P2

Health Consultation

HAVERTOWN PCP SITE

HAVERFORD TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

CERCLIS NO. PAD002338010

MARCH 24, 1998

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-800-447-1544
or
Visit our Home Page at: http://atsdr1.atsdr.cdc.gov:8080/

HEALTH CONSULTATION

HAVERTOWN PCP SITE

HAVERFORD TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

CERCLIS NO. PAD002338010

Prepared by:

Pennsylvania Department of Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

SUMMARY

To respond to the community's concerns about the possible association between cancer risks and the Havertown PCP Superfund Site, the Pennsylvania Department of Health (PADOH) reviewed multiple years of cancer mortality and cancer incidence data for the residents of the area surrounding the site. PADOH concluded that the cancer deaths and cancer incidences were not elevated for people living around the site when observed cancer deaths and incidences were compared to expected numbers.

BACKGROUND AND STATEMENT OF ISSUES

The Havertown PCP site is a National Priorities List (NPL) site in Haverford Township, Delaware County in southeastern Pennsylvania (Figure 1). From 1947 to 1963, the former wood-treatment facility known as National Wood Preservers (NWP) allegedly disposed of up to 1 million gallons of wood-treatment waste materials, primarily pentachlorophenol (PCP) in a petroleum solvent, into a well on site. In 1962, residents reported to the Pennsylvania Department of Health (PADOH) that an oily substance was being discharged into Naylors Run. The oily discharge was traced to NWP. In 1976, the U.S. Environmental Protection Agency (USEPA) initiated cleanup activities at the site that included containment operations at Naylors Run [1].

Past community concerns primarily centered around the visible contamination of Naylors Run and the possible human health hazard associated with the contaminated surface water (Figure 2). On September 24, 1997, Alice Hoffman and Barbra Allerton of PADOH, with Jack Kelly of the Agency for Toxic Substance and Disease Registry (ATSDR), conducted a site visit. The group visited the site, Naylors Run, and surrounding residential and recreational areas and talked to some residents living near Naylors Run. No residents appear to have ever used the contaminated surface water or groundwater for consumption. Additionally, significant releases of volatile organic compounds (VOCs) from surface water into the air was unlikely because the levels of VOCs in the surface water were low [1]. Children who played in Naylors Run may have been exposed to contaminants in the surface water through dermal contact and incidental ingestion. Because the stone and concrete embankment make the creek difficult to access, children were not likely to have played in the creek often, thereby limiting any possible exposure.

The contaminants found above environmental comparison values at the site and in the creek area include PCP and Polycyclic Aromatic Hydrocarbons (PAHs). The International Agency for Research on Cancer (IARC) classifies PCP as a possible human carcinogen. Available epidemiologic studies have not shown convincing evidence that PCP causes cancer in humans. Some case reports suggest a possible association between cancer (Hodgkin's disease, soft-tissue sarcoma, and acute leukemia) and occupational exposure to technical grade PCP through inhalation. However, in all of these cases, concurrent exposure to other toxic substances may have contributed to the effects [2]. EPA classifies PCP as a probable human carcinogen [3].

PAHs are a group of chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances. PAHs can be man-made or occur naturally. More than 100 different PAH compounds are known. Most PAHs do not occur alone in the environment; rather they are found as mixtures of two or more PAHs. The U.S.Department of Health and Human Services (DHHS) has determined that PAHs may reasonably be anticipated to be carcinogens. Epidemiologic studies show increased mortality due to lung cancer in humans exposed to coke oven emissions, roofing-tar emissions, and cigarette smoke through inhalation, all of which contain mixtures of PAHs. Some reports also indicate that mixtures of carcinogenic PAHs can cause skin tumors in human through dermal contact [4].

ATSDR issued a Health Assessment for the site in 1985. ATSDR did not identify anyone who had been exposed to site-related contaminants at levels associated with adverse health effects [5]. PADOH, under Cooperative Agreement with ATSDR, reviewed the health outcome data for Haverford Township as a whole and concluded no elevated cancer risks are associated with the site. PADOH and ATSDR presented those findings in a Site Review and Update (SRU) issued in 1994 [6].

After release of the SRU, citizens continued to express concerns about cancer problems possibly linked to the site. One citizen correctly pointed out that evaluation of the entire township could mask any trends that may exist in the neighborhoods close to the site. PADOH now has the technology available to respond to those concerns and has reviewed health outcome data specifically generated for the community near the site rather than the entire township. The following discussions describe the methods used to collect and analyze the data, our results, and our conclusions.

DATA COLLECTION

Previous PADOH and ATSDR activities have not identified human exposure to site contaminants. We base our analyses on community concerns. We defined our study population as those people who live nearest the site and Naylors Run. Specifically, PADOH and ATSDR defined the study area as a quarter (1/4) mile around the site and Naylors Run (Figure 3). The study area has a total population of 6,406 people (1990 Census Bureau).

PADOH obtained data for the past sixteen years (from 1981 to 1996) on cancer mortality from PADOH's *Death Certificate* database. The database includes all decedents who lived in the study area at the time of death; in other words, some decedents may have lived elsewhere at the time their cancer started. People who may have lived in the study area during the defined time period but moved away and died were not included. PADOH reviewed multiple-year data because of yearly fluctuations in data from widely varying latency periods of various types of cancer.

PADOH also maintains a *Pennsylvania Cancer Registry* (PCR) database containing data of new cancer cases diagnosed each year since 1985. Hospitals report each incidence of a

primary cancer "site" to the PCR. A cancer patient may have more than one primary cancer site. For our analyses, the number of cases refers to the number of primary sites reported rather than the number of people with cancer; however, the number of people generally correlates closely with the number of primary sites. A primary "site" is the primary organ or tissue of the body where the malignancy originated, based on microscopic examination, endoscopy, radiology, clinical examination, or other methods of diagnosis. PADOH obtained cancer incidence data from 1985-1994 from the PCR for analysis. The PCR was implemented in all areas in Pennsylvania in 1985. Thus, 1985 was the earliest year when the data became available. Cancer incidence data collected after 1994 are not yet available.

Both cancer deaths and cancer incidences were identified, based on name and address information obtained from the death certificates and the PCR, and located on a map of our defined study area using the Geographical Information System (GIS), a computer program [Figure 3, 4].

DATA ANALYSIS

Cancer is not a single disease but is a group of diseases. Each type of cancer has unique epidemiological characteristics and different latency periods, which is the time between exposure to one or more cancer-causing agents and the appearance of the cancer. The initiation of cancer may be caused by very different factors. Therefore, if a specific factor, such as exposure to PAHs, is causing cancer in an area, we would expect to see more of the particular types of cancer associated with PAH exposure than we would expect to see in a group not exposed to PAHs. If other factors are responsible for the cancers, then we would expect to see a variety of cancer types that correspond with what we would expect to see in most populations.

For our analyses, each cancer case in the study area of Haverford township was analyzed by its cancer type, using the most widely used classification schemes ICD-9 and ICD-O. A total of 23 primary types of cancer sites were analyzed [Appendix A]: buccal cavity and pharynx; esophagus; stomach; colon; rectums, anus, rectosigmoid; pancreas; larynx; rrachea, bronchus, lung, pleura; melanoma of skin; female breast; cervix uteri; corpus uteri; ovary; prostate; testis; urinary bladder; kidney and renal pelvis; brain and other nervous system; thyroid; non-Hodgkin's lymphomas; Hodgkin's Disease; multiple myeloma; and leukemia.

For each type of cancer, the number of cancer deaths and incidences that occurred (observed) in the study area are compared to the number expected using the Pennsylvania population (1990 census) as a standard. This statistical approach is known as the *Indirect Method* of analysis. The expected number is based on the average annual rate in Pennsylvania for the period 1988-1992. For each primary cancer site, by age and sex group, the age-sex-specific rate for Pennsylvania is multiplied by the number of residents in the study area for each of the respective age and sex groups. The expected number of cancer deaths and incidences is totaled across each age and sex group. The expected number is multiplied by 16 (1981-

1996) for cancer mortality and 10 (1985-1994) for cancer incidence, and the observed number is compared to the expected number for the studied time period.

The observed numbers of deaths and incidences of various cancer types are compared to the expected numbers by computing ratios of observed to expected numbers of deaths and incidences. For cancer deaths, these ratios are also called Standardized Mortality Ratios (SMRs). A statistical test (Poisson model) is used to determine statistical significance ($p<0.05$) of the ratio. If the ratio is not statistically significant, scientists assume that the cancers may have occurred by chance and any one cause for the cancers is difficult to find. If the ratio is statistically significant, scientists then feel the possibility is greater that the cancers may have beem caused by the same factor or factors.

Mortality rates were computed for residents of the study area for comparison with residents of Pennsylvania. To allow comparability, cancer mortality rates for residents of the study area were adjusted for age and sex using the 1990 Pennsylvania population as the standard. The annual average age and sex-specific mortality rate of the studied population is multiplied by the population in Pennsylvania for each of the respective age and sex groups. The adjusted number of deaths is totaled across each age and sex group. The total number is divided by the total of the standard population and multiplied by 100,000 to yield the age-sex-adjusted rate per 100,000. This statistical method is known as the *Direct Method.*

Both methods of calculation were based on the assumption that the population of the study area remained the same in size and age-sex distribution throughout the studied time period and that the age-sex-cause specific mortality or incidence for Pennsylvania also remained constant for the same time period.

RESULTS

PADOH conducted this data review to determine if any cancer trends or clusters could be identified in the population living near the Havertown PCP site. Cause and effect relationships between the site and health effects cannot be established because we are not able to exclude confounding factors, other important causal factors, which can considerably contribute to cancer cases. For example, "lifestyle" factors such as smoking, high fat and low fiber diet, alcohol consumption, and lack of physical activities have been shown to be the major risk factors for most cancers. Heredity, or family history, is also an important factor. Chemical exposures from various sources, especially in high risk occupations, in combination with other factors, may contribute to various cancers. All though a cause/effect relationship cannot be determined through analyses, we do feel that any trend could be identified if present.

The 6,406 residents in the study area included 3,125 (48.8%) males and 3,281 (51.2%) females. The proportion of persons under 18 years of age were comparable for both the study area and Pennsylvania, 23.8% and 23.5%, respectively. Persons 65 years of age and over comprised 16.9% of the study area population as compared with 15.4% of the state's

population. The study area has a slightly larger proportion of older persons than the entire Pennsylvania population.

Figures 3 and 4 represent multiple year cancer deaths and incidences data for the census blocks included in our study area. Some census blocks may seem to have more cancers. However, the underlying population density is very important to examine. More people may live in a block, and, therefore, more cancers may occur as a result of the greater population in that block. Please note that, in both figures, we can differentiate the population density between census blocks, but we cannot differentiate population density within a census block. That is, even though more people live on one side of the census block than the other side, they are all color coded with the same shade. If only part of the census block is in the study area, then we may not be able to distinguish whether a particular case or cases falls within the study area.

Cancer Mortality

Cancer is the second leading cause of death in the United States. The lifetime probability of developing cancer is now estimated at one in three. Over the past 50 years, the death rate from cancer has increased steadily throughout the United States. A sharp rise in lung cancer rates is the main reason for this increase [7]. This is also true for our study area. As shown in Figure 3, trachea, bronchus, lung, and pleura cancer was identified as the leading cause of cancer death in the study area. Colon, female breast, and prostate cancers were also identified as other leading causes of cancer deaths in both the study population and the Pennsylvania population. Although cancer may appear to be increasing in a population, cancers more commonly develop at older ages, and Americans are living longer than ever before. As noted, the study population has a greater proportion of older people than Pennsylvania as a whole.

A total of 259 cancer deaths were reported from 1981 to 1996 among the study area residents (Table 1). The 259 cancer deaths, which are less than the expected number of cancer deaths, included 134 males and 125 females. The expected number of cancer deaths for the sixteen-year study period was 269.3 (142.10 males and 127.22 females). No study area residents were reported to have died of larynx cancer, thyroid cancer, or Hodgkin's Disease during this time period.

Table 2 shows the observed numbers of cancer deaths compared to the expected number for each type of cancer by sex. The ratios of observed numbers to expected numbers may vary for different types of cancer. However, none of the differences were statistically significant, and they were not considered unusual from what is normally expected.. For example, testicular cancer for males and melanoma skin cancer for females had the greatest SMRs of 6.47 and 2.11, respectively, with reported cancer deaths of 1 and 4. Rates calculated from small numbers are subject to large random fluctuations, or unstable estimates. If the number of deaths is very small, even one more or one fewer deaths might result in major fluctuations in the mortality rate. When interpreting these rates, we must also consider important

limitations of the data such as no information on potential confounding factors. Not controlling for these factors could have a significant effect on the rates. An elevated rate based on several observed cases along with a plausible biological explanation provides stronger evidence for an elevated rate. Although a possible association between dermal exposure to PAHs and skin cancer may exist, sun exposure is the most common cause of melanoma skin cancer. Because the higher than expected deaths from melanoma skin cancer is statistically insignificant and because we do not have information on confounding factors, in this case sun exposure, we do not believe that melanom of skin demonstrates a trend for increased mortality in the study population. Causes for testicular cancer are not clear.

"Other" cancer category in Table 1 consists of over 20 small groups of cancer types, each of which had very small numbers. These numbers were too small to represent a stable estimation for analysis, and therefore, were not analyzed individually or shown individually in Table 2.

As shown in Table 2, among the residents in the study area, leukemia deaths were less than expected (3 males observed, 5.10 expected; 1 females observed, 1.33 expected). No cancer deaths from Hodgkin's Disease and soft-tissue sarcoma were observed during 1981-1996. Cancer deaths of trachea, bronchus, lung and pleura (80 observed, 71.77 expected), and melanoma of skin (6 observed, 3.79 expected) were not statistically higher than normally expected. In other words, the suspected types of cancer possibly linked to PCP and PAHs exposure were not found to be elevated in the study area.

When all cancer types were considered together, a comparison of the observed and expected cancer deaths in each age and gender group also did not indicate any statistical differences in mortality. SMRs may range as high as 5.03 for males of age 15-24 with 2 cancer deaths. Because of the very small number, this SMR was not statistically significant (Table 3).

Table 4 indicates the number of cancer deaths that occurred in four consecutive time periods and mortality rates for the study population compared with the total Pennsylvania population for each type of cancer. PADOH did not find any indications of continuous increases of cancer deaths nor any indication of cancer clusters over the sixteen-year study period. Death rates for each type of cancer among study residents were adjusted for age and sex so they are comparable with rates for all Pennsylvania residents. For all types of cancer deaths, 237.68 deaths per 100,000 population occurred annually in the study area during 1981-1996 compared to 247.35 deaths per 100,000 population in Pennsylvania.

Cancer Incidence

Table 5 shows the number of cancer cases diagnosed from 1985-1994 (170 males and 167 females) among the residents in the study area. Table 6 shows the ratio of observed to expected cases for men at 0.60 (158 observed compared to 261.23 expected) and the ratio for women at 0.64 (163 observed compared to 253.47 expected). For individual types of cancer, the observed to expected ratios were all less than 1, except melanoma of skin cancer for

female. Six were observed compared to 4.45 expected. However, this difference was not statistically significant. Human data is inadequate to show an association between skin tumors and dermal contact with PCP, although dermal exposure to PAHs is associated with skin cancer in animals. Animal studies indicate that PCP is inactive as a promoter of skin tumors in mice [2]. "Others" was not included due to a very small number of cases for each cancer type.

When all cancer types were considered together, a comparison of the observed and expected cancer incidence by each age and gender groups also indicated that fewer cancer cases were observed than expected during the study period.

Four cases of leukemia were diagnosed for men, while 6.13 cases were expected among the study residents. One female leukemia case was diagnosed, while 5.17 cases were expected. One female was diagnosed with Hodgkin's Disease with 1.61 expected, while no male cases were reported for Hodgkin's Disease. No soft-tissue sarcomas were reported. A total of 60 trachea, bronchus, lung, and pleura cancer incidences were reported compared to the expected number of 81.32 incidences. Melanoma of skin cancer incidences were compatible with the expected number (11 observed, 10.19 expected).

The quality of cancer incidence data presented in this HC is directly related to the completeness and accuracy of the information reported from each hospital. The crude rate (not adjusted for age and sex) of cancer incidence in the study area was much lower compared to all of the Pennsylvania population. PADOH is aware that cancer incidence may be under-reported. The extent of under-reporting is unknown. The PCR tries to ensure that hospitals comply with the cancer reporting requirement by frequently monitoring and auditing those with low compliance rates. Due to the uncertainty of data quality, PADOH did not compute adjusted rates for analysis.

CONCLUSION

PADOH based the cancer data review on a population of 6,406 residents living within a quarter mile around the Havertown PCP site. Comparisons of observed and expected numbers of cancer deaths and cancer incidences were carried out for 23 primary types of cancer. In no instance was the difference between the observed and expected numbers of cancer deaths and cancer incidences in the study area statistically significant during the study period. This observation was valid for males and females separately as well as for both sexes combined. Reviews of both cancer mortality and cancer incidence data in the area surrounding the site, indicate that no elevated cases of leukemia, Hodgkin's Disease, soft-tissue sarcoma, lung cancer, and melanoma of skin, which are cancers reported to be associated with PCP and PAHs exposure in other studies. While the ratios of observed to expected cancers for some types of cancer ranged as high as 6.47 (testicular cancer deaths), those ratios were based on only a few cases and cannot be considered unusual occurrences.

The cancer risks for people living in this area are not different from Pennsylvania as a whole. The data did not show any unusual rates of cancer around the site. The findings of our evaluation, which considered the population at greatest risk of exposure, substantiate conclusions based upon the larger Havertown population and presented in ATSDR's Public Health Assessment of 1985 and Site Review and Update of 1994. PADOH found no evidence of cancer clusters near the Havertown PCP Superfund site and further investigation is not warranted unless new health information becomes available which indicates people have been exposed to contaminants at levels that could be associated with health effects.

Although the leading causes of cancer deaths such as lung cancer (80 observed, 71.77 expected), colon cancer (33 observed, 28.92 expected) and female breast cancer (26 observed, 23.58 expected) were not statistically higher than expected in the study area, the numbers do show that trends for these cancers follow national trends.

Colon cancer is the second leading cause of cancer death in men and the third leading cause of cancer death in women in the nation [9] and the study area. Increased risk of colon cancer has consistently been associated with a diet high in saturated fat (especially through meat intake), low in vegetables, and low in high-fiber grains. Growing evidence also suggests that a lack of either occupational or recreational physical activity increases the risk of colon cancer.

An estimated one of every nine women will develop breast cancer at some time during her lifetime. For breast cancer death reduction, studies have demonstrated that clinical breast examination by a physician or nurse and mammography screening are effective methods for early detection of breast cancer. Failure to use mammography on a population basis is believed to account for as much as 19% to 25% of all breast cancer deaths that may have been prevented through early detection.

RECOMMENDATIONS

Although we have no follow-up recommendations for health agencies, we would like to provide community members with information on actions they can take to reduce their risks of developing some types of cancer. Specifically:

Lung cancer accounts for 28% of all cancer deaths (1993) [9], and the risk of getting lung cancer can be reduced or prevented if smoking is stopped or never started.

To reduce the risk of getting colon cancers, adopt a diet of five or more servings of fruits and vegetables daily, five or more servings of whole grains and/or beans daily with the selection of the lowest-fat choices within each food group, and increase physical activities [10, 11].

Women should consult with their health care providers about breast examinations and when and how often to have mammograms.

REFERENCES

1. U.S.E.P.A. Record of Decision for Havertown PCP, September, 1991.

2. Agency for Toxic Substances and Disease Registry, Case Studies in Environmental Medicine, Pentachlorophenol Toxicity, September 1993.

3. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Pentachlorophenol (PCP), May 1994.

4. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs), August 1995.

5. Agency for Toxic Substances and Disease Registry, Public Health Assessment for Havertown PCP, November 1985.

6. Agency for Toxic Substances and Disease Registry, Site Review and Update for Havertown PCP, September 1994.

7. American Cancer Society. Cancer Facts and Figures - 1993.

8. State Center for Health Statistics and Research. Pennsylvania Cancer Incidence and Mortality, 1988-1996.

9. Brownson, Ross C., Chronic Disease Epidemiology and Control, American Public Health Association, 1993.

10. Greenwald P, Sondik DJ, eds. Cancer control Objectives for the Nation: 1985-2000. National Cancer Institute Monographs. DHHS publication 86-2880.

11. Bal DG, Foerster SB. Changing the American diet. Impact on cancer prevention policy recommendations and program implications for the American Cancer Society. Cancer, 1991;67;2671-2680.

PREPARERS OF THE REPORT

Alice Hoffman, MHA
Epidemiology Program Specialist
Division of Environmental Health Assessment

Mark Lavin, B.S.
Environmental Health Specialist
Division of Environmental Health Assessment

CERTIFICATION

The Havertown PCP Site Health Consultation has been prepared by the Pennsylvania Department of Health under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the Health Consultation was initiated.

Gail D. Godfrey
Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this Health Consultation and concurs with its findings.

Richard, E. Gillig
Chief, SPS, SSAB, DHAC, ATSDR

FIGURES

Figure 1

Havertown PCP Site Location

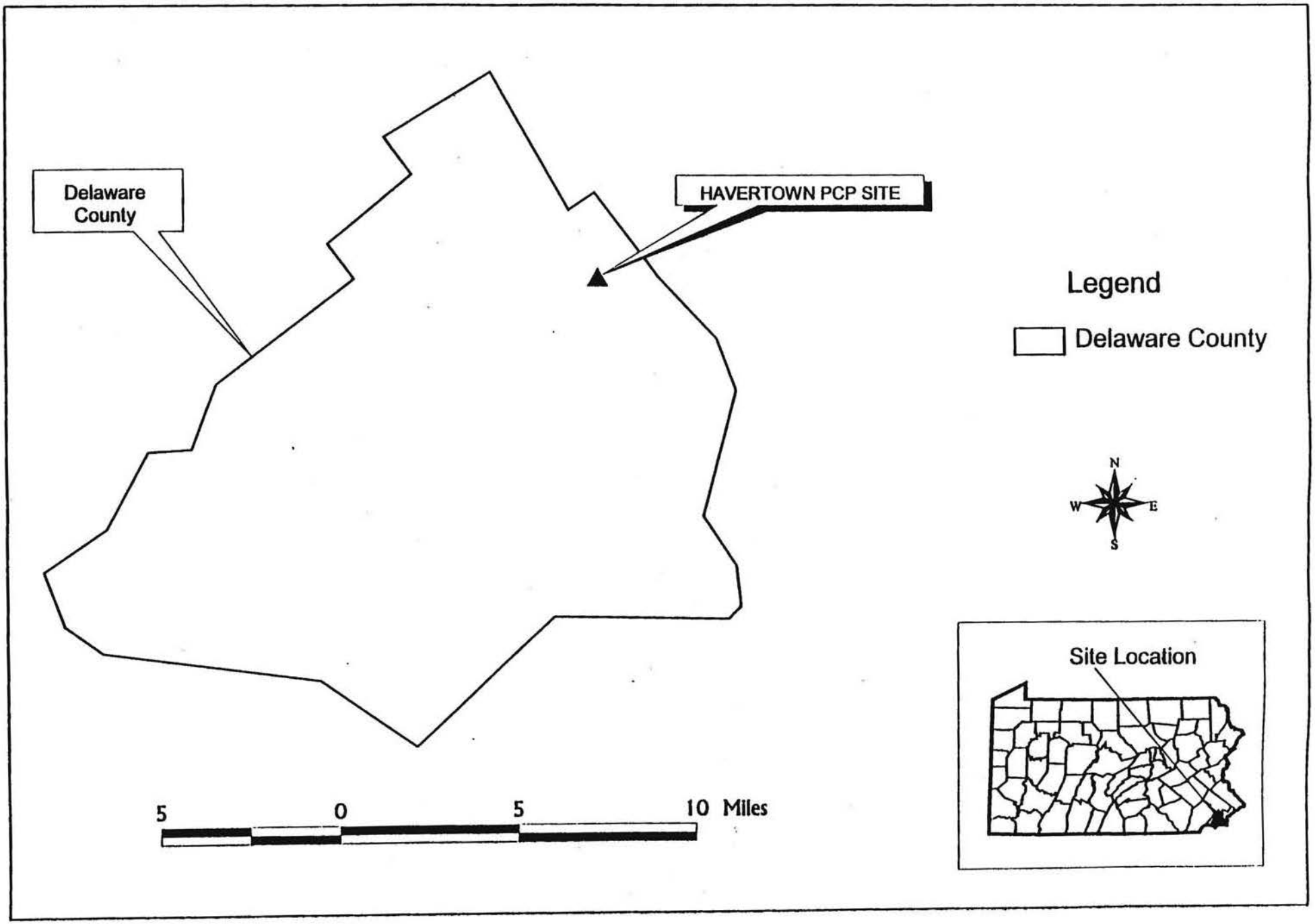
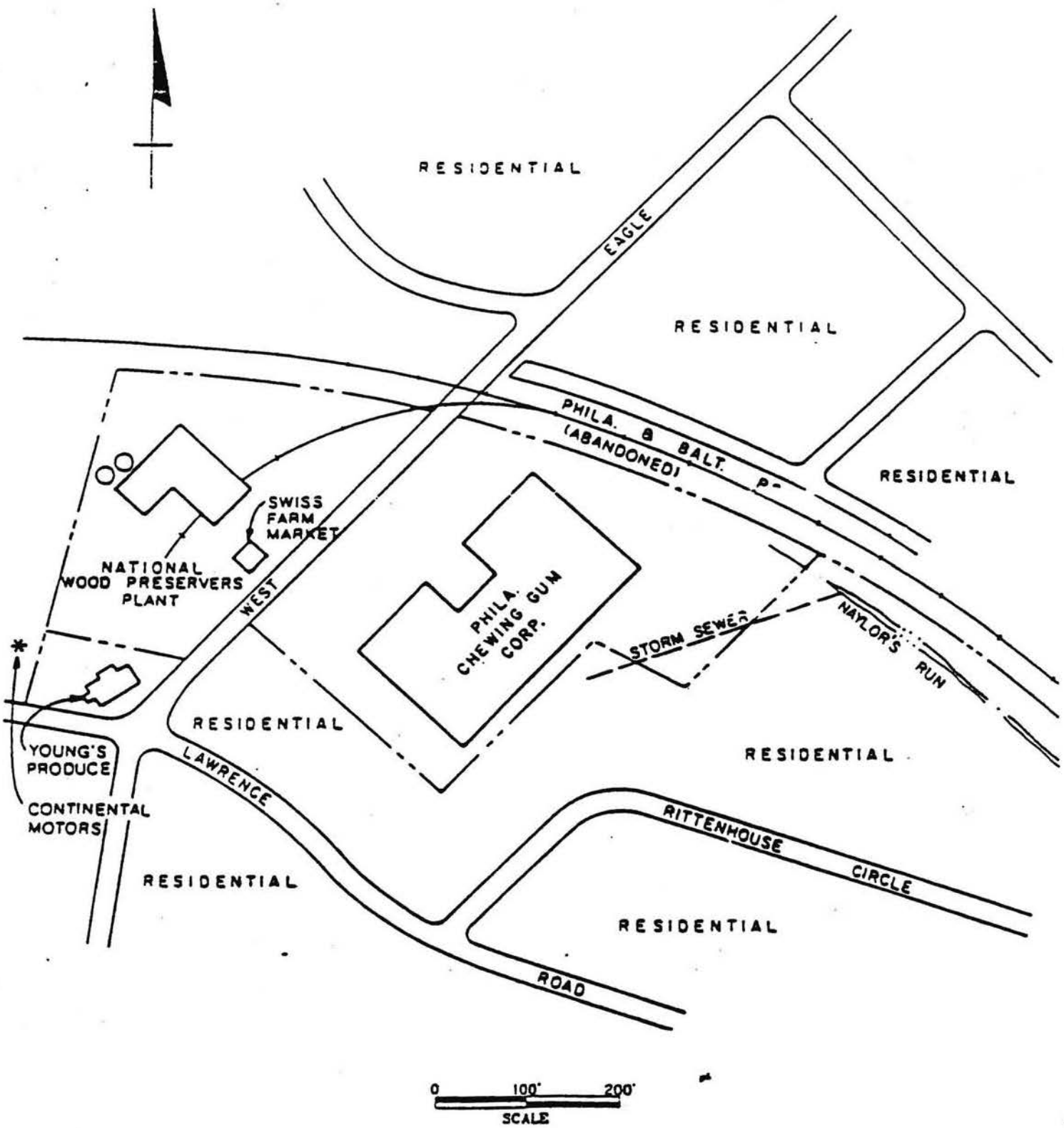


FIGURE 2



Havertown PCP Site

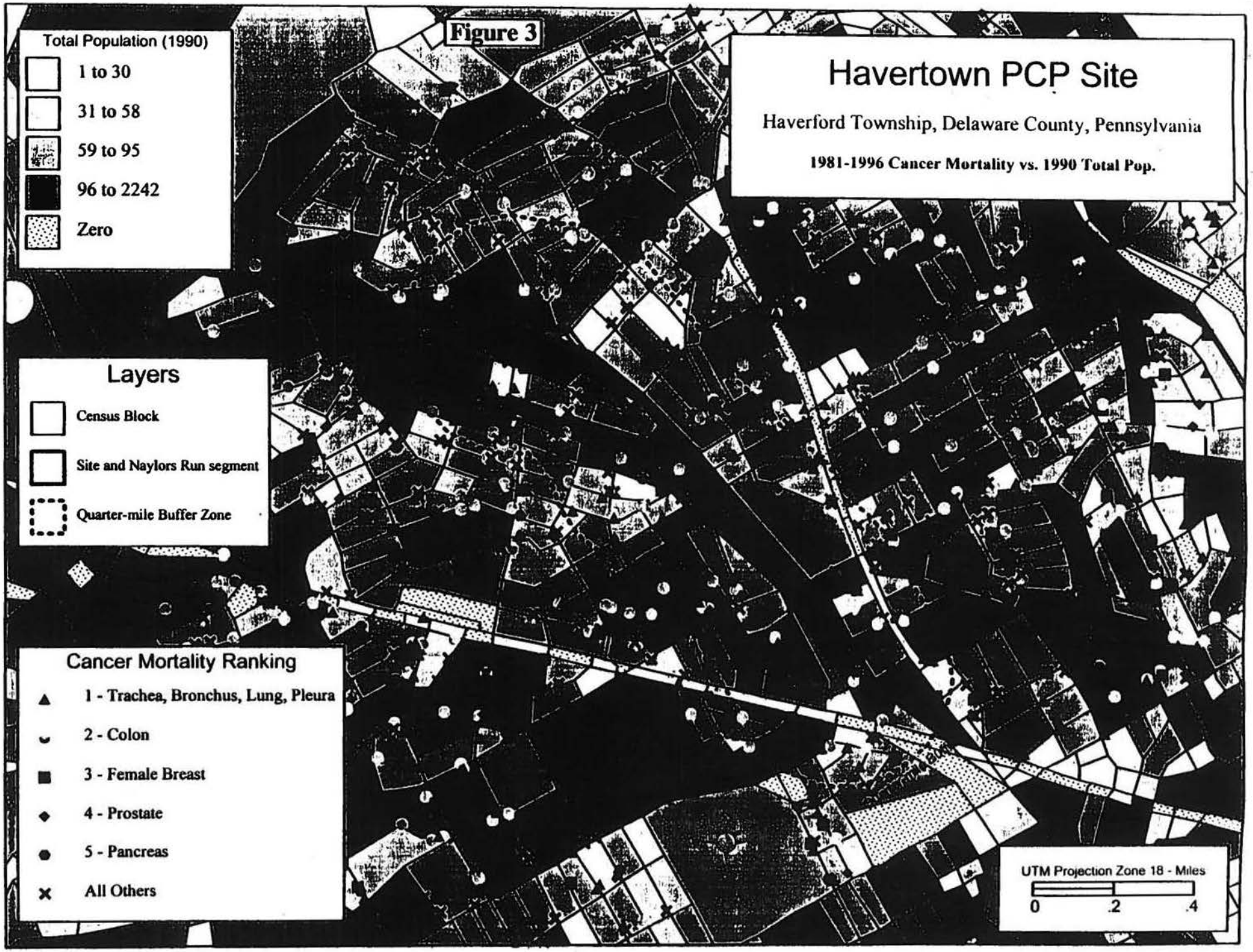


Figure 3
Havertown PCP Site
Haverford Township, Delaware County, Pennsylvania
1981-1996 Cancer Mortality vs. 1990 Total Pop.
Total Population (1990)
1 to 30
31 to 58
59 to 95
96 to 2242
Zero
Layers
Census Block
Site and Naylors Run segment
Quarter-mile Buffer Zone
Cancer Mortality Ranking
1 - Trachea, Bronchus, Lung, Pleura
2 - Colon
3 - Female Breast
4 - Prostate
5 - Pancreas
All Others
UTM Projection Zone 18 - Miles
0
.2
.4

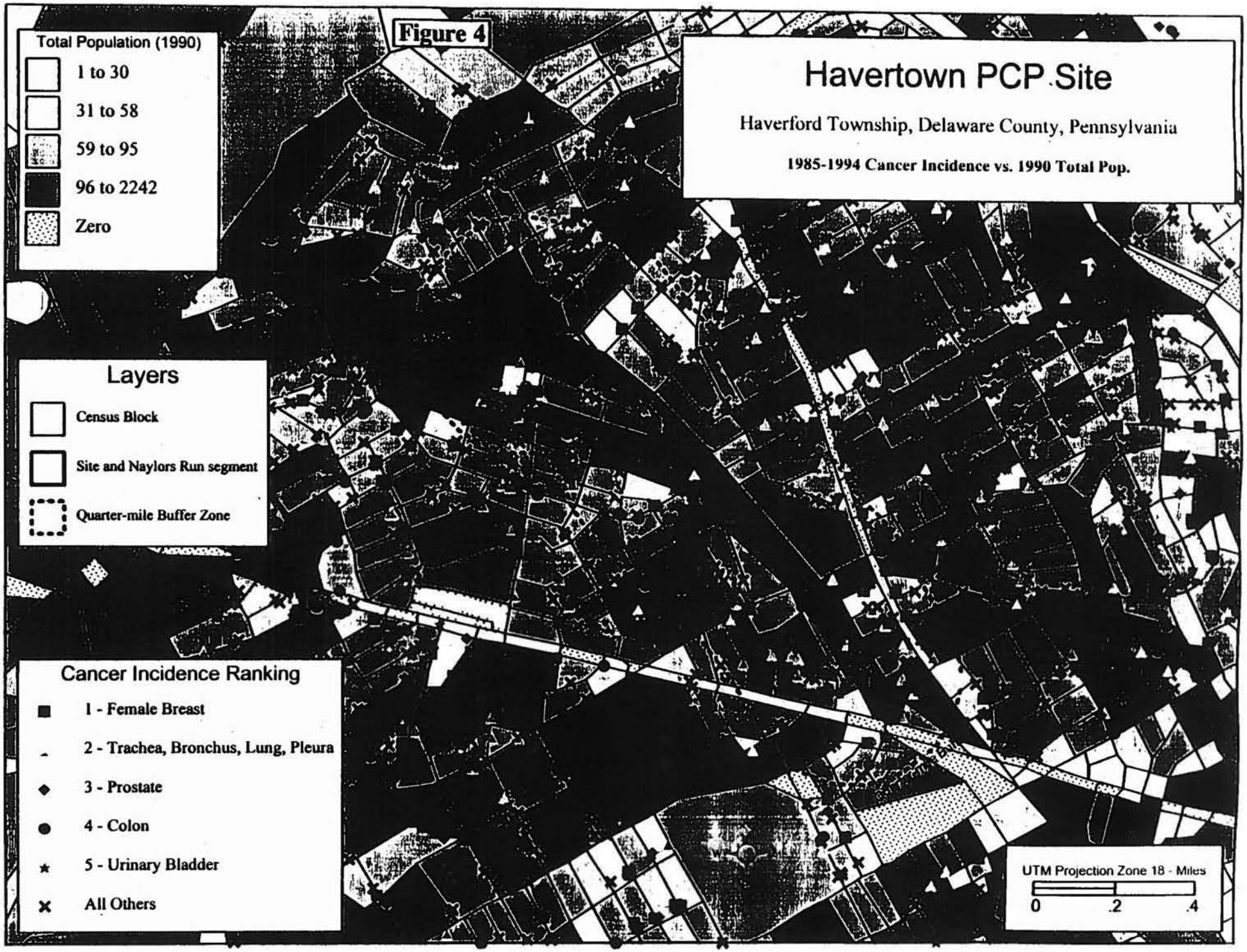


Figure 4
Total Population (1990)
1 to 30
31 to 58
59 to 95
96 to 2242
Zero
Havertown PCP Site
Haverford Township, Delaware County, Pennsylvania
1985-1994 Cancer Incidence vs. 1990 Total Pop.
Layers
Census Block
Site and Naylors Run segment
Quarter-mile Buffer Zone
Cancer Incidence Ranking
1 - Female Breast
2 - Trachea, Bronchus, Lung, Pleura
3 - Prostate
4 - Colon
5 - Urinary Bladder
All Others
UTM Projection Zone 18 - Miles
0
.2
.4

TABLES

Table 1

Cancer Deaths of Study Area in Haverford Township, Pennsylvania,
By Sex and Type of Cancer, 1981-1996

Cancer Type	Total	Male	Female
Trachea, Bronchus, Lung, Pleura	80	48	32
Colon	33	18	15
Female Breast	26	0	26
Prostate	12	12	0
Stomach	10	6	4
Cervix Uteri, Corpus Uteri and Ovary	9	0	9
Non-Hodgkin's Lymphomas	8	5	3
Pancreas	8	5	3
Brain and Other Nervous System	6	3	3
Melanoma of Skin	6	2	4
Buccal Cavity and Pharynx	5	4	1
Leukemias	4	3	1
Multiple Myeloma	4	3	1
Urinary Bladder	4	4	0
Esophagus	2	2	0
Kidney and Renal Pelvis	2	2	0
Rectum, Anus, Rectosigmoid	2	0	2
Testis	1	1	0
Other	37	16	21
Total	259	134	125

Table 2

Observed And Expected Numbers of Cancer Deaths in Study Area of Haverford Township, PA
By Cancer Type and Sex, 1981-1996

Cancer Type	ICD-9 Code	Male			Female			Both Sexes		
		Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
Buccal Cavity and Pharynx	140.0-149.9	4	2.51	1.59	1.00	1.20	0.83	5	3.71	1.35
Esophagus	150.0-150.9	2	3.95	0.51	0	4.65	-	2	8.60	0.23
Stomach	151.0-151.9	6	4.80	1.25	4	3.01	1.33	10	7.81	1.28
Colon	153.0-153.9, 159.0	18	14.31	1.26	15	14.60	1.03	33	28.92	1.14
Rectum, Anus, Rectosigmoid	154.0-154.8	0	2.43	-	2	2.16	0.92	2	4.60	0.43
Pancreas	157.0-157.9	5	6.11	0.82	3	6.51	0.46	8	12.62	0.63
Larynx	161.0-161.9	0	1.68	-	0	0.41	0.00	0	2.09	-
Trachea, Bronchus, Lung, Pleura	162.0-163.9	48	46.54	1.03	32	25.23	1.27	80	71.77	1.11
Melanoma of Skin	172.0-172.9	2	1.90	1.05	4	1.90	2.11	6	3.79	1.58
Female Breast	174.0-174.9	-	-	-	26	23.58	1.10	26	23.58	1.10
Cervix Uteri, Corpus Uteri and Ovary	180.0-180.9, 182.0-182.8, 183.0	-	-	-	9	10.86	0.83	9	10.86	0.83
Prostate	185	12	16.89	0.71	0	0.00	-	12	16.89	0.71
Testis	186.0-186.9	1	0.15	6.47	-	-	-	1	0.15	6.47
Urinary Bladder	188.0-188.9	4	3.96	1.01	0	1.81	-	4	5.77	0.69
Kidney and Renal Pelvis	189.0-189.1	2	3.07	0.65	0	2.07	-	2	5.14	0.39
Brain and Other Nervous System	191.0-192.9	3	2.95	1.02	3	2.46	1.22	6	5.40	1.11
Thyroid	193	0	0.22	-	0	0.34	-	0	0.57	-
Non-Hodgkin's Lymphomas	159.1, 200.0-200.8, 202.0-202.2, 202.6, 202.8-202.9	5	5.07	0.99	3	4.88	0.61	8	9.96	0.80
Hodgkin's Disease	201.0-201.9	0	0.45	-	0	0.38	-	0	0.83	-
Multiple Myeloma	203.0, 203.8	3	2.23	1.35	1	2.23	0.45	4	4.46	0.90
Leukemias	202.4, 203.1, 204.0-208.9	3	5.10	0.59	1	1.33	0.75	4	6.43	0.62
Total*		118	124.34	0.95	104	109.62	0.95	222	233.96	0.95

* "Other" was not included.

Table 4

Numbers and Rates of Cancer Deaths In Study Area of Haverford Township, PA
By Type of Cancer and Year, 1981-1996

Number of Deaths

Type of Cancer	All Sites	Buccal Cavity and Pharynx	Esophagus	Stomach	Colon	Rectum, Anus, Rectosigmoid	Pancreas	Larynx	Trachea, Bronchus, Lung, Pleura	Melanoma of Skin	Female Breast	Cervix Uteri, Corpus Uteri and Ovary
Year 81-84	64	2	1	2	10	2	2	0	16	2	5	1
Year 85-88	70	1	0	3	7	0	0	0	26	1	9	1
Year 89-92	65	0	1	2	8	0	6	0	18	0	8	5
Year 93-96	60	2	0	3	8	0	0	0	20	3	4	2
Observed	259	5	2	10	33	2	8	0	80	6	26	9
Expected	269.32	3.71	8.60	7.81	28.92	4.60	12.62	1.68	71.77	3.79	23.58	10.86

Death Rates Per 100,000 Population

Studied Area	237.68	5.00	1.71	9.31	30.69	1.89	7.24	0.00	72.31	5.33	45.79	16.49
Pennsylvania	247.35	3.42	4.80	7.18	26.74	4.25	11.63	1.90	65.06	2.90	42.37	19.36

Table 3

Observed And Expected Numbers of Cancer Deaths in Study Area of Haverford Township, PA
By Age and Sex, 1981-1996

	Male			Female			Total		
Age Group	Obs.	Exp.	SMR	Obs.	Exp.	SMR	Obs.	Exp.	SMR
Under 15	0	0.34	0.00	0	0.18	0.00	0	0.53	0.00
Age 15-24	2	0.40	5.03	0	0.26	0.00	2	0.66	3.04
Age 25-34	1	1.04	0.96	1	1.07	0.94	2	2.11	0.95
Age 35-44	2	3.11	0.64	2	3.51	0.57	4	6.63	0.60
Age 45-54	11	7.85	1.40	5	8.35	0.60	16	16.20	0.99
Age 55-64	18	25.84	0.70	27	22.19	1.22	45	48.03	0.94
Age 65-74	44	51.96	0.85	44	44.07	1.00	88	96.04	0.92
Age 75-84	45	40.40	1.11	31	33.50	0.93	76	73.90	1.03
Age 85+	11	11.15	0.99	15	14.09	1.06	26	25.24	1.03
	134	142.10	0.94	125	127.22	0.98	259	269.32	0.96

Table 4 (continued)

Numbers and Rates of Cancer Deaths In Study Area of Haverford Township, PA
By Type of Cancer and Year, 1981-1996

Number of Deaths

Type of Cancer	Prostate	Testis	Urinary Bladder	Kidney and Renal Pelvis	Brain and Other Nervous System	Thyroid	Non-Hodgkin's Lymphomas	Hodgkin's Disease	Multiple Myeloma	Leukemias
Year 81-84	3	1	2	0	2	0	0	0	0	0
Year 85-88	5	0	1	0	0	0	4	0	2	4
Year 89-92	1	0	0	2	3	0	4	0	0	0
Year 93-96	3	0	1	0	1	0	0	0	2	0
Observed	12	1	4	2	6	0	8	0	4	4
Expected	16.89	0.15	4.52	5.14	5.40	0.22	9.96	0.45	4.46	6.43

Death Rates Per 100,000 Population

Studied Area	22.23	2.00	3.72	1.92	5.52	0.00	7.85	0.00	3.63	3.69
Pennsylvania	31.51	0.31	5.30	4.74	5.10	0.54	9.22	0.79	4.24	8.89

Table 5

Cancer Incidences of Study Area in Haverford Township, Pennsylvania, By Sex and Type of Cancer, 1985-1994

Cancer Type	Total	Male	Female
Female Breast	63	0	63
Trachea, Bronchus, Lung, Pleura	60	40	20
Colon	46	21	25
Prostate	33	33	0
Rectum, Anus, Rectosigmoid	20	12	8
Urinary Bladder	14	11	3
Non-Hodgkin's Lymphomas	14	8	6
Melanoma of Skin	11	5	6
Stomach	9	6	3
Ovary	7	0	7
Kidney and Renal Pelvis	7	7	0
Corpus Uteri	6	0	6
Pancreas	5	2	3
Cervix Uteri	5	0	5
Leukemias	5	4	1
Larynx	4	4	0
Buccal Cavity and Pharynx	3	1	2
Thyroid	3	1	2
Mutiple Myeloma	2	1	1
Esophagus	1	1	0
Testis	1	1	0
Brain and Other Nervous System	1	0	1
Hodgkin's Disease	1	0	1
Other	16	12	4
Total	337	170	167

Table 6

Observed And Expected Numbers of Cancer Incidences in Study Area of Haverford Township, PA
By Cancer Type and Sex, 1985-1994

Cancer Type	ICD-O-2	Male			Female			Both Sexes		
		Obs.	Exp.	Ratio	Obs.	Exp.	Ratio	Obs.	Exp.	Ratio
Buccal Cavity and Pharynx	C00.0 - C14.8	1	7.54	0.13	2	3.66	0.55	3	11.20	0.27
Esophagus	C15.0 - C15.9	1	4.35	0.23	0	1.53	0.00	1	5.89	0.17
Stomach	C16.0 - C16.9	6	6.77	0.89	3	4.08	0.74	9	10.86	0.83
Colon	C18.0 - C18.9, C26.0	21	29.93	0.70	25	31.20	0.80	46	61.13	0.75
Rectum, Anus, Rectosigmoid	C19.9, C20.9, C21.0 - C21.8	12	13.48	0.89	8	10.97	0.73	20	24.45	0.82
Pancreas	C25.0 - C25.9	2	5.42	0.37	3	5.72	0.52	5	11.15	0.45
Larynx	C32.0 - C32.9	4	5.81	0.69	0	1.50	-	4	7.30	0.55
Trachea, Bronchus, Lung, Pleura	C33.9, C34.0 - C34.9, C38.4	40	51.99	0.77	20	29.32	0.68	60	81.32	0.74
Melanoma of Skin	C44.0 - C44.9, M8720 - M8780	5	5.75	0.87	6	4.45	1.35	11	10.19	1.08
Female Breast	C50.0 - C50.9	-	-	-	63	88.80	0.71	63	88.80	0.71
Cervix Uteri	C53.0 - C53.9	-	-	-	5	5.87	0.85	5	5.87	0.85
Corpus Uteri	C54.0 - C54.9	-	-	-	6	17.93	0.33	6	17.93	0.33
Ovary	C56.9	-	-	-	7	10.48	0.67	7	10.48	0.67
Prostate	C61.9	33	73.79	0.45	-	-	-	33	73.79	0.45
Testis	C62.0 - C62.9	1	2.63	0.38	-	-	-	1	2.63	0.38
Urinary Bladder	C67.0 - C67.9	11	21.10	0.52	3	7.61	0.39	14	28.71	0.49
Kidney and Renal Pelvis	C64.9, C65.9	7	7.29	0.96	0	4.99	-	7	12.28	0.57
Brain and Other Nervous System	C70.0 - C72.9	0	4.09	-	1	3.46	0.29	1	7.55	0.13
Thyroid	C73.9	1	1.29	0.78	2	3.24	0.62	3	4.53	0.66
Non-Hodgkin's Lymphomas	M9590 - M9595, M9670 - M9687, M9690 - M9709, M9711 - M9714, M9740 - M9741	8	9.38	0.85	6	9.07	0.66	14	18.45	0.76
Hodgkin's Disease	M9650 - M9667	0	1.81	-	1	1.61	0.62	1	3.42	0.29
Mutiple Myeloma	M9731 - M9732	1	2.67	0.37	1	2.80	0.36	2	5.47	0.37
Leukemias	M9800 - M9941	4	6.13	0.65	1	5.17	0.19	5	11.30	0.44
Total*		158	261.23	0.60	163	253.47	0.64	321	514.71	0.62

* "Other" was not included.

Table 7

Observed And Expected Numbers of Cancer Incidences in Study Area of Haverford Township, PA
By Age and Sex, 1985-1994

	Male			Female			Both Sexes		
Age Group	Obs.	Exp.	Ratio	Obs.	Exp.	Ratio	Obs.	Exp.	Ratio
Under 15	1	1.66	0.60	1	1.27	0.79	2	2.93	0.68
Age 15-24	3	1.81	1.65	0	3.81	0.00	3	5.62	0.53
Age 25-34	1	4.61	0.22	8	13.02	0.61	9	17.63	0.51
Age 35-44	2	8.76	0.23	9	19.78	0.45	11	28.55	0.39
Age 45-54	11	17.12	0.64	21	29.02	0.72	32	46.15	0.69
Age 55-64	26	53.46	0.49	35	56.21	0.62	61	109.67	0.56
Age 65-74	60	111.58	0.54	56	94.61	0.59	116	206.19	0.56
Age 75-84	52	73.11	0.71	25	57.98	0.43	77	131.09	0.59
Age 85+	15	14.51	1.03	13	17.11	0.76	28	31.62	0.89
Total	170	284.97	0.60	167	291.54	0.57	337	576.51	0.58

APPENDIX

APPENDIX

COMPARABILITY TABLE of ICD-O-2 and ICD-9 CODES for 23 PRIMARY CANCER SITES

PRIMARY SITE	ICD-O-2	ICD-9
Buccal Cavity and Pharynx	C00.0-C14.8	140.0-149.9
Esophagus	C15.0-C15.9	150.0-150.9
Stomach	C16.0-C16.9	151.0-151.9
Colon	C18.0-C18.9, C26.0	153.0-153.9, 159.0
Rectum, Anus, Rectosigmoid	C19.9, C20.9, C21.0-C21.8	154.0-154.8
Pancreas	C25.0-C25.9	157.0-157.9
Larynx	C32.0-C32.9	161.0-161.9
Trachea, Bronchus, Lung, Pleura	C33.9, C34.0-C34.9, C38.4	162.0-163.9
Melanoma of Skin	C44.0-C44.9 and M-8720 to M-8780	172.0-172.9
Female Breast	C50.0-C50.9 *	174.0-174.9
Cervix Uteri	C53.0-C53.9**	180.0-180.9
Corpus Uteri	C54.0-C54.9	182.0-182.8
Ovary	C56.9	183.0
Prostate	C61.9	185
Testis	C62.0-C62.9	186.0-186.9
Urinary Bladder	C67.0-C67.9	188.0-188.9
Kidney and Renal Pelvis	C64.9, C65.9	189.0-189.1
Brain and Other Nervous System	C70.0-C72.9	191.0-192.9
Thyroid	C73.9	193
Non-Hodgkin's Lymphomas	M-9590 to M-9595, M-9670 to M-9687, M-9690 to M-9709, M-9711 to M-9714, M-9740 to M-9741	159.1, 200.0-200.8, 202.0-202.2, 202.6, 202.8-202.9
Hodgkin's Disease	M-9650 to M-9667	201.0-201.9
Multiple Myeloma	M-9731 to M-9732	203.0, 203.8
Leukemias	M-9800 to M-9941	202.4, 203.1, 204.0-208.9

* Excludes males. ** Excludes in situ cases.

NOTE: Sites Buccal Cavity to Thyroid, as listed above, exclude sites M9590 to M9980 of the ICD-O (FT) and M9590 to M9989 of the ICD-O-2. See "Comparability of Codes" section of the Technical Notes for more information on the use of these codes in this report.