GUIDANCE FOR CONDUCTING POTENTIAL POLLUTION SOURCE INVENTORIES IN WELLHEAD PROTECTION AREAS

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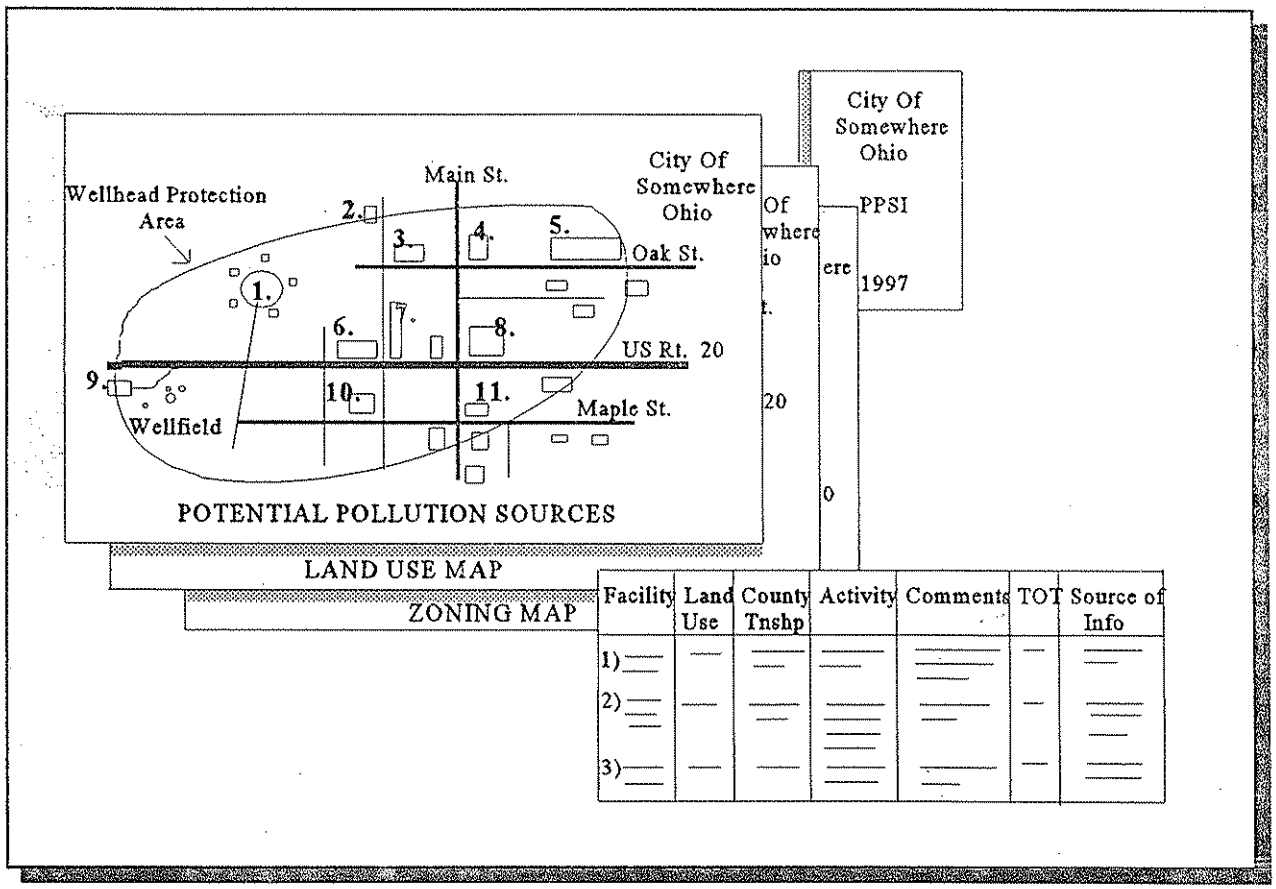

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FOREWORD: Wellhead Protection in Ohio

The Federal Safe Drinking Water Act Amendments of 1986 require all states to develop and implement a program to protect ground water supplying public water supply wells and wellfields from existing and future potential sources of contamination.

In 1989, the governor of Ohio designated the Ohio Environmental Protection Agency as the lead agency for Wellhead Protection in Ohio. In May of 1992, Ohio's Wellhead Protection Program was approved by the USEPA. The objective of Ohio's program is to protect the health of people who use ground water for their public drinking water. This is accomplished by protecting an area around public wells or wellfields in order to prevent, detect, and remediate ground water contamination. The responsibility for developing and implementing a WHP plan lies with the local public water supplier. Ohio EPA is responsible for developing technical guidance, providing direct one-on-one technical assistance, and reviewing Wellhead Protection plans.

Ohio's Wellhead Protection Program calls for each public water system to submit a Wellhead Protection plan to Ohio EPA for its review. A Wellhead Protection plan must contain the following Components:

1. **Delineation of a Wellhead Protection Area-** determines the area surrounding a public well or wellfield that supplies ground water to the well or wellfields. A Wellhead Protection area is defined by determining all the areas contributing ground water to the well or wellfield where the ground water will reach the well within approximately five years.

2. **Potential Pollution Source Inventory-** identifies any past, present, and proposed activities or land uses in and around the wellhead protection area that may pose a threat to ground water supplying the public water wells or wellfield.

3. **Management Plan-** manages the threats identified in the Potential Pollution Source Inventory. The plan must include a public involvement and education program and a contingency/emergency response plan. The management plan must also assess the need for groundwater monitoring and develop a monitoring plan if needed.

Ohio's dependence on ground water makes it a critical resource. It is estimated that Ohio uses approximately one billion gallons of ground water every day. Approximately 700,000 rural households depend on private wells for drinking water and about 85 percent of the State's 1,480 community water systems rely on ground water for all or part of their water supply. In addition, industry uses about 350 million gallons of ground water every day for manufacturing and cooling water, and agriculture uses about 10 million gallons per day for irrigation. Wellhead protection planning can help Ohioans manage the risks associated with activities in or near their wellfields and prevent the degradation of ground water resources supplying those wellfields.

Wellhead protection provides many additional benefits to a community. For example, wellhead protection:

1. Protects the community's investment in its water supply.

2. Protects the health of the community's residents using the drinking water source by preventing contamination.

3. Provides the water supply necessary for continued economic growth of a community.

4. Preserves the resource for future generations.

5. May reduce regulatory monitoring costs by enabling the water supplier to obtain a waiver from specific expensive monitoring requirements.

1.0 INTRODUCTION

This document has been prepared by the Division of Drinking and Ground Waters at the Ohio Environmental Protection Agency (Ohio EPA) to assist community officials, water suppliers, and consultants in conducting potential pollution source inventories for local Wellhead Protection (WHP) plans. Criteria that Ohio EPA uses to determine the adequacy of a potential pollution source inventory are identified and discussed.

1.1. WHAT IS A POTENTIAL POLLUTION SOURCE INVENTORY?

Wellhead Protection plans are developed to help protect the health of people using public drinking water by protecting the ground water supplying public wells or wellfields. A potential pollution source inventory (PPSI) is one component of a WHP plan. The purpose of the PPSI is to identify any past, present, or proposed activities or land uses that have the potential to contaminate the ground water supplying public wells. Once these threats are identified, a management strategy can be developed to reduce the chance of contamination occuring.

Ohio EPA encourages the startup of the PPSI as early as possible in the development of a WHP plan. In fact, a preliminary PPSI is one of the first activities undertaken in developing a WHP plan. Identifying potential threats to the public water supply and educating local officials and the community about those threats will help build a consensus that WHP planning is needed. Once support for WHP planning is obtained a more detailed inventory can be conducted concurrent with other field activities. A fact sheet on getting started on a WHP plan is available from the Ohio EPA Division of Drinking and Ground Waters (DDAGW).

Information gathered during the PPSI is essential to developing an effective management plan. Only after potential sources of contamination are identified can options to eliminate or manage those sources be evaluated. Ohio EPA encourages public water suppliers to submit the WHP area delineation and PPSI to the agency for review and comment prior to completing the management component of their WHP plan. This approach allows better communications between Ohio EPA and the public water system and helps ensure that efforts to develop and implement management strategies are directed to the right geographic areas and land uses.

1.2 ORGANIZATION OF GUIDANCE DOCUMENT

This guidance document has been divided into a foreword and six sections: 1. Introduction, 2. Step by Step Guide to completing a PPSI, 3. What should a PPSI contain and why?, 4. Data Sources, 5. Integrating the PPSI into a Management Strategy, and 6. Ohio EPA's checklist for evaluating a PPSI. The foreword to this document provides basic information on Ohio's WHP program for people unfamiliar with wellhead protection. Sections 2.0- 6.0 are outlined as follows:

Section 2.0 focuses on how to conduct the PPSI including: establishing a planning committee, locating information/maps, designing a pollution categorization scheme, conducting surveys,

recording data (standard forms and databases), verifying the accuracy of data, preparing a PPSI report, submitting the PPSI to the Ohio EPA, and updating the PPSI. An example PPSI table (Table 1) and an example PPSI base map (Figure 1) are also included in this section.

Section 3.0 addresses Ohio EPA requirements for an endorsable PPSI and provides background on why Ohio EPA uses certain criteria when evaluating the adequacy of a PPSI. A checklist, presented at the beginning of the section, is included to help keep track of meeting these requirements.

Section 4.0 identifies data sources that will help in completing the PPSI. This section identifies where data can be obtained. Also included in this section are three tables: Table 2 describes the five classes of injection wells, Table 3 lists state and local information sources, and Table 4 lists federal databases and contacts.

Section 5.0 discusses ways to integrate the PPSI into the management strategy. This section addresses factors to consider when developing a potential pollution source prioritization scheme.

Section 6.0 lists what should and what must be included in a PPSI. This is a final checklist to make sure all the necessary parts of a PPSI are present before the PPSI is submitted to the Ohio EPA.

Several appendices are also included to provide more detailed information and inventory forms to help communities/purveyors complete their PPSI:

Appendix A contains several tables with information on contaminants and potential contaminant sources.

Appendix B provides a list of the acronyms used throughout this document.

Appendix C provides information on coordinating a volunteer effort.

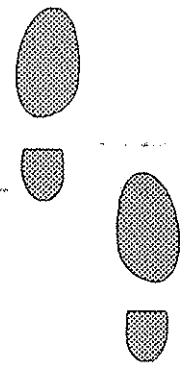
Appendix D contains a listing of the Ohio Land Use/Land Cover Classification System and land uses and their relative risk to ground water.

Appendix E contains inventory forms that Ohio EPA has developed that may be customized for each community's needs.

Appendix F contains an example of a PPSI completed as part of an Ohio EPA demonstration project at West Lafayette, Ohio. This provides an example of the information and format that the Ohio EPA recommends.

2.0 CONDUCTING A POTENTIAL POLLUTION SOURCE INVENTORY: THE STEP-BY-STEP SEQUENCE

This section guides the purveyor/community through the basic steps involved in conducting a PPSI. The following steps, including mechanisms for completing each, are discussed in detail.



1. **Get Started**
2. **Set Goals and Develop a Work Plan**
3. **Collect Existing Data**
4. **Design a Pollution Categorization Scheme**
5. **Conduct Surveys and Interviews**
6. **Record Existing Data**
7. **Verify the Accuracy of Data Collected**
8. **Submit PPSI to Ohio EPA**
9. **Update the PPSI**

2.1 GET STARTED

2.1.1 Establish a Planning Committee

Once a community has committed to WHP planning, a **WHP Planning Committee** should be established. Key individuals on this planning committee are responsible for 1. Defining roles and responsibilities, 2. Developing the program, 3. Organizing teams to conduct specific tasks, 4. Resolving multi-jurisdictional disputes. The water supplier, elected officials from all potential political jurisdictions, and staff from local health departments, planning organizations, the county Soil and Water Conservation District, the Solid Waste District, and the Local Emergency Management Agency should all be asked to join the committee.

It may also be advisable to organize a **WHP Advisory Subcommittee** composed of representatives of potentially affected businesses, residents, and landowners. This is one means of providing a forum for public participation, which is crucial to the acceptance of, and compliance with, the WHP plan. In smaller communities the subcommittee may not be necessary (i.e. potentially affected businesses, residents, and landowners can be part of the WHP Planning Committee).

Communities must realize the importance of WHP planning committees and public outreach programs. If a community has not yet formed a WHP committee, it should do so before allocating resources towards meeting specific PPSI requirements.

2.1.2 Assess Community Characteristics

After a WHP committee is formed, it should determine key community characteristics. Designing an effective inventory program requires understanding the unique characteristics of a community and assessing the community's needs. Community characteristics that affect the complexity of a Potential Pollution Source Inventory include: community size, land use, budgetary resources, aquifer vulnerability, and the level of involvement of the community.

The Size of The Community

A smaller community may be able to complete a detailed inventory at an earlier stage in its WHP effort. This may be due to fewer potential sources within the community (due to its size) as well as the ability to personally complete site visits in the community. However, a larger community may be able to complete a more general inventory and then plan, over a period of time, to conduct a more detailed inventory involving site visits or mail surveys. Larger communities might also have the monetary resources to hire a consultant to help with the inventory.

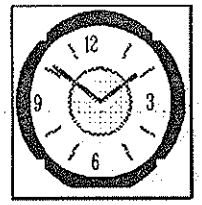
The Types of Land Use in The Community

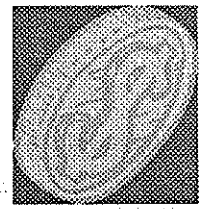
A community that has numerous commercial and industrial facilities will identify a greater number of potential pollution sources. If the community is smaller and/or the WHP area is primarily agricultural land, the inventory may identify proportionally fewer potential pollution sources.

Budgetary Restrictions

If money is available for personnel to inventory the community through site visits, the inventory may be detailed. If personnel are only available to complete a windshield survey and obtain information from state agencies, the inventory will be more general. The use of volunteers is one way to offset costs (see Appendix B). Budgetary concerns that need to be considered by the WHP Committee when undertaking a PPSI are:

1. Personnel and monetary resources available for wellhead protection;
2. Possible Consulting fees;
3. Availibility of community volunteers;
4. Technical expertise of volunteers;
5. Monetary and personnel resources necessary to maintain and update the inventory.





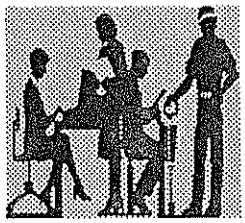
Aquifer Characteristics

An aquifer that is very vulnerable to potential contamination (such as sand and gravel/river valley aquifers or shallow bedrock aquifers) may require a more detailed inventory. For example, if the aquifer is vulnerable, it may be important to know quantities of chemicals on a site as well as the specific site management practices. If the aquifer is confined (aquifer that is overlain by a confining bed of significantly lower hydraulic conductivity than the aquifer), additional

consideration in the PPSI should be given to quarries, abandoned wells, oil and gas wells, etc. which may serve as conduits through the confining layer.

Community Involvement/Volunteers

Communities that have existing active environmental groups or civic associations may find it relatively easy to develop and maintain support for a WHP program. Communities that do not already have these mechanisms in place may face the additional challenge of trying to create and motivate a WHP community group.



Volunteers in the community can help build a coalition of support for WHP. In addition, if budgetary constraints are a concern, the use of volunteer groups such as The Retired Senior Volunteer Program (RSVP) may be considered when designing an inventory program. Other potential sources of volunteers are: high school and university clubs and classes, environmental organizations, civic groups, and church groups. If volunteers are employed to complete site visits/interviews, the volunteers should be trained. The City of El Paso, Texas used retired senior volunteers to conduct their site visits. The El Paso volunteers attended several community meetings concerning ground water protection, addressing: how ground water occurs and moves, sources of ground water contamination, examples of ground water management, and locating and inventorying potential sources of contamination. An excellent source of information on the El Paso project is a document entitled "How-To Manual for Ground Water Protection Projects" available through the Senior Volunteer Program, 2 Civic Center Plaza, El Paso, Texas, 79901-1196, phone # (915) 541-4374. The document emphasizes volunteer education as the key to the success of an inventory. Additional information on utilizing volunteers is in Appendix C.

2.1.3 Obtain Maps of the WHP Area

A map containing the location of potential pollution sources and the delineated WHP area is required in the PPSI. Land use maps and zoning maps are also required in the PPSI. The scale on all maps submitted to the Ohio EPA should be no smaller than 1 inch equals 2,000 feet (1:24,000 scale). The 7.5 minute U.S.G.S. series topographic maps are often used as a base map for recording PPSI data. Topographic maps indicate terrain, the presence of streams and lakes, and the location of highways and railroads. A larger scale map may be easier to read and provide more space for plotting potential pollution sources. Parcel maps, normally available through the county auditors, are excellent inventory base maps. Topographic maps may be ordered through:

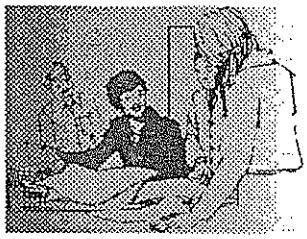
United States Geological Survey
Survey Map Distribution
Box 25286-MS-306
Federal Center
Denver, CO 80225
(303) 236-7477

Ohio Department of Natural Resources
Division of Geologic Survey
Information & Maps
4383 Fountain Square Drive
Columbus, OH 43224-1362
(614) 265-6605

Other useful maps to obtain during WHP planning are:

1. Land use and land cover maps (ODNR or hand drawn on base map)- REQUIRED in PPSI
2. Current zoning map (local municipality)- REQUIRED in PPSI (if WHP area is zoned)
3. Geologic maps (USGS, Ohio Geologic Survey)
4. Watershed maps (ODNR)
5. Sewer and water line maps (local sewer authority)
6. Mining activity maps (ODNR)
7. County highway maps (ODOT)
8. Soil classification maps (local municipalities, NRCS)
9. Subdivision boundary maps (local municipalities)
10. Commercially produced street and road maps (ODOT)

2.2 SET GOALS AND DEVELOP A WORKPLAN



The WHP planning committee should set goals and develop a work plan for completing the PPSI based on the community characteristics outlined in Section 2.1.2. Completing a successful inventory requires: an adequate number of staff (or volunteers) to complete the inventory, proper training of staff, concise and clear instructions on conducting the inventory, the authority to conduct the inventory, and the necessary forms and equipment (cars, computers, etc.) to collect and maintain data.

It may be advisable to designate an administrator to oversee information collection. The administrator should address: oversight of the staff or volunteers responsible for data collection, time lines for accomplishments, and compilation of the data in a standard format. The administrator should report activities on a regular basis to the WHP committee regarding progress on deadlines and money spent.

2.3 COLLECT EXISTING DATA

In most communities, a substantial amount of information regarding existing or potential contaminant sources can be found in records or documents related to local, state, and federal government operation. The historical aspect of a site, transportation routes and transmission lines, sewered areas, home fuel oil tank locations, zoning, and various other potential pollution sources can be identified by searching local, state, and federal databases. Section 4.0 provides information on numerous data sources which may be helpful in completing a PPSI. Table 2 and Table 3 provide additional information on state and local information sources and federal databases. Legislation that requires

business to report information about hazardous materials or pollution sources and the regulatory agencies responsible for data collection are listed in Section 4.6 .

2.4 DESIGN A POLLUTION CATEGORIZATION SCHEME

Design a scheme to categorize potential pollution sources based on various options such as: major land uses, point sources vs. non-point sources, Standard Industrial Classification Codes (SIC), or relative risk. Designing a categorization scheme will help to organize data and may be helpful in identifying which potential pollution sources pose the greatest threat to the wellfield. Some categorization schemes are briefly described below.

2.4.1 Major Land Uses

Categorizing potential pollution sources according to the major land uses such as: industrial, commercial, residential and farming is the most used method. This categorizationon scheme is consistant with local zoning. It is also a reasonable breakout for various public outreach, education, and management approaches, and can help focus more detailed inventory efforts on activities where large amounts of chemicals are commonly stored, treated or disposed. Appendix D contains a summary of the Ohio Land Use/Land Cover Classification System.

Point Sources and Nonpoint Sources

Since point sources and nonpoint sources of pollution require different monitoring schemes and remediation techniques, it is a good idea to categorize potential pollution sources into one of these two categories. Point sources are discrete sites of potential contamination (e.g., gas stations) which are usually easier to define, monitor, and manage. Nonpoint sources may cause contamination over a broad area (e.g., spreading manure over fields) or along a line (e.g., runoff from highways).

Relative Risk

Relative risk is a judgement of risk presented by various potential pollution sources. Generally, the lowest risks are: undeveloped land and residential areas. Medium risks are: agricultural production, golf courses, institutional uses and various commercial uses. The highest risks are generally: service-oriented commercial (especially gasoline stations), industrial sites, and waste disposal sites. When determining actual threats to the wellfield, other considerations such as distance of the source from the wellfield, hydrogeologic sensitivity, and type of contaminant, should also be considered. Section 5.1 discusses how to determine actual threats to the wellfield, and mechanisms for prioritizing potential pollution sources.

Standard Industrial Classification (SIC) Codes

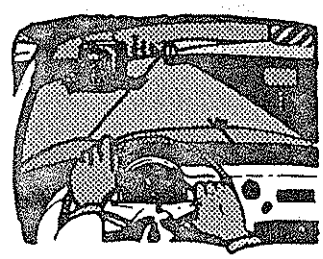
The Standard Industrial Classification (SIC) Code system classifies establishments by type of economic activity. The purpose of this system is to ease collection, tabulation, presentation and analysis of data. It also promotes uniformity and comparability in the statistical presentation of

economic information. Examples of classified units are: farms, mines, factories, and stores. The SIC Classification Manual can be found in local libraries.

2.5 CONDUCT SURVEYS AND INTERVIEWS

2.5.1 Visual Surveys and Field Surveys

Ohio EPA requires that a visual survey be conducted as part of a PPSI. This can include driving and/or walking around the wellhead protection area. In some instances individuals have been able to arrange aerial surveys. Through visual surveys of the wellhead protection area, one can confirm the locations of previously identified sources, identify new potential pollution sources and land uses, and identify gaps within the existing databases. Taking a detailed map of the community and marking the location of each potential pollution source is recommended. While compiling this pollution source map, note areas that require additional follow-up. Completing several visual surveys in different seasons may be helpful. For example, in summer, areas of stunted or dead vegetation may be found in contaminated areas. Unidentified facilities and illegal dumping sites may be easier to locate in the winter, when sparser vegetation provides less cover. This method may also be helpful in verifying locations of potential sources identified from other methods, such as record searches, historical information or interviews.A few observations that may be helpful to identify potential pollution sources are:



1) Does the vegetation appear stressed? Is it dead/dying?;
2) Are there changes in vegetation size, such as areas of healthy growth and areas of stunted growth? This may indicate a clearing, site disturbance or old access roads;
3) Is the surface discolored or stained? It may be from dumping or discharge;
4) Are there areas of irregular terrain? Land may have been filled, or areas of subsidence may indicate the presence of underground storage tanks;
5) Are there any above ground storage tanks located on the property? Tanks may be leaking and should be noted on the visual survey;
6) Are there areas of lush vegetation and swampy depressions? These could indicate a failing septic system;
7) Are there any salt piles? Improperly stored salt can be a potential pollution source;
8) Are there any wells on the site? Improperly abandoned wells pose a potential threat to the aquifer.

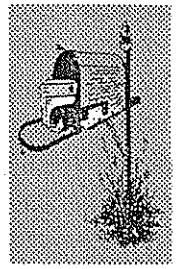
These are just a few examples of what should be identified on a visual or field survey.

When completing a field survey the forms in Appendix E may be helpful. These forms may be modified for each community's needs.

2.5.2 Mail and Phone Surveys

Two other methods for identifying potential pollution sources are mail and phone surveys. These surveys may provide information on the length of time the facility has been operating, the presence of storage tanks, types of chemicals used and if contamination has occurred on-site. Appendix E provides example questions that may be used for a mail or phone survey.

It is important to provide sufficient WHP background to the business receiving a survey. If a mail survey is being completed it may be helpful to mail a letter that outlines what wellhead protection is and how businesses can assist in the WHP effort. Also, mailing a copy of the fact sheet developed by Ohio EPA "What is Wellhead Protection?" may be very helpful. If phone surveys are conducted, the people conducting the survey should take a few minutes to educate the person being surveyed about Wellhead Protection and how their business can **potentially** impact the community's drinking water supplies.



It is important that the community understands exactly what a "potential pollution source" is. Just because a business has been identified as a potential pollution source should **not** imply it has a contamination problem or is causing a contamination problem. It is important to clarify this with the public because as the project progresses, businesses may feel defensive if they are considered **pollution sources** versus **"potential" pollution sources.**

2.5.3 Site Visits and Personal Interviews

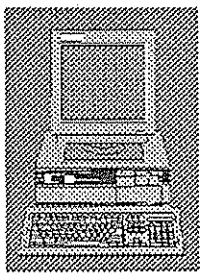
Site visits and personal interviews with business owners/operators are a great source of site-specific information as well as a good opportunity to educate those businesses operating in the WHP area about wellhead protection. Potential candidates for interviews are: owners/operators of businesses, the local fire Marshal, planning board members, building officials, health officials and long-term residents of the area. Forms that may be customized for a community's PPSI interviews can be found in Appendix E. One drawback of conducting personal interviews is that not everyone will respond and some responses may be biased. Site visits provide an opportunity to learn more about the operating procedures and facilities of businesses and industry located within the wellhead protection area. When interviewing and observing the interior of a facility, a general evaluation of the facility's neatness and cleanliness may

indicate its management.

2.6 RECORD EXISTING DATA

Data management issues should be addressed in the PPSI work plan. As data for the PPSI are collected, a community needs to evaluate how to manage the data (manually or by computer). A small community with only a few potential pollution sources may not have enough data or information to warrant development of a computer database. Larger communities and communities with numerous potential pollution sources may wish to use a computerized database. Computer databases have several advantages over manual systems. Some advantages and disadvantages of both computerized and manual systems are listed below.

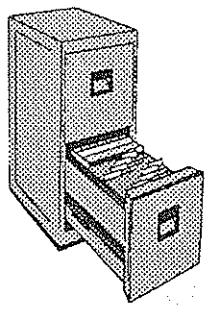
Computerized Database Management System



Advantages:
1. Greater flexibility
2. Centralized control
3. Reduction in data redundancy
4. Better security control.
5. Ability to sort and retrieve information in a variety of formats

Disadvantages:
1. Hardware and software costs
2. Maintenance costs
3. Training costs
4. Time spent modifying, backing up, and recovering data

Manual Data Base Management System



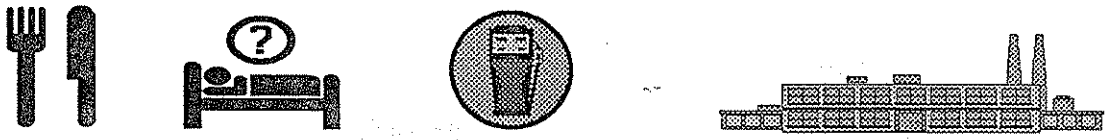
Advantages:
1. A computer consultant is not needed
2. Low cost
3. Easy set up

Disadvantages:
1. Information sharing is difficult
2. Files are less secure
3. Limited data analysis and processing capabilities
4. Replication is required to index in various ways
5. Data queries are much more difficult

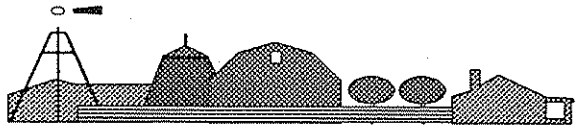
If a manual system is used, records may be organized by land use categories or alphabetized by chemicals present or facility name. To speed up a search, a separate data set may be filed by parcel number and land use category. All data bases, whether manual or computerized, require some periodic maintenance.

Standard Forms

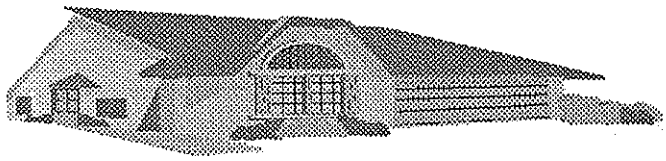
Ohio EPA has developed some standard forms for reporting pollution source inventory information tailored to specific types of land uses. Copies of forms are in Appendix E of this document. **Communities may wish to modify the forms to fit their specific needs.** The forms can be used by the community to enter the data into their computerized data base or to develop a manual database. These forms are intended to assist communities in identifying potential pollution sources and may be of assistance when developing management strategies. **The forms should not be submitted to the Ohio EPA.** It is important to remember that one facility may have several different sources (such as: liquid waste disposal site, Underground Storage Tanks (UST), aboveground storage tanks, hazardous materials). The types of information that should be recorded for various types of facilities are discussed below:



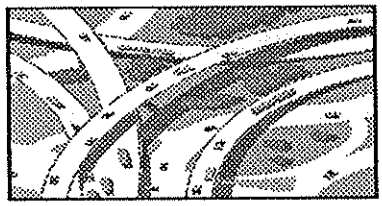
- **Commercial/Industrial/Institutional Facilities**- industrial, commercial, institutional and public facilities involved in the handling, storage, treatment and disposal of hazardous substances (as well as certain fuels and non-hazardous chemicals). Inventory records should identify each kind of chemical substance on-site; estimated quantities of each; chemical handling practices; storage and treatment information; facility design; construction information; management practices and facility permit numbers. Historical information on past chemical handling should be obtained as well as information on spills, leaks, accidents and other on-site occurrences which may have resulted in a release to ground water. Local, state and federal agencies possessing public records or first-hand information about the facility should also be identified.

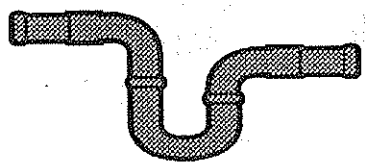


- **Agricultural Facilities**- information collected on agricultural activities should include lists of agri-chemicals (fertilizers and pesticides) and quantities used on each crop-producing parcel of land. Obtaining information on historical use is beneficial. Loading, chemical mixing, and equipment cleaning areas should be identified. For animal producing farms, recorded information should include numbers and kinds of animals as well as descriptions of animal waste storage, treatment and disposal systems and practices. Individual land parcels where manure, wastewater, or sludge are applied should be identified. Fuel storage areas on farms, chemical storage areas and machinery repair shops also should be inventoried.



- **Residential Area/Municipal Services** - surveys of residential areas should concentrate on the number, type, and density of on-lot sewage disposal systems and home fuel oil tanks. As time and resources permit, information on other residential activities such as lawn maintenance practices and certain in-residence businesses (furniture stripping, photo-finishing, machinery repair, etc.) should be gathered through survey questionnaires or personal interviews. Municipal sewer lines should be evaluated regarding age, pressurization, and proximity to the wellfield.





- **Transportation/Transmission Facilities** - the locations of major pipelines associated with utilities, oil and gas production and other fuel transportation systems should be recorded on the base map and described on the basis of product type, initial date of operation (installation), construction, and details of any documentation of substance releases. Highways, railroads, storm water systems, sewer systems, and hazardous cargo routes should be mapped, located and described.

2.7 VERIFY THE ACCURACY OF DATA COLLECTED

While collecting additional information, the data should be cross checked to confirm the data are accurate. For example, staff may verify that information obtained through a database is still correct by conducting a visual survey, or contacting the owner/operator of the facility.

2.8 PREPARE PPSI DOCUMENT AND SUBMIT REPORT TO OHIO EPA

Ohio EPA has developed specific guidelines, outlined in Chapter 3, on what is required in a PPSI document, and why specific elements are required. These guidelines were created to assist the community in preparing an endorsable PPSI document. Two copies of the PPSI document should be submitted to Ohio EPA. Preferably, one copy should be sent to the Central Office at Ohio EPA and one copy should be sent to the appropriate district office. After reviewing the document, Ohio EPA will send a letter to the public water system, endorsing, or not endorsing, the PPSI. Identification of deficiencies within the PPSI and recommendations will be included in the letter. If the delineation component of a WHP plan is not yet endorsed, Ohio EPA may decline to endorse the PPSI until the WHP area is adequately delineated. If WHP area boundaries are

revised, and portions of the new WHP area have not been adequately inventoried, Ohio EPA may withdraw its endorsement of the PPSI until the previously uninventoried areas have been adequately inventoried.

2.9 UPDATE THE PPSI

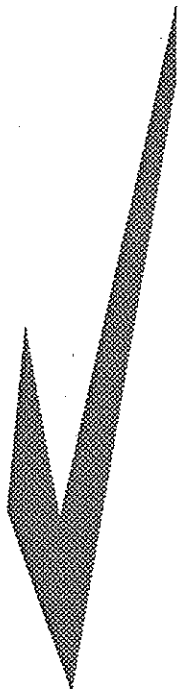
Maintaining an accurate and comprehensive inventory and assessment of potential pollution sources is an on-going effort that requires periodic updating. This includes any changes in the operational status of previously inventoried facilities and the assessment of new facilities in the WHP Area. Local officials should establish routine mechanisms for regular updating of inventory information and include a description of that mechanism in their PPSI document. Each public water supplier should evaluate updated inventory information to assure that the management element of their WHP plan still adequately protects the wellfield from contamination.

A comprehensive update and verification of the pollution source inventory should be conducted and submitted to Ohio EPA every 10 years. If a public water supplier has previously established routine mechanisms for updating and recording changes in the WHP plan, this update should require little effort. In some instances, the PPSI update will be accomplished by the same process as conducting the original inventory. The comprehensive inventory update will help ensure that information needed to support local decisions accurately represents current conditions. If a community reevaluates and revises the delineated WHP Area, then the PPSI should be reevaluated and appropriately revised.

3.0 WHAT SHOULD A POTENTIAL POLLUTION SOURCE INVENTORY (PPSI) CONTAIN?

This section describes Ohio EPA requirements for an endorsable PPSI and provides background on why Ohio EPA uses certain criteria when evaluating the adequacy of a PPSI. Ohio EPA recognizes the diversity present in Ohio communities and the review process provides the flexibility to evaluate PPSIs on a community by community basis. If a community is having difficulty meeting any of these requirements it is encouraged to contact either its Ohio EPA District office or the Central Ohio EPA office in Columbus.

The following checklist identifies the main requirements for completing a PPSI; it is provided to help communities track their progress. The importance of these requirements, and how they fit into a community's management plan, is discussed in this section.



3.1 DISCUSSION OF METHODS USED
__ **3.1.1 Databases searched**
__ **3.1.2 Visual survey**
__ **3.1.3 Sites visited**
__ **3.1.4 Historical aspect**

3.2 DISCUSSION OF POTENTIAL POLLUTION SOURCES
__ **3.2.1 Transportation routes and transmission lines**
__ **3.2.2 Sewered and unsewered areas**
__ **3.2.3 Injection wells and production wells**
__ **3.2.4 Home fuel oil tanks**
__ **3.2.5 Evaluation of the area upgradient from the WHP area**

3.3 MAPS/TABULAR LISTINGS
__ **3.3.1. Map of potential pollution sources with corresponding table**
__ **3.3.2. Land use map**
__ **3.3.3. Current zoning map**

3.4 MECHANISMS FOR UPDATES

3.1 DISCUSSION OF METHODS USED

The PPSI document that is submitted to Ohio EPA must contain a description of the methodology used to complete the inventory. This includes a description of all methods used to obtain and document information on potential pollution sources. The description assists the Ohio EPA reviewer in determining how thoroughly the potential pollution sources were inventoried. It also assists the WHP Planning Committee identify any data gaps that need to be addressed.

A summary of the delineation component should be included if the PPSI is completed and submitted as a separate component. This summary should include the population served, geology, ground water flow direction, number of public water supply wells, average depth of wells, pumping rates, and the WHP area delineation.

3.1.1 Databases Searched

What Ohio EPA requires:
A discussion of the databases that were searched must be included in the PPSI. This information should also be incorporated into the required table (See section 3.2.3 and Table 1) which lists potential pollution sources. Sources for information will be discussed in more detail in Section 4.0, and federal databases are listed in Table 4.

Why does Ohio EPA require this?
Public databases can be a tremendous source of information on not only present, but also past and future potential sources of contamination. This includes facilities and activities regulated by various environmental agencies or departments, locations with known or suspected ground water contamination, and information on chemical use, storage and releases. Database searches often provide information not obtainable through other inventory methods. They can also help determine where other inventory efforts should be focused.

3.1.2 Visual Survey

What Ohio EPA requires:
A visual survey of the WHP area must be completed as part of every PPSI. This includes walking or driving (some communities have included flying) around the WHP area, noting information on specific potential sources as well as general land use.

Why does Ohio EPA require this?
Visual surveys help identify all facilities, activities, or land uses that have the potential to contaminate ground water. Visual surveys help to confirm potential pollution sources identified through database searches or surveys. More importantly, they help identify potential sources that are not identified through other inventory methods.

3.1.3 Site Visits

What Ohio EPA requires:
The PPSI must include a discussion of site visits, personal interviews, mail/telephone surveys, and other methods used or to be completed at a future date.

Why does Ohio EPA require this?:
While they can be time consuming, site visits not only provide detailed information on current and past industry processes, management practices and pollution threats, but can also serve as excellent educational and public involvement mechanisms. Ohio EPA requires that information from site visits be included in a PPSI in order to identify the completeness of a community's PPSI and to identify any data gaps that may exist. It is realized that in highly developed areas, conducting on-site assessments of every facility may not be practical. It is important, however, that those businesses or individuals potentially affecting water quality get involved at an early stage of a WHP planning program.

Site visits and personal interviews serve as a great educational tool by informing those in the area about their local wellfield, the ground water resources being utilized, and the concept of wellhead protection. If business owners or individuals understand how their activities could impact the local water supply, they may be more likely to change their disposal and/or operating practices. If business owners feel that a regulatory program is being forced upon them, they may resist change. If they are involved in WHP development and understand that their practices could impact the wellfield and that pollution prevention measures may actually save them money, they may be more willing to make appropriate adjustments to protect the wellfield.

3.1.4 Historical Aspect

What Ohio EPA requires:
The PPSI must include the exploration of the historical use of the land. This can be done by interviewing long time residents, reviewing aerial photographs, city atlases, local historical societies' records, and Sanborn Fire Insurance Maps, etc. This information should be summarized in the inventory. The individual documents should be included in the PPSI document.

Why does Ohio EPA require this? Historical records can provide information on past activities that may need to be investigated in further detail. The present use of a parcel of land may not appear to present a potential threat; however, as historical records are examined, past activities at the site may be of concern. For example, perhaps a site was formerly a gas station and is now a floral shop. Researching whether the underground storage tanks have been removed and if there was contamination at the site may be necessary to evaluate the potential threat. Another example is old town dumps covered by pavement or recent construction.

3.2 DISCUSSION OF POTENTIAL POLLUTION SOURCES

The PPSI document submitted to Ohio EPA must include a discussion of all potential sources of ground water contamination identified during the inventory. Most of this information can be reported via the required maps and table (see Section 3.3), although a narrative summary is also preferred.

When completing an inventory a community must identify the most significant point sources of potential contamination, such as: manufacturing firms, certain commercial activities (including dry cleaners), waste disposal areas, and chemical storage areas (including underground storage tanks). Significant point sources can be identified through various database searches (see Section 4.6) and by surveys. Communities should also include some discussion of nonpoint sources such as farms and golf courses. The following Section discusses some of the other less commonly identified sources of potential pollution that Ohio EPA expects to see in a PPSI.

3.2.1 Transportation Routes and Transmission Lines

What Ohio EPA requires:
Major transportation routes and transmission lines must be inventoried and identified. These include railroads, major highways, and transmission lines for various petroleum products. The transportation routes should be evaluated for frequency of travel and materials transported. Information regarding the age and maintenance of transmission lines should be collected. This information should be included in a summary table.

Why does Ohio EPA require this?
Transportation routes present potential threats of spills from overturned tanker trucks or derailed railroad cars. Deicing chemicals applied to highways during the winter also present a potential pollution threat. In addition, potentially hazardous herbicides are often applied at higher than normal application rates in these areas to control weed growth.

3.2.2 Sewage/Septic Treatment, Transport, and Disposal

What Ohio EPA requires:
The PPSI document should discuss the presence of on-lot sewage treatment and disposal systems such as residential and commercial septic systems. Ohio EPA does not require a community to identify the location of every on-lot system. Instead, a community can simply identify sewered and unsewered areas on a map. **If there are no unsewered areas in the WHP area this should be noted in the narrative to indicate it was evaluated.** Pump or lift stations and pressurized sewer lines should also be identified.

Why does Ohio EPA require this?
Older sewer lines located close to the wellfield present a significant threat. Leaking sewage lines can be a source of organic and inorganic materials, heavy metals, nitrogen, bacterial and viral contamination. A community may need to conduct leak testing on a regular basis for lines in proximity to the wellfield. Areas with septic tanks need to be evaluated because septic systems often fail and can cause ground water contamination. According to the U.S. EPA, almost 25% of all homes in the U.S. rely on septic systems to dispose of human waste. Even though these systems release a small quantity of effluent into the environment, a high number of these systems

may make them a serious potential contamination source. Improperly sited, designed, constructed or maintained septic systems may contaminate ground water with bacteria, viruses, detergents, oils, nitrates/ammonia and synthetic chemical cleaners.

3.2.3 Injection Wells and Production Wells

What Ohio EPA requires:

The presence of injection wells and production wells should be discussed and, if applicable, their locations identified on a map. Injection is defined as the subsurface emplacement of fluids (whether liquid, sludge, semisolid, or gas) through a dug hole or a bored, drilled, or driven shaft whose depth is greater than the largest surface dimension. The age and type of injection well should be indicated in the PPSI. Table 2.0 describes injection well classification, and section 4.0 discusses sources for information on injection wells. Whether or not production wells are abandoned, and their age should also be indicated.

Why does Ohio EPA require this?

Improperly abandoned wells can act as a direct entry point through which contaminants can enter the aquifer (These include exploratory wells for gas, oil or coal, or abandoned drinking water wells). Poorly constructed wells may also provide a pathway for contaminants. Poor construction may include: cracked casing, inadequate covers or lack of concrete pads, or an absence of an annular seal. Improperly abandoned wells and poorly constructed wells pose an especially significant threat to confined aquifers, since the well provides a direct conduit for contaminants to pass through the confining layer. Injection wells pose similar, and additional threats to groundwater. Improperly used class V wells are injection wells that are of most concern and should be identified in the PPSI.

3.2.4 Home Fuel Oil Tanks

What Ohio EPA requires:

Areas with below ground home fuel oil tanks must be discussed and, if applicable, their location identified on a map. This map may be relatively simple with the areas hand-shaded to indicate where home fuel tanks are utilized and where natural gas is utilized. **Individual tanks do not have to be identified.** A good starting point to determine if an area has home fuel oil tanks is to contact the local natural gas utility and local fuel oil suppliers to find out what areas they service.

Why does Ohio EPA require this?

Home fuel oil tanks are currently unregulated and many of them may be older and/or leaking. After an area has been identified as having home fuel oil tanks, the community may want to develop a management strategy for routine inspections and maintenance for the areas close to the wellfield.

3.2.5 Evaluation of the Area Up Gradient From the Delineated WHP Area

What Ohio EPA requires:
The area UP GRADIENT of the WHP area should be evaluated for potential point and non-point pollution sources and land use activities that may present a threat to the delineated WHP Area.

Why does Ohio EPA require this?
Water from the area UP GRADIENT from the WHP area will eventually be used for public water supply, so it is important to know what potential threats are located UP GRADIENT. Also, even the best delineation cannot provide WHP area boundaries that are absolutely accurate. It may be desirable to propose management strategies for potential pollution sources near the UP GRADIENT delineated boundary, especially those sources that appear to present a significant threat. Some communities choose to create a 'buffer zone' around their WHP area to increase the level of ground water protection.

3.3 MAPS/TABULAR LISTINGS

A map of at least 1:24,000 scale (a larger scale map is easier to read), with the potential pollution sources numbered and marked on the map must be submitted to Ohio EPA. The map must include the locations of all public water supply wells and the one and five-year time of travel boundaries. Additional required maps are land use and current zoning maps. All the required maps are discussed below.

3.3.1 Map With Corresponding Table

What Ohio EPA requires:
A map (scale no smaller than 1:24,000) with numbered potential pollution source locations, public water system well locations, the wellhead protection area boundaries, and a corresponding table (see Table 1 Example Table for Submittal to Ohio EPA) must be included in the PPSI. The tabular listing should include the facility name and address, county/township, pollution threats/comments, time-of-travel location, and the sources of information (e.g. public databases searched, windshield survey, site visits). The location of potential pollution sources should be identified as within: one-year time-of-travel boundary, five-year time-of-travel boundary, or the area adjacent to the wellhead protection area.

Why does Ohio EPA require this?
A map and table will assist the community in obtaining an overall view of their potential pollution sources and the relative risk (based on proximity to the wellfield) the potential pollution sources may present to the public water supply. The map will assist the community when they begin to develop management strategies to address the potential pollution threats. This map will also assist Ohio EPA in reviewing the PPSI.

Table 1. Example Table for PPSI Submittal to Ohio EPA

Facility Name & Address	Land Use Type	County/ Township	Type of Activity	Pollution Source/ Comments	Distance from wellfiled	Source of Information
#3 John Doe Auto Repair 123 Oak Street Anytown, OH JOHN DOE (614)555-5555	Commercial/ Industrial	Franklin/ Perry	Auto Dealer	2 USTs (gasoline, waste oil); chemical use/storage (cleaning solvents, rust inhibitors, paint thinners, lacquers, oil & misc. fluids), floor drains go to septic tank	500 ft.	BUSTR (database) windshield survey
#4 Ace Manufacturing 5100 Main Street Anytown, OH	Commercial/ Industrial	Franklin/ Perry	Electrical Component Manufacturer	Began manufacturing operation in August 1991; use alkaline cleaner, zincphosphate nonchromium rinse, anionic coagulant and misc. solvents; wastewater is pre-treated and discharged to city sewer; good management practices; all above ground storage in concrete basins, spill retention barriers.	600 ft.	RCRIS, PCS (NPDES database) windshield survey; site visit (6/96)

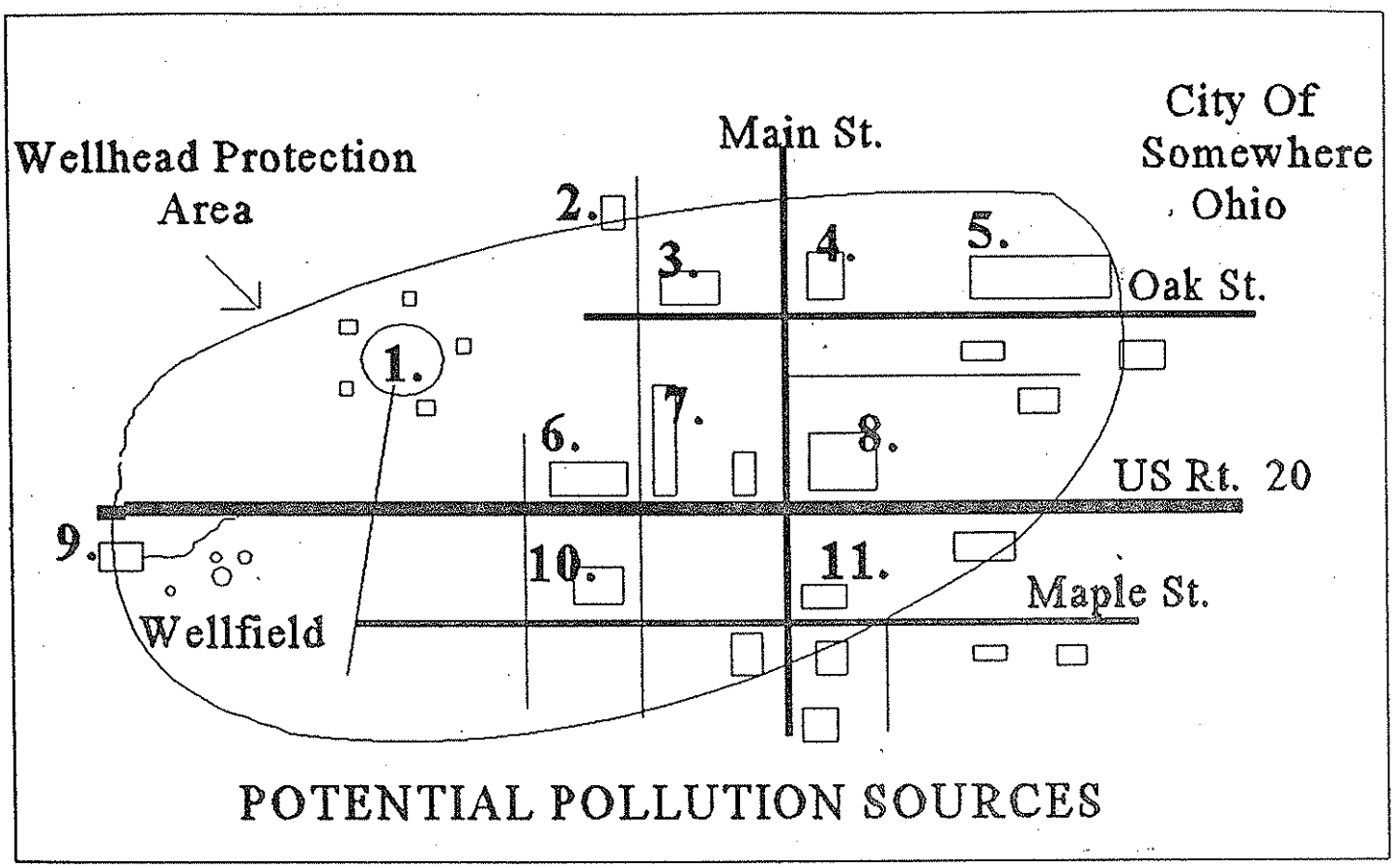


Figure 1. Example Map for PPSI Submittal to Ohio EPA

3.3.2 Land Use Map

What Ohio EPA requires:

A land use map must be included in a PPSI submittal to Ohio EPA. Land Use Maps in the 1:24,000 scale are available through the Ohio Department of Natural Resources, Real Estate and Land Management, Earth Science Information Center (ESIC). On these maps, the Anderson classification system for land use/land cover is used. The land use map submitted to Ohio EPA may be a simple map (at least 1:24,000 scale) with the areas hand colored to designate the various land uses. It does not need to be an elaborately generated computer map. The map that is included should clearly distinguish between land use categories. For example, if Xerox copies are being included that were reproduced from color copies, it may be difficult to distinguish which areas relate to which land use categories. A complete listing of all levels for the Anderson classification system is contained in Appendix D. A simplified listing is also included in Appendix D which indicates the major classifications that Ohio EPA would like to see on a PPSI land use map.

If land use maps are not completed in a community's area, other sources for this information may include: community tax assessor maps or a community's master development plan.

Why does Ohio EPA require this?

The land use map can help in targeting parcels of land or areas in a community that may need to be investigated in more detail. It may also assist the community if they are doing long range planning for resources. For example, undeveloped land can be evaluated for future supply well locations. The community may want to target undeveloped land for protective zoning or land purchase as part of the management plan.

3.3.3 Current Zoning Map

What Ohio EPA requires:

A current zoning map must be included if the WHP area is zoned. Zoning ordinances control the general types of activities within specified areas. General zoning classifications are: heavy industry, light industry, commercial, residential and agricultural. The local zoning board should be contacted for the most recent map of the community.

Why does Ohio EPA require this?

Reviewing existing zoning can help focus or prioritize inventory efforts and target which land parcels may require more investigation efforts. It is important for a community to investigate the zoning of undeveloped parcels close to the wellfield. The type of zoning on these parcels provides ideas of potential future threats. For example, a parcel close to the wellfield may be a farmfield, but is zoned industrial, thus presenting a potential significant threat to the ground water supply. A community, as part of their management strategy, may want to propose modifying the zoning on the parcel to activities that would be less threatening such as residential, parkland or green space.

Developing overlay zoning districts or zoning ordinances will be important in developing management strategies. Overlay zoning involves a separate zone placed over an existing zoning district that increases new regulations to the underlying zone. For example, a community may restrict quantities and types of chemicals that may be stored or used on site in a commercial or industrial zone within the wellhead protection area. A zoning ordinance addresses new or expanded uses while a special ordinance concerns both the existing and new land uses.

3.4 MECHANISM FOR UPDATES

What Ohio EPA requires:
A mechanism for updating the PPSI should be described and the community should indicate how often it plans to update the PPSI. Considerations of the rate of land development, changing land use, and increased water consumption should be evaluated. Ohio EPA recommends a minimum update of every 10 years and encourages updates at regularly scheduled shorter intervals. If the community reevaluates and revises its delineated WHP area, then the PPSI should be reevaluated and appropriately revised.

Why does Ohio EPA require this?
Potential threats to the wellfield may change through time. For example, businesses move in and out of areas and land use changes over time. Periodically reevaluating the potential threats to a wellfield ensures continued protection.

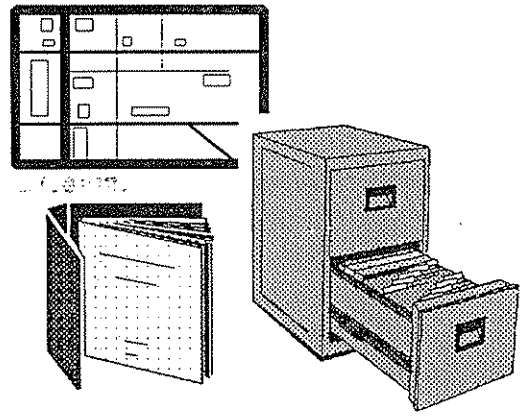
4.0 DATA SOURCES

This section identifies potential sources of information which may be helpful in completing a PPSI. Table 2 describes the classification schemes for injection wells and Table 3 and Table 4 provide information on federal databases and state and local information sources. Phone numbers and addresses are included to help access information. When requesting information from Ohio EPA, a request should also be made to the appropriate district office as well as the Central Office, because different records may be maintained at each office. Potential sources for locating data are listed below:

4.1 HISTORICAL DATA

There are many sources of historical records, such as:

- Sanborn Fire Insurance Maps
- City Atlases
- Aerial Photographs/Land Use Maps
- State/Local Historical Societies
- Chamber of Commerce Directories
- Zoning Records/Regulations (from municipality)
- Construction Permits (from municipality)
- Tax Records (from municipality)
- Commercial/Industrial Directories
- Property Transfer Records



Sanborn Fire Insurance Maps

Sanborn Fire Insurance Maps dating from 1867-1950 are available for most of the major cities. Potential useful information is the location of structures and the type of operations at the time the map was created. These maps can provide a sense of community history and how zoning (commercial and industrial) has changed over time. Sanborn maps are available through the **Library of Congress in Washington, DC** and the **Risk Information Center in Alexandria, VA.**

City Atlases

City atlases can provide a historical perspective on the past activities and development within the city. These records can assist in targeting parcels for additional research, survey or site visit. A city atlas may be available at **local libraries** or **city offices.**

Aerial Photographs/Land Use Maps

Aerial photographs may be helpful in providing a historical perspective of land use over time. Aerial photographs may be obtained through: **Ohio Department of Natural Resources**

(ODNR), Division of Real Estate and Land Management, Earth Science Information Center (ESIC), Fountain Square, Building C-2, Columbus, OH 43224, Phone: (614) 265-6770, FAX: (614) 267-2981. All requests should be made in writing and include a map outline of the area of concern, county, site, name, appropriate years of coverage, and preferable scale. Scales that may be available range from 1:24,000 to 1:4,800. The cost for a search is $25.00 per site, not including aerial photograph products. ESIC will contact the requester to discuss available coverages, turnaround times and costs of photographic products. Typical turnaround time is 10 working days for Ohio coverages and 4-8 weeks if organizations outside Ohio must be contacted. ESIC cooperates with other state and federal agencies (i.e. ODOT, USGS) to obtain aerial photographic information. The ESIC acts as a clearinghouse to provide search services for this type of information. The ESIC can also provide National Wetland Inventory Maps and Land Use Maps. The Department of Natural Resources updates the Land Use Maps approximately every 10 years. The land use maps are available on the 1:24,000 scale, and use the Ohio Land Use/Land Cover Classification based on the USGS system developed by James Anderson. The classification system is commonly referred to as the Anderson Classification system (Appendix D).

Local Soil and Water Conservation Districts or the **Natural Resource Conservation Service** (NRCS) offices (formerly Soil & Water Conservation Services (SCS)) may also have local aerial photographs available.

State/Local Historical Societies

The State and local historical societies may be able to provide a historical perspective of the municipality. The local historical societies may be able to provide names of long time residents to interview for more in-depth questions. Interviews with senior citizens or long time residents of the area can provide an excellent historical perspective on the type of businesses that have been located in the area such as the locations of old dumps.

Chamber of Commerce Directories

Chamber of Commerce Directories list local businesses and can provide information on the areas that may need more investigation. Older directories can also provide a historical perspective. Directories usually contain a contact name which may be helpful when scheduling site visits or phone interviews. A local library may have a copy of this directory for reference.

Industrial Directories

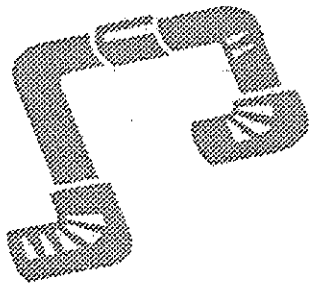
The Harris Ohio Industrial Directory is published annually by the **Harris Publishing Company in Twinsburg, Ohio, 1-800-888-5900.** Information on manufacturers throughout Ohio is available in hard copy, disk or CD ROM. Contacts for each company and Chamber of Commerce members are listed in the Directory. A local library may have a copy of this directory for reference. Industrial directories from previous years may provide Standard Industrial Classification (SIC) codes (see Step 4 for description of SIC codes) for industries that

were located in the community in the past. The SIC codes will assist in determining what types of contaminants may be present from previous industrial processes. If there are vacant or industrial buildings in the community, directories may be of assistance in identifying past activities on sites.

Property Transfer Records

Property transfer records, titles, and deeds are available at the **county courthouse** and can be very helpful when trying to develop a historical summary.

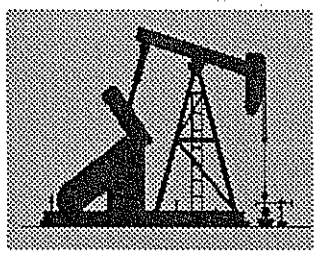
4.2 DATA ON SEWERED AND UNSEWERED AREAS



The **local utility department or sewer authority** should be able to provide information on areas that have sanitary sewers and areas that are unsewered, and the age of the lines. They should also know whether the storm water sewers are connected to a sanitary sewer. Areas that do not have a sanitary sewer or a storm water drainage system may have storm water drainage wells (dry wells). These wells collect storm water runoff and drain the water back into the subsurface aquifers. This surface drainage water can carry surface contaminants such as road salt, oil, antifreeze, pesticides and fertilizers into the groundwater. The local sewer authority will also have information on companies that have pre-treatment permits for their discharges into the sanitary sewer. These permits provide information about potential pollution sources, because these industrial facilities are allowed to discharge specific amounts of wastewater containing chemicals into the sanitary sewer system.

The sewer authorities may be able to provide information on whether private wells are still in use in residential areas and if any requirements for abandonment of existing septic systems were implemented. If the aquifer is vulnerable and a large number of homes are on septic systems, the community may want to have them connect into a sanitary sewer system as part of their management plan. If the residences have recently connected to a sanitary sewer, the community may want to verify proper abandonment of private wells and septic systems to ensure that they do not present a threat to the water supply. The **Health Department** will be able to provide information on areas dependent on septic systems and private wells.

4.3 DATA ON INJECTION WELLS AND PRODUCTION WELLS



The Underground Injection Control (UIC) Program (administered by **Ohio EPA, Division of Drinking and Ground Waters**) was established under the Safe Drinking Water Act to prevent contamination of ground water by injection wells. Injection wells are divided into five classes with Ohio EPA regulating Classes I, IV, and V and Ohio Department of Natural Resources regulating Classes II and III (See Table 2). Of most concern to the PPSI are class V wells. All Class V injection wells must be reported to the Underground Injection Control Unit of the Division of Drinking and Groundwaters at Ohio EPA. UIC regulations require the owners or operators of new and existing Class V injection wells to report the wells for inventory purposes. Some wells may require permitting, or closure, depending on the site and the materials disposed in the wells. Oil and gas wells, and class I, II, and III injection wells are identified on maps available through **Ohio Department of Natural Resources, Division of Geologic Survey**. The locations of

abandoned wells can be identified through historical record searches. The sewer authority may also have records of abandoned wells.

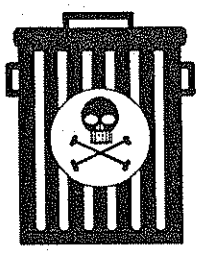
Table 2. Injection Well Classification

Class I:	Wells that are used to inject hazardous wastes, industrial or municipal waste fluids below the lowermost Underground Source of Drinking Water (USDW).
Class II:	Wells that are used to inject fluids associated with oil or the production of natural gas.
Class III:	Wells that are used to inject fluids for the extraction of minerals.
Class IV:	Wells that are used to dispose of hazardous or radioactive liquid wastes into or above the USDW (These wells are BANNED)
Class V:	Wells not included in the other classes, that usually inject non-hazardous fluids into or above a USDW. There are 30 subclasses of Class V wells, most are simple in construction and inject fluids by gravity flow or low volume pumps. They are often found in areas with no sanitary or storm sewers. Examples include: storm water drainage wells, heat pump and air conditioning return flow wells, floor drains and sumps, industrial disposal wells, automotive service disposal wells, geothermal reinjection wells, recharge wells, and wastewater wells. When completing an inventory, special attention should be given to: 1) **sumps and dry wells** that collect storm water runoff and spilled liquids (such as oil and anti-freeze from body shops and auto-maintenance facilities) and 2) **Drainage wells** that drain wet areas (may contain agricultural chemicals and bacteria). State and federal regulations require that these wells be reported to Ohio EPA.

4.4 ZONING DATA

Zoning information is available through the **local political jurisdiction.** For WHP areas that are zoned, a current zoning map (1:24,000 scale or larger) must be included in the PPSI submitted to Ohio EPA. If there is no zoning for an area this should be stated in the PPSI.

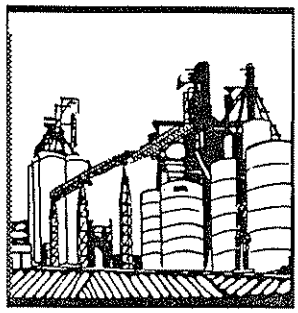
4.5 WASTE DISPOSAL DATA



Health regulations are implemented at a local level to control various activities such as waste management and wastewater disposal facilities. In some communities health regulations may be in force regarding hazardous and toxic materials, road salt, fertilizers and pesticides. The **local and County Health Departments** should be contacted for specific information. Local **Solid Waste Management Districts** may have information on open dumps, industrial and

public solid waste disposal facilities, incinerators, and other sites. Local waste haulers may have information on whom to contact.

4.6 DATA ON ABOVE GROUND AND UNDERGROUND STORAGE TANKS



Information on **above ground storage tanks** is available through the Ohio Department of Agriculture (pesticide storage), the State Fire Marshall (flammable materials storage) and the Ohio EPA Division of Emergency and Remedial Response (large quantity storage). Additional information on petroleum storage is available from the Ohio Department of Natural Resources, Division of Oil and Gas. Information on **underground storage tanks** is available through the State Fire Marshal (all tanks are registered here) and the Ohio EPA. **(See Section 4.7 'BUSTR' and 'SPCC' for additional information)**

4.7 DATA AVAILABLE THROUGH REGULATORY REPORTING

Currently, there are federal, state, and local regulatory programs that require facilities that manage or dispose of specified quantities of hazardous materials or wastes, petroleum or chemical products and/or other materials to file notifications and/or obtain permits. Notifications or permits are filed with the specified state or federal government agencies. Some of the regulatory programs that may have information available on potential pollution threats are briefly described below.

Resource Conservation and Recovery Act (RCRA) Subtitle C (regulated by Ohio EPA)
Generators of specific quantities of hazardous waste must file annual notification of hazardous waste generation activities with **Ohio EPA's Division of Hazardous Waste Management.** Notification information contains: facility location, amounts and types of generated wastes and the primary waste material management practice. RCRA also regulates the siting and operations of facilities for the treatment, storage and disposal (TSD) of hazardous waste.

RCRA Subtitle I (regulated by State Commerce Department's Bureau of Underground Storage Tanks [BUSTR])
The Bureau of Underground Storage Tanks regulation (BUSTR) must be notified by owners and operators of underground storage tanks (USTs) containing petroleum or chemical products. They have specific requirements, some of which are: leak detection, inventory control and financial responsibility. Information from BUSTR is available on location of USTs, whether a release has been suspected or confirmed, and if corrective action measures have been implemented/completed.

Superfund Amendment and Reauthorization Act (SARA) Title III Reports
Also known as the "Emergency Planning & Community-Right-to-Know Act of 1986" requires the owners or operators of facilities with specified quantities of "extremely hazardous" substances to prepare a list and report those quantities to the Ohio EPA. Specified releases of hazardous chemicals to the environment must also be reported. This program has a network (**State Emergency Response Commission (SERC)** or **Local Emergency Planning Commission**

(LEPC)) that maintain inventories of potential contaminant sources for emergency response situations that may arise. Reports of the nature, presence, quantity and management of hazardous chemicals are publicly reported in this program. Each county in Ohio has a LEPC Coordinator. This person may be very helpful when conducting a PPSI. They may already have a database created (manual or electronic) containing this information.

Listed below are various sections of SARA that have various reporting requirements.

Section 302 - Emergency Planning Reporting
Section 304 - Emergency Release Reporting
Section 311 - Hazardous Chemical Inventory Reporting
Section 312 - Annual Hazardous Chemical Inventory Reporting
Section 313 - Toxic Chemicals Release Reporting
Section 314 - Supplier Notification

National Pollution Discharge Elimination System (NPDES) (regulated by Ohio EPA, Division of Surface Water)
This program, administered by Ohio EPA's Division of Surface Water, regulates industrial and municipal discharges into waters of the state. There should be information available on effluent units and monitoring requirements.

Spill Prevention Control and Counter Measure (SPCC) (regulated by Ohio EPA Division of Emergancy and Remedial Response, and Ohio Department of Natural Resources, Division of Oil and Gas)
This program regulates the facilities that store bulk quantities of petroleum. Information available on types and quantities of petroleum products stored.

Pretreatment Permits (administered by the community; program is approved by Ohio EPA, Division of Surface Water)
This program, created by the Clean Water Act (CWA) establishes pretreatment standards for industrial wastewater discharges to a Publicly Owned Treatment Works (POTW). Many municipalities require a permit for all industrial discharges to the sanitary sewer. The wastewater treatment operator (**sewer authority**) can provide information on potential pollution threats from the permit information, such as amounts and types of materials discharged.

4.8 ADDITIONAL DATA

Phone directories may be able to provide names, addresses and phone numbers of businesses and residences that have recently moved or become new customers. This information may be helpful when updating an inventory.

Table 3. STATE AND LOCAL INFORMATION SOURCES

OHIO ENVIRONMENTAL PROTECTION AGENCY (OHIO EPA) 1800 WATERMARK DRIVE COLUMBUS, OH 43216	
AGENCY	**INFORMATION AVAILABLE**
OHIO EPA Division of Hazardous Waste Management (614)644-2917	*Hazardous Material Storage, Treatment and Disposal Facilities (incinerators, etc.) *RCRA Permits
OHIO EPA Division of Solid & Infectious Waste Management (614) 644-2621	*Solid Waste Management District Plans *Solid Waste Landfills and Dumps *Demolition, Tire Dump Sites *Incinerators, Transfer Stations, Recycling Centers
OHIO EPA Division of Emergency and Remedial Response (614)644-2924 Emergency Spills (614)644-2260 (or District Office)	*CERCLA Sites *CERCLA Unregulated NPL Site List *Emergency Spills, Leaks, Complaint Investigations, VAP Sites, Master Sites List *Community Right-to-know data *Databases of crude oil storage facilities
OHIO EPA Division of Surface Water (614)644-2001 (or District Office)	*Storm Water Pollution Prevention Plans and Permits *Sewage Treatment Plants & Wastewater Permits *Industrial Wastewater Treatment Plants *Fly Ash sites *Coal Processing Facilities *Animal Waste Management Facilities (over 1000 animal units) *Semi-Public on-site wastewater treatment plants
OHIO EPA Division of Drinking and Ground Waters (614)644-2905 (or District Office)	*Ground Water Monitoring Systems *Wellhead Protection Planning *Ground Water Quality Information *Injection Wells (dry wells) (classes I, IV and V) *Public Water Supply Plant Operations *Public Water Supply Plant Monitoring Information *Public Water Supply Inspection Reports
OHIO EPA Office of Pollution Prevention (614)644-3469	*Technical Assistance to Industry Regarding Source Reduction, Recycling or Treatment to Reduce Toxicity or Volume

OHIO DEPARTMENT OF NATURAL RESOURCES (OHIO DNR) *FOUNTAIN SQUARE* *COLUMBUS, OH 43224-1387* *(614) 265-6505*	
AGENCY	**INFORMATION AVAILABLE**
OHIO DNR Division of Oil and Gas (614)265-6922	*Oil and Gas Wells *Brine Disposal *Production and Storage Facilities *Injection Wells (oil field wastes and mineral production)(Classes II and III) *Pollution Investigation
OHIO DNR Division of Reclamation (614)265-6633	*Coal Mine Permits *Abandoned Coal Mine Areas *Acid Mine Drainage *Mine Blasting *Pollution Investigations
OHIO DNR Division of Soil and Water Conservation (614)265-6610	*Livestock and Sediment Pollution Abatement *Soil Survey Information *Areal Photography Services *Agriculture Best Management Practices
OHIO DNR Division of Geological Survey (614)265-6576	*General Geologic Information *Geologic and Topographic Maps *Underground Mines *Mineral Production and Reserves
OHIO DNR Division of Water (614)265-6717	*Well Log and Drilling Reports *Ground Water Resource Maps *Ground Water Resource Information *Ground Water Pollution Potential Maps
OTHER STATE AGENCIES	
Ohio Department of Health Bureau of Environmental Health 246 N. High Street Columbus, OH 43266 (614)466-1390	*Private Water System/Sewage System Rules *Well Driller Registration *Private Well Pollution Investigations
Ohio Department of Agriculture Division of Plant Industry Pesticide Regulation 8995 E. Main Street Reynoldsburg, OH 43068 (614)866-6361	*Pesticide Registration *Pesticide Water Testing *Pollution Investigations

AGENCY	INFORMATION AVAILABLE
Ohio Department of Commerce State Fire Marshal 8895 E. Main Street Reynoldsburg, OH 43068 (614)752-7938	*Underground Storage Tank Rules and Registration *Pollution Investigations *Underground Storage Tank Inventory
Ohio Department of Transportation Bureau of Environmental Services 25 S. Front Street Columbus, OH 43266 (614)466-7100	*Guidelines for Road De-Icing, Chemical Storage and Application *Chemical Usage Locations *PUCO routing
Public Utilities Commission 180 E. Broad Street Columbus, OH 43266 (614)466-3016	*Regulation of Railroads, Motor Carriers, Natural Gas, Electric, Sewer and Water Services *Hazardous Cargo Shipments and Routes
Ohio Emergency Management Agency 2855 W. Dublin Granville Road Columbus, Ohio 43235-2206 (614) 799-3688	*Hazardous Materials Plans *Directs Community to County and Local Emergency Planning Committees
LOCAL AGENCIES	
County and Municipal Health Districts	*Private Well and On-Lot Sewage Disposal Permits *Private Well Testing *Pollution Investigations
County or Municipal Highway Departments	*Guidelines for Road Deicing, Chemical Storage and Application *Brine Spreading for Ice and Dust Control
Local Emergency Planning Agencies	*Hazardous Materials Inventory *Spill, Leak and Accident Reports
Regional and Local Planning Commissions	*Solid Waste District Planning *Previous Pollution Source Inventories and Other Resource Evaluation Studies *Base Maps and Copies of Ordinances and Zoning Studies
County Agriculture Extension Service	*Education on Agriculture Best Management Practices, Well Construction and Maintenance, On-Lot Sewage Systems
County Soil and Water Conservation Districts	*Technical Assistance and Agricultural Best Management Practices and Pollution Abatement Measures *Agricultural Pollution Investigations (including animal units under 1000)
Local Fire Departments	*Records of Underground Storage Tanks for Flammable and Other Potential Fire Hazards *Reports and Locations on Pollution Incidents Involving Toxic, Hazardous or Flammable Substances

AGENCY	INFORMATION AVAILABLE
Local Building, Zoning, and Utility Departments	*Building Permits, Inspection Records *Sewer, Water and Gas Lines *Zoning and Plat Maps *Proposed Utility Expansion Location
Local Sewer Authority	*They May Maintain Inventories on Their Customers Who Have Permits.

Table 4. FEDERAL DATABASES

CERCLA INFORMATION SYSTEM *(CERCLIS)*	
Description:	An inventory of potential hazardous waste sites in the United States. CERCLIS covers incidents of hazardous chemical spills as well as hazardous waste sites nominated or selected for cleanup under the provision of the Superfund Amendments and Reauthorization Action 1986 (SARA).
Developed by: US EPA Office of Emergency & Remedial Response Office of Solid Waste & Emergency Response *Contacts:* FOI Officer (A-101) US EPA 401 M. Street, SW Washington, DC 20460 (202) 260-4048 US EPA 401 M. Street, SW Washington, DC 20460 (202) 260-9833 CERCLIS Hotline (202) 260-0056	*Information Available:* • **Site identification:** EPA identification number, name, alternate name (if applicable), geographic location (e.g., street address, city, county, state, and ZIP code EPA Region • **Action taken at the site:** pre-cleanup investigations, cleanup activity status, and for some sites, descriptions of environmental problems encountered. During the Preliminary Site Investigation, if the site is found to pose no environmental threat and require No Further Action, a NFA flag appears in this column • **Project dates:** actual start and completion dates • Lead agencies • **Off-site waste transfer information:** names and addresses of wastes transferred, estimated amounts transferred, and basis for these estimates

TOXIC CHEMICAL RELEASE INVENTORY *(TRI)*

Description: TRI contains a compilation of the annual toxic chemical release reports required under Section 313 of the Emergency Planning and Community Right-to-Know Act.

Developed by:

US EPA
Office of Toxic Substances
Emergency Response Division

Contact:

Information Management Division
Public Data Branch (TS-793)
USEPA
401 M. Street, SW
Washington, DC 20460
(202) 260-8680

Information Available:

- **Facility identification:** name, address, public contact number, Dun & Bradstreet (D&B) number, and EPA Identification Number
- **Substance identification:** names, uses, Chemical Abstracts Service (CAS) Registry Number, and maximum amount onsite
- **Environmental release information:** estimates of the amounts of chemicals released into the air, water, land, and injected underground, and the source of these releases
- **Waste treatment information:** condition of the general waste stream, method, treatment efficiency, and waste minimization data
- **Off-site waste transfer information:** names and addresses of wastes transferred, estimated amounts transferred, and basis for these estimates

RCRA INFORMATION SYSTEM *(RCRIS) (replacing HWDMS)*

Description: The database contains permitting and compliance monitoring activities for all generators, transporters, and TSDFs.

Developed by:

US EPA
Office of Planning, Policy and Information
and Office of Solid Waste

Contacts:

US EPA
401 M. Street, SW
Washington, DC 20460
(202) 260-4670

Information Available:

- Information on waste types
- Estimated annual quantities
- Management processes
- Data derived from Part A permit applications

UNDERGROUND STORAGE TANKS CASE HISTORY FILE

Description: The database system is a compilation of factual data from site coordinators, detailing corrective action methods to guide leaking underground storage tank corrective actions.

Developed by:

US EPA

Contacts:

US EPA
Edison, New Jersey
(201) 321-6639

Information Available:

- Documentation of hazardous materials spills
- National overview of remedial and removal actions at Superfund sites and corrective actions for UST problems
- Alternative approaches to respond to leaking underground storage tanks, cost estimates for these approaches, and information on the successes/failures of alternative corrective action approaches
- Rationale for the selection of site characterization techniques, various corrective action technologies, and termination of individual corrective actions

HAZARDOUS MATERIAL INCIDENT REPORTING SYSTEM

Description: This database provides a statistical compilation of all accidents and incidents involving hazardous materials. The system contains the following:

Developed by:

US Department of Transportation
Research and Special Programs
Administration
Information Systems Branch

Contacts:

US Department of Transportation
Research and Special Programs
Administration Information Systems Branch
DHM-63, Room 8112
401 M. Street, SW
Washington, DC 20460
(202) 366-4555

Information Available:

- Information on each reported incident
- Data elements: the data of the accident, location, shipper, carrier, commodity involved and other detailed information concerning the packaging and nature of the incident

FEDERAL REPORTING DATA SYSTEM *(FRDS)*

Description: FRDS organizes and stores information on public water supply systems (PWSS).

Developed by:

US EPA
Office of Drinking Water

Contacts:

US EPA
Office of Drinking Water
401 M. Street, SW
Washington, DC 20460
(202) 260-2799

Information Available:

- Inventory information, including physical characteristics of water supply, well-specific information, location and source of well
- Compliance-related information, including violations, enforcement actions, variances, and exemptions

WATER MANAGEMENT PERMIT COMPLIANCE SYSTEM

Description: The system monitors the NPDES process for permits.

Developed by:

Permit Compliance System
Waste Management Division
US EPA

Contacts:

US EPA
401 M. Street, SW
Washington, DC 20460
(202) 260-8313

Information Available:

- Information about permittee and application process to issue permit
- Information on effluent units
- Monitoring requirements for permittees

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5.0 HOW TO INTEGRATE THE PPSI INTO A MANAGEMENT STRATEGY

Once the PPSI is complete, a community needs to begin developing a management plan (the final component of a WHP plan). The management plan must address mechanisms for managing land use in the WHP area to reduce the possibility that the potential pollution sources identified in the PPSI will contaminate the wellfield.

5.1 PRIORITIZE POTENTIAL POLLUTION SOURCES

Upon inventorying the potential pollution sources, it is a good idea to prioritize the sources according to the risk they pose to drinking water resources. This will help determine which sources require immediate attention to prevent contamination.. Potential sources that pose little risk may not need to be managed and should not be the initial focus of the management plan. They should, however, be considered in the development of long term management strategies.

There are many ways to prioritize potential pollution sources and it is up to the community to develop a prioritization scheme that fits into their management strategies best. A good starting point for prioritizing potential pollution sources is to assess the actual threats to the wellfield. The *actual threat* of any given potential pollution source or land use is based on several considerations, including:

1. **Distance** of the potential pollution source from the wells
2. Whether the chemical is stored, disposed and/or released **above-ground or below-ground**
3. **Amount** of chemicals stored, disposed and/or released at that site
4. **Mobility** of the chemicals within the subsurface
5. Whether the chemical is **containerized** or not
6. **Toxicity** of the chemicals that are likely to be associated with that source/land use
7. **Management practices** already in place by owner/operators of sources

Of the above considerations, the first one--**distance from the wells**--is the easiest to determine with certainty. Potential pollution sources near the wells warrant a higher priority than those distant from the wells. It is common to rank potential pollution sources into the following categories: those within the one-year time-of-travel area; those between the one- and five-year time-of-travel areas; and those outside the five-year time-of-travel area. Although distance from wells may be the easiest method to prioritize potential pollution sources, other potential pollution source characteristics must also be considered.

Whether a potential pollution source involves **disposal, storage, or release above-ground or below-ground** is also easy to determine. Above-ground storage, disposal, or release threatens the aquifer less than below-ground disposal or storage, because the soil acts as a filter for many common ground water contaminants. Plants in the soil layer take up nitrate, and organic matter

binds up many other kinds of contaminants, including micro-organisms. On this basis, underground storage tanks (USTs), septic systems, and insecure wells warrant a higher priority.

It is more difficult to determine the **toxicity, amount, and mobility of chemicals** that may be associated with any potential pollution source, primarily because there may be little reliable information about what kinds of chemicals exist (or may have existed) at a given site.
Even when records do exist, it still may be difficult to evaluate the **mobility** of the chemicals in the subsurface. Mobility depends on a number of factors related to the site's geology, especially the amount of clay present, which tends to inhibit mobility. Soil surveys and Drastic Maps can help identify WHP area site conditions, such as which areas have sandy soils versus clay rich soils. In sandy soils, with relatively little clay present, it may be assumed that *any* potential pollution source or land use poses a higher degree of risk. However, mobility also depends on the characteristics of the chemicals. A chemical's solubility in water is one key factor. (For example, benzene and TCE are more soluble in water than most other volatile organic compounds (VOCs), which is one reason why these two chemicals are among the most commonly seen ground water contaminants.) However, as with toxicity, it is difficult to use this criterion to prioritize potential pollution sources because it is often uncertain what kinds of chemicals are associated with given sources.

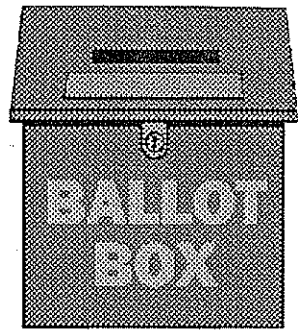
Containerization can make a potential pollution source more of a threat in some cases and less of a threat in others. If chemicals have been disposed of recently, containerization in structurally sound vessels will make the chemicals less of a threat than if they were allowed to infiltrate into the aquifer unimpeded. However, containerized chemicals buried decades ago may only now be starting to leak, while uncontainerized chemicals disposed of that long ago have undoubtedly been diluted and chemically decomposed. In this case, containerized chemicals may pose a greater threat.

5.2 BEGIN DEVELOPING A MANAGEMENT STRATEGY

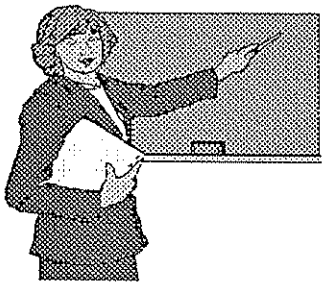
After the potential pollution sources have been prioritized, management options can be considered. The first step in this process is gathering information on the applicability and effectiveness of federal, state, and local regulations for managing land use activities in the WHP area. Identifying management options and collecting local opinions on which management options are workable for citizens that will be affected by the management plan are critical elements of information collection. The WHP committee or a management subcommittee can be used as a clearinghouse for local input. The goal of this research is to identify numerous management options, both regulatory and non-regulatory, that could be utilized to manage land use in the WHP area.

One of the early decisions that has to be made for each source category is whether existing regulations are sufficient to protect the wellfield. If regulations exist, the WHP Management plan should utilize them to avoid duplication of effort and maximize the efficiency of the plan.

If the WHP Committee believes that existing regulations are sufficient, then the management plan must confirm that all facilities within the WHP area can be managed by an existing set of regulations, and are registered with the appropriate regulatory agency. Unregistered facilities need to be identified and reported to the appropriate regulatory authority to provide the desired level of protection to the community. The management plan should also be supplemented by non-regulatory, educational programs.



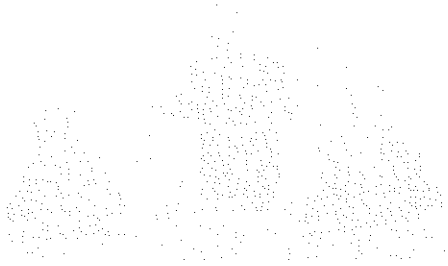
If current regulations are insufficient for protecting the wellfield or no regulations exist, the community must develop local regulations and/or develop non-regulatory approaches. Regulatory approaches include: using zoning to manage land use (rezoning or overlay zoning), requiring specific training, and instituting special reporting requirements. Non-regulatory approaches emphasize voluntary action and education to promote land use activity that reduces potential threats to the wellfield. Many of the non-regulatory management practices complement regulatory programs, and various incentive programs can be created to encourage voluntary action. Non-regulatory approaches include: public education, purchasing property or development rights, local hazardous waste collection, waste minimization, and encouraging farmers to follow Best Management Practices for agricultural areas within the WHP area.



Additional requirements of a management plan include:

1. A public involvement and education program,
2. A contingency plan, and
3. A determination of whether groundwater monitoring is necessary and the development of a groundwater monitoring plan if needed.

A public water system (WHP planning committee) should seek a meeting with Ohio EPA early in the development of a management plan. Ohio EPA personnel can discuss various options available to a community.



6.0 OHIO EPA's CHECKLIST FOR REVIEWING A PPSI

This short checklist was developed to assist communities to ensure they have included everything Ohio EPA evaluates for endorsing a PPSI.

6.1 MUSTS

1) Must provide **narrative of methodology used** (i.e., searched federal, state and local databases, visual survey). **(Section 3.1)**

2) Must **complete a visual survey** (to identify gaps in databases, identify new pollution sources and land use and confirm locations of previously identified sources). **(Section 3.1.2)**

3) Ohio EPA strongly encourages site visits. The PPSI must include a **discussion of site visits** (this includes site visits conducted or planned). **(Section 3.1.3)**

4) Must **explore the historical aspect of land use** (interviews with senior citizens, old aerial photos, etc. will be helpful for this). **(Section 3.1.4)**

5) Must **identify transportation routes and transmission lines (railroad, major highways, gas transmission lines** should be included on summary table and indicated on a map). **(Section 3.2.1)**

6) Must **identify sewered and unsewered areas.** Should indicate location and age of major sewer lines (old lines and pressurized lines may leak, unsewered areas may have greater number of Class V injection wells and septic tanks). **(Section 3.2.2)**

7) Must **identify areas with below ground home fuel oil tanks** (not covered by BUSTR). **(Section 3.2.4)**

8) Must **provide a map** (USGS 7 ½" topo or 1:24,000 scale or larger) **with numbered potential pollution sources** (with **corresponding table**, example Table 2), **location of PWS wells** and **time-of-travel boundaries and delineated WHP Area. (Section 3.3.1)**

9) Must include a **land use map** (designating urban, commercial, industrial, transportation routes, recreation areas, agriculture, range land, forest land, water, wetland, etc). **(Section 3.3.2)**

10) Must include a **current zoning map** (industrial, commercial, residential, and agricultural), if zoning exists in the area. If zoning does not exist it should be stated in the submitted document. **(Section 3.3.3)**

6.2 SHOULDS

1) Should have **searched appropriate databases** (federal, state [State Emergency Response Commissions, SERCs] and local [Local Emergency Planning Commissions, LEPCs]). **(Section 3.1.1)**

2) Should include locations of **injection wells, production wells and abandoned wells. (Section 3.2.3)**

3) Should **evaluate major land uses and point sources of potential pollution immediately upgradient from WHP Area. (Section 3.2.5)**

4) Should **include a mechanism for updates.** A community will be requested to submit an updated PSI every 10 years, at a minimum. If a community reevaluates or revises its delineated WHPA, then the PPSI should be re-evaluated and appropriately revised. **(Section 3.4)**

6.3 COMMON ERRORS

1) No description of methodology used (databases searched, windshield surveys, site interviews).

2) Utilizing available reports that are too general and not researching/confirming their information.

3) No explanation of how sources were identified (example: gas stations from BUSTR or windshield survey) (if from BUSTR, most likely in compliance).

4) Not identifying past and future sources (example: former land uses, such as a gas station that has been converted into a flower shop).

APPENDIX A
Types of Ground Water Contaminants and Their Sources

Appendix A contains a brief review of several of the most common contaminants to a wellfield. Potential sources of these and other contaminants are indicated in Table 5 and Table 6. Not all potential pollution sources are listed in the provided tables, and each source will not always contain the listed contaminants that are normally associated with that specific source.

Generally, ground water contamination is caused by substances that are either liquids or easily dissolved in water. Common ground water contaminants are discussed in the following section. The types of potential pollution sources that these contaminants are associated with are also discussed.

Volatile Organic Compounds (VOCs): VOCs are volatile chemicals that vaporize rapidly when exposed to atmospheric air. They are associated primarily with solvents and gasoline. Commonly detected VOCs in ground water include:

- benzene, toluene, ethylbenzene, and xylene (from gasoline)
- trichloroethylene (TCE), from various industrial solvents
- trichloroethane (TCA), from various industrial solvents
- perchloroethylene (PCE, or "perc"), associated with dry cleaning fluids
- methyl ethyl ketone (MEK), associated with paint strippers and other solvents

When breathed at very high concentrations, most VOCs can cause an acute reaction in humans, including headaches, impairment of the nervous system, nausea, and respiratory problems. In addition, many VOCs are believed to cause cancer. (The evidence for benzene's carcinogenicity is especially compelling.) Thus, exposure to VOCs is a concern even at very low levels. For all these reasons, federal standards for concentrations in drinking water are very low for many VOCs--typically 5 parts per billion (ppb) or less.

VOCs are generated in liquid form, though they quickly vaporize when exposed to air. In the subsurface, most of them are somewhat soluble in ground water. Some, like benzene, tend to float on the water table. Others, like TCE, tend to sink to the base of the aquifer and pool there. However, a certain portion of any subsurface VOC will dissolve in ground water, and this portion tends to be relatively mobile. Moreover, VOCs are found in many of the most common household products and in the most widely used industrial fluids. Ohio EPA's database indicates that **VOCs are the biggest problem for public water systems using ground water in Ohio.** Most of the ground water-based public water systems that have been required to install additional treatment systems--and/or abandon wells entirely--have done so because of VOC contamination that has migrated into the wellfield from some nearby industrial or commercial site (**Figure 3**).

Large-scale ground water contamination by VOCs is associated most commonly with leaks in **underground storage tanks** and leaching from **wastewater ponds** at industrial sites where large amounts of solvents are or were used. However, VOC contamination may also result from oil and gas extraction, disposal of household waste, improper disposal of commercial wastes, and other sources

Treatment of ground water contaminated by VOCs is expensive, usually requiring the installation of an air stripping tower.

Polychlorinated Biphenyls (PCBs): PCBs are part of the conducting fluid in transformers and capacitors, and are considered highly toxic. Health effects include probable cancer and reproductive effects. Working transformers are often located on telephone poles in wellfields. If PCB-laced fluid leaks from a transformer, it could potentially appear in the public water system. However, a greater concern is PCBs leaking from old transformers left in junkyards and old dumps. Since PCBs are not very mobile in ground water, they are detected in ground water only rarely and have been detected very rarely in public water systems in Ohio.

Nitrate: Nitrate is probably the second most common water quality problem in ground water-based public water systems. (It is also a major concern in many private wells in rural, agricultural areas.) Nitrate occurs naturally in the soil where nitrogen-fixing plants like clover and alfalfa are growing. It also is found in manure and wastewater sludge. High nitrate levels are associated with:

- **agricultural activities** (due to spreading of fertilizers, typically in the form of manure or anhydrous ammonia, urea, or ammonium sulfate)
- **on-lot septic systems** (generally found in rural areas, where sanitary sewer lines have not yet been installed)
- **wastewater sludge**, from wastewater treatment plants--commonly applied to fields as fertilizer
- **golf courses** and other areas of heavy lawn maintenance.

Nitrate is mostly associated with a potentially fatal condition in infants called methemoglobinemia--or "blue-baby syndrome". This condition results in the infant being unable to obtain sufficient oxygen, which causes the blue coloration of the skin. It is related to the immaturity of an infant's lungs; once out of infancy, the baby is no longer at risk. However, because of this risk to infants, federal standards for levels of nitrate in drinking water are 10 parts per million (ppm). In addition, ingested nitrate is associated with spontaneous abortions in laboratory animals and livestock, and a recent epidemiological study conducted in Indiana suggests a compelling link between nitrate ingestion and spontaneous abortions in humans. According to this study, multiple miscarriages occurred in healthy women drinking ground water (from private wells) containing nitrate concentrations of 19-26 ppm.*

Nitrate is very soluble in ground water. In Ohio and throughout the Midwest, levels of nitrate in ground water used for drinking water are frequently found at levels of 5 ppm or more. *In private domestic wells* in agricultural areas, levels sometimes significantly exceed the federal standard. Sampling of public water supply systems across Ohio indicates that nitrate levels rarely exceed the federal standard *in public water supply systems*. On the other hand, these same data indicate that the highest levels are typically associated with buried valley aquifers. Reverse osmosis and ion exchange are two methods that can be used to remove nitrate from water; however, relatively few public water systems are equipped for this process.

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*"Spontaneous Abortions Possibly Related to Ingestion of Nitrate-Contaminated Well Water--LaGrange County, Indiana, 1991-1994", *Morbidity and Mortality Weekly Review*, Vol. 45, No. 6, July 5, 1995, pp. 569-572.

Herbicides and Pesticides: Herbicides and pesticides refer to a variety of mostly synthetic chemicals that are used to control weeds or various human or plant pests. Many of these chemicals are semi-volatile. When breathed at high concentrations, many herbicides and pesticides can cause an acute reaction in humans, including headaches, dizziness, impairment of the nervous system, nausea, and respiratory problems. In addition, a number of herbicides and pesticides are suspected of causing cancer. Thus, federal standards for levels of certain herbicides and pesticides in drinking water are quite low, similar to those for VOCs.

Additionally, in the mid-1990s, research has indicated that certain chemicals-- primarily herbicides pesticides, and PCBs-- may cause birth defects, learning problems, and predisposition to certain cancers (Our Stolen Future, 1995). These chemicals are "hormone disruptors" that imitate hormones occuring naturally in humans and animals. Unlike most other synthetic chemicals, very small amounts of a hormore disruptor can cause a significant response, especially if the chemical is absorbed by a fetus at a particular stage of development. The U.S. EPA is currently considering imposing standards for certain chemicals based on the ablity to disrupt hormones.

Herbicides and pesticides are associated primarily with **agricultural land use**, **golf course maintenance**, and residential **lawn maintenance**. Also, spraying may be used to inhibit growth of foliage along **railroad right-of-ways**. Despite much media attention in recent years, contamination of pubic drinking water supplies by herbicides and pesticides does not appear to be a significant concern for most of Ohio's ground water-based public water suppliers. In 1996, about 2,000 ground water-based public water systems in Ohio were sampled for herbicides and pesticides. Of these, only two (2) systems produced samples with detectable levels of those contaminants.

Heavy Metals: Certain metals--including mercury, lead, cadmium, and chromium--can cause serious human health effects if ingested regularly at high enough levels. Most of these metals occur naturally in the subsurface, but they rarely appear at high levels in ground water naturally. Under certain conditions, such as low pH, metals may dissolve and be detected in ground water at unusually high levels. Acid **mine drainage** is the surface water manifestation of this condition. Also, high levels of metals have been detected in ground water flowing beneath old **industrial wastewater ponds** at industrial sites involved with metal-working. Finally, they can be found in **wastewater sludge,** fly ash and bottom ash from **incinerators** and **coal-burning power plants**, in run-off from **coal piles**, and in **road salt**. Generally speaking, however, metals are not very mobile in the subsurface, and ground water contamination by metals from anthropogenic (human-caused) sources have not proved a significant concern for ground water-based public water systems in Ohio.

Salt: Salt is not considered toxic to humans, but when dissolved in ground water it releases chloride ions that impart an unpleasant taste to the water. While chloride is a naturally-occurring constituent in ground water, high levels of chloride may render the water unpotable. Therefore, road salt is included in the list of common ground water pollutants. Typical sources include **piles of road salt**, which are sometimes left uncovered on permeable surfaces outside a municipal garage. During the winter, **roadways and walkways** may be salted to melt ice. However, the most significant potential source of high chloride levels may be **oil and gas wells**, and their associated **brine pits**. In southern Ohio during the 1990s, a public

water system traced high chloride levels in the drinking water to an old oil/gas well that had not been properly abandoned.

Other Organic Compounds: A number of organic compounds that are not included under VOCs or herbicides/pesticides may present a concern to ground water quality. Less volatile fractionations of petroleum products, such as diesel, fuel oil, hydraulic oils, etc. sometimes appear as contaminants in ground water. Diesel is associated mostly with **USTs at service stations**, and with **above-ground storage tanks on farms and at commercial sites**. Fuel oil is associated primarily with above- or below-ground **fuel oil tanks** located next to residential dwellings in rural areas where gas lines have not yet been extended. Hydraulic oils and other heavy fractionations of petroleum are associated mostly with **commercial and industrial sites**.

Microorganisms (bacteria, viruses, etc.): Microorganisms are the oldest--and among the most dangerous--types of drinking water contaminants. In developing countries, waterborne pathogens are responsible for approximately one-third of all deaths--many of them children.** The diseases spread through contaminated drinking water include hepatitis A, typhoid fever, cholera, and salmonella. Most of these diseases are associated with lack of sanitation. However, even in the United States, domestic wells frequently test positive for coliform bacteria.

Fortunately, the soil is an excellent filter of microbes, and most bacteria and viruses do not persist in the ground water environment for long. (In fact, the guideline of a 300-foot "sanitary radius" around a well, which is used in Ohio and in many other states, originated long ago in Europe where it was recognized that wells surrounded by an unimpacted area with a radius of a couple hundred feet tended to be relatively free of microbial contamination.) However, where microbes are introduced directly into the subsurface with minimal filtering, microbial contamination of the drinking water may occur, and the effects on human health can be serious or even fatal.

Most public water systems in Ohio are required by Ohio EPA to chlorinate the water they offer to the public. As long as a system's chlorinator is operating properly, the drinking water should be relatively free of microbial contamination. Failure of a chlorinator can have serious consequences. In 1949, the Village of Loudonville's chlorinator broke down for 24 hours, and within that time period, *a thousand residents* experienced gastrointestinal illnesses! The illnesses later were attributed to pathogens emanating from leaking sanitary sewer lines located within the wellfield, not far from the wells.

Considering all the above, it makes good sense to minimize sources of microbial contamination close to the wellfield--for example, within the one-year time-of-travel area. Such sources include **on-lot septic systems, sanitary sewer lines, spreading of manure or wastewater sludge, manure pits**, and **out-houses**. Direct conduits into the aquifer may also result in microbial contamination, such as **domestic wells** that are poorly secured or maintained, **building excavations**, **sinkholes**, and **quarries**. Surface water drains into the aquifer- also known as "dry wells", "Class V wells", and "French drains"- facilitate movement of surface water into the aquifer and are a potential source for microbial contamination.

**Anne E. Platt, *Infecting Ourselves: How Environmental and Social Disruptions Trigger Disease*, Worldwatch Paper 129, Worldwatch Institute, April 1996, p. 42.

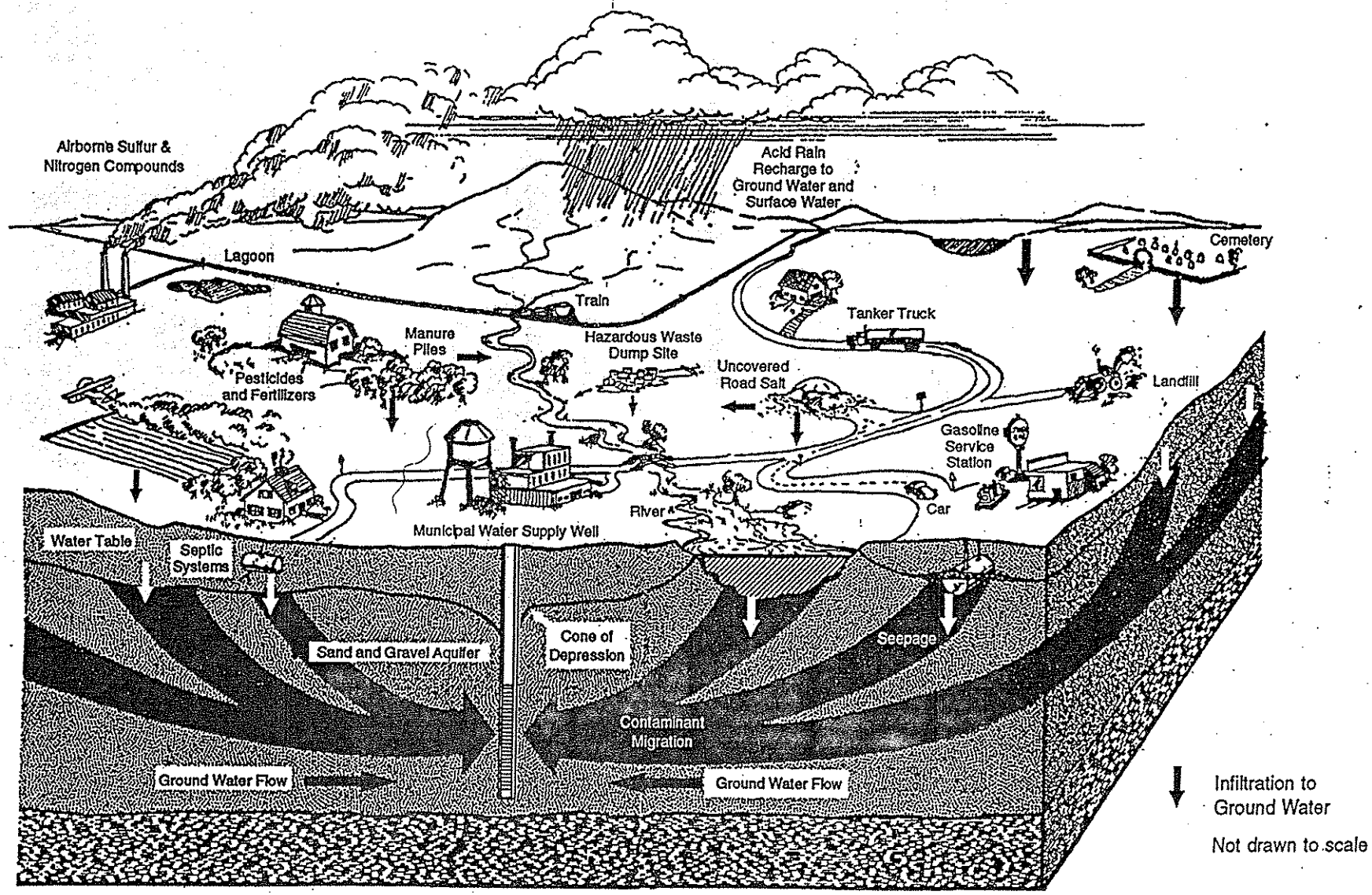

Figure 2. Potential Sources of Ground Water Contamination. USEPA, 1983; Paly and Steppacher

INTERIM - SUBJECT TO PUBLIC COMMENT

TABLE 5.

POTENTIAL SOURCES OF GROUND WATER CONTAMINATION

SOURCE	*Health and Environmental Concerns*
NATURALLY OCCURRING SOURCES	
Decaying organic matter	Bacteria
Hydrogeological events	Salt-water/brackish water intrusion (or intrusion of other poor quality formation water); contamination by a variety of substances through sink-hole infiltration in limestone terrains
Radioactive gas (geological origin)	Radionuclides (radon, etc.)
Rocks and soils	*Aesthetic Contaminants:* Iron and iron bacteria; manganese; calcium and magnesium; *Health and Environmental Contaminants:* arsenic; asbestos; metals; chlorides; fluorides; sulfates; sulfate-reducing bacteria and other microorganisms
AGRICULTURAL SOURCES	
Animal feedlots and burial areas	Livestock sewage wastes; nitrates; phosphates; chloride; chemical sprays and dips for controlling insect, bacterial, viral and fungal pests on livestock; bacteria, viruses
Chemical storage areas and containers	Pesticide and fertilizer residues
Crop areas and irrigation sites	Pesticides; fertilizers; gasoline and motor oils from chemical applicators
Drainage wells and canals (agricultural)	Pesticides; fertilizers; bacteria; salt water (in areas where the fresh-saltwater interface lies at shallow depths and where the water table is lowered by channelization, pumping, or other causes)
Machinery areas	Automotive wastes; welding wastes
Manure spreading areas and storage pits	Livestock sewage wastes; nitrates
RESIDENTIAL SOURCES	
Apartments and condominiums	Swimming pool maintenance chemicals; pesticides for lawn and garden maintenance and cockroach, termite, ant, rodent, and other pest control; wastes from onsite sewage treatment plants; household hazardous wastes
Common household maintenance	***Common Household Products:*** Household cleaners; oven cleaners; hobbies supplies; drain cleaners; toilet cleaners; disinfectants; metal polishes; jewelry cleaners; shoe polishes; synthetic detergents; bleach; laundry soil and stain removers; spot removers and dry cleaning fluid; solvents; lye or caustic soda; household pesticides; photochemicals; printing ink; other common products ***Wall and Furniture Treatments:*** Paints; varnishes; stains; dyes; wood preservatives (creosote); paint and lacquer thinners; paint and varnish removers and deglossers; paint brush cleaners; floor and furniture strippers ***Mechanical Repair and Other Maintenance Products:*** Automotive wastes; waste oils; diesel fuel; kerosene, brake fluid; antifreeze; #2 heating oil; grease; degreasers for driveways and garages; metal degreasers; asphalt and roofing tar; tar removers; lubricants; rustproofers; car wash detergents; car waxes and polishes; rock salt; refrigerants

TABLE 5
POTENTIAL SOURCES OF GROUND WATER CONTAMINATION -- Continued

SOURCE	*Health and Environmental Concerns*
Lawns and gardens	Fertilizers; herbicides and other pesticides used for lawn and garden maintenance
Septic system and cesspools	Septage; coliform and noncoliform bacteria; viruses; nitrates; metals; synthetic detergents; cooking and motor oils; bleach; pesticides; paints; paint thinner; photographic chemicals; swimming pool chemicals; septic tank/cesspool cleaner chemicals; elevated levels of chloride, sulfate, calcium, magnesium, potassium, and phosphate
Swimming pools	Swimming pool maintenance chemicals
Underground storage tanks	Home heating oil
MUNICIPAL SOURCES	
Artificial ground water recharge	Storm water runoff; excess irrigation water; stream flow; cooling water; treated sewage effluent; other substances that may contain contaminants, such as nitrates, metals, detergents, synthetic organic compounds, bacteria, and viruses
Dumps: open dumping and burning sites; closed dumps	Organic and inorganic chemicals; metals; oils; wastes from households and businesses
Highways, road maintenance depots, and deicing operations	Herbicides in highway rights-of-way; road salt (sodium and calcium chloride); road salt anti-caking additives (ferric ferrocyanide, sodium ferrocyanide); road salt anticorrosives (phosphate and chromate); automotive wastes
Incinerators (municipal)	Heavy metals; hydrocarbons; formaldehyde; methane; ethane; ethylene; acetylene; sulfur and nitrogen compounds
Park lands	Fertilizers; herbicides; insecticides
Public and residential areas infested with mosquitoes, gypsy moths, ticks, ants, and other pests	Pesticides
Recycling/reduction facilities	Residential and commercial solid waste residues
Schools and government offices and grounds	Solvents; pesticides; acids; alkalis; waste oils; machinery/vehicle servicing wastes; gasoline and heating oil from storage tanks; general building wastes
Sewage treatment plants and sewer lines (municipal)	Municipal wastewater; sludge; 14 treatment chemicals
Sewer overflows (municipal oil; pal sewers and storm water drains)	Municipal wastewater; sludge; treatment chemicals; urban runoff; gasoline; other petroleum products; road salt; microbial contaminants
Storm water drains and basins	Urban runoff; gasoline; oil; other petroleum products; road salt; microbiological contaminants
Sumps and dry wells	Storm water runoff; spilled liquids; used oil; antifreeze; gasoline; other petroleum products; road salt; pesticides; bacteria; and a wide variety of other 3substances
Surface Impoundments:	Sewage wastewater; nitrates; other liquid wastes; microbiological contaminants

TABLE 5
POTENTIAL SOURCES OF GROUND WATER CONTAMINATION -- Continued

SOURCE	*Health and Environmental Concerns*
Storage, treatment and disposal ponds, lagoons, etc.	There are as many as 180,000 surface impoundments in the U.S. Many impoundments which are used for waste management may be required to have liners to minimize potential ground water contamination.
Waste landfills (municipal)	Leachate; organic and inorganic chemical contaminants; wastes from households and businesses; nitrates; oils; metals
Wastewater by products wastewater applied to land areas	Organic matter; nitrate; inorganic salts; heavy metals; coliform and or noncoliform bacteria; viruses; nitrates; sludge; nonhazardous wastes
Well pumping that causes inter-aquifer leakage, induced filtration, or landward migration of sea water in coastal areas; etc	Saltwater; excessively mineralized water
Wells: water supply wells, monitoring wells, older wells, domestic and livestock wells, unsealed and abandoned wells and test hole wells	Surface runoff; effluents from barnyards, feedlots, septic tanks, cesspools; gasoline; used motor oil; road salt
COMMERCIAL SOURCES	
Airports, abandoned airfields	Jet fuels; deicers; diesel fuel; chlorinated solvents; automotive wastes; heating oil; building wastes
Auto repair shops	Waste oils; solvents; acids; paints; automotive wastes; miscellaneous cutting oils
Barber and beauty shops	Perm solutions; dyes; miscellaneous chemicals contained in hair rinses
Boat yards and marinas	Diesel fuels; oil; septage from boat waste disposal areas; wood preservative and treatment chemicals; paints; waxes; varnishes; automotive wastes
Car dealerships (especially those with service departments)	Automotive wastes; waste oils; solvents; miscellaneous wastes
Car washes	Soaps; detergents; waxes, solvents degreasers; miscellaneous chemicals
Camp grounds	Septage; gasoline; diesel fuel from boats; pesticides for controlling mosquitoes, ants, ticks, gypsy moths, and other pests; household hazardous wastes from recreational vehicles (RVs)
Carpet stores	Glues and other adhesives; fuel from storage tanks if forklifts are used
Cemeteries	Pathogens, formaldehyde, lead; leachate; lawn and garden maintenance chemicals
Construction trade areas and materials (plumbing, heating and air conditioning, painting, paper hanging, decorating, drywall and plastering, acoustical insulation, carpentry, flooring, roofing and sheet metal, wrecking and demolition, etc.)	Solvents; asbestos; paints; glues and other adhesives; waste insulation; lacquers; tars; sealants; epoxy waste; miscellaneous chemical wastes
Country clubs	Fertilizers; pesticides; swimming pool chemicals; automotive wastes

TABLE 5
POTENTIAL SOURCES OF GROUND WATER CONTAMINATION -- Continued

SOURCE	*Health and Environmental Concerns*
Dry cleaners	Solvents (perchloroethylene, petroleum solvents, Freon); spotting chemicals (trichloroethane, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)
Funeral services and crematories	Formaldehyde; wetting agents; fumigants; solvents; bacteria and viruses
Furniture repair and finishing shops	Paints; solvents; degreasing and solvent recovery sludges
Gasoline services stations	Oils; solvents; miscellaneous wastes
Golf courses	Fertilizers; pesticides; automotive (lawnmower) waste fluids
Hardware/lumber/parts stores	Hazardous chemical products in inventories; heating oil and forklift fuel from storage tanks; wood-staining and treating products such as creosote
Heating oil companies, underground storage tanks	Heating oil; wastes from truck maintenance areas
Horticultural practices, garden nurseries, florists	Herbicides, insecticides, fungicides, and other pesticides
Jewelry/metal plating shops	Sodium and hydrogen cyanide; metallic salts; hydrochloric acid; sulfuric acid; chromic acid
Junk yards, scrap and auto	Any wastes from businesses, households, and automobiles; gasoline, battery acid, battery lead, oil, grease, anti-freeze, brake fluid, freon, and PCB-laden oils from transformers
Laundromats	Detergents; bleaches; fabric dyes
Medical institutions	X-ray developers and fixers; infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; dental acids; miscellaneous chemicals
Office buildings and office complexes	Building wastes; lawn and garden maintenance chemicals; gasoline; motor oil
Paint stores	Paints; paint thinners; lacquers; varnishes; other wood treatments
Pharmacies	Spilled and returned products
Photography shops, photo processing laboratories	Biosludges; silver sludges; cyanides; miscellaneous sludges
Print Shops	Solvents; inks; dyes; oils; photographic chemicals
Railroad tracks and yards	Diesel fuel; herbicides for rights-of-way; creosote for preserving wood ties
Research laboratories	X-ray developers and fixers; infectious wastes; radiological wastes; biological wastes; disinfectants; asbestos; beryllium; solvents; infectious materials; drugs; disinfectants (quaternary ammonia, hexachlorophene, peroxides, chlornexade, bleach); miscellaneous chemicals
Sports and hobby shops	Gunpowder and ammunition; rocket engine fuel; model airplane glue
Storage Tanks (above ground and underground)	Heating oil; diesel fuel; gasoline; other petroleum products; other commercially used chemicals
Transportation services for passenger transit (local and interurban)	Waste oil; solvents; gasoline and diesel fuel from vehicles and storage tanks; fuel oil; other automotive wastes

TABLE 5
POTENTIAL SOURCES OF GROUND WATER CONTAMINATION -- Continued

SOURCE	*Health and Environmental Concerns*
Veterinary services	Solvents; infectious materials; vaccines; drugs; disinfectants (quaternary ammonia, hexachlorophene, peroxides, chlornexade, bleach); x-ray developers and fixers
INDUSTRIAL SOURCES	
Landfills (chemical)	Leachate; hazardous and nonhazardous wastes; nitrates
Material stockpiles (coal, metallic ores, phosphates, gypsum)	Acid drainage; other hazardous and nonhazardous wastes
Radioactive waste disposal sites	Radioactive wastes from medical facilities, power plants, and defense operations; radionuclides (uranium, plutonium)
Storage tanks and containers (above ground and under ground)	Heating oil; diesel and gasoline fuel; other petroleum products; hazardous and nonhazardous materials and wastes
Surface impoundments storage, treatment, and disposal ponds, lagoons	Hazardous and nonhazardous liquid wastes; septage; sludge
Transport and transfer stations (trucking terminals, rail yards, waterway loading docks, pipeline terminals and airports)	Fuel tanks; repair shop wastes; other hazardous and nonhazardous wastes
Unregulated dumps (wet and dry excavation sites)	A wide range of substances; solid and liquid wastes; oil-field brines; spent acids from steel mill operations; snow removal piles containing large amounts of salt
Waste tailing ponds (commonly for the disposal of mining wastes)	Acid; metals; dissolved solids; radioactive ores; other hazardous and nonhazardous wastes impoundments
Well drilling operations: oil and brine storage facilities, oil and gas wells	Brines associated with oil and gas operations; industrial detergents; well treatment solvents; crude oil and natural gas
Wells: Operating and abandoned production and exploratory wells (for gas, oil, coal, geothermal, and heat recovery); test hole wells; monitoring and excavation wells	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals
Wells (injection)	Highly toxic wastes; hazardous and nonhazardous industrial wastes; oil-field brines
Wells (dry)	Saline water from wells pumped to keep them dry
INDUSTRIAL PROCESSES (PRESENTLY OPERATED OR TORN-DOWN FACILITIES)	
Asphalt plants	Petroleum derivatives
Communications equipment manufacturers	Nitric, hydrochloric, and sulfuric acid wastes; heavy metal sludges; copper-contaminated etchant (e.g., ammonium persulfate); cutting oil and degreasing solvent (trichloroethane, Freon, or trichloroethylene); waste oils, corrosive soldering flux; paint sludge, waste plating solution
Electric and electronic equipment manufacturers and storage facilities	Cyanides; metal sludges; caustics (chromic acid); solvents; oils; alkalis; acids; paints and paint sludges; calcium fluoride sludges; methylene

TABLE 5
POTENTIAL SOURCES OF GROUND WATER CONTAMINATION -- Continued

SOURCE	*Health and Environmental Concerns*
	chloride; perchloroethylene; trichloroethane; acetone, methanol; toluene, PCBs
Electroplaters	Boric, hydrochloric, hydrofluoric, and sulfuric acids; sodium and potassium hydroxide; chromic acid; sodium and hydrogen cyanide; metallic salts
Foundries and metal fabricators	Paint wastes; acids; heavy metals from sand from molds containing lead; metal sludges; plating wastes; oils; solvents; explosive wastes
Furniture and fixtures manufacturers	Paints; solvents; degreasing sludges; solvent recovery sludges
Machine and metalworking shops	Solvents; metals; miscellaneous organics; sludges; oily metal shavings; lubricant and cutting oils; degreasers (tetrachloroethylene); metal marking fluids; mold-release agents
Mining operations (surface and underground), underground storage mines	Mine spoils and tailings that often contain metals; acids; highly corrosive mineralized waters; metal sulfides;xic trace metals
Unsealed abandoned mines used as waste pits	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals
Paper mills	Metals; acids; minerals; sulfides; other hazardous and nonhazardous chemicals; organic sludges; sodium hydroxide; chlorine; hypochlorite; chlorine dioxide; hydrogen peroxide
Petroleum production and storage companies, secondary recovery of petroleum, fuel blenders	Hydrocarbons; oil-field brines (highly mineralized salt solutions)
Industrial pipelines	Corrosive fluids; hydrocarbons; other hazardous and nonhazardous materials and wastes
Photo processing laboratories	Cyanides; biosludges; silver sludges; miscellaneous sludges
Plastics materials and synthetics	Solvents; oils; miscellaneous organics and inorganics (phenols, producers resins); paint wastes; cyanides; acids; alkalis; wastewater treatment sludges; cellulose esters; surfactant; glycols; phenols; formaldehyde; peroxides; etc.
Primary metal industries (blast furnaces steel works, and rolling mills)	Heavy metal wastewater treatment sludge; pickling liquor; waste oil; ammonia scrubber liquor; acid tar sludge; alkaline cleaners; degreasing solvents; slag; metal dust, baghouse dust containing lead
Publishers, printers, and allied	Solvents; inks; dyes; oils; miscellaneous organics; photographic industries chemicals
Public utilities (phone, electric power, gas)	PCBs from transformers and capacitors; oils solvents; sludges; acid solution; metal plating solutions (chromium, nickel, cadmium); herbicides from utility rights-of-way
Sawmills and planers	Treated wood residue (copper quinolate, mercury, sodium bazide); tanner gas; paint sludges; solvents; creosote; coating and gluing wastes
Stone, clay and glass manufacturers	Solvents; oils and grease; alkalis; acetic wastes; asbestos; heavy metal sludges; phenolic solids or sludges; metal-finishing sludge
Welders	Oxygen, acetylene
Wood preserving facilities	Wood preservatives; creosote

TABLE 5
POTENTIAL SOURCES OF GROUND WATER CONTAMINATION -- Continued

SOURCE	*Health and Environmental Concerns*

SOURCE: USEPA, 1993

Table 6. Quantities and Types of Chemicals Typically Used, Stored, or Transferred by Land Use Activities

Large Amounts of Chemicals	
Industrial Activities: Chemical manufacturing; electronics; petroleum refining and storage: metal treating; food processing; wood and pulp processing; textile manufacturing; warehousing	*Chemical Categories:* Organic Solvents; Petroleum; other organics; metals
Commercial Activities: Gas Stations; furniture strippers; drum cleaning	Petroleum; organics
Moderate Amounts of Chemicals	
Commercial Activities: Dry cleaners; junk yards; auto repair and body shops pest controllers; photographic processing; machine shops; auto parts stores; lawn and garden/farm stores; paint stores; hardware stores; medical facilities	*Chemical Categories:* Organic solvents; petroleum; pesticides metals; nitrates; other organics
Agricultural Activities: Heavy chemical use agricultural (fruits and vegetables)	Nitrates; pesticides
Residential Activities: Urban housing; high density (greater than 2 dwelling units per acre) using septic system	Nitrates; pesticides; other organics
Small Amounts of Chemicals	
Commercial Activities: Grocery stores; department stores; office buildings; laundromats; food service; shoe repair; barber and beauty shops	*Chemical Categories:* Organics; petroleum
Agricultural Activities: Low chemical use agriculture (forage crops)	Nitrates
Residential Activities: Moderate and low density (less than 2 dwelling units per acre) using septic systems	Nitrates; organics (petroleum); pesticides

Source: Modification U.S. EPA, 1991, New York State Department of Env. Conservation.

APPENDIX B

ACRONYM LIST

BUSTR	Bureau of Underground Storage Tanks
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CERCLIS	CERCLA Information System
CWA	Clean Water Act
EPA	Environmental Protection Agency
ESIC	Earth Science Information Center
FRDS	Federal Reporting Data System
LEPC	Local Emergency Planning Commission
NPDS	National Pollution Discharge Elimination System
NRCS	Natural Resource Conservation Service
ODNR	Ohio Department Of Natural Resources
ODOT	Ohio Department of Transportation
PPSI	Potential Pollution Source Inventory
PUCO	Public Utilities Commission of Ohio
PWS	Public Water System
RCRA	Resource Conservation and Recovery Act
RCRIS	RCRA Information system
RSVP	Retired Senior Volunteer Program
SARA	Superfund Amendment and Reauthorization Act
SDWA	Safe Drinking Water Act
SERC	State Emergency Response Commission

SIC	Standard Industrial Classification
SPCC	Spill Prevention Control and Counter Measure
TOT	Time Of Travel
TRI	Toxic Chemical Release Inventory
UIC	Underground Injection Control
USDW	Underground Source of Drinking Water
USGS	United States Geologic Survey
UST	Underground Storage Tank
WHP	Wellhead Protection

APPENDIX C

COORDINATING A VOLUNTEER EFFORT

Many towns, cities and villages do not have the time, monetary resources or staff to dedicate to inventorying potential pollution sources. Utilizing volunteers can help defray the costs to a community. Recruiting volunteers from the community also promotes the educational aspect of WHP. The city of El Paso, Texas utilized volunteers in a successful effort. The community utilized retired senior volunteers to compile the inventory of potential sources of contamination. The volunteers researched city historical records and contacted the landowners and businesses within the WHP area. Local retired Senior Volunteer Programs (RSVP) may be a good source of volunteers. Selecting a coordinator for the volunteer effort is very important.

BENEFITS OF UTILIZING VOLUNTEER GROUPS

There are many benefits from a volunteer effort in a community. Several benefits of utilizing volunteer groups for a pollution source inventory are:

1. Increased community awareness of ground water issues/WHP Program;
2. Increased protection of local water supplies;
3. Cost savings to municipalities; and
4. The personal satisfaction of volunteers.

An excellent reference guide on organizing and implementing a volunteer effort is "How-To-Manual For Ground Water Protection Projects" written by Lillian Madarchik, 1992. Copies are available by contacting Lillian Madarchik at (915) 541-4374 at the Retired Senior Volunteer Program (RSVP). The publication provides excellent examples of press releases to provide to the public. It also provides a good overview on developing community involvement and training volunteer groups to complete pollution source inventories.

The committee that is coordinating the WHP program in the area should develop a reference packet of information for interested volunteers. Background information on WHP and ground water resources may be helpful. Information on conducting a pollution source inventory and the important role that volunteers can play should be included.

Useful information in the reference packets for volunteers may be:

- information on RSVP programs and other recruiting organizations
- local ground water conditions (vulnerability factors, general geology of the area, depth to ground water)
- information from U.S. EPA and other State agencies on WHP programs
- volunteer job descriptions
- explanation of ground water inventory

RECRUITING EFFORTS/POTENTIAL VOLUNTEERS

Use your local phone books, chamber of commerce directories to contact organizations for volunteers. Listed below are potential groups to contact:

1) Retirees from companies, agencies, organizations
   - public utilities
   - gas and oil companies
   - pipeline companies
   - environmental firms
   - engineering firms
   - Army, Marine, Navy retired officers associations and retired enlisted associations
   - farmers and agricultural societies
   - National Association Retired Federal Employees (NARFE)
   - American Association Retired Persons (AARP)
   - City, county, state, retired, employees (planning, engineering, hydrology, geology, water land use, agriculture, health)
   - senior citizens

2) Environmentally Related Organizations
   - Sierra Club
   - Audubon Society
   - United States Geological Survey
   - County Agricultural Agents
   - Garden Clubs
   - Environmental issues councils
   - Cousteau Society
   - Wilderness Federation

3) Other Organizations
   - local historical society
   - gem and mineral societies
   - League of women voters
   - Archeological society
   - Museum groups
   - Health Departments
   - Department of Natural Resources
   - Voluntary organizations (Lions' Rotary, Kiwanis, Knights of Columbus
   - Boy Scouts/Girl Scouts
   - Church organizations

4) Schools, Colleges, Universities
   - Universities of Lifelong Learning
   - Local school districts (middle/high school)
   - Community Colleges
   - College and universities (departments of geology, environmental science, engineering and urban planning).

IMPORTANCE OF MEDIA

Informing the media of the ongoing project is very important. Obtaining their support for this program will assist in the acceptance of WHP planning by the community.

Media contacts may possibly be:

- newspapers, radio, television, news magazines (listed in local yellow pages)
- water bills (contact public water supplier)
- neighborhood newspapers, company newsletters, retiree groups (contact local Chamber of Commerce).

COORDINATOR RESPONSIBILITIES

To keep the effort on track, a coordinator may be needed. The coordinator should distribute map packets and name tags. They should also make sure that geographic areas are covered with no duplication of efforts. A workshop/training session should be scheduled to train the volunteers on completing a site visit/interview.

Tips from other communities that have used the volunteer approach are:

- Volunteers must be able to read maps; volunteers should be pre-screened for map reading skills and trained in map reading if necessary.
- Children may not be ideal volunteers (due to map reading skills) but teaming them up with a retiree may produce a good team. It can be a learning process for both.
- Volunteers should never make a cold call! People should be expecting them, through media announcements or more reliably, by mailing a notice directly to businesses and residences that are to be visited.
- A kick-off reception (with punch and cookies, etc.) is a friendly way to start the inventory.
- Volunteers should have a photo badge with the mayor's signature on it. This conveys prestige and accountability.

After the inventory is completed using volunteers, it may be nice to:

- Hold a recognition luncheon.
- Provide a certificate of recognition.
- Provide mileage reimbursement if possible.
- Recognize the volunteers through the media.
- Send a thank you letter from the agencies, mayor.
- Provide volunteers the opportunity to speak at other conferences.

EXAMPLE FROM EL PASO, TX

Do you feel quality drinking water is important?

As a _____ citizen, approximately ____% of your drinking water comes out of the ground. In fact, about half of the people in the U.S. get their drinking water from wells.

This ground water has been safe to drink for a long time. However, as human activity increases, our ground water is threatened by contamination from a variety of sources, such as abandoned wells, trash dumps, etc.

You are needed as a volunteer to inventory potential sources of contamination to protect _____ drinking water. The _____ and the _____ are organizing a citizen seminar for you to find out more about this volunteer effort. The seminar is the beginning of citizens working to protect their community's drinking water.

Only citizens and their local governments can protect drinking water sources, because ground water is a very local problem. What is true in one town may be the opposite just down the road; the rocks and sands below the surface are very complex. Also, the causes of contamination are often the innocent practices of ourselves and our fellow citizens.

Do you feel quality drinking water is important? _____ ground water belongs to your grandchildren -- please volunteer to protect it!

December 15th
8:30am-3:00pm
Citizen Ground Water Protection Seminar
City Council Chambers
2nd Floor, City Hall
One Civic Center

_____

For more information, call the Retired Senior Volunteer Program at _____ .

From: Madarchik, 1992.

EXAMPLE FROM EL PASO, TX

ANSWERS TO THE MORE FREQUENTLY ASKED QUESTIONS ON THE _____ GROUND WATER PROTECTION PROJECT

- **WHAT IS THE _____ GROUND WATER PROTECTION PROJECT?**
  This project is designed to allow the citizens of _____ to take an active role in maintaining their ground water quality. The concept is to minimize land use restrictions while maximizing ground water protection. To do this, the _____ delineates protection areas around _____'s water supply wells. Volunteers throughout the community will conduct an inventory of potential sources of contamination within the protection areas. A site-specific report will then be written which addresses the inventoried items. The city/county will then enact appropriate best management practices to deal with the items that are a threat to the aquifer.

  The _____ will provide all of the training, necessary maps, and inventory forms.

- **WHY SHOULD I PARTICIPATE IN THIS PROJECT?**
  _____ percent of _____'s drinking water comes from the ground. If the water supply becomes contaminated, the consequences are self-evident. Clean-up of the aquifer would take many years and would run into the millions of dollars.

  The success of this project depends on volunteers like yourself. You can provide information about potential contamination sources surrounding public water supply wells in you neighborhood.

- **IS THE AQUIFER CONTAMINATED?**
  No. it is not. This program is preventative in nature. The _____ would like communities to inventory these potential sources of contamination before they become a problem.

- **WHY ARE VOLUNTEERS BEING USED?**
  The _____ has realized on previous similar projects that volunteers are enthusiastic, have an expert knowledge and history of the area, and are dedicated to providing top quality information. Also, the use of volunteers means that your water bills won't be increased to cover the cost of hiring an outside consulting company!

  This project also has the goal of educating the public through participation in the inventory, news media coverage, and dissemination of the final report.

- **IS THERE ANY RISK TO MYSELF IN DOING THIS PROJECT?**
  No, absolutely not! You will not come into contact with any substance that would cause you harm. You will merely be recording information on maps and forms and asking questions of your neighbors and local businessmen.

- **WHAT TYPES OF PEOPLE ARE YOU LOOKING FOR?**

People of all ages and backgrounds are necessary for success. Retired senior citizens have so much experience to lend and have a keen historical knowledge of the area. Consider making this a family outing and take your child with you to conduct the inventory. The questions they ask will give them a better sense of how important it is to protect our water supply.

If you recognize a junk yard or gas station and can ask questions, then you can help.

- **WHAT WILL I HAVE TO DO?**
  Sign up to inventory a wellhead protection are within your neighborhood. _____ staff will train you how to inventory an area and be available to answer questions by phone during the inventory process.

  The inventory process depends on the type of area you have chosen. It may consist of a door-to-door survey of residents or a "windshield survey", stopping to ask key questions and obtaining landowner names.

- **HOW LONG WILL THE INVENTORY TAKE?**
  It depends upon a number of things; 1) the number of areas you sign up for; 2) your individual work pace; and 3) the weather. Generally, it ranges from one day to one week.

- **WHERE DO I RECEIVE THIS TRAINING?**
  On (date), there will two training sessions at (location) located at (address). The first will run from 9:00am - 12:00pm. The second session will be from 3:00pm - 6:00pm. If you are unable to attend the scheduled training, we will make arrangements with you to get you trained!

- **WHAT TYPES OF POTENTIAL SOURCES OF CONTAMINATION WILL WE BE LOOKING FOR?**
  There are many possible sources of contamination that you will need to record. Many of these will be obvious, such as municipal landfills, junkyards, and gas stations. Abandoned wells, underground storage tanks, and septic systems are not obvious and will require contacting the landowner. A few other sources include agricultural fields and golf courses (fertilizer and pesticide use), cemeteries, grain storage bins, pipelines, railroad and highway hazardous waste transportation routes, sumps and dry wells, storage areas for chemicals, etc.

- **WHAT IF I AM PHYSICALLY UNABLE TO GO OUT AND INVENTORY THE PROTECTION AREAS?**
  No problem! Even if you cannot do a door-to-door inventory, you can still do a windshield inventory by driving through the area or going with a friend who drives. Also, you can contribute by researching city and county records, reviewing aerial photos in planning departments, or assisting with data entry. The bottom line is that everyone has a valuable service to contribute!

- **WHAT IF THERE ARE NO PROTECTION AREAS IN MY NEIGHBORHOOD?**

  You can still help. Consider inventorying an area close to your neighborhood. Although a well may not be in your immediate neighborhood, it still contributes to your drinking water.

Some of the protection areas may be in rural areas of the country. consider spending a couple of days out of the city by working in these areas.

From: Madarchik, 1992.

EXAMPLE FROM EL PASO, TX

WELLHEAD INVENTORY SUGGESTIONS

1. Organize into groups and elect group survey chiefs to coordinate the inventory numbers and activities.

2. Notify appropriate law enforcement offices that you will be in the neighborhoods conducting WHP inventories. Landowners may be suspicious of door-to-door activities.

3. You may want to begin your inventory with a windshield tour of each area. As you are doing the tour, be on the lookout for things that may indicate the presence of potential contaminants. (Example 1: Service stations would assure the presence of underground storage tanks and possible disposal wells. Example 2: Rural residences may have both septic systems and water wells). If you see something that gives you reason to think a potential contaminant exists then approach the owner/operator of the facility and go over the inventory form with them.

4. When inventorying using the door-to-door technique, be sure you are wearing your identification badge and should you encounter an owner who is not willing to participate but has a potential source on their property, merely write "NOT AVAILABLE" in the "name" space of the inventory form. Be sure to thank the individual for their time, apologize for the inconvenience, and leave. It is not necessary to try and force a confrontation

5. Identify key local officials:
   - Planning boards (to identify present or future major thoroughfares, sewer lines, etc. within your WHP Areas);
   - ODNR or U.S.G.S. (to identify existing water wells, abandoned wells, etc. within your WHP Areas);
   - Underground Water Conservation Districts (to identify active water wells within your WHP Areas);
   - Health officials (to identify existing septic systems, dumps, landfills, etc. within your WHP Areas);
   - Fire chief (to identify existing underground storage tanks, hazardous material routes or containment facilities within your WHP Areas);
   - County Food Control Districts (to identify drainage canals, etc.).

6. Consult city directories for possible industrial site and activities within the WHP Areas (listings for automobile service and repair shops, dry cleaning, furniture stripping shops, photographic processing plants, etc.)

7. Review city and county records:
   - planning departments may have both recent and historic maps and aerial photographs;
   - city licensing departments may have records of all UST's, water wells, etc.;
   - public utility departments may have records of sewer and gas lines.

8. Review the hydrologic system of the area (identify drainage basins, flood prone areas, wetlands, etc.).

9. Obtain information on spills from city-county fire departments, police and county sheriff's records (including illegal dumping), and local news media.

10. Abandoned wells may be difficult to locate. Many times these wells are hard to see until you are on top of them. Most successful searches have employed a combination of record searching, talking with residents, and actually looking for the well. Be particularly aware in the older sections of the city. Check rural areas that may have had water wells and septic tanks before being annexed onto the city. Also, don't forget about quarries. Many times quarries have wells used to drain water.

11. Don't forget that underground and aboveground storage tanks occur not only at service stations but perhaps at these places as well:

auto dealerships	aerial applicators
dry cleaners	paving-construction contractors
fire stations	printers
police stations	metal finishers
school bus barns	bus lines
municipal offices	airports
taxicab facilities	photographic suppliers
trucking companies	pest control services
funeral homes	laboratories

12. Be on the lookout for storm water drainage wells. These wells receive storm water runoff from paved areas including parking lots, streets, highways, residential subdivisions, etc. Special Drainage Wells may also exist which are used for swimming pool drainage, lake level control drainage, or construction dewatering. You may want to contact a city engineer or planner, building inspector, maintenance supervisor, developer, landowner or tenant, or well driller.

13. A common item in this area is Heat Pump/Air Conditioning Return Flow Wells. These wells are used to reinject ground water used to heat or cool a building by a heat pump or air conditioning system. To identify these wells, you should check with homeowners, developers, maintenance supervisors, heat pump installer or contractor.

14. Of particular concern, you should be on the lookout for Automobile Service Station Disposal Wells. These wells are used to inject waste from repair bay drains or other floor drains at service stations, garages, car dealerships, etc. You should consult with the manager of the station (gas stations and garages), maintenance or repair supervisor (automobile dealers). Common questions to ask include: How are the repair bay wastes managed or disposed? If an injection well is used, what type is used (dry well, septic system, cesspool, drainage well, etc.)? Many gasoline station and garage owners may not have the knowledge of records on their disposal systems. Intensive detailed questioning may provide some answers which were not easily answered before.

THESE SUGGESTIONS HAVE BEEN COMPILED TO ASSIST YOU IN CONDUCTING YOUR POTENTIAL CONTAMINATION SOURCE INVENTORY. THIS SUGGESTION LIST SHOULD NOT BE CONSIDERED ABSOLUTE OR EXHAUSTIVE. FEEL FREE TO USE ANY OTHER METHOD THAT WOULD WORK FOR YOU!

From: Madarchik, 1992.

APPENDIX D

OHIO
LAND USE/LAND COVER
CLASSIFICATION
(commonly know as the Anderson classification)
SIMPLIFIED VERSION

1. Urban or Built-Up Land
   - 11. Residential
   - 12. Commercial and Services
   - 13. Industrial
   - 14. Transportation, Communications and Utilities
   - 15. Industrial and Commercial Complexes
   - 16. Mixed Urban and Built-Up Land
   - 17. Other Urban or Built-Up Land
2. Agricultural Land
   - 21. Cropland and Pasture
   - 22. Orchards, Groves, Vineyards, Nurseries, and Ornamentals

   Horticultural Areas
   - 23. Confined Feeding Operations
   - 24. Other Agricultural Land
3. Rangeland
4. Forest Land
5. Water
   - 51. Streams and Canals
   - 52. Lakes
   - 53. Reservoirs

6. Wetland
7. Barren Land

COMPLETE LIST

1. Urban or Built Up Land
    - 11 Residential
        - 111 Single Unit
        - 112 Multiple Unit
            - 1129 Apartment Complexes
        - 113 Mobile Home Parks
    - 12 Commercial and Services
        - 121 Retail Trade
            - 1211 Junk Yards
            - 1212 Shopping Centers
        - 122 Institutions
            - 1221 Educational
            - 1222 Religious
            - 1223 Health Care
            - 1224 Correctional
            - 1225 Military
        - 123 Recreation
            - 1231 Marinas
            - 1232 Drive In Movies
            - 1233 Amusement Parks
            - 1234 Race Tracks
            - 1235 Fairgrounds
    - 13 Industrial
        - 131 Light Industries
        - 132 Heavy Industries
            - 1321 Electric Power Generating Plants
    - 14 Transportation, Communications/Utilities
        - 141 Transportation
            - 1411 Airports
            - 1412 Rail
            - 1413 Highways
            - 1414 Ports
        - 142 Communications
        - 143 Utilities
            - 1431 Electric
            - 1432 Gas
            - 1433 Water
            - 1434 Wastewater
    - 15 Industrial and Commercial Complexes
    - 16 Mixed Urban or Built Up Land
    - 17 Other Urban or Built Up Land
        - 171 Undeveloped
        - 172 Zoos
        - 173 Golf Courses
        - 174 Cemeteries
        - 175 Parks
        - 176 Landfills and Wastedumps
        - 177 Water Control
        - 178 Campgrounds
2. Agriculture
    - 21 Cropland and Pasture
        - 211 Cropland
            - 2111 Row Crops
            - 2112 Cover Crops
            - 2113 Fall Plowed Land
        - 212 Pasture
    - 22 Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas
        - 221 Orchards and Groves
        - 222 Vineyards
        - 223 Nurseries and Ornamental Horticultural Areas
    - 23 Confined Feeding Operations
    - 24 Other \agricultural Land
        - 241 Farmsteads
3. Rangeland
    - 32 Shrub and Brush Rangeland
        - 321 Young Shrub & Brush
        - 322 Mature Shrub & Brush
4. Forest Land
    - 41 Deciduous Forest Land
    - 42 Evergreen Forest Land
    - 43 Mixed Forest Land
    - 44 Clear-cut Forest Land
5. Water

51 Streams and Canals
52 Lakes
53 Reservoirs
54 Bays and Estuaries
55 Ponds

6 Wetlands
61 Forested Wetlands
62 Non Forested Wetlands

7 Barren
72 Beaches
73 Sandy Areas Other Than Beaches
74 Bare Exposed Rock
75 Strip Mines and Other Surface Excavations
751 Strip Mines
7511 Active
7512 Inactive Not Reclaimed
7513 Inactive Partially Reclaimed
7514 Reclaimed Not in Use

7521 Other Surface Excavations
7521 Quarries
7522 Sand and Gravel Pits
7523 Borrow Pits

76 Traditional Areas
77 Mixed Barren Land

From: Soil and Water Conservation, 1988.

APPENDIX E

SAMPLE INVENTORY FORMS

This Appendix contains sample inventory forms that communities may want to modify to fit their needs. The forms were developed with the intent of assisting communities in collecting information necessary for developing effective management strategies. These forms may be useful for site visits. A sample form for mail and phone surveys is also included.

Commercial/Industrial/Institutional

Land Use:

1.) **Name of Facility**_____

2.) **Facility Address** _____
Street _____
City,State,Zip_____
County/Township_____
Phone # _____
Standard Industrial Classification Code (SIC)_____

3.) Facility Contact _____
Title _____
Person Interviewed (if different)_____

4.) Other Locational Information
Distance from community's water supply system_____
Latitude _____ Longitude_____
Time-of-Travel located in _____1 year _____5 year _____Adjacent Area

5.) **Potential Pollution Source** (Select appropriates ones)

Above Ground Storage Tanks	Septic System (leachfield)
Deicing/Salt Storage Piles	Spills/Materials Handling
Drums	Stock Piles
Injection/Drainage Wells/Dry Wells	Stripmine/Mine Drainage
Land Application	Surface Impoundment/Lagoon/Pond/Pit
Lagoon/Pond/Pit	Waste Disposal
Landfill	Waste Pile Area
Other (describe)	Underground Storage Tanks

6.) Any monitoring wells present? _____yes _____no
details:

7.) Is this facility sewered? _____yes_____no
Are floor drains connected to sewer? _____yes _____no

8.) Facility with Septic Tank/Aeration System? _____yes _____no
Comments (age, maintenance, etc.):

10.) Private Well? _____yes _____no

11.) Is there ongoing environmental remediation? _____yes _____no
If yes, what type of remediation?
Is this remediation currently under agency litigation? Voluntary clean-up?

Commercial/Industrial/Institutional

12.) **Detail(s) of Potential Pollution Source**

Source (from table in #5)_____

(if multiple sources, attach sheets with additional information on each source)

Operating Status: proposed _____ active_____ inactive _____ abandoned _____

Date of Start-up:_____ Date of Abandonment/Closure: _____

ID#: _____ Agency Regulated by _____

Division Regulated by _____

Storage Tanks? _____yes _____no

_____Above Ground (AG) _____Under Ground (UG)

Secondary Containment _____yes _____no

Age	Size	Tank Material	Material Stored	AG/UG

Comments on Maintenance (testing frequency and procedures):

Chemicals/Products Used:

CAS	Storage Method	Quantity	Disposal Method	Use

Inspected by_____ **Date**_____

NAME

0004.pm4/rd

RESIDENTIAL AREA/MUNICIPAL SERVICES

Land Use:

1.) **Name of Owner or Subdivision Name** _____

2.) **Address** _____

Street _____

City,State,Zip _____

County _____

Township _____

Phone # _____

Standard Industrial Classification Code (SIC) _____

3.) Name of Person Interviewed _____

Title _____

4.) Other Locational Information

Distance from Community's Water Supply System _____

Latitude _____ Longitude _____

Time-of-Travel located in: _____1 year _____5 year _____Adjacent Area

5.) Approximate Age of Subdivision Area/Houses: _____ years

6.) Approximate Age of Municipal Services (water lines, sewer lines, etc.): _____ years

7.) Well Water or Municipal Supply? _____

8.) Septic System/Aeriation System or Sewered? _____

9.) Heating: _____Fuel Oil _____Natural Gas

Fuel Oil Tanks? _____Size _____Qty. _____Age

Above ground? _____

Below ground? _____

10.) Stormwater Drains? _____numbers (attach map with locations)

Stormwater Basin? _____ (attach map with locations)

11.) Abandoned Wells? _____yes _____no

_____number (attach map with locations)

Were appropriate abandonment procedures implemented? _____

For Municipalities

12.) Storage Piles:

Materials _____

Quantity _____

Covered? _____

RESIDENTIAL AREA/MUNICIPAL SERVICES - Page 2

13.) Sewered Areas (attach map with location)
Age of Lines _____

14.) Waterlines (attach map with location)
Age of Lines _____

15.) Maintenance Areas (locate on map)
Describe:

16.) Storage Tanks: _____yes _____no
_____Above Ground (AG) _____ Under Ground (UG)
Secondary Containment: _____yes _____no

Age	Size	Tank Material	Material Stored	Above Ground/Under Ground

Inspected by _____ **Date**_____
NAME

0005.pm4/rd

FARMING

Land Use:

1.) **Name of Owner/Operator** _____

2.) **Address** _____
Street _____
City,State,Zip _____
County _____
Township _____
Phone # _____
Standard Industrial Classification Code (SIC) _____

3.) Name of Person Interviewed: _____
Title (Owner, Operator, other): _____
Approximate size of parcel _____

4.) Other Locational Information:
Closest Distance from Community Water Supply System _____
Latitude: _____ Longitude: _____
Time-of-Travel located in: _____1 year _____5 year

5.) Operating Status: _____proposed _____active _____inactive _____abandoned

6.) Date of Start-up: _____ Date of Abandonment/Closure: _____

7.) Agri-chemicals used (type & quantity)/parcel over last 3 years
Crops grown regularly _____
Tillage procedures _____
Fertilizers: Type/Qty. _____
Pesticides: Type/Qty. _____
Herbicides: Type/Qty. _____
Storage Procedures:

Mixing Location/Procedures:

Irrigation Location/Procedures:

Soil testing? Chemigation - (check valve for back siphoning):

Field Drainage Systems? Tiling? Dry Wells?

8.) Animals
& Type:

Animal waste, storage, treatment & disposal systems:

FARMING -- Page 2

Location of parcels where manure, wastewater are applied:

Confined feeding area?

9.) Are Storage Tanks Present?

Age	Size	Tank Material	Material Stored	Above Ground/Under Ground

Comments (describe tank testing frequency & procedures):

10.) Vehicle Maintenance Areas?
Chemical Storage Areas?
Machinery Repair Shop Location?

11.) Floor Drains Present in Barn? _____yes _____ no
Sewered?

12.) Water Wells Present? _____yes _____no
Age_____ Location_____
Septic System? _____yes _____no
Size _____ Location _____ Problems _____
Maintenance _____ Date of Last Maintenance _____
Condition (soggy, odor, etc.)
Abandoned Wells? _____yes _____no
Dry Wells Present? _____yes _____no

Inspected by _____ **Date** _____
NAME

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TRANSMISSION/TRANSPORTATION FACILITIES

Land Use:

1.) **Facility Name:** _____

2.) **Address:** _____
Street: _____
City, State, Zip: _____
County: _____
Township: _____
Phone#: _____
Standard Industrial Classification Code (SIC) _____

3.) Name of Person Interviewed: _____
Title _____

4.) Locational Information: (describe) _____
Closest Point from Community's Water Supply System _____
Latitude _____ Longitude _____
Time-of-Travel located in: ____ 1 year ____5 year _____Adjacent Area

5.) Describe Facilty Type:
Pipeline (contents)
Railroad
Highway
River
Distribution Center
Other

6.) Operation and Construction Information _____

7.) Describe Any Past Pollution Incidents _____

8.) Date of Installation _____
Date of Abandonment/Closure _____
Date of Recent Construction/Repair _____

9.) Additional Information (protection measures, handling practices, common product) _____

Inspected by: _____ **Date** _____

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OHIO ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PROGRAM
CLASS V INJECTION WELL INVENTORY REPORTING FORM
As Required by Chapter 3745-34-15(B) of the Ohio Administrative Code

1. Facility Name and Location

2. Name and Address of Legal Contact

   Telephone Number (___) _____

3. Ownership of Facility

4. Nature of Type of Injection Well

   Well Code _____

5. Operating Status of Injection Well

6. Date Injection Began_____

Please send completed forms to: Class V Coordinator, Division of Ground Water, Ohio Environmental Protection Agency, 1800 WaterMark Drive, PO Box 1049, Columbus, OH 43216-0149.

0002.hs/rd

SURVEY FOR MAIL/PHONE

Name of Facility/Business

_____

Owner/Manager of Facility/Business

_____

Address of Facility/Business

_____

Phone Number

_____

FACILITY/BUSINESS INFORMATION

When did your Facility/Business begin operation?

What were the previous use(s) of site (if known)?

Are any of the following located on your property?

Water Wells
If yes, please state the number of well(s), the depth of the well(s), and the pumping rate.

Abandoned Water Wells
If yes, please state the number of well(s), the depth of the well(s) and how it was abandoned.

Above Ground Storage Tanks
If yes, please state the size and number of the tank(s), the product stored in the tank(s), age of tank(s) and if any containment features exist.

Underground Storage Tanks
If yes, please state the size and the number of tank(s), the product stored in the tank(s), and the age of the tank(s)

SAMPLE WELLHEAD PROTECTION PLAN SURVEY FOR MAIL/PHONE (page 2)

Does your business handle, manufacture, sell, use, store, generate, or dispose of, any of the following items? (If your business files annual reports with Ohio EPA on hazardous waste, please attach copy)

1) PCB
2) Dioxin
3) Crude Oil
4) Gasoline
5) Diesel Fuel
6) Heating Oil
7) Other Distillate Fuel
8) Asphalt
9) Animal or Vegetable Oil
10) Waste Oil
11) Other Oil
12) Petroleum Solvents
13) Naphtha
14) Mineral Spirits
15) Vermin Poisons
16) Insecticides
17) Nematicides
18) Herbicides
19) Fungicide
20) Antibiotics
21) Fertilizer
22) Metals
23) Acids
24) Organic Solvents
25) Caustics
26) Alcohols
27) Amines
28) Aldehydes
29) Brines
30) Paints
31) Other

If yes to any of the above items, what are the quantities of each item handled, manufactured, sold, used, generated, or disposed of per year, and how are they stored?

Have you ever had any spills or releases of any of the items listed above? If yes, please indicate the date of the spill, or the date of the release discovery, and the type and quantity of the spill an any remedial actions take.

Thank you for filling out and returning this survey!

APPENDIX F

POTENTIAL POLLUTION SOURCE INVENTORY COMPLETED FOR WEST LAFAYETTE, OHIO DEMONSTRATION PROJECT

Potential Pollution Source Inventory Report

for the

Village of West Lafayette, Ohio

July 1996

Completed by

Ohio Environmental Protection Agency
Division of Drinking and Ground Waters
Program Development Unit
1800 WaterMark Drive
Columbus, Ohio 43216-1049

and

Ohio Department of Natural Resources
Division of Water
1939 Fountain Square Drive
Columbus, Ohio 43224-1336

Table of Contents

INTRODUCTION

As part of a demonstration project on "Nonpoint Source Pollution in Wellhead Protection Areas", the Village of West Lafayette agreed to work with Ohio EPA and the Ohio Department of Natural Resources to develop a PPSI for the Village of West Lafayette. The PPSI information was gathered in 1993 and 1994, and several maps based on that information were produced during 1995 and 1996. These efforts are the subject of this report.

PPSI Information Collection

Because information collection was initiated before the WHP area had been delineated, a focus area was specified, consisting of a circle centered on the wellfield with a radius of two miles.

Information in this inventory then was obtained by three primary methods. First, databases from various state agencies were searched by sending letters to the appropriate offices. Next, a windshield survey was conducted. Finally, site visits were conducted at most of the sites identified by the previous two methods. In addition to these methods, aerial photos were obtained to help identify previously existing ("historical") potential pollution sources. These methods are described in more detail below.

Database searches. Database searches were completed by requesting information on regulated sites from appropriate state agencies within a two-mile radius of their wellfield. The following state agencies and their respective divisions were contacted regarding potential pollution threats in the West Lafayette area.

Ohio EPA, Division of Hazardous Waste Management
Ohio EPA, Division of Emergency and Remedial Response
Ohio EPA, Division of Solid and Infectious Waste Management
Ohio EPA, Division of Surface Water
Ohio EPA, Division of Drinking and Ground Waters, UIC Program
Ohio EPA, Division of Drinking and Ground Waters
Ohio Department of Natural Resources (ODNR), Division of Oil & Gas
ODNR, Division of Geologic Survey
ODNR, Division of Reclamation
ODNR, Division of Water, Ground Water Section
Ohio Department of Agriculture, Division of Plant Industry, Pesticide Regulation Section
Ohio Department of Commerce, State Fire Marshal, Bureau of Underground Storage Tank Regulations (BUSTR)

Windshield Survey. A windshield survey (that is, driving around town, street by street, to visually inspect the vicinity) was completed to verify site locations of data from the agency requests and to identify companies or sites that were not listed in the various databases.

Site Visits. Site visits and/or personal interviews were completed for almost all the sites identified by the database searches and windshield survey. The site visits provided detailed information on

the type of activity, facility operation, product and waste storage and handling of various chemical types associated with the operation.

Historical Aspect. Aerial photographs of the area from 1956 to 1961 were reviewed (**Figure 1**), and residents were interviewed. During this process, it was discovered that the library used to be a gas station. The tanks from this gas station have been removed. The old town dump on George Street, active in the 1940s-1950s, is now a residential area.

General Zoning and Land Use

Presently there is no zoning in West Lafayette. Of the area depicted in the land use map for this area (**Figure 2**), 57% is devoted to agriculture (cropland and pasture), and 11.5% is residential, with pockets of commercial and industrial use comprising only 1.5%. The remaining 30% consists largely of shrubland and brush (3%), "mixed urban and built up land" (2.5%) and forest land (19%). Strip-mined areas, wetlands, and streams complete the balance.

The area surrounding the wellfield is almost entirely agricultural. The area to the east and northwest of the wellfield is planted with corn, with occasional soybean rotation. This land is subject to reduced tillage. South of the wellfield is a berry farm (Wen-Mar Farms) and to the southwest there is a residential area of single-family homes with relatively small lots.

Potential Pollution Source Inventory

Potential pollution sources identified with a two-mile radius of West Lafayette are summarized in **Table 1**). The number of each potential pollution source in the table corresponds to the location map shown in **Figure 6**.

The identified sources are also described below, organized into categories of point sources and nonpoint sources, and into subcategories of usage types (industrial, commercial, residential, etc.).

Potential Point Sources

Industrial Sites

Yankee Wire Cloth Products. Wire mesh filter screens are manufactured at two sites. Various cleaning fluids are used; however, detailed information was not provided. Potential contaminants handled at this site may include **VOCs, other organics** and **heavy metals**. More information should be obtained on the amounts and types of chemicals used, and on the company's handling and disposal practices, before selecting any additional management strategies for this site.

Jones Metal Company. Various metal products are manufactured. The site has several inactive surface impoundments, a neutralization pond, a Class V injection well and a hazardous material storage area. Potential contaminants handled at this site may include **VOCs, other organics** and **heavy metals**. Due to its proximity to the wellfield, and the numerous potential sources of significant contamination, this site should receive high priority when considering management strategies to further protect the wellfield.

Coshocton Valley Corporation (a.k.a. Penn-Michigan Facility). This closed facility has a surface impoundment and possible USTs. It is a suspected source of an extensive **VOCs plume** that has been identified in the subsurface between this site and the public water supply wells. This plume is described in detail on page 10.

Commercial/Retail

Bates Car Care Center. This facility is a car service center and gasoline retailer. There are three metal underground storage tanks (USTs) on site which were installed in 1971 but are no longer used. These tanks are registered with BUSTR. Considering their age and construction (metal), the tanks may be corroded. Provided they were fully evacuated of petroleum products, these tanks should not be a significant concern.

BP Gas Station. This facility is a Car Care service center and gasoline retailer. There are three (3) USTs onsite, according to BUSTR's files: two 8,000 gallon tanks of gasoline and one 500 gallon waste oil tank. The tanks were installed in 1987 and thus are relatively new. No details are available concerning their construction.

Extermital Termite & Pest Control. This pest control company keeps a small inventory (20-30 gallons) of pesticide concentrate on site. It is located over three miles upgradient of the wells, outside the WHP area.

Kobels Nursery. This landscape nursery and garden supply retailer has fertilizers and pesticides on site, but is also located over three miles upgradient of the wells, outside the WHP area.

Shaiers Auto Salvage. This 3.5 acre auto salvage yard contains unspecified amounts of waste oils, auto fluids and batteries. It is located almost three miles upgradient of the wells, outside the WHP area.

Dairy Mart. This convenience store and gasoline retailer on Main Street has two or three USTs that are registered with BUSTR. They were installed in 1983. No information was provided on tank size or construction.

Brake Service Center. This auto service center and gasoline retailer presumably has USTs present, but no information was provided concerning number, size, contents, age, or construction. More information should be collected before selecting any additional management strategies for this site.

Institutional/City Services

Road Salt Storage. The Village of West Lafayette has covered **road salt** storage facilities.

Wastewater Treatment Plant. The Village of West Lafayette Waste Water Treatment Plant has several concrete basins containing sewage sludge. These are located over a half mile upgradient of the wells, just outside the WHP area. As discussed above, sludge can introduce **bacteria, viruses, nitrates**, and **heavy metals** into the ground water. The bacteria and viruses tend to die off rather quickly in the subsurface environment, and heavy metals generally are not very mobile. However, nitrates can be a real threat to drinking water quality.

Landfill. An inactive landfill that operated from the 1950s-1968 is located just off State Route 751, over three miles upgradient of the wellfield. It may contain residential, commercial and industrial waste.

Town Dump. The old town dump is located in the one-year time-of-travel area, only 1,000 feet directly upgradient of the wellfield. It was active during the 1940s and 1950s. It probably received various household chemicals, which could contribute volatile organics to the ground water. Any uncontainerized chemicals left there so long ago should not constitute a threat today; however, if structurally sound barrels of material were buried there, the area may still warrant concern.

Miscellaneous

Stormwater Retention Basin. A stormwater retention basin associated with Fairview Manor Mobile Home Park is located approximately 300 feet from the public water supply well. This basin warrants attention, especially since the pumping test of 1990 indicated that water in this basin recharges very rapidly to the subsurface. The runoff area for this basin and the ditches that feed it should be investigated to determine what kinds of pollutants might enter the system during heavy rainfall, and what kind of additional management strategies might be used to protect the wellfield from these pollutants. Presumably, potential pollutants would include **oil** and other **automobile fluids** as well as **lawn chemicals** and possibly **agricultural chemicals**.

Potential Nonpoint Sources

Agricultural Sources. The WHP Area is surrounded on three sides by agricultural land uses. Fields located to the east and west are continuously planted with corn, with occasional soybeans. Reduced tillage is practiced, which means that some application of **herbicides and pesticides** is likely required. **Manure** is applied in the autumn, in some cases with nitrification inhibitors. The purpose of the inhibitors is to retain nitrogen in the soil over the winter; however, an added benefit is that they reduce leaching of nitrate into the ground water. South of the wellfield is a berry farm. Little detailed information was obtained about the agricultural practices here; however, it is likely that **fungicides** are applied periodically.

Hickory Flats Greens Golf Course and River Greens Golf Course. The storage and application of pesticides and fertilizers may present a potential threat. However, Hickory Flats is not located in the WHP area, or even upgradient from the wellfield. River Greens Golf course is located over three miles upgradient of the wellfield.

Oil and Gas Production in the Area. There are approximately 58 active, abandoned and proposed oil & gas production wells and storage facilities in the area (see **Figure 4**). These could contaminate ground water with petroleum products or brine.

Home Fuel Oil Tanks. Natural gas is used throughout West Lafayette. No home fuel oil tanks were identified by windshield survey.

Septic Systems. In 1993-94, when this inventory was conducted, there were still a few unsewered residences near the wellfield. (However, these may be scheduled to tie in to the sanitary sewer. This information should be verified before planning any strategies to better manage septic systems.) The residences in question are located northeast of the wellfield, just outside the municipal boundaries. These residences have been using septic systems to dispose of wastewater. Septic leachfields, if malfunctioning, may introduce high levels of nitrate, bacteria, and viruses into the ground water. If families are dumping household chemicals down the drain, these also could enter the ground water.

Sanitary Sewers. Most homes and facilities in West Lafayette discharge wastewater into sanitary sewer lines that lead to the wastewater treatment plant due east of the wellfield (exceptions are discussed in the preceding section on "septic systems". The main sewer trunk lines were installed in the 1930s and are therefore relatively old. It is likely that they are leaking in many places. Most of the other lines were installed in the 1950s. Treated wastewater is discharged into the Tuscarawas River, under a NPDES permit.

Stormwater Sewers. Stormwater lines are located just outside Russell Street, which forms the southern boundary of the WHP area. The water moving through these lines may contain a wide range of contaminants, particularly oil, automotive fluids, fertilizers, and pesticides/herbicides. The lines tie into a trunk line that carries treated wastewater from the wastewater treatment plant to the Tuscarawas River. The location of the trunk line is shown on the map in **Figure 7**.

French Drains. Fifteen "french drains" are located throughout West Lafayette. Most of the drains were installed between 1970-1980 and a few were installed in mid-1980. These were installed to improve drainage in the low lying west area and were constructed by digging a trench and lining

the trench with gravel (see **Figure 5**). They may facilitate the movement of a wide variety of surface water contaminants into the aquifer.

Cemeteries. There are two cemeteries in the Village. Potential contaminants could include formaldehyde and arsenic; however, these probably do not present much of a threat.

Transportation/Transmission Lines

Railroad. The Columbus and Ohio River Railroad passes through the WHP area. Traffic along this route is not high; one train per day or less is typical. Types of goods transported should be investigated. Potential threats include chemical spills and pesticide/herbicide application in the right-of-way.

Highways. State Route 751 and State Route 93 pass through the WHP area, presenting potential threats from transportation spills and deicing chemicals.

Natural Gas Line. Most of West Lafayette is served by natural gas. A substation is located at the intersection of Main and Johnson Streets. Due to the permeability of West Lafayette's sandy soils and subsurface materials, natural gas leaking from a line would tend to move upward and escape into the atmosphere. Provided the line only transports natural gas, it should not be a significant concern.

Contaminant Plumes

Since 1991, low levels of vinyl chloride have been detected sporadically in the public water supply. In response to these detections, Ohio EPA contracted with PSARA Technologies to perform a hydrogeologic study of West Lafayette (PSARA Technologies, Inc., March 1995, Volume 1 Report). The study indicated the presence of various volatile organic compounds throughout the water column in an area that includes the eastern half of town as well as the northwestern portion of town (**Figure 8**). Trichloroethylene (TCE) was the compound detected most frequently and at the highest levels; it was found in 71 ground water samples at concentrations as high as 1648 micrograms per liter (ug/l). Also detected were low concentrations of other chlorinated compounds (**Table 2**). All of these compounds are typically used as solvents, and may be used in the production of paints, plastics, dyes, perfumes and fumigants. Most of them are suspected human carcinogens (based primarily on studies performed on mice). Vinyl chloride is used in the production of polyvinyl chloride, from which plumbing pipes and many other common items are manufactured, but it may also be present as a breakdown product of TCE and perchloroethylene (PCE).

In addition, hydrocarbon compounds including benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected at very low concentrations (see Table 2). These compounds typically are associated with gasoline spills or leaks.

From this study, PSARA identified two main contaminant plumes that are referred to as the 1,1,1-TCA (trichlorethane) plume and the TCE plume*. (However, both plumes contain low levels of the other compounds detected.)

The core of the 1,1,1-TCA plume is located immediately north of the former Penn-Michigan lagoon and contains concentrations of 1,1,1-TCA ranging from 103 ug/l to 186 ug/l (**Figure 9**). This plume becomes narrower with depth, and more elongated to the north and south. The TCE plume is

much larger. Its core similarly extends from the northern portion of the former Penn-Michigan plant to the north-northwest (**Figures 10 and 11**). At an elevation of 720 feet (about 80 feet below surface), the plume appears to split up into two sub-plumes. In the western sub-plume, concentrations decrease with depth. However, in the eastern sub-plume, TCE concentrations increase with depth.

The TCE plume is a much larger plume than the 1,1,1-TCA plume, with a maximum length of 2400 feet from southeast to northwest, and a maximum width of 1300 feet from west to east. The leading edge of the plume has already been intercepted by public supply Well No. 3 (**Figure 12**). The Village is preparing to install an air stripping tower to remove the volatile organics from the water supply.

Prioritization of Potential Pollution Sources

As a matter of convenience, distance from the wells was the main criterion used to evaluate the actual threat, as follows:

- Potential pollution sources located **within the one-year time-of-travel area** were considered a HIGH priority. (Thus, the stormwater basin located on the wellfield received a high priority, despite uncertainty about the types or amounts of pollutants it receives.)

- Potential pollution sources located **within the boundaries of the WHP area** were considered higher priority on that basis alone. Based on a qualitative evaluation of the toxicity, solubility, and amounts of chemicals used at the site (where known or possible to estimate), certain sites were downgraded to MEDIUM or LOW priority.

- Potential pollution sources located **outside the WHP area boundaries and upgradient from the wells** were automatically assigned MEDIUM or LOW priority, depending on qualitative evaluation of other considerations.

- Potential pollution sources located **outside the WHP area and downgradient or sidegradient from the wells** were assigned a LOW priority.

The resulting priority rankings are listed in **Table 3** on page 21.

With this information, it is possible to focus management strategies on those sources that pose the greatest apparent threat to West Lafayette's wellfield. However, it will be necessary for West Lafayette's WHP planning committee to make the final decisions on which management strategies to implement.

Updating the PPSI

The Village of West Lafayette's WHP Planning Committee will also need to discuss how often they will update the PPSI. Ohio EPA's Wellhead Protection Program recommends an update at least every ten years. However, most communities are planning to implement reporting requirements that will allow for immediate updating of the PPSI whenever a new potential source appears. In some cases, these reporting requirements are established by a local WHP ordinance. In other cases they are simply written into existing regulations. For example, such a requirement could be added to existing building codes. In addition to these mechanisms, some communities are committing to conducting windshield surveys and examining state databases every two or three years, to update the condition of existing sources, and identify any new sources that were not discovered through the reporting requirements.

Table 1. Potential Pollution Source Inventory Summary

Village of West Lafayette -- Potential Pollution Source Inventory							
Facility Name / Address	**Land Use**	**County / Township**	**Type of Activity**	**Potential Pollution Source / Comments**	**General Location**	**Distance to Well**	**Source of Information**
1. Yankee Wire Cloth Products 22440 County Rd. 124 West Lafayette, Ohio 43845	Industrial	Coshocton / Lafayette	Manufacture of Wire Mesh Filter Screens	Water/Detergent Cleaners Waste Oils TCE Solvents (previous limited use)	outside zone of contribu-tion	3700 ft.	Site Visit
2. Yankee Wire Cloth Products 221 West Main Street West Lafayette, Ohio 43845	Industrial	Coshocton / Lafayette	Manufacture of Wire Mesh Filter Screens	Water/Detergent Cleaners Waste Oils TCE Solvents (previous limited use)	within WHP area	2350 ft.	Site Visit
3. Bates Car Care Center 504 West Main Street West Lafayette, Ohio 43845	Commercial / Retail	Coshocton / Lafayette	Car Service & Gas Sales 3 - Tanks (6,000; 4,000; 2,000) Inactive (1971 metal)	BTEX	within WHP area	1800 ft.	Site Visit, SFM-BUSTR Record Search
4. B. P. Station 140 West Main Street West Lafayette, Ohio 43845	Commercial / Retail	Coshocton / Lafayette	Car Service Center & Gasoline Sales 3 Tanks (2-8,000; 1-4,000) 1 Waste Oil Tank (500) (new tanks 1987)	BTEX and Waste Oil	within WHP area	2475 ft.	Site Visit, SMF-BUSTR Record Search
5. Jones Metal Company 305 North Center Street West Lafayette, Ohio 43845	Industrial	Coshocton / Lafayette	Metal Products 2 Surface Impoundments(inactive) 1-storm water runoff, 1-acid/caustic neutralization pond (1940-1985, 2,000-4,000 gallons per month) 1 Noncontact Cooling Water Class V Injection well 1 Hazardous Materials Storage Building	Minor use of MEK Hydraulic Oils Rubber Solvent Acids Caustic Soda Cleaner	within WHP area	3050 ft.	Site Visit, Ohio EPA Records Search

Village of West Lafayette -- Potential Pollution Source Inventory							
Facility Name / Address	**Land Use**	**County / Township**	**Type of Activity**	**Potential Pollution Source / Comments**	**General Location**	**Distance to Well**	**Source of Information**
6. Extermital Termite & Pest Control 56713 County Road 9 West Lafayette, Ohio 43845	Commercial	Coshocton / Oxford	Pest Control Applicator Storage of Pesticide Concentrate (20-30 gallons)	Dursban ZE and TC Equity	outside WHP area	16,800 ft.	Site Visit
7. Kobels Nursery 22573 St Route 751 West Lafayette, Ohio 43845	Commercial / Retail	Coshocton / Oxford	Landscape Nursery and Lawn and Garden Sales	Fertilizer, Herbicide (Roundup) and Pesticide (limited use - only when needed)	outside WHP area	16,600 ft.	Site Visit
8. Shaiers Auto Salvage Yard 22267 St Rt 751 West Lafayette, Ohio 43845	Commercial / Retail	Coshocton / Oxford	Auto Salvage Yard 3.5 acres	Waste Oils/auto fluids and batteries	outside WHP area	14,300 ft.	Site Visit
9. Fairview Manor Mobile Home Park 324 West Franklin Drive West Lafayette, Ohio 43845	Residential	Coshocton / Lafayette	Storm Water Runoff Basin 300 feet from public water supply well	Surface water (chemicals unknown)	within 1 year TOT	300 ft.	Site Visit
10. West Lafayette Township Maintenance Building 400 Block Seventh Street West Lafayette, Ohio 43845	Township Services	Coshocton / Lafayette	Road Salt Storage (Covered Facility)	Salt (Chloride)	outside WHP area	5000 ft.	Site Visit

Village of West Lafayette -- Potential Pollution Source Inventory

Facility Name / Address	Land Use	County / Township	Type of Activity	Potential Pollution Source / Comments	General Location	Distance to Well	Source of Information
11. Village of West Lafayette 200 East Railroad Street West Lafayette, Ohio 43845	Village Services	Coshocton / Lafayette	Road Salt Storage Facility (Covered Facility) (Oil or Gas Tanks ??)	Salt (Chloride)	with 5 year TOT	2675 ft.	Site Visit
12. Village of West Lafayette 600 East Main Street (Ripple Lane Extension) West Lafayette, Ohio 43845	Village Services	Coshocton / Lafayette	Waste Water Treatment Plant (4 Concrete Basins - Activated Sludge) Sludge Drying Beds (not used) Sludge Disposal (Land Application at Airport	Sewage (BOD, Ammonia, Metals, etc.)	outside WHP area	3875 ft.	Site Visit
13. Dairy Mart West Main Street West Lafayette, Ohio 43845	Retail	Coshocton / Lafayette	Gasoline Sales 2 or 3 Tanks (size ?) 1983 (fiberglass ?)	BTEX	within WHP area	2100 ft.	State Fire Marshal, BUSTR - records search
14. Brake Service Center East Main Street West Lafayette, Ohio 43845	Commercial / Retail	Coshocton / Lafayette	Gasoline Sales Tanks (?)	BTEX	5 year	3200 ft.	State Fire Marshal, BUSTR - records search
15. Columbus & Ohio River Railroad	Transportation	Coshocton / Lafayette & Oxford	Transporter of goods (previous spills/accidents near village (?)	?	Traverses WHP area	1550 - 7000 ft.	Site Visit
16. Hickory Flats Greens Golf Course 54118 Township Rd. 155 West Lafayette, Ohio 43845	Recreation / Retail	Coshocton / Lafayette	Golf Course Maintenance Storage and Application of Chemicals (Gasoline Tanks ?)	Fertilizers, Herbicides & Pesticides	outside WHP area	9,450 ft.	Site Visit

Village of West Lafayette -- Potential Pollution Source Inventory							
Facility Name / Address	**Land Use**	**County / Township**	**Type of Activity**	**Potential Pollution Source / Comments**	**General Location**	**Distance to Well**	**Source of Information**
17. River Greens Golf Course 22749 St. Route 751 West Lafayette, Ohio 43845	Recreation / Retail	Coshocton / Oxford	Golf Course Maintenance Storage and Application of Chemicals (Gasoline Tanks ?)	Fertilizers, Herbicides & Pesticides	outside WHP area	17,250 ft.	Site Visit
18. Village of West Lafayette 22560 St. Route 751 West Lafayette, Ohio 43845	Village Services	Coshocton / Oxford	Landfill (1950's - 1968?)	Residential/ Commercial and Industrial Waste	outside WHP area	16,400 ft.	Site Visit
19. Village of West Lafayette George Street	Disposal Facility	Coshocton / Lafayette	Old town dump	???	within 1 year TOT area	1,000 ft.	Site Visit
20. Misc. Locations in Valley	Commercial	Coshocton / Lafayette	Oil or Gas Production Wells and Storage Facilities - 58 (active, abandonded or proposed)	Oil and Gas by-products, chloride from brine pits	through-out valley	2,200-13,000 ft.	Records Search - Ohio Department of Natural Resources, Division of Oil & Gas
21. Agricultural Activities in Valley	Commercial / Retail	Coshocton / Lafayette	Row Crop (Corn and Soybeans) Berry Farming (application, mixing and storage of fertilizers and pesticides/herbicides)	Nitrate (from fetilizer), herbicides, pesticides	within WHP area and through-out valley	300 ft. and greater	Site Visit
22. Village of West Lafayette West Lafayette, Ohio 43845	Village Services	Coshocton / Lafayette	15 Storm Water Runoff Drains ("French Drains") Various locations	Oil and Grease, Misc	within WHP area	2,000-5,275 ft.	Site Visit

Village of West Lafayette -- Potential Pollution Source Inventory							
Facility Name / Address	**Land Use**	**County / Township**	**Type of Activity**	**Potential Pollution Source / Comments**	**General Location**	**Distance to Well**	**Source of Information**
23. Coshocton Valley Corp. Aka: Penn Michigan Facility (Closed) 200 North Kirk Street West Lafayette, Ohio 43485	Industrial	Coshocton / Lafayette	Porcelain kitchen fixtures Surface Impoundment (UST ?)	Metals, solvents, others	within WHP area	2,000 ft.	Record Search - Ohio EPA

Table 2. Volatile Organic Compounds Detected in Ground Water at West Lafayette, Ohio

Compound	*Concentration Range[a] (µg/ℓ)*	*MCL[b] (µg/ℓ)*	*Health Effects[b] from Chronic Low-Level Exposures*
Trichloroethylene (TCE)	ND-1648	5	Cancer (suspected)
1,1,1-Trichloroethane (1,1,1-TCA)	ND-185.78	200	Liver, nervous system effects
Vinyl Chloride	ND-4.28	2	Cancer (suspected)
Total of other chlorinated solvents, includes:	ND-169.47		
1,1-Dichloroethene		7	Cancer (suspected), liver, kidney effects
cis-1,2-Dichloroethene		70	
trans-1,2-Dichloroethene		100	Cancer (suspected)
1,1-Dichloroethane		none	Cancer (suspected)
1,2-Dichloroethane		5	
Methylene chloride		none	Cancer (suspected)
Perchloroethylene (PCE)		5	Cancer (suspected)
Chloroform		[c]	Cancer (suspected)
Chloromethane		none	
BTEX (total), includes:	ND-3.85		
benzene		5	Cancer
toluene		100	Liver, kidney, nervous system, circulatory effects
ethylbenzene		700	
xylene		10,000	

ND = non-detect. Detection limit = 5 µg/ℓ in most cases

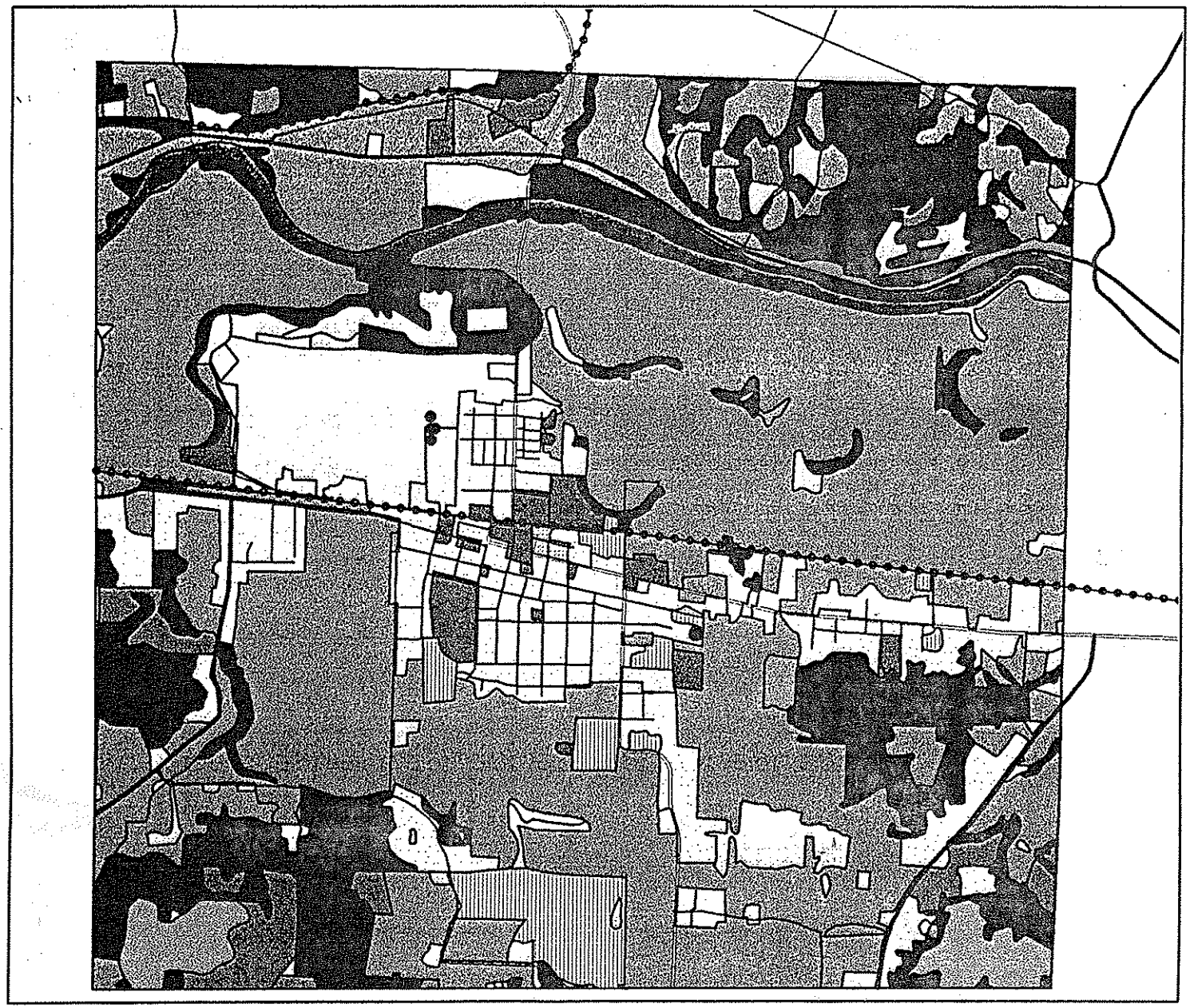
[a]Summarized from data presented in PSARA, 1995 Table 7-11.

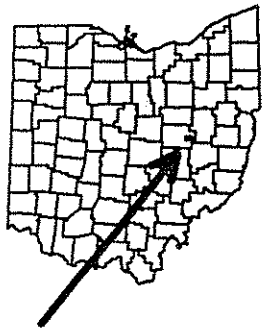
[b]From EPA, 1994 National Primary Drinking Water Standards.

TABLE 3. Prioritization of Potential Pollution Sources at West Lafayette

HIGH	MED-HIGH	MEDIUM	MED-LOW	LOW
Yankee Wire Cloth[1] Control (W. Main St. facility)	Septic systems[3]	Bates Car Care Ctr.	Wastewater Plant	Extermital Termite & Pest
BP Oil			Town Dump	Kobels Nursery
Dairy Mart[1]			Sanitary Sewer Lines	Shaiers Auto Salvage
Brake Service Center[1]			French Drains not listed as HIGH	Road Salt Storage
Stormwater Basin				Landfill
French drains at:				Agricultural areas
--Jones Metal				Golf courses
--S.R. 93				Oil & gas wells
Railroad[2]				Cemeteries
Highways[2]				Natural gas lines
Contaminant Plume				Storm water sewers

[1] More information about USTs and management practices might result in a lower prioritization.
[2] If chemical spills were to occur.
[3] If not properly maintained. This item may need updating, since the septic systems northeast of the wellfield are scheduled to be decommissioned, and replaced by sanitary sewer lines.





Legend

- WL Water Wells

Roads
- County
- Municipal
- State
- Township
- U.S.
- Railroad

Landuse
- Residential
- Commercial & Services
- Trans, Comm, & Utilities
- Mixed Urban & Built Up Land
- Other Urban or Built Up Land
- Cropland and Pasture
- Other Agricultural Land
- Shrub & Brush Rangeland
- Forest Land
- Streams & Canals
- Lakes
- Ponds
- Non Forested Wetlands
- Strip Mines & Excavations

0.2 0 0.2 0.4 Miles

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Division of Drinking and Ground Waters

July 1996, David Wilburn & Dick McClish

Figure 2: Village of West Lafayette Landuse/Land Cover

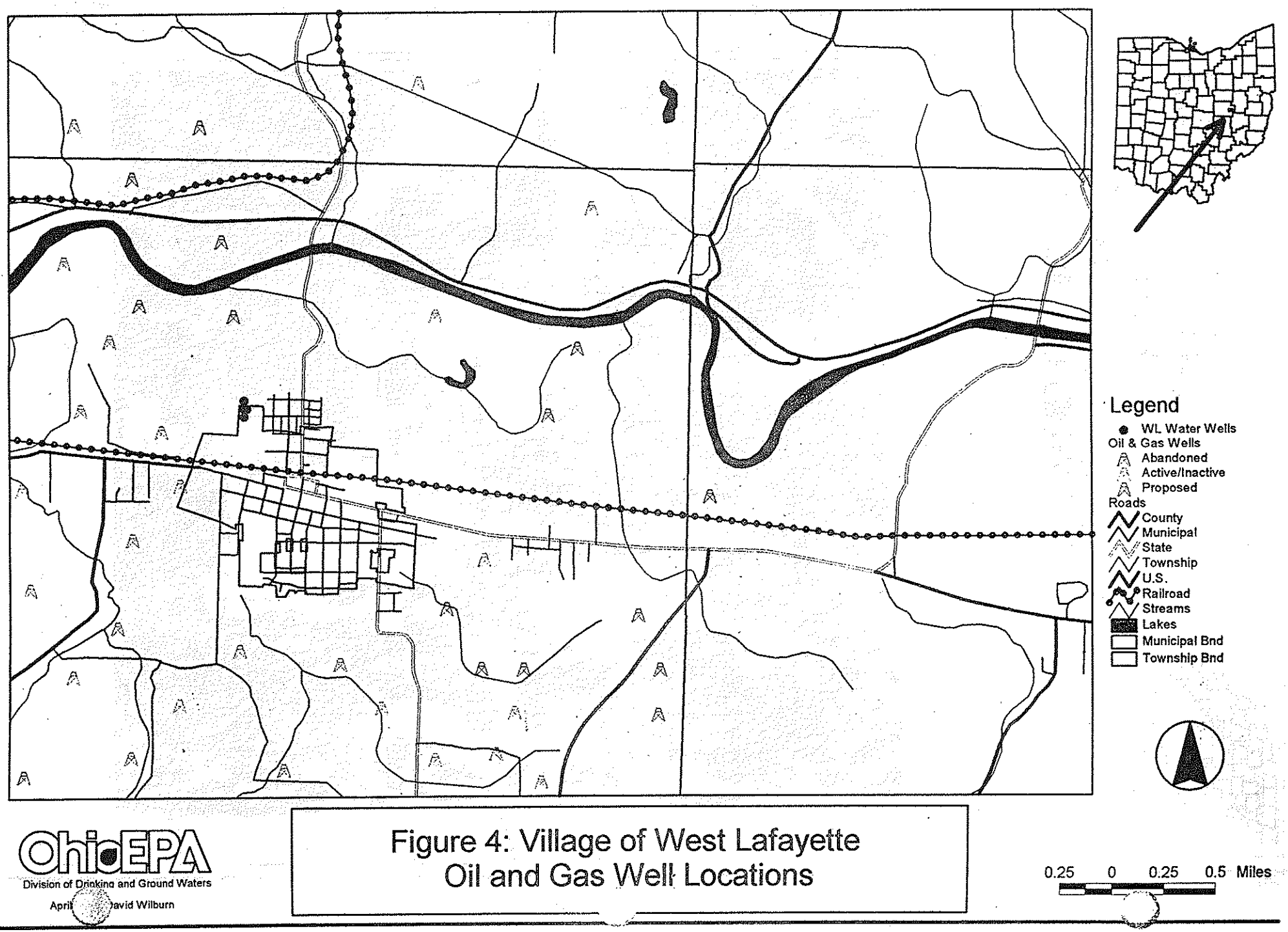
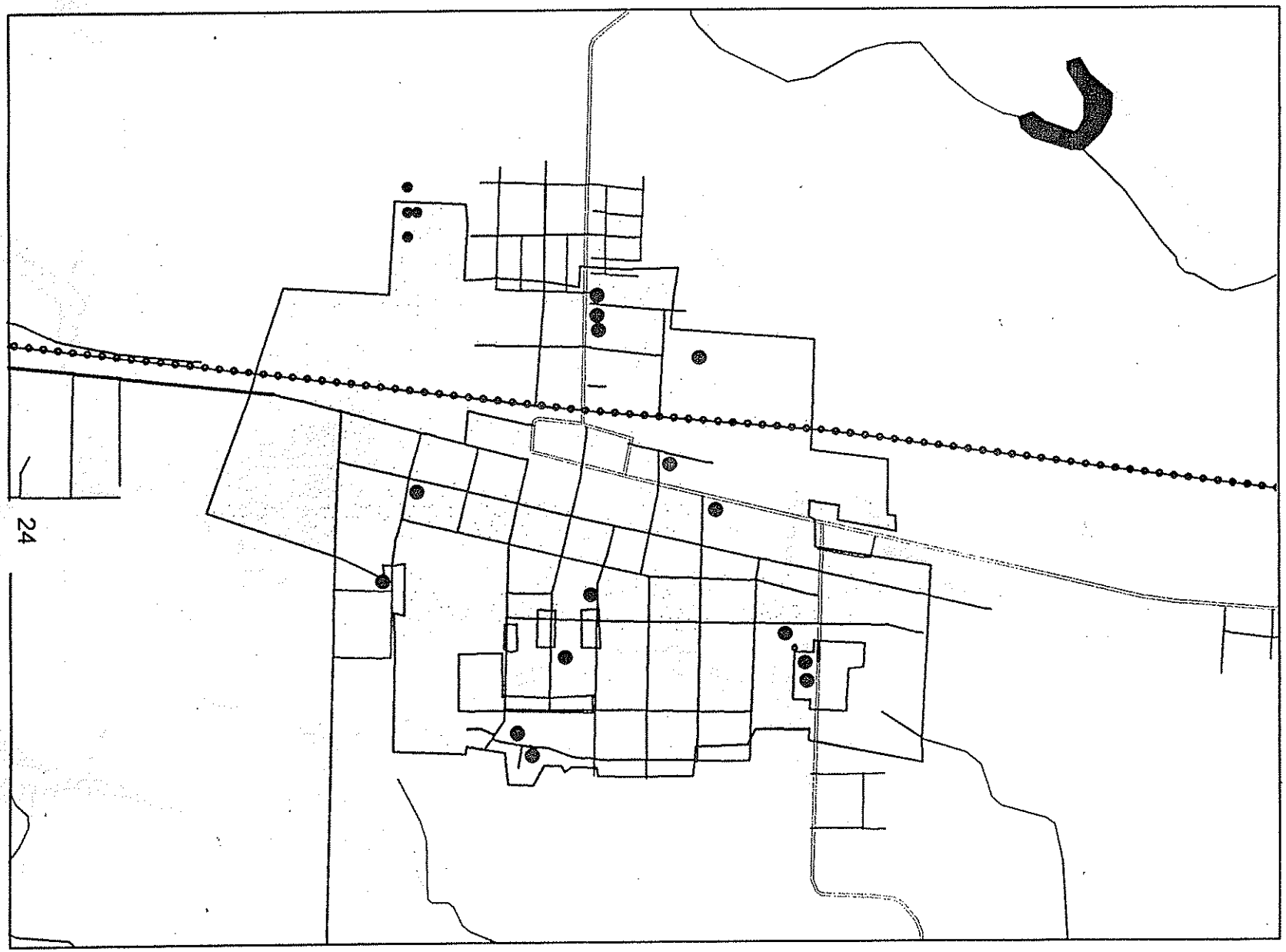
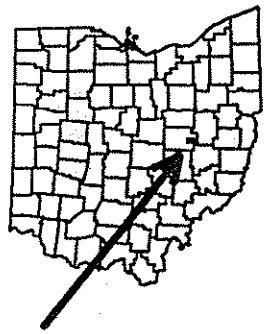


Figure 4: Village of West Lafayette Oil and Gas Well Locations





Legend

- UIC Class V Wells
- WL Water Wells

Roads

- County
- Municipal
- State
- Township
- U.S.
- Railroad

Streams

Lakes

Municipal Bnd

Township Bnd

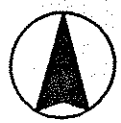


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Figure 5: Village of West Lafayette Locations of Drainage Wells (French Drains)

0.1 0 0.1 0.2 Miles

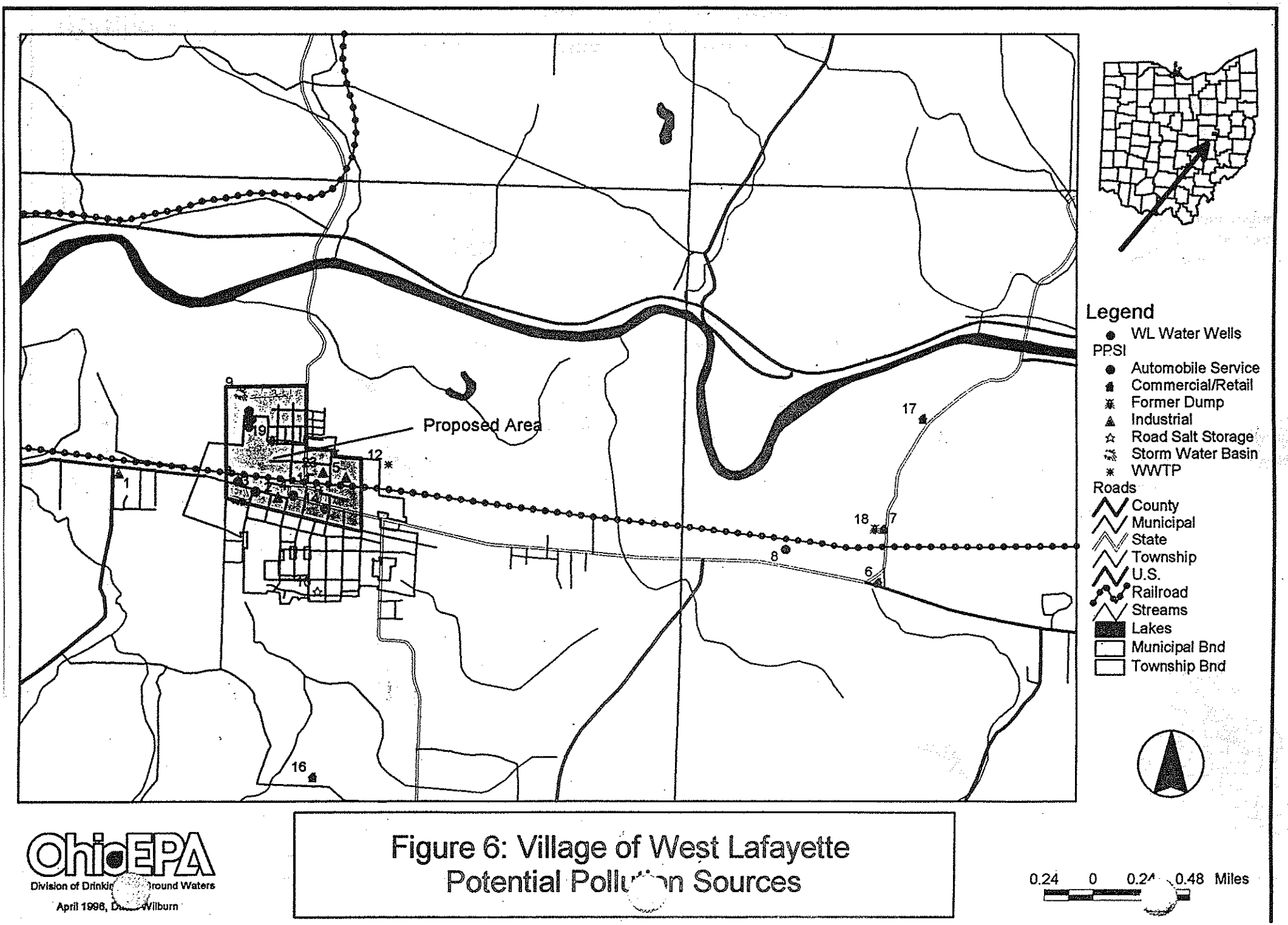

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Figure 6: Village of West Lafayette
Potential Pollution Sources

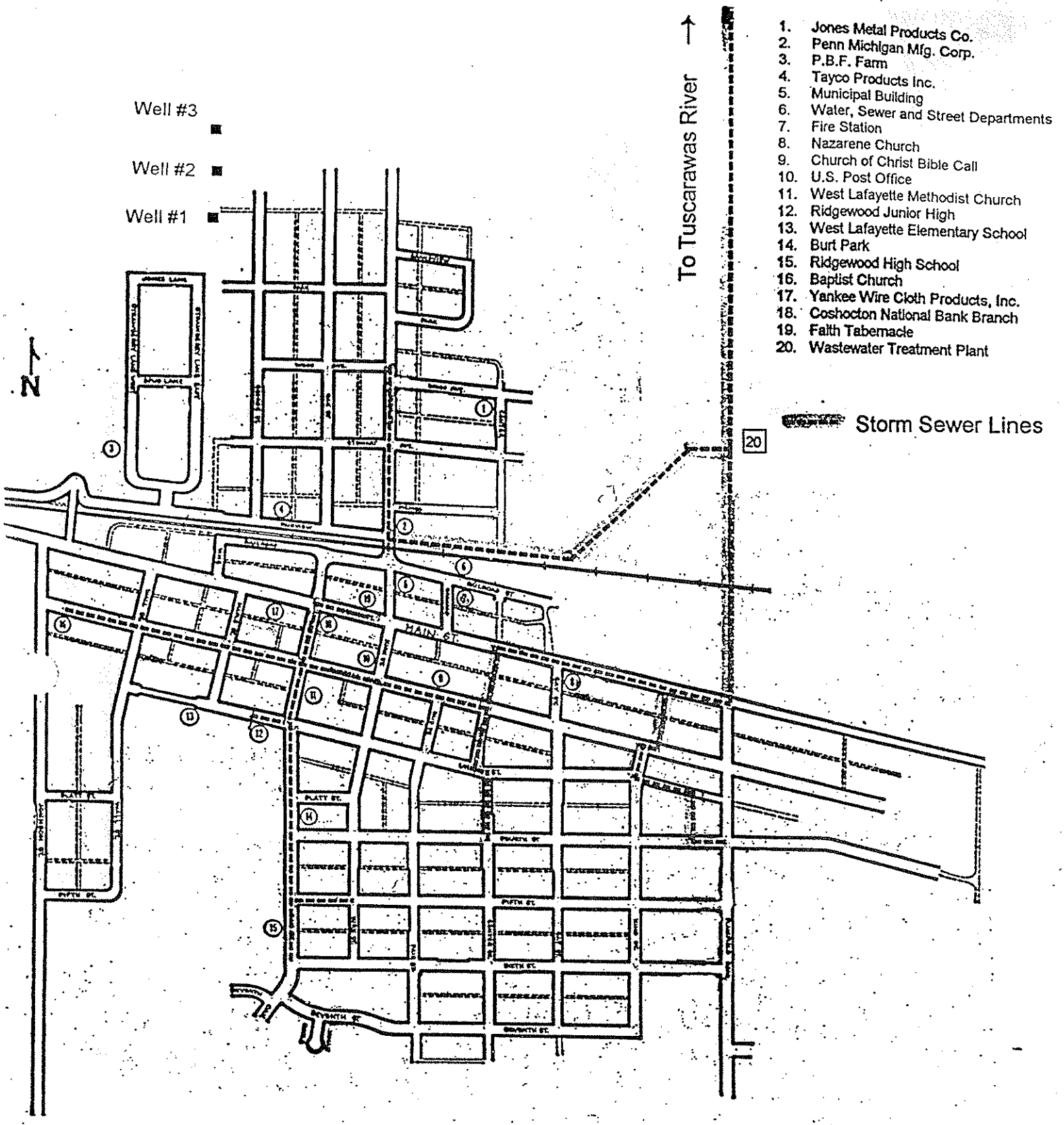

Figure 7. Village of West Lafayette Storm Water Sewer Lines

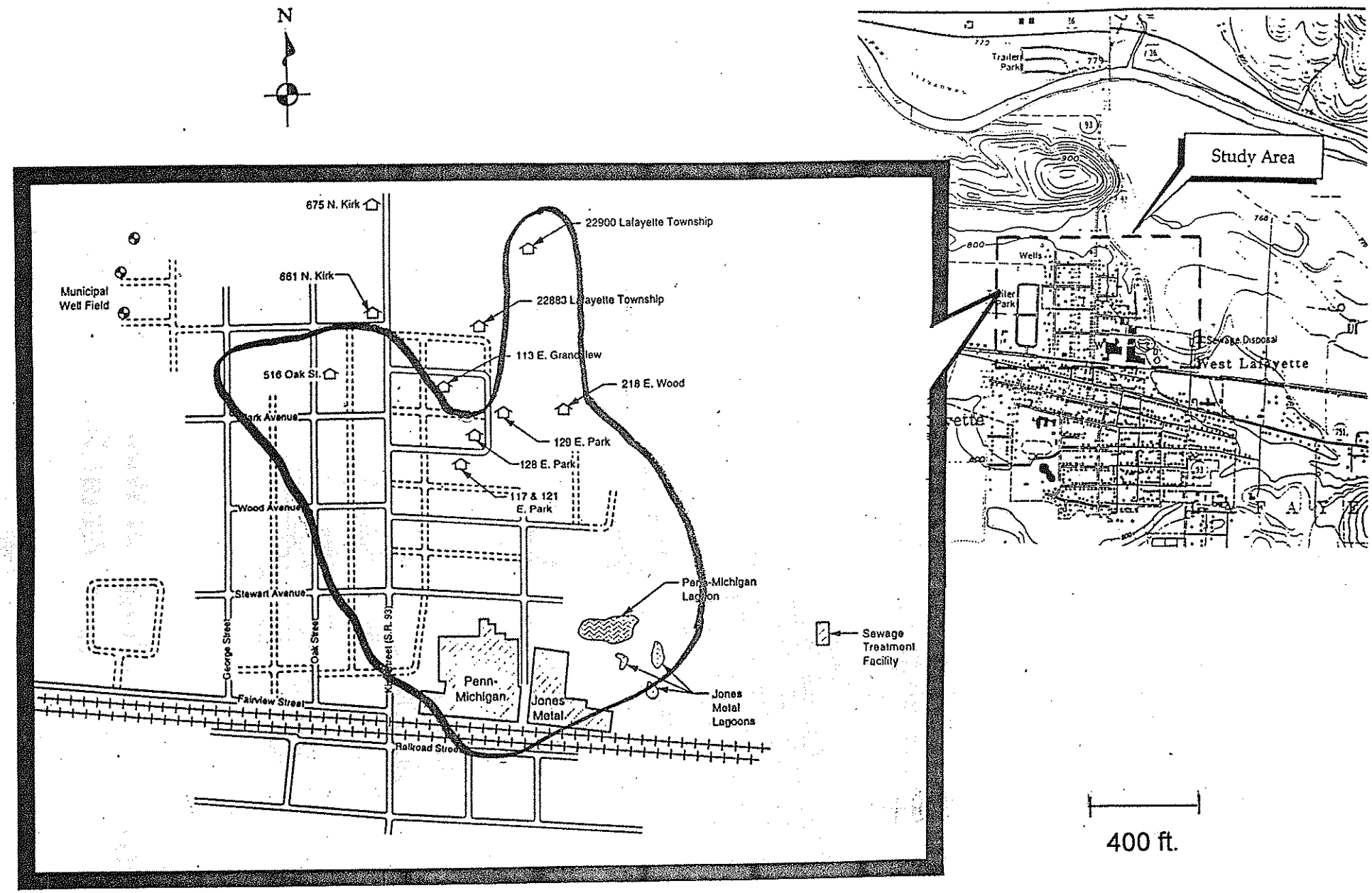

Figure 8. General Location of VOCs Detected in Ground Water at West Lafayette

REFERENCES

Dean Lillian, David Lusch, contributions by: Debbie Spakoff, Brant Fisher, Elgar Brown, Linda Helstowski, Patsy Clark, Ruth Kline-Robach, 1994. Wellhead Protection Planning Guide for Michigan Communities, Michigan State University, Groundwater Education in Michigan, Institute of Water Research Lansing, MI 106 pp.

Koehler, Bruce 1993. Developing an Inventory of Potential Sources of Ground Water Pollution with Application to Dearborn County, Indiana, Portion of Whitewater Valley Aquifer System, Ohio-Kentucky-Indiana Regional Council of Governments, 123 pp.

Madarchik, 1992. How-To Manual for Ground Water Protection Projects, Retired Senior Volunteer Program, El Paso, TX, 55 pp.

Ohio Cooperative Extension Service, 1992. Building Coalitions, The Ohio Center for Action on Coalition Development for Families and High Risk Youth, The Ohio State University. Series of Fact Sheets.

Ohio EPA, 1989, Ground.Water, Public Information Center, Columbus, Ohio, 20 pp.

Ohio EPA, 1992. Ohio Wellhead Protection Program, Division of Drinking and Ground Waters, Columbus, OH, 96 pp.

Soil and Water Conservation, 1988. Ohio Land Use Cover Classification System, Ohio Department of Natural Resources, Miscellaneous Report, No. 17, 5th Edition, 14 pp.

T/Maker Company, 1996. ClickArt Incredible Image Pak 65,000, T/Maker Company, Mountain View, CA, 1162 pp.

U.S. EPA, 1991. Guide for Conducting Contaminant Source Inventories for Public Drinking Water Supplies: Technical Assistance Document, Office of Ground Water and Drinking Water, Washington, DC, 53 pp.

U.S. EPA, 1993. Wellhead Protection: A Guide for Small Communities; Office of Research and Development, Office of Water, Washington, D.C., 144 pp.