

LIMERICK GENERATING STATION UNITS 1 & 2  
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE  
REVISION 20 PAGE CHANGES

The attached pages and tables are considered part of a controlled copy of the Limerick Generating Station EROL. This material should be incorporated into the EROL by following the instructions below.

After the revised pages have been inserted, place the page that follows these instructions in the front of Volume 1.

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**THIS EROL SET HAS BEEN UPDATED TO  
INCLUDE REVISIONS THROUGH 20  
DATED 9/84.**

## CHAPTER 2

## THE SITE AND ENVIRONMENTAL INTERFACES

2.1 GEOGRAPHY AND DEMOGRAPHY

## 2.1.1 SITE LOCATION AND DESCRIPTION

2.1.1.1 Specification of Location

Limerick Generating Station is located in southeastern Pennsylvania on the Schuylkill River, about 1.7 miles southeast of the limits of the Borough of Pottstown, and about 20.7 miles northwest of the Philadelphia city limits. The Schuylkill River passes through the site, separating the western portion, located in East Coventry Township, Chester County, from the eastern portion, located in Limerick Township and Pottsgrove Township, Montgomery County, Pennsylvania. Figure 2.1-1 identifies the general location of the Limerick site, and Figure 2.1-2 shows the immediate environs, within 5 miles of the site.

The Universal Transverse Mercator coordinates of the Limerick Unit 1 reactor are 4,452,582.462 meters north and 449,984.170 meters east, Zone 18T. The corresponding Greenwich coordinates for Unit 1 are 40°13'26.67" north latitude and 75°35'16.27" west longitude. The Unit 2 reactor is located at 4,452,582.462 meters north and 450,033.548 meters east, Zone 18T of the Transverse Mercator Coordinate System, with corresponding 40°13'26.64" north latitude and 75°35'14.15" west longitude coordinates.

2.1.1.2 Site Area

The land portion of the site consists of 595 acres, as shown in Figure 2.1-3. The property within the site boundary is owned by Philadelphia Electric Company except as noted below. The site boundary is shown in Figure 2.1-3. As shown in Figure 2.1-3, the site is traversed by several public roads, a ConRail right-of-way, and the Schuylkill River. These areas, including the island in the river, are considered public passageways and not part of the site property.

The site is located in gently rolling countryside, traversed by numerous valleys containing small streams that empty into the Schuylkill River. On the eastern bank of the Schuylkill River, the terrain rises from just under el 110 MSL, at the river, to approximately el 300 MSL toward the east, which is the highest ground on the site boundary. Two parallel streams, Possum Hollow Run and Brooke Evans Creek, cut through the site in wooded valleys, running southwest into the Schuylkill River. Grade in the area of the reactor and turbine enclosures is about el 217

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MSL. On the western bank of the river the terrain is relatively flat, rising only about 50 feet from the shore to the western edge of the site. One small stream flows southeastward through the site to the Schuylkill River.

The exclusion area for Limerick Generating Station, shown in Figure 2.1-3, is defined as the area encompassed by a radius of 2500 feet from the center of each reactor unit. The property within the exclusion area is owned by Philadelphia Electric Company, except as noted below. As shown in Figure 2.1-3, the exclusion area is traversed by several public roads, a ConRail right-of-way, and the Schuylkill River. These areas, including the island in the river, are considered public passageways and not part of the site property. Arrangements for control of public access to these areas in the event of an emergency have been made with the Pennsylvania State Police and with ConRail, as described in the Emergency Plan.

There are no outstanding mineral rights within the exclusion area.

The locations of principal station structures are shown in Figure 2.1-4. In addition, the Limerick Atomic Information Center is located on the site property. The information center, owned and operated by Philadelphia Electric Company, is open to the public during specified hours. Admission to the information center is controlled by Philadelphia Electric Company.

A power plant simulator, used for training operating personnel, is adjacent to the site. This facility is operated by General Physics Corporation. Use of the facility is controlled by Philadelphia Electric Company.

### 2.1.1.3 Boundaries for Establishing Effluent Release Limits

The boundary line of the restricted area, as defined in 10 CFR Part 20, is identical to the site boundary line shown in Figure 2.1-3. The land area within the boundary lines is owned by Philadelphia Electric Company. Control of public passageways is discussed in Section 2.1.1.2.

There are no permanent residences within the restricted area.

Station effluent release points are shown in Figure 3.1-2.

### 2.1.2 POPULATION DISTRIBUTION

#### 2.1.2.1 Population Within 10 Miles

The population distribution within 10 miles, as a function of distance and direction, for the decades 1970 through 2020 and for 1985, is listed in Tables 2.1-1 through 2.1-7. The 1970 and 1980



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data are taken from actual census data and the other years are taken from projections (Table 2.1-15). The 1985 projections are considered to be representative of population near the year of initial station operation, and the 2020 projections represent population near the end of station operation. These projections are based on 1980 census data. The 1980 data shows that population has decreased. A map, keyed to Tables 2.1-1 through 2.1-7, is provided in Figure 2.1-5.

The population distribution within 10 miles is based upon the number of households, obtained from a 1980 meter count of Philadelphia Electric Company's residential customer billing file, and a 1980 meter count of Metropolitan Edison Company's billing file. A factor of 2.88 persons per residential meter in Philadelphia Electric Company territory, and a factor of 2.70 persons per residential meter for the Metropolitan Edison Company territory were used to convert the meter count into population.

Projected populations were determined by using county projection factors obtained from state agencies. Where information was not available to the year 2020, Philadelphia Electric Company extended the available information through that year. Table 2.1-15 lists the sources of population information.

Population for the year 1983 was estimated by Philadelphia Electric Company by extrapolation of data between 1980 and 1990. Projections for the years 2010 and 2020 were made by increasing projections for the year 2000 at a rate of 20% per 10-year period.

### 2.1.2.2 Population Between 10 and 50 Miles

Population distribution between 10 and 50 miles for the decades between 1970 through 2020 and for the year 1985 is listed in Tables 2.1-8 through 2.1-14. The 1970 and 1980 data are taken from actual census data and the other years are based on projections (Table 2.1-15). A map, keyed to Tables 2.1-8 through 2.1-14, is provided in Figure 2.1-6.

Projected populations were determined by using county projection factors obtained from state agencies. Where information was not available to the year 2020, Philadelphia Electric Company extended the available information through that year. Table 2.1-15 lists the sources of population information.

Population changes for 1950 through 1980 in the counties within 50 miles of the station are indicated in Table 2.1-16.

### 2.1.2.3 Transient Popu'ation

The transient population in the site area is classified as daily or seasonal. The daily transients result from an influx of employees to local business and industrial facilities. Local industries, and their location and employment, are listed in Table 2.1-17. The only industries with a significant daily transient population are Mrs. Smith's Pie Company, Sircom Knitting Company, and Crouse Company.

Seasonal transients result from use of recreational areas, of which there is only the Countryside Swim Club, Inc., within 1.3 miles of the station. The maximum daily attendance at the swim club is estimated to be 800, with a daily average of 400 during the summer season.

A 1976 creel survey of people fishing the Schuylkill River within 5 km of the station showed that 96 percent lived within 10 km of the river and thus do not comprise a transient population. These data also projected 1980 fishing pressure within 5 km of the station at 8800 angler hours for the principal fishing months of May through September. The average time spent fishing was 3.5 hours from shore and 4.7 hours by boat. Less than 20 percent of the fishing pressure came from boats. Table 2.1-42 describes boating hours per year as cited by the Pennsylvania Fish Commission. Based on these data and data collected in a 1980 creel survey conducted as part of the Limerick preoperational program, an average of 1100 boaters per year could be expected to use the Schuylkill River within 10 miles of the station, most of which would occur below Vincent Dam (3.3 miles below the station).

### 2.1.2.4 Age Distribution

The age distribution in Montgomery County compared with the U.S. population in 1980 is shown below:

<u>Age</u>	<u>Percent in Age Group</u>	
	<u>Montgomery County</u>	<u>United States</u>
0-11	14.9	17.7
12-17	10.5	10.3
18 and over	74.6	72.0
Total	100.0	100.0

There is no reason to believe that there will be a significant difference in age distribution in the year 2000 between the United States and Montgomery County. The United States age distribution in 2000 is shown below:

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<u>Age</u>	<u>Percent in Age Group</u>
0-11	16.5
12-17	8.7
18 and over	74.8
Total	100.0

### 2.1.3 USE OF ADJACENT LANDS AND WATERS

The general land use character of the area within 5 miles of the Limerick site is rural and open, and contains one major forest, located in northern Limerick and Lower Pottsgrove Townships. A discussion of local land use was provided in Section 2.1.4 of the Limerick Generating Station Environmental Report - Construction Permit Stage (Revised). There have been no major changes in actual or projected land use patterns.

Present and projected land use within a 5-mile radial area of Limerick is presented in Tables 2.1-18 and 2.1-19. The urban development and population concentration near Limerick lies outside a 2-mile ring and, historically, has been oriented along the Schuylkill River, with recent suburban growth spilling out over municipal boundaries. About half of the 1980 population was located in the Boroughs of Pottstown, Royersford, Spring City, and unincorporated areas of South Pottstown and Kenilworth. Pottstown Borough, with a 1980 population of 22,729 people, is the largest local municipality. The borough's population declined from 1960 to 1970 and continued to decline from 1970 to 1980.

#### 2.1.3.1 Industries

Industries with 10 or more employees within 5 miles of Limerick Generating Station are listed in Table 2.1-17. The number of employees, products, and locations is listed for each establishment.

The nearest industry to the site is the Pottstown Trap Rock Quarry, Inc. Operations of the quarry include the detonation of explosives in the process of quarrying stone. However, the use of explosives is infrequent and only enough explosives for one particular application are brought to the quarry. There are no explosives stored on the quarry site. Other industries located within 1.3 miles of the station include Hooker Chemical Company, Mahr Printing, Inc., Eastern Warehouses, Inc., Amerind-MacKissic, Inc., and Structural Foam, Inc. The location of these industries is shown in Figure 2.1-7. Hooker Chemical Company is the only establishment near the Limerick Generating Station that has significant quantities of hazardous materials stored onsite. These materials are listed in Table 2.1-20.

As shown in Figure 2.1-8, there is a natural gas pipeline adjacent to the site, consisting of two separate pipes, operated by the Columbia Gas Transmission Company, and an oil pipeline operated by



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Atlantic Richfield Company within the site area. Other pipelines within 5 miles of the station are operated by Philadelphia Electric Co, Mobil Oil, Texas Eastern Transmission Corp, Transcontinental Gas Pipe Line Corp, and UGI Corp. Pipe sizes, age, operating pressure, etc., are listed in Table 2.1-21. At the present time, there are no plans to utilize these pipelines to transport products other than those currently transported.

### 2.1.3.2 Transportation Routes

The major transportation routes located within 5 miles of the site include the following:

- a. U.S. Route 422, an east-west highway passing approximately 1-1/2 miles to the north of the site.
- b. Pennsylvania (PA) Route 100, a north-south highway passing approximately 4 miles west of the site.
- c. Pennsylvania (PA) Route 724, a southeast-northwest highway passing approximately 1 mile southwest of the site.
- d. The Consolidated Rail Corporation line (formerly Reading Company), passing through the site along the north bank of the Schuylkill River. The line is comprised of three tracks and has a rail spur serving the station.
- e. The Consolidated Rail Corporation line (formerly Pennsylvania Central Railroad), running in north-south direction, passing along the western boundary of the site.

These transportation routes are shown in Figure 2.1-8. Planned changes to local transportation routes include the extension of the Schuylkill Expressway, and Interstate Route No. 76 from Valley Forge to the terminus of the Pottstown bypass, U. S. Route 422. The proposed alignment follows the Schuylkill River, generally about a mile away, and passes near the northern boundary of Royersford Borough. About midway through Limerick Township, the expressway veers northward to join with U.S. Route 422. In the vicinity of the Limerick site, the expressway is located farther away from the Schuylkill River than in any other location.

Expressway interchanges now exist along the Pottstown Bypass at PA Route 100, Hanover Street, Keim Street, PA Route 724, Firestone Blvd., Township Line Road (presently labeled Evergreen Road on all street signs), and existing U.S. Route 422. The PA Route 100 interchanges are modified types, which necessitate turning movements across traffic flow to get onto and off the ramps. This turning movement tends to lower traffic capacity of the feeder streets, as well as the ramps.

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TABLE 2.1-3

POPULATION DISTRIBUTION 0-10 MILES  
1985  
DISTANCE (MILES)

<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-Mile Total</u>
60	712	933	414	786	3,296	6,201
48	1,135	254	499	212	2,533	4,681
48	42	210	349	288	3,894	4,831
12	60	207	397	237	5,359	6,272
21	156	282	406	436	5,341	6,642
30	186	309	279	604	9,620	11,028
6	385	147	5,054	4,230	7,126	16,948
0	204	306	2,861	1,704	22,544	27,619
3	368	356	176	365	4,150	5,418
12	656	331	551	288	1,986	3,824
74	195	220	334	322	1,913	3,058
49	192	572	492	1,714	2,041	5,060
37	127	1,884	1,627	1,132	2,405	7,212
42	334	3,122	11,556	3,699	10,215	28,968
21	300	1,953	6,955	1,366	4,176	14,771
36	742	1,802	1,290	1,361	6,839	12,070
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499	5,794	12,888	33,240	18,744	93,438	164,603

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TABLE 2.1-4

POPULATION DISTRIBUTION 0-10 MILES  
1990  
DISTANCE (MILES)

<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-Mile Total</u>
63	741	972	431	818	3,433	6,458
50	1,182	265	519	221	2,637	4,874
50	44	219	363	300	4,055	5,031
13	63	216	413	247	5,582	6,534
22	163	294	422	454	5,563	6,918
31	194	322	291	629	10,019	11,486
6	401	153	5,263	4,406	7,423	17,652
0	218	327	3,058	1,822	24,097	29,522
3	393	380	188	390	4,436	5,790
13	701	354	588	307	2,123	4,086
79	208	235	357	344	2,046	3,269
53	205	612	526	1,831	2,179	5,406
40	136	2,013	1,739	1,210	2,570	7,708
44	347	3,251	12,035	3,852	10,639	30,168
22	313	2,034	7,244	1,423	4,351	15,387
38	773	1,876	1,344	1,417	7,123	12,571
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527	6,082	13,523	34,781	19,671	98,276	172,860

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## LGS ERCL

TABLE 2.1-5

POPULATION DISTRIBUTION 0-10 MILES  
2000  
DISTANCE (MILES)

<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-Mile Total</u>
64	756	990	440	834	3,499	6,583
51	1,205	270	529	225	2,690	4,970
51	45	223	370	306	4,134	5,129
13	64	220	421	252	5,691	6,661
22	166	300	431	463	5,672	7,054
32	198	329	297	641	10,213	11,710
6	408	156	5,365	4,491	7,566	17,992
0	224	336	3,141	1,871	24,749	30,321
3	404	390	194	401	4,557	5,949
14	720	363	604	316	2,179	4,196
81	214	241	367	353	2,102	3,358
54	211	628	540	1,881	2,239	5,553
41	139	2,068	1,786	1,243	2,640	7,917
45	354	3,314	12,268	3,927	10,844	30,752
22	319	2,073	7,384	1,450	4,435	15,683
38	788	1,913	1,370	1,444	7,261	12,814
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537	6,215	13,814	35,507	20,098	100,471	176,642

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## LGS EROL

TABLE 2.1-6

POPULATION DISTRIBUTION 0-10 MILES  
2010  
DISTANCE (MILES)

<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-Mile Total</u>
77	907	1,189	528	1,001	4,199	7,901
61	1,446	324	635	271	3,227	5,964
61	54	268	444	367	4,960	6,154
15	77	264	505	302	6,828	7,991
27	199	360	517	555	6,806	8,464
38	237	394	356	769	12,257	14,051
8	490	188	6,438	5,390	9,081	21,595
0	269	403	3,769	2,245	29,703	36,389
4	485	469	232	481	5,468	7,139
16	864	436	725	379	2,616	5,036
98	257	289	440	424	2,523	4,031
65	253	754	648	2,258	2,685	6,663
49	167	2,482	2,143	1,491	3,168	9,500
54	425	3,977	14,722	4,712	13,013	36,903
27	383	2,488	8,861	1,740	5,323	18,822
46	945	2,295	1,644	1,733	8,714	15,377
646	7,458	16,580	42,607	24,118	120,571	211,980

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TABLE 2.1-7

POPULATION DISTRIBUTION 0-10 MILES  
2020  
DISTANCE (MILES)

<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-Mile Total</u>
92	1,088	1,426	633	1,202	5,039	9,480
73	1,736	389	762	325	3,873	7,159
73	64	322	533	441	5,952	7,385
18	92	317	606	363	8,195	9,591
32	239	432	620	666	8,167	10,156
46	285	473	427	923	14,708	16,862
9	588	225	7,726	6,468	10,895	25,911
0	323	484	4,523	2,694	35,640	43,664
5	582	562	279	577	6,562	9,567
20	1,037	523	970	455	3,140	6,045
117	308	347	528	509	3,027	4,836
78	303	905	777	2,709	3,226	7,909
59	200	2,978	2,572	1,790	3,801	11,400
64	510	4,773	17,667	5,655	15,616	44,285
32	459	2,986	10,634	2,099	6,385	22,585
55	1,135	2,754	1,972	2,080	10,455	18,451
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773	8,949	19,896	51,129	28,946	144,681	254,374

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TABLE 2.1-10

POPULATION DISTRIBUTION 10-50 MILES  
1985  
DISTANCE (MILES)

<u>0-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	<u>50-Mile Total</u>
6,201	15,786	55,411	58,654	26,896	162,948
4,681	25,699	193,709	184,827	40,999	449,915
4,831	19,495	21,217	26,719	52,088	124,350
6,272	54,208	56,225	21,111	39,128	176,944
6,642	71,745	94,178	191,806	348,565	712,936
11,028	136,168	600,174	571,592	108,755	1,427,717
16,948	84,872	948,054	500,820	186,962	1,737,656
27,519	31,051	257,792	32,345	23,407	372,214
5,418	78,282	39,399	343,371	24,571	491,041
3,824	43,076	27,358	49,699	50,543	174,500
3,058	9,030	37,127	12,403	19,894	81,512
5,060	9,084	26,382	78,015	142,849	261,390
7,212	4,335	18,608	53,247	79,911	163,313
28,968	129,767	76,716	27,363	30,747	293,561
14,771	4,579	18,068	17,852	66,226	121,496
12,070	13,491	16,858	7,843	36,416	86,678
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164,603	730,668	2,487,276	2,177,667	1,277,957	6,838,171

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TABLE 2.1-11

POPULATION DISTRIBUTION 10-50 MILES  
1990  
DISTANCE (MILES)

<u>0-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	<u>50-Mile Total</u>
6,458	16,501	57,759	61,579	28,963	171,260
4,874	26,941	202,042	193,452	43,149	470,458
5,031	20,676	22,643	29,000	54,133	130,488
6,534	56,983	60,007	22,529	41,340	187,393
6,918	74,718	99,879	204,701	368,386	754,602
11,486	141,812	545,945	545,422	119,787	1,363,452
17,652	87,619	853,199	509,471	201,709	1,669,650
29,522	33,077	255,520	35,376	24,065	377,560
5,790	83,674	40,942	356,138	25,115	511,659
4,086	46,044	29,239	52,309	53,205	184,883
3,269	9,652	39,671	13,226	21,149	86,967
5,406	9,678	28,101	83,101	152,160	278,446
7,708	4,486	19,777	56,708	94,972	173,651
30,169	136,351	80,556	28,896	32,451	308,422
15,387	4,929	18,974	18,681	68,972	126,943
12,571	14,243	17,682	8,183	38,340	91,019
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172,860	767,384	2,371,936	2,217,772	1,356,901	6,886,853

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## L3S EROL

TABLE 2.1-12

POPULATION DISTRIBUTION 10-50 MILES  
2000  
DISTANCE (MILES)

<u>0-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	<u>50-Mile Total</u>
6,583	16,837	58,743	62,871	29,786	174,820
4,970	27,473	205,566	198,282	44,225	480,516
5,129	21,141	23,177	30,320	59,686	139,453
6,661	58,184	61,422	24,904	47,162	198,333
7,054	76,172	102,127	209,526	389,831	784,710
11,710	144,573	542,450	572,224	137,627	1,408,584
17,992	89,099	844,309	550,741	224,521	1,726,662
30,321	33,947	256,615	39,309	25,600	385,792
5,949	85,943	42,015	368,752	26,026	528,687
4,196	47,295	30,036	54,130	55,746	191,403
3,358	9,915	40,738	13,566	21,947	89,524
5,553	9,931	28,797	85,157	155,924	285,362
7,917	4,564	20,260	58,108	87,041	177,890
30,752	139,379	82,329	29,560	33,205	315,225
15,683	5,078	19,391	19,088	70,460	129,700
12,814	14,581	18,059	8,347	39,276	93,077
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176,642	784,114	2,376,034	2,324,885	1,448,063	7,109,738

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## LGS EROL

TABLE 2.1-13

POPULATION DISTRIBUTION 10-50 MILES  
2010  
DISTANCE (MILES)

<u>0-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	<u>50-Mile Total</u>
7,901	20,203	70,491	75,444	35,745	209,784
5,964	32,968	246,677	237,938	53,069	576,616
6,154	25,371	27,813	36,384	71,622	167,344
7,991	69,822	73,705	29,886	56,593	237,997
8,464	91,406	122,553	251,430	467,794	941,647
14,051	173,487	650,942	686,669	165,153	1,690,302
21,595	106,916	1,013,175	660,888	269,426	2,072,000
36,389	40,734	307,940	47,173	30,722	462,958
7,139	103,134	50,417	442,504	31,232	634,426
5,036	56,752	36,041	64,955	66,896	229,680
4,031	11,895	48,889	16,280	26,336	107,431
6,663	11,919	34,557	102,185	187,108	342,432
9,500	5,478	24,311	69,729	104,447	213,465
36,903	167,256	98,795	35,473	39,845	378,272
18,822	6,094	23,269	22,906	84,552	155,643
15,377	17,499	21,671	10,016	47,131	111,694
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211,980	940,934	2,851,246	2,789,860	1,737,671	8,531,691

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## LGS EROL

TABLE 2.1-14

POPULATION DISTRIBUTION 10-50 MILES  
2020  
DISTANCE (MILES)

<u>0-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	<u>50-Mile Total</u>
9,480	24,242	84,586	90,526	42,888	251,722
7,158	39,555	296,007	285,513	63,674	691,907
7,385	30,441	33,371	43,654	85,939	200,790
9,591	83,778	88,441	35,859	67,908	285,577
10,156	109,680	147,060	301,706	561,341	1,129,943
16,862	208,176	781,112	823,984	198,173	2,028,307
25,911	128,297	1,215,788	793,046	323,302	2,486,340
43,664	48,875	369,510	56,603	36,862	555,514
8,567	123,754	60,496	530,994	37,474	761,285
6,045	68,045	43,245	77,941	80,271	275,597
4,836	14,273	58,659	19,532	31,599	128,899
7,998	14,296	41,466	122,616	224,521	410,897
11,400	6,573	29,168	83,668	125,325	256,134
44,285	200,700	118,545	42,560	47,807	453,897
22,585	7,310	27,917	27,482	101,452	186,746
18,451	20,994	26,002	12,018	56,551	134,016
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254,374	1,129,039	3,421,369	3,347,702	2,085,087	10,237,571

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## LGS EROL

TABLE 2.1-15

## SOURCES OF PROJECTED POPULATIONS

<u>State</u>	<u>1970</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>	<u>2020</u>	
Delaware	1	7	8	2	2	6	6	
Maryland	1	7	8	3	3	6	6	
New Jersey	1	7	8	4	4	6	6	
Pennsylvania	1	7	8	5	5	6	6	

		<u>Year of Estimate</u>	
1	U.S. Census	1970	
2	Delaware Development Office, Delaware Population Consortium	1982	
3	Maryland Department of State Planning	1982	
4	New Jersey Department of Labor, Division of Planning and Research, Office of Demographic and Business Economic Analysis	1983	
5	Pennsylvania Department of Environmental Resources	1983	
6	Philadelphia Electric Company	1984	
7.	U.S. Census	1980	
8.	Philadelphia Electric Company, based on projections made by sources 2, 3, 4, and 5	1984	

APPENDIX 5.2C

50-MILE POPULATION AND CONTIGUOUS POPULATION DOSE MODEL

5.2C.1 The calculation of 50-mile population doses utilized the following equations and assumptions:

5.2C.1.1 For drinking, inhalation, and external exposure:

$$D_j^p = 0.001 \sum_d P_d \sum_a D_{jda} F_a$$

where:

$D_{jda}$  = Annual dose to organ j in subregion d to an average individual in age group a, mrem/yr (doses calculated using average individual usage and model, Ref 5.2-1).

$D_j^p$  = Annual population dose to organ j, man-rem/yr.

$F_a$  = Fraction of total population belonging to age group a (Ref 5.2-1).

$P_d$  = Population in subregion d; see Table 5.2C-1

0.001 = Number of rems/mrem

5.2C.1.2 For ingestion of foods:

$$D_j^p = 0.001 \sum_p P_p \sum_{ia} F_a \bar{C}_{ip} U_{ap} DF_{aij}$$

where:

$\sum_p$  = sum over food product P.

$P_p$  = Population consuming food product p:  
= 50-mile population if the amount produced within 50 miles is greater than the total amount that could be consumed by the 50-mile population (see Table 5.2C-1).  
= Total that could be served if less than 50-mile population.

$\bar{C}_{ip}$  = 50-mile average concentration of nuclide i in food p, pCi/kg or pCi/l (average concentration in each subregion weighted by the total amount produced in each subregion). See Section 2.1.3.

$U_{ap}$  = Use by age group a of food p, kg/yr or l/yr (Ref 5.2-1).



## LGS EROL

$DF_{aij}$  = Ingestion dose factor for age group a, nuclide i and organ j, mrem/pCi intake (Ref 5.2-1).

$D_j^p$  = Annual population dose to organ j, man-rem/yr.

5.2C.2 The calculation of population doses to the contiguous population of the United States utilized the following equations and assumptions.

5.2C.2.1 Liquid effluents - since liquid effluents are limited to the river below LGS, and in 50 radial miles salt water is reached, the same equations and total drinking water dose that apply to 50-mile population may be utilized for U.S. Doses. Drinking water is the most significant pathway considered. Fish ingestion and shoreline recreation pathway exposures for the U.S. were also set equal to the 50-mile population exposures.

5.2C.2.2 Gaseous effluents - the following equation has been extracted from the USNRC computer code entitled GASPAR.

- a. Submersion in noble gases - noble gases are assumed to be released, pass over the portion of the U.S. east of the site, and then become diluted by the entire atmosphere of the world. The total dose to the U.S. population is:

$$D_j^n = D_j^{s0} + D_j^f + D_j^e$$

where:

$D_j^{s0}$  = 50-mile population dose from initial release, man-rem/yr.

$D_j^f$  = Dose to the U.S. population from first pass of noble gases, man-rem/yr for organ j.

$D_j^e$  = Dose from noble gases after 15 years of buildup and dilution in the world's atmosphere, man-rem/yr.

$D_j^N$  = Dose to the total U.S. population.

The three components are calculated as:

$D_j^{s0}$  = As in Section 5.2C.1.

$$D_j^f = 3.17 \times 10^4 \times 0.001 \times IQ \times USPOP/INV \\ \times \frac{1 - \text{Exp}(-\lambda_i CD/ws)}{\lambda_i} \times SF \times DF$$

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## LGS EROL

TABLE 5.2C-1

(Page 1 of 2)

POPULATION DISTRIBUTION(1)  
2000  
DISTANCE (MILES)

<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	<u>10-Mile Total</u>
61	740	540	681	999	8,905	11,926
141	263	335	460	194	3,988	5,381
27	95	285	411	397	3,810	5,025
32	91	353	470	230	2,350	3,526
23	144	406	606	480	15,327	16,986
73	167	426	371	419	18,357	19,813
0	533	1,501	5,647	1,578	4,077	13,336
18	490	2,110	5,748	2,384	40,319	51,069
5	621	388	107	536	6,434	8,091
0	732	461	500	355	3,219	5,267
88	296	259	447	423	5,078	6,591
67	326	753	632	1,509	1,782	5,069
65	79	1,590	1,593	2,534	406	6,267
10	108	4,630	15,745	4,726	11,757	36,976
24	477	3,415	8,677	2,033	1,116	15,742
11	762	1,255	1,233	920	7,035	11,216
645	5,924	18,707	43,328	19,717	133,960	222,281

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## LGS EROL

TABLE 5.2C-1 (Cont'd)

(Page 2 of 2)

<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	<u>50-Mile Total</u>
6,829	46,286	46,773	25,174	136,989
25,272	215,644	183,280	37,574	467,151
32,778	23,802	31,732	52,752	146,090
52,418	61,837	25,372	39,811	182,964
66,515	140,102	263,769	476,933	964,306
168,561	747,667	699,313	105,747	1,741,100
116,919	1,252,024	724,448	143,256	2,249,983
38,367	269,704	35,137	29,640	423,916
95,506	39,132	436,266	24,908	603,902
44,671	37,951	52,662	68,035	208,587
6,461	52,976	13,528	20,704	100,260
11,030	23,711	74,921	152,049	266,780
3,932	17,805	49,845	79,117	156,967
132,836	76,946	20,317	26,559	293,636
8,414	18,249	14,247	51,353	108,005
10,593	15,770	5,735	29,634	72,949
821,102	3,039,606	2,677,345	1,363,246	8,123,585

Based on 1970 census data. This census data is conservative because the weighted ratio of the 1980 census data to the 1970 census data (i.e.,  $\sum \frac{(1980 \text{ POP} - 1970 \text{ POP})}{1970 \text{ POP}}$ )

shows a net decrease in population dose.

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Total Residual Chlorine: The sum of the free chlorine and the combined chlorine.

Weekly: Once in each calendar week, at intervals of approximately 7 days, plus or minus 3 days.

### 1.2 ABBREVIATIONS

BWR: Boiling Water Reactor

10 CFR Part 50: Code of Federal Regulations;  
Title 10 - Atomic Energy  
Part 50 - Licensing of Production and  
Utilization Facilities

FSAR: Final Safety Analysis Report

IRC: Independent Review Committee

LGS: Limerick Generation Station

NEPA: National Environmental Policy Act

MPC: Maximum Permissible Concentration

MSL: Mean Sea Level

NRB: Nuclear Review Board

NRC: Nuclear Regulatory Commission

POR: Plant Operations Review

PMF: Probable Maximum Flood

PSAR: Preliminary Safety Analysis Report

USGS: United States Geological Survey

WSP: Water Supply Paper (USGS)

### 1.3 SYMBOLS

Btu/hr: Heat transfer rate, British thermal units  
per hour

°C: Temperature, degrees Celsius

cfs: Water flow, cubic feet per second

°F: Temperature, degrees Fahrenheit



## LGS EROL

ft<sup>3</sup>: Volume, cubic feet  
fps: Speed, feet per second  
fpm: Speed, feet per minute  
gpd: Liquid flow, gallons per day  
gpm: Liquid flow, gallons per minute  
lb/day: Weight flow rate, pounds per day  
m/sec: Speed, meters per second  
mg/liter: Concentration, milligrams per liter  
Mgd: Liquid flow, million gallons per day  
mph: Speed, miles per hour  
MWt: Power, megawatts of thermal power

### 2. LIMITING CONDITION FOR OPERATION

#### 2.1 NONRADIOLOGICAL LIMITS

Not Applicable.

### 3. NONRADIOLOGICAL MONITORING

#### a. Initiation and Duration of Monitoring Programs

The aquatic environmental monitoring program described in this section will commence at the onset of commercial operation, except as specified under each program. It will continue until modified or terminated, normally 2 years after commercial operation of Unit 2, as provided in these ETS.

#### b. Delays in Sample Collection

If sample collection cannot be undertaken on the scheduled date, due to unusual conditions such as equipment failure, or an act of nature (meteorological and/or hydrological) that prevents the sample from being obtained or analyzed, the factual basis will be recorded, and collections will commence on the first practical date following the scheduled date.

## LGS EROL

plant superintendent shall report to, and consult with the Superintendent, Nuclear Section of the Generation Division or, in his absence, to the superintendent, Fossil and Hydro Section of the Generation Division. The management organization is shown in Figure A 5-1.

### 5.2 STATE AND FEDERAL PERMIT AND CERTIFICATES

Section 401 of the Federal Water Pollution Control Act requires any Applicant for a federal license or permit to conduct any activity that may result in any discharge into navigable waters to provide the licensing agency with a certification from the state having jurisdiction that the discharge will comply with applicable provisions of Sections 301, 302, 306, and 307 of the FWPCA. Section 401 further requires that any certification provided under this section will set forth any effluent limitations, and other limitations and monitoring requirements necessary to ensure that any Applicant for federal license or permit will comply with the applicable limitations. Accordingly, the Applicant will comply with the requirements set forth in the Section 401 certification. Subsequent revisions to the certifications are accommodated in accordance with the provisions of Section 5.8.2.

### 5.3 REVIEW AND AUDIT

Committees for review and audit of plant operations are described below.

In addition to the responsibilities specified in Appendix A to the Operating License, the committees will have the following responsibilities concerning the environmental impact of the plant:

- a. Plant Operations Review Committee (PORC)
  1. Review proposed onsite tests and experiments and results thereof, when such tests have environmental significance.
  2. Review proposed changes to the environmental technical specifications.
  3. Review operating instructions as specified in Section 5.5.
  4. Review environmental deviations as specified in Section 5.4.

## LGS EROL

### b. Nuclear Review Board (NRB)

1. Review proposed changes to the environmental technical specifications.
2. Review proposed changes or modifications to plant systems, or equipment that may affect the environmental impact of the plant.
3. Review all reported environmental deviations.

### c. Independent Review Committee

An Independent Review Committee (IRC) will review the following aspects pertaining to the environmental impact of the station:

1. Objectives, effectiveness, and results from the environmental monitoring programs, prior to submittal to the NRC.
2. Proposed changes to the environmental technical specifications, and the evaluated impact of the changes.
3. Proposed changes or modifications to station systems, or equipment to determine the environmental impact of the changes.
4. Proposed written procedures and changes as described in Section 5.6, and proposed changes thereto, that affect the environmental impact of the station.

## 5.4 ACTION TO BE TAKEN IF A PROTECTION LIMIT OR REPORT LEVEL IS EXCEEDED, OR IF HARMFUL EFFECTS ARE DETECTED

- a. For the purpose of this specification, an environmental deviation is defined as stated in Section 1.1.
- b. Any environmental deviation shall be reported to the superintendent, Nuclear Section of the Generation Division or, in his absence, to the superintendent, Fossil and Hydro Section of the Generation Division, and reviewed by the PORC. This committee shall prepare a separate report for each environmental deviation. This report will include an evaluation of the cause of the deviation, extent and magnitude of the impact, and recommendations for appropriate action to prevent or reduce the probability of such a deviation.

## LGS EROL

- c. Copies of all such reports will be submitted to the superintendent, Nuclear Section of the Generating Division, and to the chairman of the NRB for review and approval of any recommendations.
- d. The superintendent, Nuclear Section of the Generation Division will report the circumstances of any environmental deviation to the NRC, as specified in Section 5.7.2.
- e. If harmful effects or evidence of irreversible damage not considered in the Final Environmental Statement are detected by the monitoring programs, the licensee will provide to the NRC staff an analysis of the problem and a plan of action to be taken to eliminate, or significantly reduce the detrimental effects or damage.

### 5.5 UNIT OPERATING PROCEDURES

- a. Plant personnel will have instructions available for use in operation of the plant components and systems that could have an impact on the environment.
- b. Instructions and appropriate checkoff lists will be provided for the following:
  - 1. Normal startup operation and shutdown of systems and components involving the environmental aspects of the plant.
  - 2. Actions to be taken to correct specific and potential malfunctions of systems or components involving the environmental aspects of the plant.
  - 3. Surveillance and testing requirements of environmental monitoring equipment associated with the monitoring required by these ETS.
- c. All instructions described under 5.5.a and 5.5.b and changes thereto, will be reviewed and approved by the plant superintendent prior to implementation.
- d. Temporary changes to instructions that do not change the intent of the original instruction may be made, provided such changes are approved by the shift superintendent and at least one other member of the plant staff knowledgeable in the areas(s) affected by the procedure. Such changes will be documented and subsequently reviewed by the plant superintendent.



## 5.6 ENVIRONMENTAL PROGRAM DESCRIPTION DOCUMENT

The Applicant will prepare an environmental program description document describing the programs that are required by these ETS. These program descriptions will be submitted to the NRC after approval of these ETS, and subsequent modifications to these programs will be made by the Applicant in conformance with Section 5.6.3.

### 5.6.1 PROCEDURES

Detailed written procedures, including applicable checklists and instructions, will be prepared and followed for activities involved in carrying out the ETS. Procedures will include purpose(s), objective(s), program duration, experimental design, milestone (to indicate objectives have been fulfilled, are being fulfilled, or cannot be fulfilled), sampling, data processing including storage, instrument calibration, measurements, analyses, rationale for interpreting analyses, and actions to be taken when limits (where appropriate) are exceeded.

### 5.6.2 PROGRAM RESULTS

Procedures will be established to ensure that the nonradiological program results are accomplished, including analytical measurements. The procedures will document the program in policy directive, designate a responsible organization or individuals, include purchased services (e.g., contractual laboratory or other contract services), provide for audits of results and procedures by Applicant personnel or designated personnel, and systems to identify and correct deficiencies, investigate anomalous or suspect results, and review and evaluate program results and reports.

Procedures will be established, as required by the NPDES Permit, to ensure the quality of nonradiological program results.

### 5.6.3 CONSISTENCY WITH INITIALLY APPROVED PROGRAMS

Modifications to, or changes in the initially approved programs, developed in accordance with Section 5.6, will be governed by the need to maintain consistency with previously used programs so that direct comparisons of data are technically valid. Such modifications or changes will be justified and, as appropriate, supported by comparative sampling programs (or studies) demonstrating the comparability of results, or provide a basis for making adjustments that permit direct comparisons.

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QUESTION E310.3 (Section 2.1)

Please revise the demographic data and projections using data from the 1980 Census. (EROL Section 2.1.)

RESPONSE

Section 2.1 has been changed to provide data from the 1980 census. Tables 2.1-3 through 2.1-7 and 2.1-10 through 2.1-15 have been changed to provide demographic data based on the 1980 census survey.