and the fuel handling buildings of Unit 1. The effective area of Unit 2, which was used in the calculations, is 1/3 of the plant effective area; i.e., 0.0056167 square miles.

The values of  $R_{jk}$  were evaluated by Vallance (Reference 20) using the general aviation accident data from the five-year period 1964-1968. Because of improvements in technology and air traffic control, there has since been a decrease in the accident rate per aircraft movements. Assuming that the same rate of decrease holds for accident rates for landing and takeoff operations, and using 1966 as the base year for Vallance's (Reference 20) accident statistics, Reference 21 derives the accident rates for the year 1980 to be  $0.9 \times 10^{-6}$  and  $2.4 \times 10^{-6}$  per takeoff and landing respectively. These accident rates were used in the calculations. The distribution function  $D_k$  used in the calculations was derived by Vallance (Reference 19) and is expressed as follows:



$$D_k = \frac{0.22}{r} e^{-r/2} e^{-0/80} \quad \text{for takeoff}$$

$$D_k = \frac{0.31}{r} e^{-r/2.5} e^{-0/43} \quad \text{for landing}$$

where

$r$  = distance from the end of the runway to the crash location, in miles

$\theta$  = angle between the extended runway centerline and a line from the end of the runway to the crash location, in degrees.

The present probability of an aircraft crashing into Dresden 2, as calculated by EQ. 1 for each direction of travel at the four airports, is presented in Table 6.

## 7.2 Airways

Four low-altitude federal airways have their nearest edge within two miles of the station: V69, V38, V171, and V429.

According to the Air Route Traffic Control Center (Reference 24), peak daily IFR traffic within 10 nautical miles of Dresden for 1981 before the PATCO strike was 327 aircraft traversing the area. The amount of VFR traffic is not available since the traffic control centers have no control over these flights. The VFR traffic is therefore estimated to be equal to the amount of IFR traffic. Thus, using SRP 3.5.1.6,

$$\begin{aligned} P_{FA} &= (4 \times 10^{-10} \times 2 \times 326 \times 365 \times 0.0056167) / 9.21 \\ &= 0.581 \times 10^{-7} \text{ per year} \end{aligned}$$

The present and projected probabilities of aircraft from the four airports and nearby airways crashing into Dresden 2 are presented in Table 8. As shown in the table, the total projected probability of aircraft crashing into Dresden 2 is  $4.16 \times 10^{-7}$  per year.

Conservatism included in these calculations are:

- The use of the maximum effective area of Unit 2 of the plant.
- The distribution function  $D$  and accident rate  $R$  used for the Morris and Joliet Airports are those derived for crashes within five miles of an airport. Use of these rates for Morris and Joliet, which are 8 miles and 10 miles from the station, respectively, is conservative.

- The use of peak daily or monthly traffic from FAA-supplied documents to calculate the yearly number of operations.
- VFR traffic was estimated to be equal to peak IFR traffic before the PATCO strike.

Based on these conservatisms, and since the total probability (Table 8) of aircraft impact is within the acceptance criteria of SRP 3.5.1.6, it is concluded that aircraft operations in the vicinity of Dresden do not present an undue risk to the plant.

8. CONCLUSIONS

This study has identified potential accidents near Dresden Station - Unit 2 as a result of activities at nearby industrial, transportation, and military facilities. Twelve sources of hazard were identified and evaluated with respect to their being considered design basis events. Table 1 summarizes these sources and the findings of this report. Only 2 out of 14 nearby industrial facilities which were expected to have explosive or flammable materials did not provide information. These industries are identified in Section 2.1 and their possible hazards are not addressed in this report.

Based on the summary given in Table 1, with the minor exception noted in the table, Dresden Unit 2 is considered to meet the safety requirements outlined in NRC SRP's 2.2.1-2.2.2, 2.2.3, and 3.5.1.6.

9. REFERENCES

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2. Final Environmental Statement, Dresden Nuclear Power Station, Units 2&3, November 1973, USAEC.
3. Dresden FSAR, Amendment 9/10, Response to NRC Question IF.
4. Telephone conversation between J. Bueler, Federal Aviation Administration, and J. Wilson, Sargent & Lundy, October 6, 1981.
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7. Telephone conversation between J. A. Wilson of Sargent & Lundy and Mr. Hurley of Uniroyal Company, speaking for the Joliet Army Ammunition Plant, October 27, 1981.
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18. Response to SEP Topic II-1.B-Dresden, "Population Distribution," April 1981.
19. "A Study of the Probability of an Aircraft Using Waukegan Memorial Airport Hitting the Zion Station," by J. M. Vallance, Pickard, Lowe, & Associates, Inc., April 7, 1972.
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21. "Report of the ASCE Committee on Impactive and Impulsive Loads," Civil Engineering and Nuclear Power, Vol. V, September 15-17, 1980.
22. Chicago Aeronautical Chart, May 14, 1981.
23. Telephone conversation between Owen Leander of the FAA and J. A. Wilson of Sargent & Lundy, February 5, 1982.
24. Letter from G. C. Gunter, Chicago ARTCC, February 25, 1982.
25. Telephone conversations between E. White, Joliet Airport and J. A. Wilson, Sargent & Lundy, March 16 and 24, 1982.
26. Telephone conversation between Morris Municipal Airport and J. A. Wilson, Sargent & Lundy, March 16, 1982.
27. FAA Form 5010-1, Airport Master Record.
28. Letter from K. J. Eger, Senior Engineer, Licensing and Radiological Safety, General Electric Company, to J. A. Wilson, Environmental Coordinator, Sargent & Lundy, December 4, 1981.
29. Telephone conversation between J. Beard, Plant Manager, Reichhold Chemical Company, and J. A. Wilson, Environmental Coordinator, Sargent & Lundy, January 20 and April 21, 1982.
30. Written response from F. M. Gamble of A. P. Green Refractories Company to J. A. Wilson, Environmental Coordinator, Sargent & Lundy, December 3, 1981.
31. Letter of confirmation from J. A. Wilson, Environmental Coordinator, Sargent & Lundy, to T. DeSanty of Airco Industrial Gases, November 30, 1981.

32. Written response from G. Melhorn, General Manager, ALUMAX Mill Products, Inc. to J. A. Wilson, Environmental Coordinator, Sargent & Lundy, dated December 3, 1981.
33. Telephone conversation between J. Erzen, Armak Industrial Chemical Division, and J. A. Wilson, Environmental Coordinator, Sargent & Lundy, February 4, 1982.
34. Written response from Durkee-SCM Chemical Company to J. A. Wilson, Environmental Coordinator, Sargent & Lundy, January 22, 1982.
35. Letter from N. Namani, Environmental Engineer, Mobil Chemical Company to J. A. Wilson, Environmental Coordinator, Sargent & Lundy, March 12, 1982.
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Table 1 Assessment Summary

HAZARD NUMBER	SOURCE OF POTENTIAL HAZARD	REPORT SECTION	DESIGN BASIS EVENT?
<u>Explosion from:</u>			
1	Industrial facilities*	2.1	No, based on adequate separation distance**
2	Highway transportation	2.2	No, based on adequate separation distance
3	Railway transportation	2.3	No, based on adequate separation distance
4	Waterway transportation	2.4	No, based on adequate separation distance
5	Military facilities	2.5	No, based on adequate separation distance
6	Pipelines	2.6	No, based on frequency of $6 \times 10^{-6}$ /yr using conservative assumptions
7	Vapor cloud explosion & fire from waterway transportation	3.1	No, based on frequency of $4 \times 10^{-7}$ /yr
8	Toxic chemicals	4	Not part of SEP II-1.C
9	Collision with intake structure	5	No, based on physical considerations
10	Liquid spills	6	No, based on physical considerations
<u>Aircraft impact from:</u>			
11	Airports	7.1	No, based on frequency of $3.24 \times 10^{-7}$ /year
12	Airways	7.2	No, based on frequency of $0.93 \times 10^{-7}$ /year

\*Data for facilities which responded to the questionnaire

\*\*There is one exception to this conclusion - the benzene storage tank on the Reichhold Chemical site.

Table 2 Industries Within 5 Miles of  
Dresden Station (Ref. 18)

INDUSTRY	DISTANCE (MILES) & DIRECTION	PRODUCT
GE BWR Training Center & Spent Fuel Storage	0.7 - SW	Spent nuclear fuel storage
Reichhold Chemicals	1.6 - W	Resins and chemicals
A. P. Green	2.1 - SSW	Brick and clay
Airco Industrial Gases	2.5 - NW	CO <sub>2</sub>
Northern Illinois Gas	2.5 - NW	Natural gas
Alumax Mill Products	2.8 - NW	Aluminum sheet and coil
Northern Petrochemicals	3.3 - NW	Ethylene, ethylene oxide glycol
Northern Petrochemical Dock	2.1 - W	
ARMAK Chemicals	3.6 - WNW	Fatty nitrogen chemicals
Durkee SCM Chemicals	3.2 - ENE	Edible oil
Truck Terminal	3.6 - ENE	Under construction
Dow Chemicals	3.7 - E	Polystyrene plastic
Dow Chemical Dock	2.7 - E	
Exxon (chemical plant)	3.9 - ENE	Under construction
Hydrocarbon Transportation, Inc.	4.0 - NW	Propane
Streator Industrial Supply	4.0 - S	Industrial supplies
Mobil Chemical Co.	4.1 - NE	Polystyrene sheets & crystal
Joliet Livestock Market	4.2 - ESE	Livestock
Mobil Oil Refinery	4.5 - NE	Petroleum products
Commonwealth Edison Co. Collins Station	5.0 - WSW	Electricity



Table 3 Dresden Island Traffic Statistics  
Fiscal Years 1973 - 1978 (Refs. 6, 11)

COMMODITY TYPE	FISCAL YEAR						Average
	1973	1974	1975	1976	1977	1978	
Total commodities, tons x 10 <sup>6</sup>	28.476	30.853	27.808	25.882	23.452	19.521	26.0
Hazardous materials,* tons x 10 <sup>6</sup>	5.653	6.073	5.358	5.059	4.093	3.658	5.0
Liquefied Gases,** tons	0.0	0.0	0.0	17,992	0.0	0.0	3000.0

\*Hazardous materials are defined as all materials listed under the category of petroleum products in the lock statistics.

\*\*Liquefied gases shown are the amounts transported on the entire navigable length of the Illinois River.

Table 4 Casualty and Spill Statistics -  
Fiscal Years 1969 thru 1972 (Ref. 10)

CASUALTY/SPILL	ILLINOIS RIVERS	WESTERN RIVERS
Casualties** - all type barges	178	2831
Casualties of hazardous material barges***	40	508
Spills from hazardous material barges	1	69
Casualties of liquefied gas barges	---	9
Spills from double-skinned vessels	---	7
Total length of waterway (miles)	333	3137

\*Lower Mississippi, Upper Mississippi, Ohio, and Illinois Rivers; casualties from these rivers constitute 97% of the casualties on western rivers.

\*\*Casualties which result in any of the following: loss of life, damage to cargo in excess of \$1,500, or release of cargo.

\*\*\*Hazardous material barges are generic type 17, 18, and 29 vessels. See Reference 10 for description.

TABLE 5  
 DATA ON AIRPORTS WITHIN 10 MILES  
 OF DRESDEN STATION (REFS. 22, 23, 27)

	<u>TYPE</u>	<u>APPROX. DIST. FROM STATION</u>	<u>DIRECTION FROM STATION</u>	<u>NO. OPERATIONS</u>	<u>LENGTH OF RUNWAY</u>	<u>WIDTH OF RUNWAY</u>	<u>TYPE OF RUNWAY</u>	<u>ORIENTATION OF RUNWAY</u>
FRGMM	PVT.	4.5 miles	E	50*	2,773 ft.	100 ft.	TURF.	NNE-SSW
MORRIS	PVT.	8 miles	WNW	1,942*	2,400 ft. 2,897 ft.	135 ft. 60 ft.	TURF. ASPH.	E-W N-S
ROSSI	PVT.	9 miles	N	< 50**	2,400 ft.	70 ft.	TURF.	E-W
BUHBY	PVT.	9.9 miles	NNE	45**	1,800 ft.	100 ft.	TURF.	N-S
JOLIET	Pub.	10 miles	NNE	10,000*	3,452 ft. 2,970 ft.	125 ft. 100 ft.	TURF. ASPH.	NE-SW NW-SE
ADELMANN***	PVT.	1 mile	NE	20**	1,600 ft.	70 ft.	TURF.	SE-NW

\* Total peak month from FAA supplied documents

\*\* Number per month as supplied by owner of airport

\*\*\* Recently approved airstrip

Table 6 Data for Aircraft Crash and Probability Analysis

AIRPORT	OPERATING MODE	r (MILES)	$\theta$ (DEG)	$D(r, \theta)$ (/MILES <sup>2</sup> )	$R_x \bar{10}^6$ (/OPERATION)	N (OPERATIONS/ YEAR)	A (MILES <sup>2</sup> )	$NARD \times 10^{-7}$ (/YEAR)
FROMM	Landing	4.5	90	0.0014	2.4	150	0.0056167	0.02833
		4.5	90	0.0014	2.4	150	0.0056167	0.02833
	Take-Off	4.5	90	0.00167	0.9	150	0.0056167	0.01267
		4.5	90	0.00167	0.9	150	0.0056167	0.01267
MORRIS	Landing	8.0	25	0.000883	2.4	1456	0.0056167	0.17333
		8.0	155	0.000043	2.4	1456	0.0056167	0.00833
		8.0	65	0.00035	2.4	4370	0.0056167	0.206
		8.0	115	0.00011	2.4	4370	0.0056167	0.06467
	Take-Off	8.0	25	0.000369	0.9	1456	0.0056167	0.027
		8.0	155	0.000073	0.9	1456	0.0056167	0.00533
		8.0	65	0.00022	0.9	4370	0.0056167	0.04867
		8.0	115	0.00012	0.9	4370	0.0056167	0.02633
JOLIET	Landing	10.0	10	0.00045	2.4	6000	0.0056167	0.364
		10.0	170	0.000011	2.4	9000	0.0056167	0.01333
		10.0	80	0.000088	2.4	22500	0.0056167	0.26667
		10.0	100	0.000056	2.4	22500	0.0056167	0.17
	Take-Off	10.0	10	0.00013	0.9	7500	0.0056167	0.04933
		10.0	170	0.000018	0.9	7500	0.0056167	0.00667
		10.0	80	0.000055	0.9	22500	0.0056167	0.06267
		10.0	100	0.000043	0.9	22500	0.0056167	0.049
ADELMANN	Landing	1.0	115	0.01433	2.4	60	0.0056167	0.116
		0.9	80	0.0374	2.4	60	0.0056167	0.30233
	Take-Off	1.0	115	0.0317	0.9	60	0.0056167	0.0906
		0.9	80	0.05734	0.9	60	0.0056167	0.174

Table 7 Pipelines within 5 Miles of the Site

PIPELINE COMPANY	PIPE SIZE (in)	MATERIAL CARRIED	OPERATING PRESSURE (PSI)	CLOSEST DISTANCE TO THE PLANT (MILES)
Natural Gas	36	Natural Gas	858	1.75
Pipeline Co.	36	Natural Gas	858	1.70
	30	Natural Gas	858	1.60
	36	Natural Gas	650	1.25
	30	Natural Gas	858	1.70
	30	Natural Gas	858	1.60
HydroCarbon	10	Propane, Natural Gas	2100	4.0
Transportation, Inc.	10	Propane, Natural Gas	2100	4.0
	6	Propane, Butane	500	2.0
Northern Illinois Gas	36	Natural Gas	740	2.5
	10	Out of Operation	---	2.5
	4	Natural Gas	Unknown	3.0
Amoco	10	Crude Oil	---	3.0
	12	Crude Oil	---	3.0
	22	Crude Oil	---	3.0

Table 8 Probability of Aircraft Impact from Airports and Airways within 10 Miles of Dresden Station

<u>SOURCE</u>	<u>PRESENT PROBABILITY OF IMPACT PER YEAR</u>	<u>PROJECTED* PROBABILITY OF IMPACT PER YEAR</u>
Fromm Airstrip	$0.082 \times 10^{-7}$	$0.082 \times 10^{-7}$
Morris Airport	$0.560 \times 10^{-7}$	$0.896 \times 10^{-7}$
Joliet Airport	$0.982 \times 10^{-7}$	$1.571 \times 10^{-7}$
Adelmann Airstrip	$0.683 \times 10^{-7}$	$0.683 \times 10^{-7}$
Airways	$0.58 \times 10^{-7}$	$0.929 \times 10^{-7}$
TOTAL	$2.887 \times 10^{-7}$	$4.161 \times 10^{-7}$

\*Air traffic projections are based on the forecasts given in Reference 13.

INDUSTRIAL SITES IN VICINITY

- 1 MIDWEST FUELS REPROCESSING PLANT (GE)
- 2 NORTHERN PETROCHEMICAL CO.
- 3 ALUMAX
- 4 REICHHOLD CHEMICAL CO
- 5 A. P. GREEN
- 6 GENERAL ELECTRIC CO TRAINING SCHOOL
- 7 MOBIL CHEMICAL
- 8 MOBIL OIL
- 9 DURKEE SCM

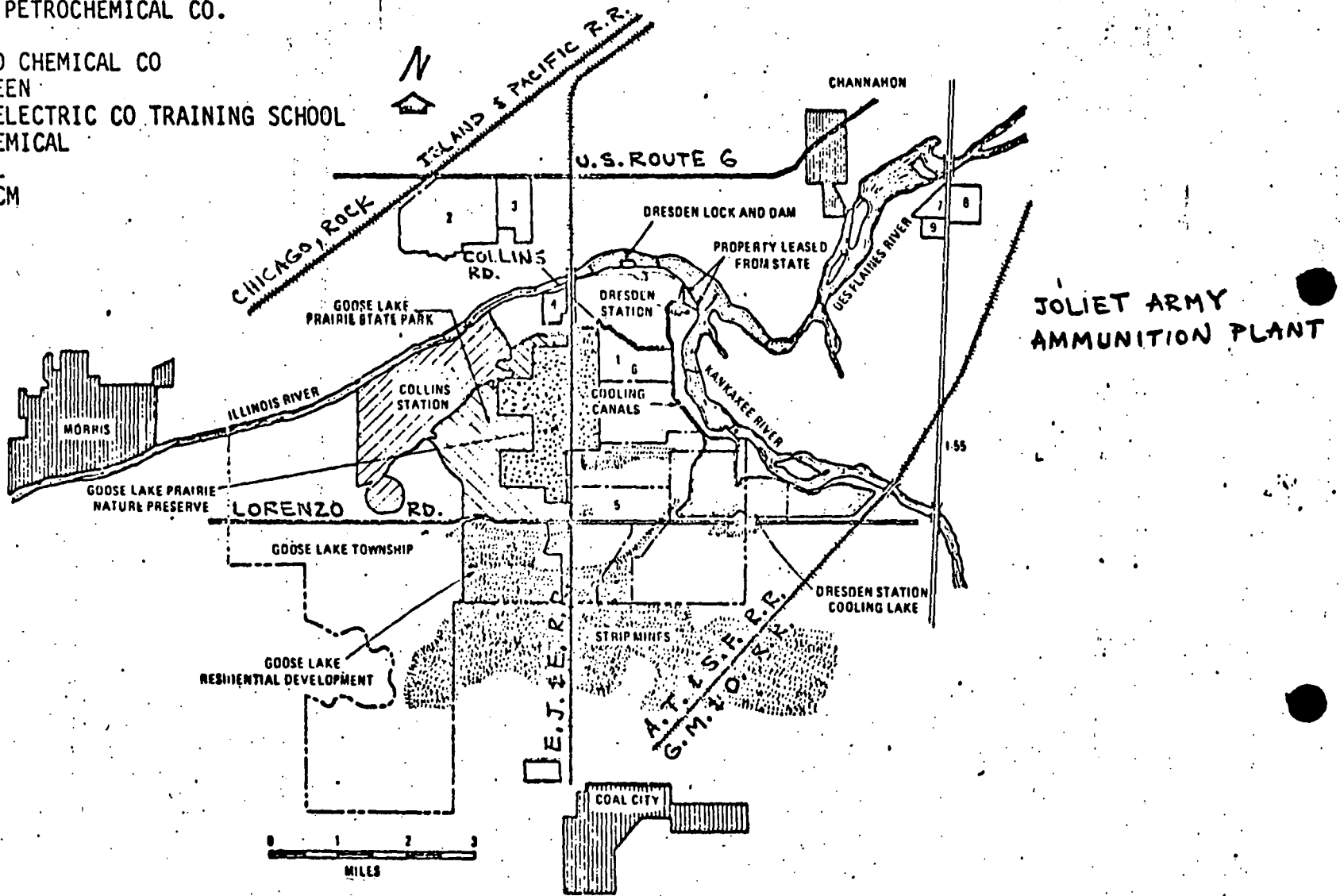


Figure 1 Dresden Nuclear Power Station Area Map

**LEGEND**

- 36"
- · - · 36"
- - - 30"
- - - 36"
- · - · 30"
- - ● 30"

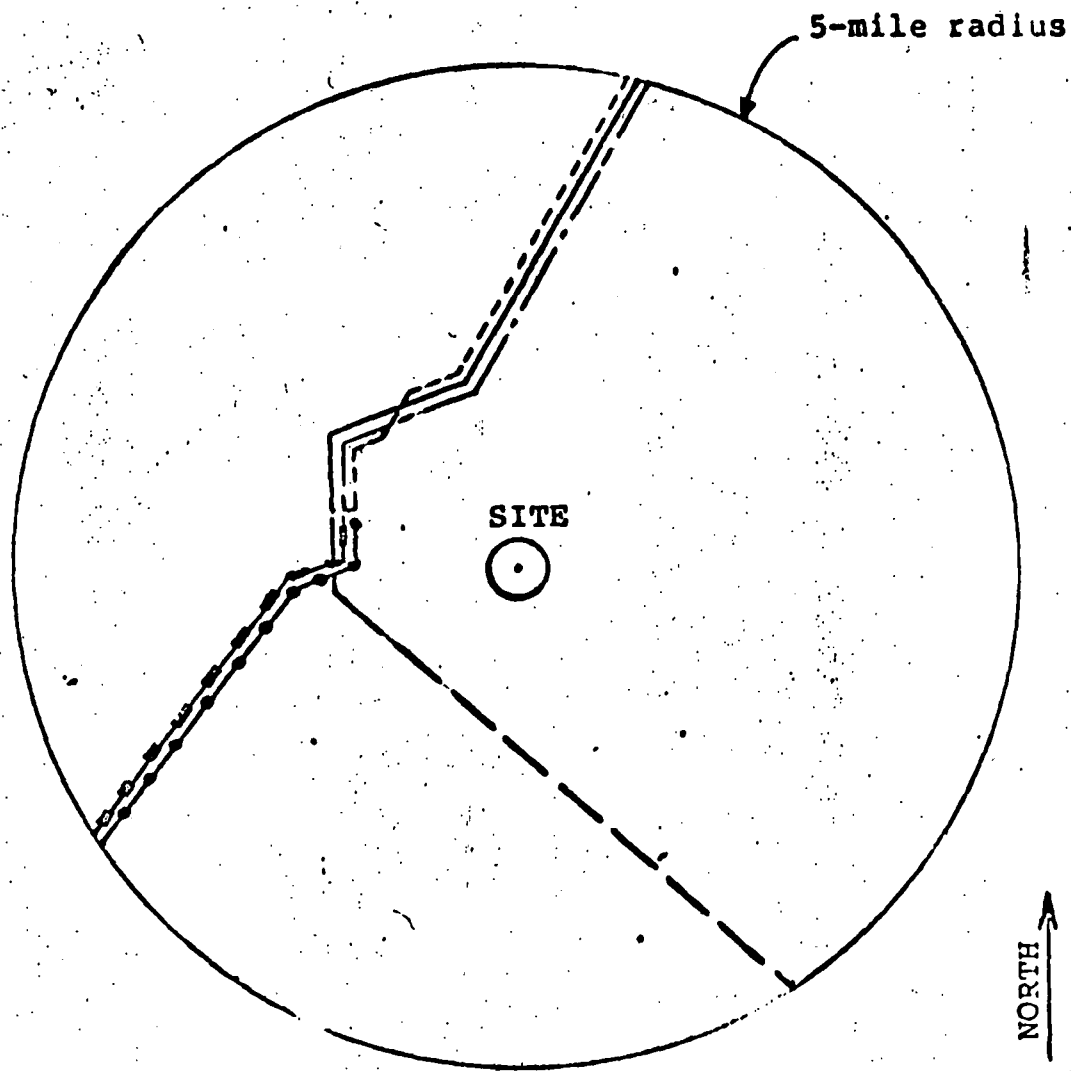


Figure 2 Pipelines Considered in the Evaluation of Hazard From Explosion