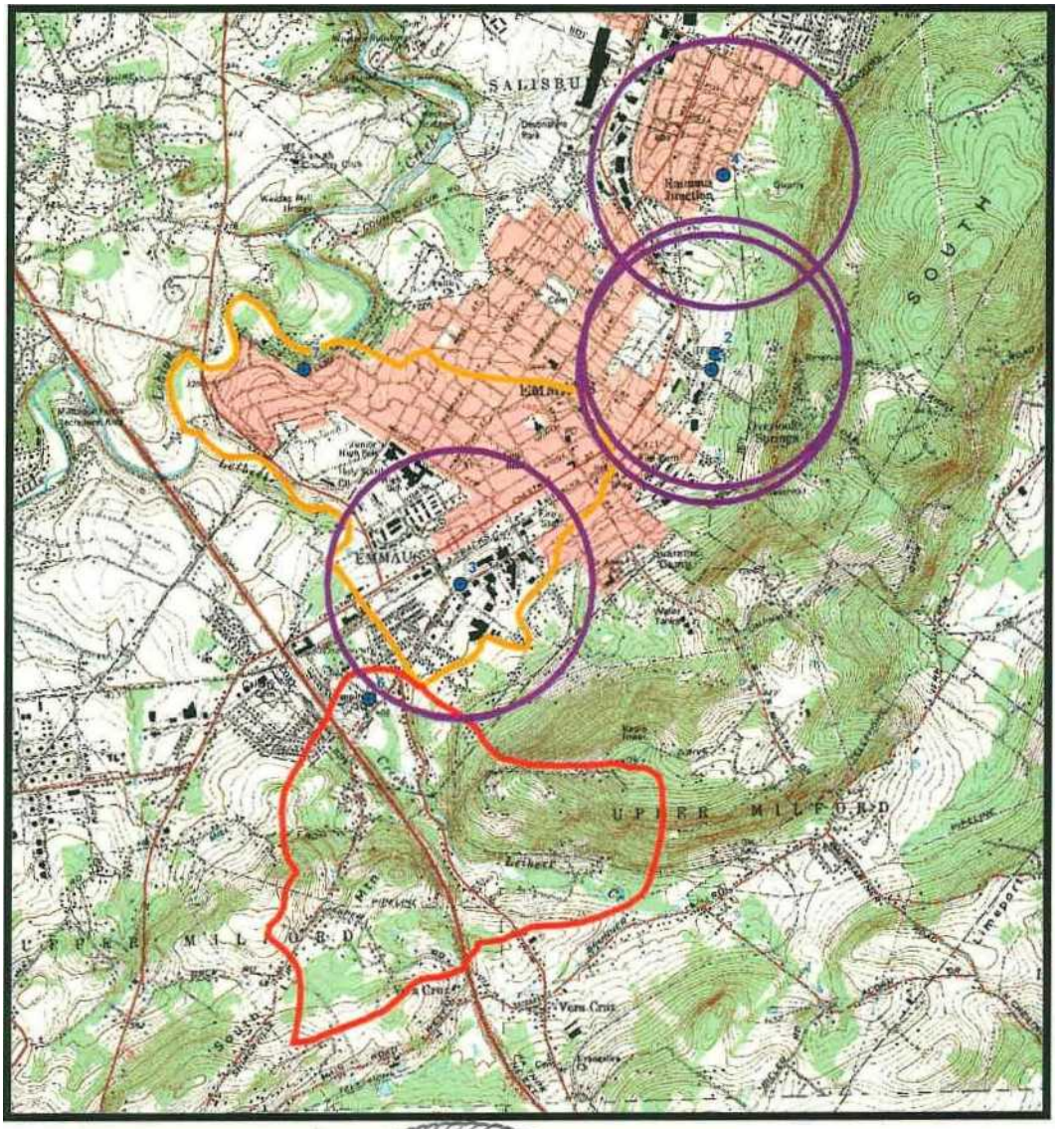
Wellhead Protection Plan

Emmaus Borough Public Water System

Borough of Emmaus, Lehigh County, Pennsylvania

PWSID 3390032
July 2004



Information Sheet

SWAP Final Meeting, April 12, 2005

Lehigh County Authority at 11:00 a.m.

Emmaus Borough Public Water at 1:00 p.m.

Location: Upper Macungie Township Municipal Building
8330 Schantz Road, Breinigsville, PA 18031

The Source Water Assessment and Protection (SWAP) program identifies and ranks potential pollution threats to a public water supply. The potential pollution threats could be past or current activities such as agriculture, commerce, industry or residential. This program does not implement any protection measures to protect the water source(s). Protection at this time is voluntary for the water supplier and community to do. The SWAP program should not be used for any other purpose other than the implementation of a wellhead or watershed protection plan, which can protect the water supply source(s).

The SWAP program is required because the United States Congress required the Environmental Protection Agency (EPA), which in turn required the Pennsylvania Department of Environmental Protection (PA DEP) to evaluate all public water sources in Pennsylvania.

The source water assessment for the above water suppliers are complete and is available for public viewing at the NE DEP Wilkes-Barre office. The reports can be viewed by scheduling an appointment with the Records Management Department at 570 826-5472. Please see the attached Executive Summaries from the completed SWAP reports to get an overview of what was identified and ranked. The water supplier also will receive a complete copy of the SWAP report for their system.

The first step in the SWAP program was to field locate potential pollution sources within a default area and then these potentional pollution sources were ranked as a potential threat according to SWAP guidance. Please note that there may be sources that were not identified because not every square foot of the study area was viewed and observations were made from public thoroughfares. Also, a majority of the activities were ranked a high threat since control practices were unknown for the activity and a file review, interview and/or close inspection was not done. The second step was to identify the source water area. A source water area is an area that supplies water to a supply intake. The information used to evaluate the water source (i.e. well, spring, reservoir, stream) is based on readily available data.

The SWAP assessment is not considered a permanent evaluation and the assessment can be modified to meet the future issues of the community.

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The DEP recommends that the water supplier and the community work together to implement a voluntary source water protection program. A source water protection program is a proactive managerial approach to identify and minimize existing and potential threats to a drinking water source(s) of supply. Currently, the DEP does not require source water protection but only recommends that a water supplier implement a protection program.

Minimum Elements required for a DEP recognized source water protection plan:

1. Steering Committee
2. Public participation
3. Source water area delineation
4. Potential contamination source identification
5. Management plan
6. Emergency plan for alternate water supply
7. Future source siting plan

Please note that the above steps are a suggested outline of how to complete a source water protection plan.

A source water protection plan for this water system is an attainable goal and a majority of the above seven steps are addressed in the SWAP report or should be addressed by the water supplier through their daily operations. The NE DEP office recommends that the community (citizens and industry), local government and water supplier form a steering committee to implement a source water protection plan. Grant money from DEP is available ($50,000 for a groundwater system and $200,000 for a surface water system) to implement a source water protection plan if the above minimum elements are followed and matching funds of 10% is met.

In conclusion, the SWAP assessment report is not a protection plan for the water system studied. This assessment report is developed with the idea that the water supplier and the community would use this report to implement a voluntary protection program that meets the needs of the area. The PA DEP recognizes not every past and current potential pollution source activity was identified. Also, the PA DEP will not update this report and this report has the possibility of becoming outdated due to changing activities in the area.

Northeast Pennsylvania Department of Environmental Protection contact:

Water Supply Management, SWAP Program
2 Public Square
Wilkes-Barre, PA 18711-0790
570 826-2511

For more information on source water protection visit EPA's or DEP's web sites below:
http://www.epa.gov/safewater/protect/sitemap.html
http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/srceprot/default.htm

(Attachment Executive Summaries from the complete reports for the above referenced water supply systems)

Executive Summary

The Pennsylvania Department of Environmental Protection (PA DEP) Northeast (NE) Office has completed its Source Water Assessment of the Lehigh County Authority (LCA), WLSA Central Division water system, Lehigh County, PA as of November 2004. The report is based on data from water supplier, database research and field observations made by the NE DEP Office. At this time, no written public comment was received to aid in identifying potential pollution sources.

The source water assessment only evaluates the raw water before delivery to the customer. The source water assessment does not evaluate any treatment techniques. At the time of drafting this report the water supplier studied had been providing water that meets PA DEP drinking water standards.

This report provides the public water supplier and the community with scientific and technical information to start a voluntary source water protection program. Source water is the water that supplies a groundwater well, spring, or surface water body. A source water program is a proactive managerial approach to identify and minimize existing and potential threats to a drinking water source(s) of supply.

The source water assessment area at this time is approximately a 1.25-mile radius circle with its center located near Valley View Circle off Park Lane in Upper Macungie Township. This 1.25-mile radius circle area contains potential pollution source activities that may threaten the drinking water supply. The assessment area circle encompasses a northeastern section of Upper Macungie Township and a southwestern section of South Whitehall Township. The 1.25-mile radius circle is not considered a rigorous geological delineation but an acceptable source water delineation area according to PA DEP standards when there is not enough data and/or time available to delineate a source water area.

The source water assessment was conducted by evaluating the water system and 66 potential pollution activities inside the area stated above in July 2002.

The assessment found 55 individual potential pollution **point** activities inside the source water area. The activities are categorized below with associated total category quantity and greatest percentage of activities in the category.

Category	Quantity	Greatest Percentage
Agricultural	0	
Commercial	19	Auto repair shop, Gas service station
Industrial	25	Industrial park
Miscellaneous	11	Underground petroleum storage tank
Residential	0	
Total	55	

The above 55 potential pollution **point** activities are also ranked as greatest to lowest threats to the water supply. The threat values are broken down into 6 levels from A as highest to F as lowest and are listed below:

Rating	Quantity	Total Percentage
A	49	89
B	1	2
C	0	0
D	5	9
E	0	0
F	0	0
Totals	55	100

The assessment also found 11 potential pollution **non-point** activities inside the source water area. These **non-point** activities are scattered throughout the area and have a quantity value of thousands of individual sources. The study ranked the 11 **non-point** potential pollution activities in the source water area from A as highest to F as lowest and also listed the activity quantity and percentage below:

Ranking	Quantity	Percentage
A	10	91
B	1	9
C	0	0
D	0	0
E	0	0
F	0	0
Total	11	100

In conclusion, the DEP recommends that the water supplier, because of all the high potential threats identified near the water supply, adopt a source water protection plan. The highest risk or threat of potential pollution to the water system by activity quantity is the following:

Individual Point Source Activities:

> Auto repair shops, Gas service stations, Industrial parks, and Underground petroleum storage tanks.

Non-Point Source Activities:

> Fuel oil storage tanks, household cleaning supplies, highway spills, highway salt applications, lawn care supplies, on-lot sewage disposal, petroleum pipelines, sewer pipelines, swimming pools, wells (abandoned or active), and boreholes (abandoned or active).

Grant money is available from PA DEP to reduce the cost of implementing a source water protection plan.

Executive Summary

The Pennsylvania Department of Environmental Protection (PA DEP) Northeast (NE) Office has completed its Source Water Assessment of the Lehigh County Authority (LCA), WLSA Central Division water system, Lehigh County, PA as of November 2004. The report is based on data from water supplier, database research and field observations made by the NE DEP Office. At this time, no written public comment was received to aid in identifying potential pollution sources.

The source water assessment only evaluates the raw water before delivery to the customer. The source water assessment does not evaluate any treatment techniques. At the time of drafting this report the water supplier studied had been providing water that meets PA DEP drinking water standards.

This report provides the public water supplier and the community with scientific and technical information to start a voluntary source water protection program. Source water is the water that supplies a groundwater well, spring, or surface water body. A source water program is a proactive managerial approach to identify and minimize existing and potential threats to a drinking water source(s) of supply.

The source water assessment area at this time is approximately a 1.25-mile radius circle with its center located approximately 0.7 mile southwest of the intersection of State Route 22 and State Route 100 in Upper Macungie Township. This 1.25-mile radius circle area contains potential pollution source activities that may threaten the drinking water supply. The assessment area circle is entirely within Upper Macungie Township. The 1.25-mile radius circle is not considered a rigorous geological delineation but an acceptable source water delineation area according to PA DEP standards when there is not enough data and/or time available to delineate a source water area.

The source water assessment was conducted by evaluating the water system and 70 potential pollution activities inside the area stated above in July 2002.

The assessment found 60 individual potential pollution **point** activities inside the source water area. The activities are categorized below with associated total category quantity and greatest percentage of activities in the category.

Category	Quantity	Greatest Percentage
Agricultural	1	Fertilizer storage or use
Commercial	30	Bus or truck terminal, Auto repair shop
Industrial	17	Industrial park
Miscellaneous	11	Underground petroleum storage tank
Residential	1	Fuel oil storage
Total	60	

The above 60 potential pollution **point** activities are also ranked as greatest to lowest threats to the water supply. The threat values are broken down into 6 levels from A as highest to F as lowest and are listed below:

Rating	Quantity	Total Percentage
A	56	93
B	1	2
C	0	0
D	3	5
E	0	0
F	0	0
Totals	60	100

The assessment also found 10 potential pollution **non-point** activities inside the source water area. These **non-point** activities are scattered throughout the area and have a quantity value of thousands of individual sources. The study ranked the 10 **non-point** potential pollution activities in the source water area from A as highest to F as lowest and also listed the activity quantity and percentage below:

Ranking	Quantity	Percentage
A	9	90
B	1	10
C	0	0
D	0	0
E	0	0
F	0	0
Total	10	100

In conclusion, the DEP recommends that the water supplier, because of all the high potential threats identified near the water supply, adopt a source water protection plan. The highest risk or threat of potential pollution to the water system by activity quantity is the following:

Individual Point Source Activities:

Auto repair shops, Bus and truck terminals, Gas service stations, Industrial parks, and Underground petroleum storage tanks.

Non-Point Source Activities:

Fuel oil storage tanks, household cleaning supplies, highway spills, highway salt applications, lawn care supplies, on-lot sewage disposal, sewer pipelines, swimming pools, wells (abandoned or active), and boreholes (abandoned or active).

Grant money is available from PA DEP to reduce the cost of implementing a source water protection plan.

Executive Summary

The Pennsylvania Department of Environmental Protection (PA DEP) Northeast (NE) Office has completed its Source Water Assessment of the Lehigh County Authority (LCA), WLSA Central Division water system, Lehigh County, PA as of November 2004. The report is based on data from water supplier, database research and field observations made by the NE DEP Office. At this time, no written public comment was received to aid in identifying potential pollution sources.

The source water assessment only evaluates the raw water before delivery to the customer. The source water assessment does not evaluate any treatment techniques. At the time of drafting this report the water supplier studied had been providing water that meets PA DEP drinking water standards.

This report provides the public water supplier and the community with scientific and technical information to start a voluntary source water protection program. Source water is the water that supplies a groundwater well, spring, or surface water body. A source water program is a proactive managerial approach to identify and minimize existing and potential threats to a drinking water source(s) of supply.

The source water assessment area at this time is approximately a 2.75-mile radius circle with its center located approximately 0.3 mile south of the intersection of Lower Macungie Road and Mill Creek Road in Lower Macungie Township. This 2.75-mile radius circle area contains potential pollution source activities that may threaten the drinking water supply. The assessment area circle encompasses a large section of Lower Macungie Township and Macungie Borough. The study area also encompasses smaller sections of the following areas: Upper Macungie Township, South Whitehall Township, Salisbury Township, Emmaus Borough, Upper Milford Township, and Alburtis Borough. The 2.75-mile radius circle is not considered a rigorous geological delineation but an acceptable source water delineation area according to PA DEP standards when there is not enough data and/or time available to delineate a source water area.

The source water assessment was conducted by evaluating the water system and 160 potential pollution activities inside the area stated above in July 2002.

The assessment found 149 individual potential pollution **point** activities inside the source water area. The activities are categorized below with associated total category quantity and greatest percentage of activities in the category.

Category	Quantity	Greatest Percentage
Agricultural	5	Animal feedlot
Commercial	70	Auto repair shop, Repair shop
Industrial	20	Industrial park, RCRA facility
Miscellaneous	50	Underground petroleum storage tank
Residential	4	Swimming pool
Total	149	

The above 149 potential pollution **point** activities are also ranked as greatest to lowest threats to the water supply. The threat values are broken down into 6 levels from A as highest to F as lowest and are listed below:

Rating	Quantity	Total Percentage
A	126	85
B	6	4
C	0	0
D	17	11
E	0	0
F	0	0
Totals	149	100

The assessment also found 11 potential pollution **non-point** activities inside the source water area. These **non-point** activities are scattered throughout the area and have a quantity value of thousands of individual sources. The study ranked the 11 **non-point** potential pollution activities in the source water area from A as highest to F as lowest and also listed the activity quantity and percentage below:

Ranking	Quantity	Percentage
A	10	91
B	1	9
C	0	0
D	0	0
E	0	0
F	0	0
Total	11	100

In conclusion, the DEP recommends that the water supplier, because of all the high potential threats identified near the water supply, adopt a source water protection plan. The highest risk or threat of potential pollution to the water system by activity quantity is the following:

Individual Point Source Activities:

Auto repair shops, Gas service stations, Industrial parks, Repair shops, and Underground petroleum storage tanks.

Non-Point Source Activities:

Fuel oil storage tanks, household cleaning supplies, highway spills, highway salt applications, lawn care supplies, on-lot sewage disposal, petroleum pipeline, sewer pipelines, swimming pools, wells (abandoned or active), and boreholes (abandoned or active).

Grant money is available from PA DEP to reduce the cost of implementing a source water protection plan.

Executive Summary

The Pennsylvania Department of Environmental Protection (PA DEP) Northeast (NE) Office has completed its Source Water Assessment of the Emmaus Borough Public Water system, Lehigh County, PA as of October 2004. The report is based on data from water supplier, database research and field observations made by the NE DEP Office. At this time, no written public comment was received to aid in identifying potential pollution sources.

The source water assessment only evaluates the raw water before delivery to the customer. The source water assessment does not evaluate any treatment techniques. At the time of drafting this report the water supplier studied had been providing water that meets PA DEP drinking water standards.

This report provides the public water supplier and the community with scientific and technical information to start a voluntary source water protection program. Source water is the water that supplies a groundwater well, spring, or surface water body. A source water program is a proactive managerial approach to identify and minimize existing and potential threats to a drinking water source(s) of supply.

The source water assessment area at this time is approximately a 1.75-mile radius circle with its center located near the intersection of North 5th Street and North Street in Emmaus Borough. This 1.75-mile radius circle area contains potential pollution source activities that may threaten the drinking water supply. The assessment area circle encompasses all of Emmaus Borough, sections of City of Allentown, Lower Macungie Township, Upper Milford Township, Upper Saucon Township, and Salisbury Township. The 1.75-mile radius circle is not considered a rigorous geological delineation but an acceptable source water delineation area according to PA DEP standards when there is not enough data and/or time available to delineate a source water area.

The source water assessment was conducted by evaluating 230 potential pollution activities inside and outside the area stated above in January 2003. The Emmaus Borough Public Water wellhead advisory committee and or contractor(s) identified all potential pollution activities

The assessment found 220 individual potential pollution **point** activities inside and outside the source water area. The activities are categorized below with associated total category quantity and greatest percentage of activities in the category.

Category	Quantity	Greatest Percentage
Agricultural	1	Pesticide storage or use
Commercial	63	Auto repair shop, Gas service station
Industrial	52	RCRA facility, Industrial Park
Miscellaneous	102	Underground petroleum storage tank
Residential	2	Fuel oil storage, On lot septic
Total	220	

The above 220 potential pollution **point** activities are also ranked as greatest to lowest threats to the water supply. The threat values are broken down into 6 levels from A as highest to F as lowest and are listed below:

Rating	Quantity	Total Percentage
A	172	79
B	9	4
C	0	0
D	36	16
E	3	1
F	0	0
Totals	220	100

The assessment also found 10 potential pollution **non-point** activities inside and outside the source water area. These **non-point** activities are scattered throughout the area and have a quantity value of thousands of individual sources. The study ranked the 10 **non-point** potential pollution activities in the source water area from A as highest to F as lowest and also listed the activity quantity and percentage below:

Ranking	Quantity	Percentage
A	9	90
B	1	10
C	0	0
D	0	0
E	0	0
F	0	0
Total	10	100

In conclusion, the DEP recommends that the water supplier, because of all the high potential threats identified near the water supply, adopt a source water protection plan. The highest risk or threat of potential pollution to the water system by activity quantity is the following:

Individual Point Source Activities:

> Auto repairs shops, Gas service stations, RCRA facilities, Small quantity hazardous waste generator, and Underground petroleum storage tanks.

Non-Point Source Activities:

> Fuel oil storage tanks, household cleaning supplies, highway spills, highway salt applications, lawn care supplies, on-lot sewage disposal, sewer pipelines, swimming pools, wells (abandoned or active), and boreholes (abandoned or active).

The Emmaus Borough Public Water system is currently in the process of completing a source water protection program and has received a PA DEP source water protection grant to complete this process.

Winfield Iobst
Mayor

Craig B. Neely
President of Council

Bruce E. Fosselman
Borough Manager

28 South Fourth Street
Emmaus, PA 18049-3899

(610) 965-9292
FAX (610) 965-0705

October 25, 2004

Mr. Richard Stepanski
Water Supply Management
Technical Services Chief
Department of Environmental Protection
2 Public Square
Wilkes Barre, PA 18711

Re: Borough of Emmaus
Wellhead Protection Plan Submittal

Dear Mr. Stepanski,

Please find enclosed three copies of the recently completed Wellhead Protection Plan for the Emmaus Borough Wells. As you are aware, the Steering Committee for the project assumed full control in February 2004.

The report has been completed using the information generated by Barry Isett and Associates, Inc. However, the Plan was reorganized into the DEP template.

I trust you find the Plan complete and await your comments and approval.

Sincerely,

Jeffry D. Clapper
Public Works Director

JDC/jlv
Enclosure

3900-FM-WM0285 9/2001

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT

REQUEST FOR APPROVAL OF A WELLHEAD PROTECTION PROGRAM

1. Date Sept 4, 2004

2. **System Name** Emmaus Borough Water Department	3. **System Address** 28 South 4th Street, Emmaus, PA 18049
4. **Email Address** jclapper@emmausborough.com	5. **System Phone #** 610-965-9288
6. **Municipality** Emmaus Borough	7. **County** Lehigh
8. **Contact Person Name** Jeffry D. Clapper, Public Works Director	9. **Contact Person Address** 28 South 4th Street, Emmaus, PA 18049
10. **Contact Person Phone #** 610-965-9288	
11. **PWSID #** R3-3390032	12. **DEP Source ID(s) # / Well ID(s) # (Contact local DEP District Office for #)** Well #1 - WUSID #8806, Well #2 - WUSID #8807, Well #3 - WUSID #8808 Well #4 - #8809, Well #6 - #8811, Well #7 - #8812

By submission of this request for approval of our Wellhead Protection Program, we attest that we have included all of the following minimum elements:

- ☒ Steering Committee and Public Participation
- ☒ Wellhead Protection Area Delineation Map/Narrative
  Signature of Professional Geologist who performed rigorous delineation (if applicable)
  Signature
- ☒ Contaminant Source Inventory
- ☒ Wellhead Area Management and Commitment
- ☒ Contingency Planning
- ☒ Provisions for New Water Sources
- ☒ Expectations for Annual Report
- ☐ Are all water sources included in this plan? ☒ Yes ☐ No If not, please explain:
- ☒ Enclosed three complete copies of the Wellhead Protection Program

12. Signature of Requester

13. Title Public Works Director	14. Date Sept 3, 2004

See Reverse Side for Mailing Instructions

Winfield Iobst
Mayor

Craig B. Neely
President of Council

Bruce E. Fosselman
Borough Manager

28 South Fourth Street
Emmaus, PA 18049-3899

(610) 965-9292
FAX (610) 965-0705

January 11, 2007

William J. Manner
Environmental Program Manager
Watershed Management Program
Department of Environmental Protection
2 Public Square
Wilkes-Barre, PA 18711-0790

RE: Wellhead Protection Plan Annual Update

Dear Mr. Manner,

Please find enclosed the 2006 Wellhead Protection Plan Update for the Borough's Wellhead Protection Plan.

In your correspondence you requested a written explanation of our management approach to the plan as follows:

The Steering Committee has been replaced by an Environmental Advisory Council (EAC) whose formation and direction by their charter is mandated to continue to implement the management options stated in the plan. As you are aware, due to the lack of accurate data in the plan, public education is the primary goal to achieve.

The EAC meets monthly on the 4th Monday of each month at 7:00 p.m. The meetings alternate between Emmaus and Upper Milford Township Administration Offices.

In 2006 the EAC chose 3 projects to complete:

1. Publish quarterly article in local newspaper on topics relating to water quality.
2. Conduct a cleanup day on April 22, 2006 of old abandoned dump site. Approximately 30 tons of scrap metal and 70 tires were removed and disposed of.
3. Sponsor and man an information stand at the local Farmers Market on topics relating to water quality. The Farmers Market is open every Sunday from May to November.

In addition to the above, the EAC helped with our Annual Watershed Awareness Day at Community Park. The event targets 8th grade students at the East Penn School District. There were 18 different presenters who taught 600-700 students in two sessions.

In 2007 the EAC intends to:

1. Meet monthly.
2. Hold Watershed Awareness Day on May 16, 2007.
3. Publish quarterly articles in local newspaper on topics relating to water quality.
4. Staff presentation table at the local Farmers Market in summer 2007.

I hope the written narrative is satisfactory to you, and if you have any questions I can be reached at 610-965-9288.

Sincerely,

Jeffry D. Clapper
Public Works Director
JDC/rgf

Cc: File

3800-FM-WSM0098 3/2000

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER SUPPLY MANAGEMENT

Date Received _____

ANNUAL WELLHEAD PROTECTION PROGRAM UPDATE

THIS FORM SHOULD BE COMPLETED IN ORDER TO MAINTAIN APPROVED STATUS OF A WELLHEAD PROTECTION PROGRAM.

REPORT FOR CALENDAR YEAR: JAN. 1 TO DEC. 31, 2006 (Fill in *previous* year)

RETURN BY **MARCH 31** TO THE WATER SUPPLY REGIONAL MANAGER AT THE REGIONAL OFFICE THAT SERVES YOUR COUNTY (See list on page 2)

1. System Name Borough Of Emmaus		**2. System Address** 28 S 4th Street, Emmaus, Pa 18049
3. PWSID# 3390032	**4. Municipality** Emmaus	**5. System Phone #** 610-965-9288
6. Source ID(s) # / Well ID(s) # All Emmaus Municipal Wells No 1, No 2, No 3, No 4, No 6, No 7		**8. County** Lehigh
8. Contact Person Name Jeffry D. Clapper		**9. Contact Person Address** Same as Above
10. Contact Person Phone # Same as Above		**11. E-mail Address** jclapper@borough.emmaus.pa.us

Please answer the following questions as completely as possible, and include additional pages if necessary.

1. List any major changes in groundwater withdrawal, including new or abandoned sources.

No Changes

2. Please describe any land use changes within the wellhead protection area.

No Changes

3. List any new contaminant sources including the type, amount, and distance from each water source. Locate the contaminant source(s) on a map as well as the water source and attach to this form.

No New Contaminant Sources

4. Include any contaminant sources that are no longer a threat to the water supply. Please explain Locate the contaminant source(s) on a map and please attach to this form.

No Changes

5. Describe resources that have been applied to the wellhead protection program (budget items, in-kind sources, materials, etc.).

In kind manpower
Meeting Facilities
Copies for public and distribution to others

6. Are you complying with your management implementation schedule? ☒ Yes ☐ No
If not, please explain:
Describe any management techniques that have been implemented.

Formation of an Environmental Advisory Council which replaces Steering Committee.
Publication of educational information and public education efforts

7. Include future plans and implementation dates for the upcoming year.

Quarterly article in local newspaper about water quality issues.
Presentation of ground water model at farmers market summer 2007.
Watershed Awareness Day May 16, 2006 at Community Park.
Monthly meetings of EAC 4th Monday each month at 7:00 PM.

8. Signature	9. Title	9. Date
	PW Director	1/9/07

DEP REGIONAL OFFICES

Northwest Region - WSM 230 Chestnut St. Meadville, PA 16335-3481 814-332-6899 ***Counties:*** *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*	**Northcentral Region - WSM** 208 W. Third St., Suite 101 Williamsport, PA 17701 570-327-3675 ***Counties:*** *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*	**Northeast Region - WSM** 2 Public Square Wilkes-Barre, PA 18711-0790 570-826-2511 ***Counties:*** *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming*
Southwest Region - WSM 400 Waterfront Drive Pittsburgh, PA 15222-4745 412-442-4217 ***Counties:*** *Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland*	**Southcentral Region - WSM** 909 Elmerton Ave. Harrisburg, PA 17110 717-705-4708 ***Counties:*** *Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York*	**Southeast Region - WSM** Suite 6010, Lee Park 555 North Lane Conshohocken, PA 19428 610-832-6059 ***Counties:*** *Bucks, Chester, Delaware, Montgomery and Philadelphia*

Pennsylvania Department of Environmental Protection

2 Public Square
Wilkes-Barre, PA 18711-0790
January 4, 2007

Northeast Regional Office

570-826-2511
Fax 570-830-3016

DELIVERY CONFIRMATION NO. 0304 1560 0003 4352 3386

Mr. Jeffry D. Clapper
Public Works Director
Emmaus Borough Public Water
28 South 4th Street
Emmaus, PA 18049

Re: Wellhead Protection Program
Source Water Protection Plan
Annual Update Form Request

Dear Mr. Clapper

The Pennsylvania Department of Environmental Protection (PA DEP) is sending this letter to the Emmaus Borough Public Water, Source Water Protection Committee to inform the steering committee that the source water protection plan annual update form must be submitted to PA DEP. The annual update form is enclosed with this letter and should be completed by the steering committee and returned to our office by March 31, 2007. This annual update form was also sent to you in a June 2006 letter explaining this process, along with the approval letter for the source water protection plan. The update form is for the Emmaus Borough Public Water, public water supply identification number 3390032, well sources 1, 2, 3, 4, 6, and 7.

The annual update form should be filled out completely and no spaces should be left blank. Additional paper may be used if there is not enough room available on the form. The PA DEP is asking for the steering committee to look over the source water protection plan that was prepared by Barry Isett & Associates, Inc. in July 2004, and the Report Forward by the Emmaus Borough Public Water Steering Committee January 2006 to see if anything in the plan has changed. If anything has changed since the plan was developed, please document the new information on the annual update form. The PA DEP is not requiring the steering committee to hire a consultant to complete this form. The form can and should be filled out by someone who is familiar with the source water protection plan and the local community.

Also, The PA DEP is requiring that the update explain what was and is currently being done for a management approach to protect the water supply source area. You and Mr. Ahlert explained verbally to Andrew Augustine of PA DEP at a May 16, 2006 meeting at Emmaus Borough Hall that education is the management approach method for the source water protection plan. The PA DEP accepted the verbal notification that this was the management approach method for the source water area, but now this must be explained in writing (i.e., who is doing the management approach, where the management is being done, what is being done for management, when the management is being done). This was explained to you in the approval letter the PA DEP sent to you in June 2006. The PA DEP would also like to know the date(s) of the last steering committee meeting(s) and how public participation and education was done since the source water plan approval in June 2006.

If the PA DEP does not receive a completed annual update form and an explanation of an implemented management approach to protect the water supply source area at the PA DEP office, Watershed Management Program, 2 Public Square, Wilkes-Barre, PA 18711, the PA DEP will consider the source water protection plan for the Emmaus Borough Public Water to be inactive. The source water plan still must be in accordance with the Pennsylvania Safe Drinking Water Regulations (25 Pa. Code § 109.713), regarding source water protection.

If you should have any questions, please feel free to contact Andrew Augustine of my staff at 570-830-3101.

Sincerely,

William J. Manner
Environmental Program Manager
Watershed Management Program

Enclosure: Annual Wellhead Protection Program Update form

Winfield Iobst
Mayor

Michael G. Waddell
President of Council

Bruce E. Fosselman
Borough Manager

28 South Fourth Street
Emmaus, PA 18049-3899

(610) 965-9292
FAX (610) 965-0705

February 7, 2008

Mr. William J. Manner, Program Manager
Watershed Management Program
Department of Environmental Protection
2 Public Square
Wilkes-Barre, PA 18711-0790

RE: 2007 Annual Update
Wellhead Protection Plan

Dear Mr. Manner,

Please find enclosed herewith the Annual Wellhead Protection Program update form you sent to me on January 22, 2008. In addition to this form, I offer the following summary of the activities that occurred in 2007 relating to the management recommendations contained in the Wellhead Protection Plan.

The Steering Committee was replaced with a Multi-Municipal Environmental Advisory Council (EAC). The EAC consists of 4 residents from the Borough of Emmaus and 4 residents from Upper Milford Township. The Chairperson during 2007 was Dr. William H. Ahlert, Upper Milford Township. The EAC held regular meetings on the 4th Monday of each month during the year. The meetings are held at each municipal building on alternating months at 7:00 p.m. The last meeting of 2007 was not held due to the holidays.

The EAC was very active during the year and sponsored or co-sponsored the following events:

- Watershed Awareness Day – May 16, 2007
  18 presenters on water/environmental related topics to 600-700 8th grade students of East Penn School District

- Earth Day Cleanup – April 21, 2008
  75 volunteers cleaned up roadways in the Emmaus Borough and Upper Milford Township

Additionally, the EAC presented educational materials, including demonstrations of a ground water model and a stream erosion model, to residents at the Farmers Market throughout the summer, Heritage Days, Memory Days, and the Annual Vera Cruz

A Community United for Progress
www.borough.emmaus.pa.us

Homecoming at Mystic Chain Park. The EAC published articles in the East Penn Press and the Borough of Emmaus newsletters as well.

The EAC has been active in attending regional EAC meetings that were held at the Lehigh County Planning Commission and at Liberty High School to network with other EAC's in Lehigh and Northampton Counties.

A storm drain stenciling program is also underway in the Borough to spray paint a "DO NOT POLLUTE" message on the surface of all inlets.

As you are aware, the existing Wellhead Protection Plan resulted in primarily educational management recommendations due to the lack of accurate data relating to well zones and recharge rates. There has been some interest from the EAC in securing additional funding to improve the accuracy of the Wellhead Protection Plan. Please contact me so we can discuss this.

I trust that this information will satisfy the 2007 update for the Wellhead Protection Plan. If you have any questions, I can be reached at 610-965-9288.

Sincerely,

Jeffry D. Clapper
Public Works Director
JDC/rgf

Cc: Emmaus Borough Manager
Emmaus Council Members
Upper Milford Township Manager
Upper Milford Township Supervisors
EAC Members
✓ File

3900-FM-WM0098 9/2001

Date Received _____

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT

ANNUAL WELLHEAD PROTECTION PROGRAM UPDATE

THIS FORM SHOULD BE COMPLETED IN ORDER TO MAINTAIN APPROVED STATUS OF A WELLHEAD PROTECTION PROGRAM.

REPORT FOR CALENDAR YEAR: JAN. 1 TO DEC. 31, 2007 (Fill in ***previous*** year)

RETURN BY **MARCH 31** TO THE WATER SUPPLY REGIONAL MANAGER AT THE REGIONAL OFFICE THAT SERVES YOUR COUNTY (See list on page 2)

1. System Name Borough of Emmaus		**2. System Address** 28 S. 4th St. Emmaus, PA 18049
3. PWSID# 3390032	**4. Municipality** Emmaus	**5. System Phone #** 610-965-9288
6. Source ID(s) # / Well ID(s) # Well 1 #8806 - Well 2 #8807 - Well 3 #8808 Well 4 #8809 - Well 6 #8811 - Well 7 #8812		**8. County** Lehigh
8. Contact Person Name Jeffry D. Clapper		**9. Contact Person Address** Same as above
10. Contact Person Phone # Same as above		**11. E-mail Address** JClapper@borough.emmaus.pa.us

Please answer the following questions as completely as possible, and include additional pages if necessary.

1. **List any major changes in groundwater withdrawal, including new or abandoned sources.**
   Reduction of total withdrawal (-300,000+- gal/day) due to improved leak detection program.

2. **Please describe any land use changes within the wellhead protection area.**
   None

3. **List any new contaminant sources including the type, amount, and distance from each water source. Locate the contaminant source(s) on a map as well as the water source and attach to this form.**
   None

4. Include any contaminant sources that are no longer a threat to the water supply. Please explain. Locate the contaminant source(s) on a map and please attach to this form.

None

5. Describe resources that have been applied to the wellhead protection program (budget items, in-kind sources, materials, etc.).

Emmaus Borough and Upper Milford Township provide financial support and meeting spaces as needed for the EAC.

6. Are you complying with your management implementation schedule? ☒ Yes ☐ No
If not, please explain:
Describe any management techniques that have been implemented.

7. Include future plans and implementation dates for the upcoming year.

Similar educational outreach and functions as 2007.

8. Signature	9. Title	9. Date
	Public Works Director Borough of Emmaus	2/7/08

DEP REGIONAL OFFICES

Northwest Region - WSM 230 Chestnut St. Meadville, PA 16335-3481 814-332-6899 ***Counties:*** *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*	**Northcentral Region - WSM** 208 W. Third St., Suite 101 Williamsport, PA 17701 570-327-3636 ***Counties:*** *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*	**Northeast Region - WSM** 2 Public Square Wilkes-Barre, PA 18711-0790 570-826-2511 ***Counties:*** *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming*
Southwest Region - WSM 400 Waterfront Drive Pittsburgh, PA 15222-4745 412-442-4217 ***Counties:*** *Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and*	**Southcentral Region - WSM** 909 Elmerton Ave. Harrisburg, PA 17110 717-705-4708 ***Counties:*** *Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York*	**Southeast Region - WSM** Suite 6010, Lee Park 555 North Lane Conshohocken, PA 19428 610-832-6060 ***Counties:*** *Bucks, Chester, Delaware, Montgomery and Philadelphia*

3800-FM-WSM0099 3/2000

Date Received _____

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER SUPPLY MANAGEMENT

ANNUAL WELLHEAD PROTECTION PROGRAM UPDATE

THIS FORM SHOULD BE COMPLETED IN ORDER TO MAINTAIN APPROVED STATUS OF A WELLHEAD PROTECTION PROGRAM.

REPORT FOR CALENDAR YEAR: JAN. 1 TO DEC. 31, 2007 (Fill in ***previous*** year)

RETURN BY **MARCH 31** TO THE WATER SUPPLY REGIONAL MANAGER AT THE REGIONAL OFFICE THAT SERVES YOUR COUNTY (See list on page 2)

1. System Name Borough of Emmaus		**2. System Address** 28 S. 4th St. Emmaus, PA 18049
3. PWSID# 3390032	**4. Municipality** Emmaus	**5. System Phone #** 610-965-9288
6. Source ID(s) # / Well ID(s) # Well 1 #8806 Well 2 # 8807 - Well 3 #8808 Well 4 #8809 - Well 6 #8811- Well7 #8812		**8. County** Lehigh
8. Contact Person Name Jeffry D. Clapper		**9. Contact Person Address** Same as above
10. Contact Person Phone # Same as above		**11. E-mail Address** JClapper@borough.emmaus.pa.us

Please answer the following questions as completely as possible, and include additional pages if necessary.

1. List any major changes in groundwater withdrawal, including new or abandoned sources.

Reduction of total withdrawal (-300,000± gal./day)
due to improved leak detection program.

2. Please describe any land use changes within the wellhead protection area.

None

3. List any new contaminant sources including the type, amount, and distance from each water source. Locate the contaminant source(s) on a map as well as the water source and attach to this form.

None

4. Include any contaminant sources that are no longer a threat to the water supply. Please explain. Locate the contaminant source(s) on a map and please attach to this form.

None

5. Describe resources that have been applied to the wellhead protection program (budget items, in-kind sources, materials, etc.).

Emmaus Borough and Upper Milford Township provide financial support and meeting spaces as needed for the EAC.

6. Are you complying with your management implementation schedule? ☒ Yes ☐ No
If not, please explain:
Describe any management techniques that have been implemented.

7. Include future plans and implementation dates for the upcoming year.

Similar educational outreach and functions as 2007.

8. Signature	9. Title	9. Date
	Public Works Director Borough of Emmaus	2/5/08

DEP REGIONAL OFFICES

Northwest Region - WSM 230 Chestnut St. Meadville, PA 16335-3481 814-332-6899 ***Counties:*** *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*	**Northcentral Region - WSM** 208 W. Third St., Suite 101 Williamsport, PA 17701 570-327-3675 ***Counties:*** *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*	**Northeast Region - WSM** 2 Public Square Wilkes-Barre, PA 18711-0790 570-826-2511 ***Counties:*** *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming*
Southwest Region - WSM 400 Waterfront Drive Pittsburgh, PA 15222-4745 412-442-4217 ***Counties:*** *Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland*	**Southcentral Region - WSM** 909 Elmerton Ave. Harrisburg, PA 17110 717-705-4708 ***Counties:*** *Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York*	**Southeast Region - WSM** Suite 6010, Lee Park 555 North Lane Conshohocken, PA 19428 610-832-6059 ***Counties:*** *Bucks, Chester, Delaware, Montgomery and Philadelphia*

Pennsylvania Department of Environmental Protection

2 Public Square
Wilkes-Barre, PA 18711-0790
January 22, 2008

Northeast Regional Office

570-826-2511
Fax 570-830-3016

CERTIFIED MAIL NO. 7007 0710 0000 4381 6912

Mr. Jeffry D. Clapper
Public Works Director
Emmaus Borough Public Water
Emmaus, PA 18049

Re: Wellhead Protection Program
Source Water Protection Plan
2007 Annual Update Form Request

Dear Mr. Clapper:

The Pennsylvania Department of Environmental Protection (PA DEP) is sending this letter to the Emmaus Borough Public Water, Source Water Protection Committee, to inform the steering committee that the source water protection plan annual update form must be submitted back to PA DEP. This annual update form is enclosed with this letter and should be completed by the steering committee and submitted back to our office by March 31, 2008. This annual update form was also sent to the steering committee chairperson, Mr. Clapper, in June 2006 explaining this process along with the approval letter for the source water protection plan. The update form is for the Emmaus Borough Public Water, Public Water Supply Identification No. 3390032, well sources 1, 2, 3, 4, 6, and 7.

The annual update form should be filled out completely and no spaces should be left blank. Additional paper may be used if there is not enough room available on the form. The PA DEP is asking for the steering committee to look over the original source water protection plan that was prepared by Alexander Ulmer, Professional Geologist No. PG-001720-G, from Barry Isett & Associates, Inc., Trexlertown, PA, the January 25, 2006 Report Forward (6 pages and 2 maps) prepared by the Emmaus Borough Public Water, Wellhead Protection Steering Committee, added to the front of the original July 25, 2004 Wellhead Protection Plan, and any previous update(s) to see if anything in the plan has changed. If anything has changed since the plan was developed or updated, please document the new information on the annual update form. The PA DEP is not requiring the steering committee to hire a consultant to complete this form. The form can and should be filled out by someone who is familiar with the source water protection plan and the local community. Also, the steering committee should see if the management strategy is applicable for local community current needs.

The PA DEP would also like to know the date(s) of the last steering committee meeting(s) and know how public participation and education was done since last year's annual update. The importance of continuing meetings, public education/outreach, and source water area management is critical and should not be overlooked. An active protection program reduces the risk of source water contamination to the water system. The more active a source water plan is, the less chance that contamination can occur.

If the PA DEP does not receive this annual update form back to the PA DEP, Watershed Management Program, 2 Public Square, Wilkes-Barre, PA 18711 office, the PA DEP will consider the source water protection plan for the Emmaus Borough Public Water to be inactive. Also, the source water plan still must be in accordance with the Pennsylvania Safe Drinking Water Regulations (25 Pa. Code § 109.713), regarding source water protection.

Just to let you know, the PA DEP has received Emmaus Borough Public Water 2006 annual update form. The PA DEP would like to congratulate Emmaus Borough Public Water on all your work in 2006, especially:

1) Forming an Environmental Advisory Council (EAC);
2) Publishing articles in local newspaper;
3) Having an environmental education booth at local farmers market; and
4) Holding an Environmental Awareness Day in May 2006.

Finally, it is highly recommended that the 2006 annual form and the 2007 annual update form (the one you are filling out now) be added to the original source water plan and report forward. This will allow the original source water plan developed two years ago be current.

If you should have any questions, please feel free to contact Andrew Augustine of my staff at 570-830-3101.

Sincerely,

William J. Manner
Program Manager
Watershed Management Program

Enclosure: Annual Wellhead Protection Program Update Form

REPORT FOREWORD

Borough of Emmaus
Wellhead Protection Plan

In October 2004, the Borough of Emmaus submitted this plan to DEP for approval. On September 7, 2005 review comments were received by DEP relating to the submitted plan. On December 19, 2005, DEP Representatives, Bill Manner and Andrew Augustine met with the Borough of Emmaus to discuss the review comments. It was determined during that meeting that addressing the comments in a foreword appended to the report would best identity these comments for future readers.

This foreword lists the review comments and a brief narrative relating to each comment. Additionally, the individual pages in the report where the review comments apply are marked with a reference to the report foreword.

Review Comment No. 1

Section 1, Introduction and Background

First page, last paragraph must include the following:

- The words "public participation and" in line #2 before the wording "public education".
- The words "Zone III" in line #3 discussing delineation of Zone I and II.

Review Comment No. 2

Section 1, Introduction and Background

Second page, second to last paragraph, titled "Land Description":

The watershed that contains these wells is also located within a part of the City of Allentown (near 31st Street and Little Lehigh Creek). Also, the maximum elevation within southeastern Emmaus Borough is 800 feet near Suamme Camp.

Review Comment No. 3

Section 2, Steering Committee & Public Relations

This section shall include the chairperson's phone number. This section shall also include a description of roles and responsibilities of the Steering Committee.

- The chairperson for the Steering Committee was William Ahlert, resident of Upper Milford Township. His office phone number is 610-740-1010.

- The Steering Committee members worked as a group to review the material submitted by the engineer to be included in the report. The Steering Committee completed this report after a final draft was given to them by the engineer in February 2004.

Review Comment No. 4

Section 3, SWP Area Delineation

Figure 7, Zone II Delineation for Wells
This map must be enlarged to a scale of 1:24,000 or better detail.

- An enlarged delineation map is inserted inside front cover of report.

Review Comment No. 5

Section 3, SWP Area Delineation

Page 34, Calculated Fixed Radius Method
The "H=open interval or length of well screen" is misinterpreted as open borehole of the well minus the casing. It is actually the saturated aquifer thickness, which may include part of the cased borehole interval. To calculate the saturated aquifer thickness, the depth of water below ground surface must be known. This corrected calculation can be seen in two United States Geologic Surveys, Water-resources Investigations reports #99-4047 and #02-4271, which are specifically written for bedrock aquifers in Pennsylvania. The cover pages and appropriate text from the two reports are included for your reference.
Table 6 "Hydrogeologic Properties for the Emmaus Public Supply Wells" has Maximum Permitted Pump Rate volumes that do not agree with the well information in Appendix 7. The pump rate in cubic feet per day listed in Table 6 when converted by 7.48 gallons per cubic foot does not equal the appendix 7 volumes. Also, the Maximum Permitted Pump Rate quantity should be listed as cubic feet per day not feet per day.

Review Comment No. 6

Section 3, SWP Area Delineation

Page 35, Simplified Variable Shape Method
This method should use the saturated thickness of the aquifer, not the entire aquifer thickness or total length of the borehole, unless the entire borehole and/or aquifer is completely saturated.

Review Comment No. 7

Section 3, SWP Area Delineation

Page 37, Mass Balance Equations

The average annual ground water recharge value interpreted from the R.E. Wright Associates, Inc. 1992 report is not applicable for the mass balance equation. The recharge rate of 830,000 gpd/sq. mi. for the Hardyston Quartzite (sandstone) and the recharge rate of 990,000 gpd/sq. mi. for the Leithsville or Allentown Formations (carbonate or dolomitic limestone) is too high. The rates should be lower than stated, because the 830,000 gpd/sq. mi. and 990,000 gpd/sq. mi. rates used from the R.E. Wright study, table 6-6 page 6-39 includes groundwater evapotranspiration. It is the DEP's opinion that the groundwater recharge rate should be lower. The DEP recommends a conservative (drought year) Estimated Annual Baseflow Rate of 350,000 gpd/sq. mi. for the Hardyston Quartzite (sandstone) and 650,000 gpd/sq. mi. the Leithsville or Allentown Formations (carbonate or dolomitic limestone). A non-conservative Estimated Annual Baseflow Rate would be 640,000 gpd/sq. mi. for the Hardyston Quartzite (sandstone) and 840,000 gpd/sq. mi. the Leithsville or Allentown Formations (carbonate or dolomitic limestone). These values are from the same R.E. Wright Associates, Inc. 1992 study, table 6-6 that you have referenced, but using the baseflow values not groundwater recharge rate, which includes evapotranspiration.

These lower values that the DEP is recommending are similar to the ones that are referenced in the 1995 Meiser and Earl, Inc., Borough of Emmaus well 6 and 7 study that are incorporated in the Emmaus Borough Wellhead Protection Plan, which is part of this review. For example, the 1995 Meiser and Earl, Inc. study (well 6, page 10) used a carbonate recharge value of 0.67 gpm/acre or 617,472 gpd/sq. mi.

The DEP does not agree with calculating the mass balance equation for wells 1 and 2 separately. The pumping rate for wells 1 and 2 should be combined, because both of these wells could be run at the same time, which would produce a larger source water area.

Review Comment No. 8

Section 3, SWP Area Delineation

Calculation Summary

The DEP understands that the Source Water Protection grant agreement stated that the 1995 Meiser and Earl, Inc. studies for wells 6 and 7 and the Environmental Protection Agency's (EPA) – DEP's default radius of 0.5 mile will be used for the completion of the Emmaus Borough Wellhead Protection Plan. Andrew Augustine, DEP, did state at a February 14, 2002 meeting with Emmaus Borough Public Water and Barry Isett and Associates, Inc. (BIA) at BIA offices that the default wellhead protection 0.5 mile radius would be acceptable, but Augustine asked that supplemental calculations be run to develop a second opinion of the source water area in the Emmaus area. The DEP is requesting the above comments be incorporated into the revised Emmaus Borough Public Water Wellhead Protection Plan but still allow the 0.5 mile default radius and/or the Meiser and Earl, Inc. study area as the wellhead protection area. The DEP is requesting that the wellhead protection plan state that the new calculations show that the wellhead protection area could be larger, but the 0.5-mile default and the Meiser and Earl, Inc. study is the recognized wellhead protection area.

Review Comment No. 9

Section 3, SWP Area Delineation

Zone I for Wells 6 and 7

The DEP is requiring the Borough of Emmaus to meet all standards in DEP's regulation, Chapter 109.603. (b) regarding Zone I for wells 6 and 7. Chapter 109.603. (b) refers to owning or controlling the land, potential contaminant usage, etc. The Zone I are not required because wells 6 and 7 were permitted before October 9, 1995 but since the water supplier is requesting DEP approval of a wellhead protection plan, including a Zone I area(s), the DEP is requiring Zone I standards to be met. The water supplier has the option to drop the Zone I classification from the wellhead protection plan, since the sources were permitted before October 9, 1995. Also, the Zone I values for wells 6 and 7 are not correct. The values should be 453 feet for well 6 and 430 feet for well 7, even though the maximum Zone I value could be 400 feet. The different result is because the saturated aquifer thickness should be used, as discussed above in the paragraph called "Calculated Fixed Radius Method page 34". Again, the DEP is allowing the option that the water supplier not recognize the Zone I areas or get the recognition of the Zone I areas but meet all standards of Chapter 109.603. (b) regulations.

Review Comment No. 10

Section 4, Contaminant Source Inventory and Discussion

Figure 9, Potential Contaminant Source Map

Map should be produced at a scale size of 1:24,000 or a better detail.

There is no detailed conclusion as to what are the major potential pollution source activities to the area. The DEP SWAP Report section in Section 4 of the wellhead protection plan did discuss the "most obvious threats," such as the former Rodale Manufacturing site, fire training grounds, and PA Turnpike, but also had vague activities discussed in Section 4, such as commercial/industrial activities along Broad and Lehigh Streets. The DEP is requesting to have a specific list of activities to follow up on. This is indirectly required because it is required to document that sources were targeted for or provided education regarding potential risks to the water supply. It would be impractical to target all pollution activities found for education, so that is why a selective major group list of activities is needed. The activities targeted for follow up education are entirely up to the Steering Committee. The DEP also recommends that this may be the time for the Steering Committee to start approaching the identified potential pollution activity owners to find out what is the true pollution threat at the site, because most of the assessment was done as a windshield survey and/or control practices at an activity may not be known.

- An enlarged Potential Contaminant Source Map is inserted inside front cover of report.
- The potential contaminant sources listed in this report are only listed as general information. The Borough of Emmaus has formed an Environmental Advisory Council with Upper Milford Township. This Council is working on further classification, remediation, and education of the potential contaminant sources.

Review Comment No. 11

Section 5, WHP Area Management and Commitment

There is no specific management method stated that will be done for the Emmaus wellhead protection area. There are five different land uses discussed with over twenty different management options but it was not stated that any of the options discussed would be implemented. A table must be provided that lists management options for identified threats. The activities that require management options can be found in the major group list discussed in Section 4, which is not complete yet. When the management options are finally chosen, they must be appropriate to the delineated source water area. The management options should have the cost to do the management activity, where the funding will come from, and have a schedule for implementation. This management option is also discussed in the Wellhead Protection Plan, DEP SWAP Report, page 1, Potential for Release section; the plan states "After SWAP rankings are complete for a potential contaminant source inventory list, measures should be implemented to protect the water supply wells from contaminates from sites with high rankings".

- The Borough's Environmental Advisory Council is responsible for continuing identification and/or remediation of the potential contaminant sources, as well as implementing the management options listed in this report. The Council is organizing its efforts toward these goals.

Review Comment No. 12

Section 6, Emergency/Contingency Planning

The Emergency Response Plan (ERP) should list the volatile organic chemical (VOC) removal system as treatment, along with spare parts available and manufacture/supplier. The VOC treatment should be listed on a separate sheet and added to section 3.3.B. in the ERP.

Section 3.4 "Description of Surrounding Area" includes gas stations, farms, bulk fuel storage and pipeline, railroads, turnpike, local roadways. Are these potential sources of contamination that are considered the activities targeted for follow up education as outlined in Section 4 above?

The ERP should have a contact for a bulk water supply truck/hauler. A bulk water supply truck/hauler is required as per PA DEP Chapter 109.713(6), because of the following:

- It is required to have arrangements for bulk hauling as stated in the DEP Checklist for Minimum Elements for Local WHP Program form.
- The water system does not have a water source(s) outside the identified source water area/watershed; all sources are located in the same aquifer and located less than 3 miles apart.
- The water supply has two interconnects with the City of Allentown, but the interconnects need to be rebuilt to be functional. The DEP does recommend to research the possibility of restoring the interconnect(s) from Allentown to provide an alternate water source to Emmaus.

The ERP should address where the bulk water will be provided and have contingency to prevent freezing in the winter season. All the bulk water information should be listed

in section 5.2.A. of the ERP. The DEP is not requesting to purchase a bulk water supply truck, etc., only to have a documented procedure to schedule a bulk water supply in an emergency.

- The emergency response plan has been revised to include this comment.

Review Comment No. 13

Section 6, Emergency/Contingency Planning

Section 6, Emergency Measures

This section lists anticipated emergency events and descriptions of how to handle each listed situation. The "Prolonged Water Outage" description should be moved between the Source Pump Failure and Tank Leaks, per the outlined list. The paragraph is out of order that the index is in.

- The emergency response plan has been revised to include this comment.

Review Comment No. 14

Section 6, Emergency/Contingency Planning

Last page, New Sources

A plan must be completed, which describes a plan for a new well source(s). The new well source planning must include the following:

- List potential sites
- Describe existing land use(s)
- Describe predicted Zone I area
- Describe how to obtain access and rights to areas if necessary
- Describe how the area will be protected

The DEP is not requiring the water supplier to conduct a hydrogeologic study and/or drill a new well(s). The DEP is requiring the water supplier to review the contaminant source inventory to find future new source locations that has a low pollution risk and in a different aquifer or up gradient of pollution sources. This new source plan is a "wish list"; if the water supplier had the resources to add a new source(s), where would it be that is physically practical?

- The Borough of Emmaus is currently working on establishing water system interconnections with the City of Allentown and Lehigh County Authority. It has been determined by the municipal engineer that the interconnections are the most economical choice for new sources at this time. Both water systems provide good quality drinking water which can provide the Borough with additional drinking water.

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Introduction and Background

The Emmaus Water Department provides drinking water to approximately 4,800 households and businesses in the Borough and neighboring communities. Water is pumped from six municipal supply wells and disinfected with chlorine before it is distributed to consumers.

Several of the Emmaus wells have been impacted by groundwater contamination. Volatile organic carbon compounds (VOCs) have been found in all but one of the Emmaus municipal supply wells. The Borough treats the contaminated water with VOC removal systems.

To protect its wells from new sources of contamination, the Borough of Emmaus initiated a Wellhead Protection (WHP) Study in accordance with the Pennsylvania Department of Environmental Protection's (PA DEP's) Wellhead Protection Program. The purpose of the Wellhead Protection Plan is to:

1. Clearly identify potential sources of contamination to the wellheads.
2. Allow Emmaus to effectively educate the public on the importance of their drinking water source.
3. Serve as the first step for long-term sustainable planning for the future of the community.
4. Provide a comprehensive action plan in case of an emergency.

Development of a WHP program is voluntary. However, the DEP encourages communities throughout Pennsylvania to establish wellhead protection programs, which include the following:

1. The formation of a steering committee to establish and implement the wellhead protection program. Their role, in conjunction with the Borough of Emmaus, is to conduct a potential contaminant source inventory, provide options for the management of the WHP area, seek public input into the creation of the WHP plan, seek approval of the WHP program, and implement the WHP program.
2. Development of a public education program.
3. Delineation of the Zone I and II WHPA.
4. Identification of potential contamination sources within the wellhead protection area.
5. Development and implementation of wellhead protection area management options to protect the water sources.
6. Development of a Contingency Plan for alternative water supply sources, in the event the groundwater supply becomes contaminated, and emergency response planning for incidents that may impact water quality.

See Review Comment No. 1 in Report Foreword

7. Conduct new water source planning to insure the protection of new water source locations and to augment current supplies.

The focal point of a WHP program is the delineated Wellhead Protection Area (WHPA). The Safe Drinking Water Act defines a wellhead protection area as the surface and subsurface area surrounding a well or wellfield supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield. The DEP Safe Drinking Water Regulations define a three-tiered WHPA as follows:

- **Zone I** - The protective zone immediately surrounding a well, spring, or infiltration gallery which shall be 100 to 400 feet in radius depending on site-specific source and aquifer characteristics.
- **Zone II** - The zone encompassing the portion of the aquifer through which water is diverted to a well or flows to a spring or infiltration gallery. Zone II shall be a ½ mile radius unless a more detailed delineation is approved.
- **Zone III** - The zone beyond Zone II that contributes significant surface water and groundwater to Zone I and Zone II.

The Emmaus Water Department will submit an Annual Wellhead Protection Program Update form (DEP 3900-FM-WM0098 9/2001) to the DEP by March 31st of each year to ensure that this plan remains current.

Land Description

All six public supply wells are located within the Borough of Emmaus. However, the watershed that contains these wells is located in the Borough of Emmaus, Upper Milford Township, Salisbury Township, and Lower Macungie Township (see Figure 1). The Borough and Townships are all located in the south-central part of Lehigh County, Pennsylvania.

Borough of Emmaus

The Borough of Emmaus ("Emmaus") is located in a valley flanked by the ridges of the South Mountain to the south and east. The Little Lehigh Creek partially bounds the Borough to the north. The Borough is located on gently sloping lowland. Leibert Creek, with headwaters in Upper Milford Township, flows from the south through Emmaus until it converges with the Little Lehigh Creek at the northwestern corner of the Borough. Elevations range from approximately 520 ft. near South Mountain to approximately 350 ft. along the northwestern and northeastern corners of the Borough. The central section of the Borough is located along a topographic high point (450 ft.) which grades moderately down in all directions (USGS, Allentown West and East Quadrangle Maps).

See Review Comment No. 2 in Report Foreword

Upper Milford Township

Upper Milford Township ("Upper Milford") is located along both the western and southern edges of the Borough of Emmaus. The most notable topographic feature of Upper Milford is South Mountain. Leibert Creek flows south through the water gap in the South Mountain in a northerly direction into Emmaus. The ridges grade steeply down into the valley areas. Elevations range from approximately 920 ft. at the top of South Mountain (at the east side of the water gap) to approximately 350 ft. along the western edge of the Township along the Leibert Creek.

Salisbury Township

The section of Salisbury Township ("Salisbury") that is of interest in this study is demarcated by South Mountain, the most notable ridge in the watershed. Elevation ranges from approximately 1,000 ft. at the top of the mountain to approximately 450 ft. at the western flank of the mountain. This section of Salisbury is primarily an environmentally protected zone, with some sparse residential development on the ridge. The slopes are steeply sloping to abrupt (near Overlook Springs area).

Lower Macungie Township

Only a very limited section of Lower Macungie Township ("Lower Macungie") is of interest in this study. This area is along the northwestern tip of Emmaus where Well No. 7 is located. This section of Lower Macungie is gently sloping lowland. The Little Lehigh Creek flows through this section of Lower Macungie. Topographic elevations range from approximately 350 ft. (near Well No. 7) to approximately 400 ft.

Climate

The climate in the study area is temperate with relatively high humidity. Precipitation is nearly evenly distributed throughout the year, with slightly more in July and August than in other months. The 1951-80 normal precipitation at the Lehigh Valley International Airport is 44.31 in./yr. January is the coldest month; the 1951-80 average annual temperature for January is 27.3 °F. July is the warmest month; the 1951-80 average annual temperature for July is 73.9 °F (Sloto *et al.*, p. 5).

Physiography

The study area, including the Borough of Emmaus, is located primarily in the Great Valley Section of the Valley and Ridge Province. The Reading Prong Section of the New England Province lies directly to the south of Emmaus; Upper Milford lies within this New England Province.

Great Valley Section

The Great Valley is an almost continuous valley from New York to Georgia. It is divided into two belts, with different geologic and topographic features. One belt, which is located outside the study area, is underlain by Ordovician age shales, siltstones, and sandy beds. Topography is characterized by rolling hills and well-developed drainage. This terrain is usually 100 to 150 ft. higher than the adjacent limestone due to its greater resistance to erosion (Geyer and Bolles, p. 353).

The second belt, which includes most of the study area, is underlain by Cambrian and Ordovician age limestones and dolomites. The resultant topography is characterized by low, flat, gently rolling terrain; the low relief is due entirely to the solubility of the thick sequence of carbonate rocks (Geyer and Bolles, p. 353-354). Elevations are commonly 400 to 500 ft. within this belt (Schultz, p. 346). Disappearing streams, sinkholes, and caves are typical karst topographic features (Geyer and Bolles, p. 353-354).

Minor variations in lithology, within the shale and carbonates described above in the separate belts, produce linear ridges. Sandy units within the shale stand out, and cherty and silicified units in the carbonates also remain above the adjacent, more soluable units. Drainage density is low on the carbonates but relatively high on the shales, because precipitation seeps below the surface of the carbonates into solution passages. Runoff moves considerable distances underground to reemerge in springs. In contrast, on the relatively impermeable shales, a higher percentage of precipitation runs off directly on the surface.

Reading Prong Section

Geyer and Bolles offer the following description for the Reading Prong: "This region is deeply dissected mountain range. The local relief is as great as 500 ft., and the ridge summits rise more than 800 ft. above the Great Valley. The Reading Prong is represented by an east-west-trending belt of ridges that range from 6 to 8 miles in width and extend from the Delaware River to the Schuylkill River in the vicinity of Reading. South Mountain is the most prominent topographic feature. The hills and ridges are composed principally of Precambrian metamorphic and igneous rocks, minor amounts of Cambrian quartzite, and Precambrian Limestone."

Water System Description and Source Characteristics

History and Service Area

The first water system within the Borough of Emmaus was established in 1871. This system was a series of pipes connecting springs located on South Mountain. The spring water was distributed to customers through small diameter distribution piping. In 1927, two wells were drilled at the site of the existing "Main Pumping Station" location at Klines Lane and Minor Street. In subsequent years, the spring connections were abandoned, other wells were drilled, and series of water mains were installed to create the current system.

Today, the Emmaus Borough Water System [PWSID No. PA 3390032] provides water service to approximately 4,800 customers in Emmaus Borough and surrounding areas, including portions of Salisbury Township (201 customers), Upper Milford Township (181 customers) and Lower Macungie Township (9 customers), with a system-wide average daily demand of 1.531 million gallons. The water system is managed by the Emmaus Water Department, which is a branch of the Borough's Public Works Department.

Groundwater Wells

The Emmaus Borough Water System is supplied by groundwater pumped from six wells located in and around the municipal boundaries of the Borough (see Figure 1). Wells 1 and 2 are located at Klines Lane and Minor Street. Well 4 is located at Glenwood Street and Mountain Boulevard. Well 6 is located at Shimerville Road and South 15th Street. Well 7 is located at Macungie Avenue and Orchid Place. Groundwater is treated by two methods: (1) the water from Wells 1, 2, 4, and 7 is treated by an aeration process to remove volatile organic chemical contaminants, and (2) chlorine is added to the water supply at all individual well locations for disinfection.

Well 3, located at South 10th and Broad Street, is currently not in service due to chemical contamination. In 1988, the Borough abandoned Well 5, which was located at North 6th Street and Berger Street, because of chemical contamination. The source of contamination for both these wells is the Rodale Manufacturing/Square D Superfund site.

Well No. 6 is located along Leibert Creek, just north of Shimerville Road, within the southern end of the Borough of Emmaus, Lehigh County, Pennsylvania. The well is in the Great Valley Physiographic Section of the Ridge and Valley Province, approximately 500 ft. from the Reading Prong Section of the New

England Province, according to Figure 5-1 in the JPC "Wellhead Protection Demonstration Project" report December 1992 (Meiser & Earl, 1995).

The Emmaus Borough Water Department is constantly striving to maintain high quality drinking water and an adequate supply that meets all regulatory requirements. Past projects have included the upgrading of five of the Borough's six wells; the most recent upgrade was completed in June 1999.

Source Water Quality

The Emmaus Water Department conducts water quality sampling of all municipal supply wells in accordance with DEP regulations. This section provides a brief overview of water quality data provided by Mr. Jeff Clapper on May 27, 2003.

Inorganic Parameters

The Emmaus Water Department collects samples for inorganic parameters approximately once every three years. Antimony, arsenic, barium, beryllium, chromium, cyanide, fluoride, mercury, nitrate, nitrite, selenium, silver, and thallium were not detected above the MCL in any samples.

The MCL was exceeded for cadmium (Well 4, 0.006 mg/L on 3/5/1994) and lead (100 N. 6th Street, 0.017 mg/L on 9/5/1980) one time for each parameter.

Regulated VOCs

The water department regularly samples the supply wells for VOCs. Only two parameters, tetrachloroethylene (a.k.a. perchloroethylene or PERC) and trichloroethylene (a.k.a. TCE) have been detected above the MCL. A third parameter, *cis*-1,2-dichloroethlyene (a.k.a. *cis*-1,2-DCE) is regularly detected but not above the MCL.

Tetrachloroethylene is regularly detected above the MCL of 0.005 mg/L in the raw water from Well 4. After treatment, this parameter is not detected above the laboratory detection limit of 0.0005 mg/L. This parameter is also detected in the raw water from Well 7, although generally at concentrations lower than the MCL.

Trichlorotheylene is regularly detected above the MCL of 0.005 mg/L in the raw water from Wells 1, 2, 3, 4, and 7. After treatment, this parameter is not detected above the laboratory detection limit of 0.0005 mg/L.

Unregulated Parameters

The water department also samples for several unregulated parameters, including perchlorate; 2,4-dinitrotoluene; 2,6-dinitrotoluene; acetochlor; DCPA; 4,4'-DDE; EPTC; molinate; and terbacil. None of these parameters were detected above the laboratory detection limit.

Disinfection Byproducts

Total trihalomethanes (TTHMs) are measured regularly in the Emmaus water system. After 1985, TTHMs were not detected above the MCL of 0.1 mg/L.

Water System Demand

The water department currently meets water supply demands for its customers. Available water exceeds demand. Currently the Borough Wells have the capability of producing 3.3 MGD and average consumption is 1.5 MGD.

Current Land Use

The land use in the Borough of Emmaus is predominantly residential with smaller amounts of commercial, industrial, park and recreation, public, agricultural, and open land. A Conservation District with minimal development exists on South Mountain in Upper Milford Township. The balance of existing land use in Upper Milford Township is residential and agricultural. The older homes are on small lots, most of which could not accommodate a replacement on-site treatment system. Recent development is on larger (1.25 acre) lots. The Vera Cruz area is a village with some commercial development. Upper Milford Township is largely agricultural and residential.

Previous Studies

A detailed hydrogeologic study was prepared by Meiser & Earl in 1995 for Wells 6 and 7. BIA conducted a thorough review of this study and used their WHP zones for Wells 6 and 7 for this study. Several example wellhead protection reports were reviewed, including the Borough of Telford WHP and RKR Hess Wellhead Protection Demonstration Project. A wellhead protection ordinance for the Borough of Kutztown was also reviewed as part of this study. A brief summary of these reports, detailing the relevance to this current-day Emmaus WHP study, is included below.

Meiser & Earl

Meiser & Earl prepared a detailed WHPA Delineation of the Borough of Emmaus public supply Wells 6 and 7 for the Joint Planning Commission of Lehigh and Northampton Counties in September 1995. These reports included a delineation of Zones I, II, and III. Most of the data used for the calculations were from

published sources. However, Meiser & Earl also used data from pump tests performed on the wells, as well as physical data of the wells (*i.e.,* depth of wells, depth of casing, etc.). The geologic data used in the calculations, from both published sources and from actual data from the municipal supply, does not vary with time. Although the pump rate can change, Meiser & Earl used relatively conservative pump rates. BIA determined the wellheads delineated by Meiser & Earl for Wells 6 and 7 are acceptable and adapted these wellhead protection zones as part of this study. A more detailed explanation and analysis of the Meiser & Earl report is included in Section 3.1.

Borough of Kutztown WHP Ordinance

The wellhead protection ordinance for the Borough of Kutztown (Berks County) established a wellhead protection overlay district for the purpose of protecting groundwater supplies. The ordinance regulates land use within the overlay district, specifies reporting requirements for certain regulated land uses within the overlay district, and established the means for enforcement.

Borough of Telford WHP Plan

The Borough of Telford's wellhead protection report included background about the plan guidelines and regulations, delineation of the wellhead protection zones, a contaminant source inventory, description of the steering committee, and recommended plan.

Joint Planning Commission/RKR Hess Wellhead Protection Demonstration Project

The Lehigh-Northampton County Joint Planning Commission and RKR Hess prepared a Wellhead Protection Demonstration Project under contract with the Environmental Protection Agency. This project was completed in December 1992. The goal of this project, as stated in the final report, was "to assure continuing water supply viability of Lehigh-Northampton Counties wells through integration of existing state regulatory programs for specific contaminant sources with new municipal regulatory initiatives and enhanced continuity between state and local enforcement responsibilities." The major elements addressed in this report included a listing of major groundwater contaminant sources, a contaminant source inventory, application of a geographic information system, environmental landscape classification system (physiography and geology), wellhead protection delineation methodologies, example wellhead protection area delineation for four selected well sites, an example wellhead protection model ordinance, wellhead protection supplemental initiatives (WHPA management options), water supply contingency planning, educational initiatives, and recommended enhancements to the Lehigh-Northampton County wellhead protection program.

Summary of Example Reports

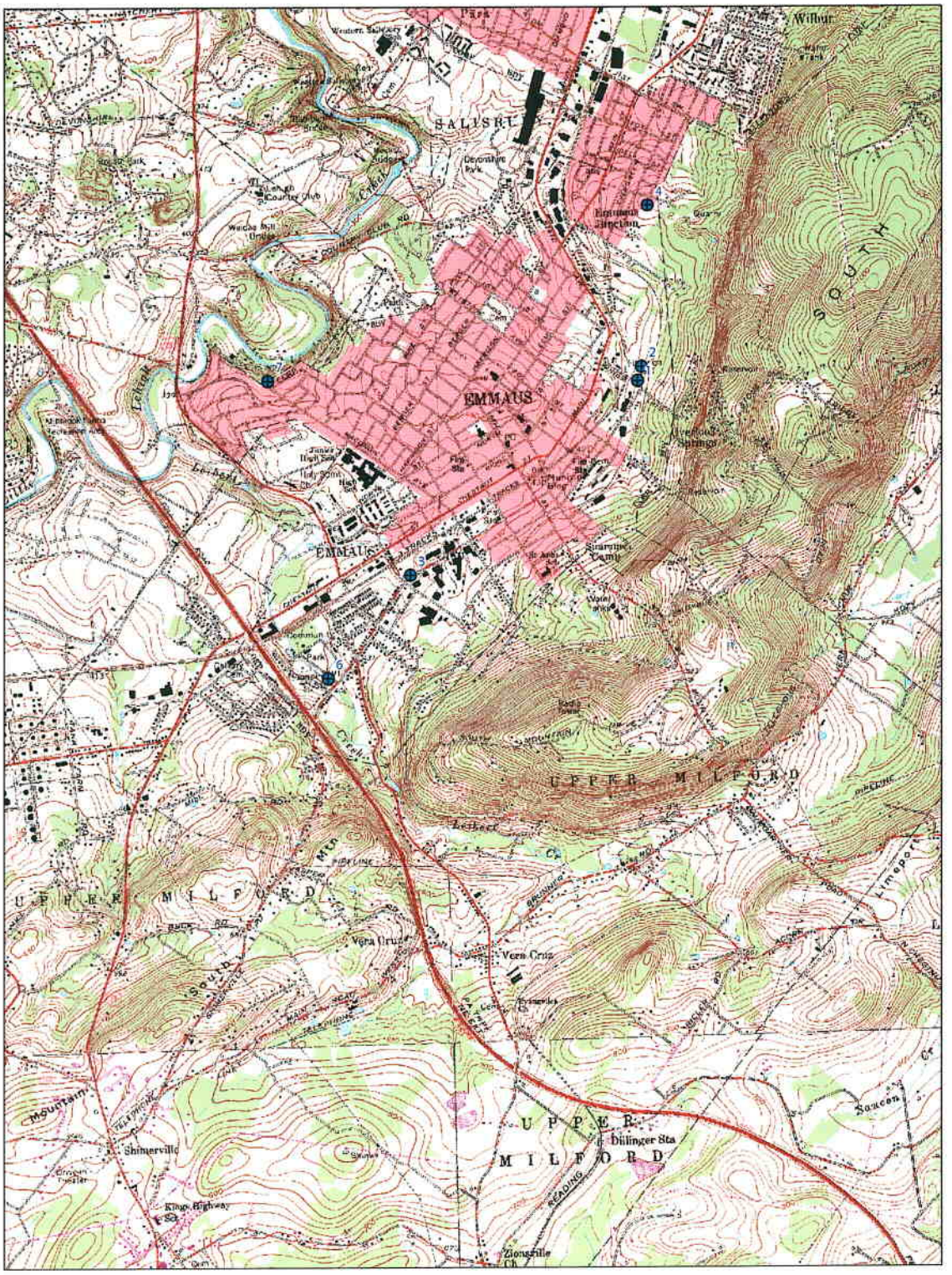
These example reports were used by BIA as a reference for the general report format and calculation of the wellhead protection zones. However, BIA's report ultimately relied on guidance from the DEP, the DEP's checklist for minimum elements of a wellhead protection study, and input from the Borough of Emmaus and the steering committee.

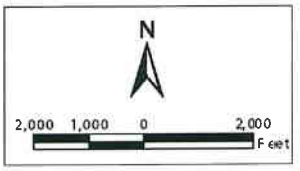
Leibert Creek Watershed Assessment

A watershed assessment for the Leibert Creek Watershed was prepared concurrently with this report. The Leibert Creek Watershed forms part of the recharge area to the Emmaus wells. Although the watershed assessment is an independent report, it includes:

- Extensive information about the nature of the recharge areas and the quality of the surface water.
- A review of the existing ordinances in Upper Milford Township and a discussion of the potential for such a review in the Borough of Emmaus.
- Recommendations for strengthening the ordinances for surface and groundwater protection.
- Recommendations for the preservation of open space, limiting non-point source pollution, and promoting public awareness.

The watershed assessment should be considered a supplemental resource to this document.





Legend

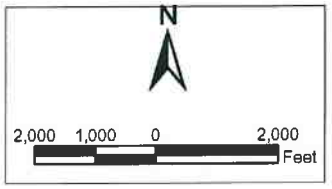
● Emmaus Borough Wells

USGS Topographic Map: Allentown East, Allentown West, East Greenville and Milford Square Quadrangles

Layout Created by Barry Isset & Associates, 2003

Figure 1: Emmaus Borough Public Supply Wells

BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors
855 S. Route 100 & Kriebel Lane
Trexlertown, PA 18087-0147
610-398-0904



Legend

● Emmaus Borough Wells

Geo-Environmental Consultants, Rodale Manufacturing Site, Emmaus, PA, September 1993

Layout Created by Barry Isett & Associates, 2003

Figure 6: Ground Water Contour Map from GEC Rodale Map

BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors
86 S. Route 100 & Kressler Lane
Trexlertown, PA 18087-0147
610-398-0904

Section 2: Steering Committee and Public Relations

The formation of a steering committee and public participation were integral components of this project. This section describes the formation and actions of the steering committee and efforts to include public participation.

Public Advisory Meetings

At the project onset, the steering committee was conceived to consist of a limited number of representatives from the Borough of Emmaus, Upper Milford Township, interested watershed-minded organizations, and BIA. It was anticipated the steering committee would meet quarterly to guide and develop the project throughout its duration.

Letters of introduction and invitation were drafted and sent to approximately 30 individuals and organizations. The list of individuals and organizations was jointly compiled by the Borough of Emmaus and BIA; input was also received from the DEP project advisor, Mr. Andrew Augustine. These letters were sent to residents of Emmaus, Upper Milford Township, and interested watershed-minded organizations. All meetings were publicly advertised. This process was repeated for three meetings. The invitation list included the DEP Project Advisors, all attendees from the initial meeting, and other local industries (Reading Railroad, PA Turnpike Commission, car dealerships, etc.). Example letters of introduction and invitation, as well as documentation of meeting advertisement is included.

Public support at these meetings was strong and the group was well-represented by members of the community and watershed-minded organizations. Table 2 lists the dates, location, and purpose of these project advisory committee meetings. A sign-in sheet was provided for each meeting to record the names and contact information for the attendees. All of these meetings were documented with minutes that were distributed to all attendees.

Table 2: Summary of Project Advisory Committee Meetings

Date	*Location*	*Purpose*
01/29/2002	Emmaus Borough Hall	Initial Meeting–Provide overview of the Emmaus Wellhead Protection Project
04/09/2002	Emmaus Borough Hall	Solicit public input for potential contaminant sources; discuss Watershed Awareness Day; solicit public input/participation for water quality monitoring of private wells; discuss inlet stenciling by Emmaus High School; discuss other miscellaneous items
6/18/2002	Upper Milford Township	Discuss old business (items listed in 4/09/02 meeting); solicit volunteers for Steering Committee; discuss stormwater BMPs.

See Review Comment No. 3 in Report Foreword

8/13/2002	Emmaus Borough Hall	Public awareness meeting to update public; Presentation by representative of Square D on Rodale Superfund Site.
3/13/2003	Emmaus Borough Hall	Public awareness meeting to update public. Formation of a formal steering committee
4/1/2003-2/30/2004		Review of project draft documents by steering committee

Technical Guidance Meetings

In addition to the public advisory committee meetings, several other meetings were held as part of this project. The purpose of these technical guidance meetings was to obtain input from the project sponsor (Emmaus), project co-sponsor (Upper Milford Township), and the project advisor (PA DEP). These meetings were attended by BIA (Alex Ulmer, Chris Kotch, Nate Hoffman, Lori Girvan, and Jill Heller), the Borough of Emmaus (Dan Delong and Jeff Clapper), Upper Milford Township (Dan Delong), and the PA DEP (Andrew Augustine). In March 2003 a steering committee was formed. The steering committee met on a regular monthly schedule. Additionally the steering committee conducted other meetings as necessary to review information and provide input to Barry Isett and Associates, Inc. In February 2004 the steering committee directed Barry Isett and Associates, Inc. to provide a final draft document. The committee completed this report, without further assistance from Barry Isett and Associates, Inc.

Table 3 lists the dates, location, and purpose of the steering committee meetings. All of these meeting were documented with meeting minutes, which were distributed to all attendees.

Table 3: Summary of Technical Guidance Meetings

Date	*Location*	*Purpose*
2/14/2002	Office of BIA	To review progress of project to date with client and the PA DEP; to review future tasks.
3/12/2002	Field Visit	Dan Delong gave BIA tour of WHPAs
7/2/2002	Office of BIA	Discuss status of WHP project and next action items
10/5/2002	Office of BIA	Select final locations of monitoring wells; select parameters to be analyzed; review lab quotes

Steering Committee Meetings

In March 2003 a steering committee was formed. The Borough of Emmaus provided a meeting space. The purpose of the first three steering committee meetings was to review the Growing Greener grant application and compare the task list to what had actually been completed correctly. The committee found numerous deficiencies. Subsequently the steering committee drafted a memo that included their review comments based upon the Growing Greener grant application and other information. BIA and the DEP (Mr. Augustine) attended the fourth formal steering committee meeting to address the steering committee's comments. The committee also requested that BIA prepare a draft of formal goals for the committee.

The steering committee continued to meet on a monthly basis. Documentation of the steering committee members, committee members roles, titles, and organization which they represent are summarized below in Table 4. Dr. William Ahlert served as the steering committee chairman.

Table 4: Steering Committee Members

Name	*Title*	*Organization*
Mr. Bill Ahlert	Chairperson	Resident
Mr. Jeff Clapper	Member	Emmaus Public Works Director
Mr. Dan Delong	Member	Upper Milford Township
Mr. Jim Baker	Member	Resident
Ms. Joyce Marin	Member	Borough Council Member, Resident
Mr. Craig Neely	Member	Borough Council Member, Resident
Mr. Steve Baier	Member	Resident
Mr. Brain Evans	Secretary	Resident
Ms. Angelika Forndran	Member	Resident
Ms. Debra Lermitte	Technical Assistance Representative	Wildlands Conservancy
Mr. Joel Jordan	Technical Assistance Representative	PA Rural Water Association
Ms. Rebecca Hayden	Technical Assistance Representative	Lehigh County Conservation District

Table 5 summarizes the steering committee meeting dates, location, and purpose.

Table 5: Summary of Steering Committee Meetings

Date	*Location*	*Purpose*
5/22/03	Emmaus Borough Hall	To discuss the role of the Steering Committee, assess protection areas for each supply well
6/17/03	Emmaus Borough Hall	Review proposed report outline, discuss possible interconnection agreement

7/15/03	Emmaus Borough Hall	Goals and objectives of project and committee
8/19/03	Emmaus Borough Hall	Finalize steering committee goals, review mgmt. Option matrix, SWAP ranking, interconnection agreement status
9/16/03	Emmaus Borough Hall	Review mgmt. option matrix, interconnection agreement, land use matrix
11/12/03	Emmaus Borough Hall	Review groundwater modeling approach, ordinance assessment process, alternative water supply, additional well testing possibilities, selected wellhead protection zones
1/20/04	Emmaus Borough Hall	Discuss revisions to draft. Recommendations for second and final round of ground water sampling.
5/18/04	Emmaus Borough Hall	Discuss state review process and schedule, review revised SWAP rankings and incorporation of mgmt. Options
7/12/04	Emmaus Borough Hall	Review committee member comments, responsibility of Borough and committee in finalizing report, discuss additional input from state and regional water organizations

Public Participation

Public participation for this project was to include three public meetings: one at the initial stages of the project to educate and inform the public about the Wellhead Protection Plan, the second at the mid-point of the project to provide a status report to interested persons, and the third approximately 1 month before project completion for public review and comment. Additionally, other events directed toward public participation were:

Watershed Awareness Day: April 27, 2002

The first public informational/educational meeting, a Watershed Awareness Day, was held on April 27, 2002 in the Emmaus Community Park. The purpose was to educate the public on how individual members of the local community, local businesses, and the government play a role in the quality and quantity of local water resources. In addition to Emmaus, Upper Milford, and BIA, several other organizations played a key role in the Watershed Awareness Day. These organizations included Wildlands Conservancy, Retired Seniors Volunteer Program, Berks County Conservancy, Joanne Kostecky Garden Design, Lehigh County Authority, and local Girl Scouts and Boy Scouts.

Public Status Update

Approximately 60 people attended the second public awareness meeting, held on August 13, 2002 at the Upper Milford Township Building. The primary purpose of this meeting was to give the general public an overview of the Wellhead Protection Plan and the Leibert Creek Watershed Assessment.

Ms. Maria Garcia, of the Philadelphia Office of the EPA, and Mr. Prakish Patel, of Snyder Electric (a.k.a. Square D), also gave a presentation on the status of the Square D Superfund Site located at 6th and Minor Streets in the Borough of Emmaus. This presentation included an overview of past operation at the site, discussion on type and extent of groundwater contamination on-site, and a summary of the remediation that has been conducted to date.

Watershed Awareness Day: May 14, 2003

Eighteen volunteer presenters set up stations relating to erosion, water quality, conservation and contamination. There was a particular emphasis on managing properties and activities around wells. A groundwater model was used to demonstrate how surface pollution could damage the aquifer and surrounding wells. The program specifically targeted eighth grade students from the East Penn School District. Approximately 500 students attended the event, which was divided into two sessions.

Heritage Days: July 2003

Two members from the steering committee set up a table on Main Street during this event. Information relating to water, water quality, erosion and contamination was presented to residents that attended Heritage Days. General information relating to the Wellhead Protection Plan was presented.

Watershed Awareness Day: May 19, 2004

Sixteen volunteer presenters set up stations relating to erosion, water quality, conservation and contamination. There was a particular emphasis on managing properties and activities around wells. A groundwater model was used to demonstrate how surface pollution could damage the aquifer and surrounding wells. Again the program specifically targeted eighth grade students from the East Penn School District. Approximately 750 students attended the event, which was divided into two sessions.

Plan Availability

The final Wellhead Protection Plan will be available for public review at the Emmaus Borough Hall.

Annual Update

An Annual Wellhead Protection Program Update form must be completed and submitted each calendar year to the DEP. This submittal is required to maintain an approved status for the wellhead protection program. The completed form must be returned by March 31st to the water supply regional manager of the PA DEP. This form has seven questions relating to:

- major changes in groundwater withdrawal
- major land use changes
- new contaminant sources
- contaminant sources that are no longer a threat
- resources applied to wellhead protection program
- are you complying with your management implementation schedule
- future plans and implementation dates for the upcoming year

Winfield Iobst
Mayor

raig Neely
President of Council

28 South Fourth Street
Emmaus, PA 18049-3899

(610) 965-9292
FAX (610) 965-0705

January 22, 2002

Mr. Joel Jordan
PA Rural Water Association
138 W. Bishop Street
Bellefonte, PA 16823

Re: Watershed Assessment and Development Plan for Leibert Creek and Wellhead Protection Plan for the Borough of Emmaus Public Water System

Dear Fellow Citizen or Organization:

You have an opportunity to make a difference in the quality of life in our community.

Our request will not take a great deal of your time, but your input can play a vital role in helping the Borough of Emmaus, Upper Milford Township, and the Leibert Creek Watershed Community, to provide a clean and viable water resource for the citizens of our region.

We are asking you or someone else in your organization to be a citizen advisor for two water quality initiatives that are being funded through the Pennsylvania Department of Environmental Protection's (DEP) Growing Greener Program. The initiatives involve a "Wellhead Protection Plan for the Borough of Emmaus Public Water System", and a "Watershed Assessment and Development of a Restoration Plan for Leibert Creek". Emmaus' water system draws from the Leibert Creek Watershed and serves not only Emmaus, but also residents of Upper Milford, Salisbury and Lower Macungie Townships. Leibert Creek is a tributary of the Little Lehigh Creek, a water source of the City of Allentown, so its protection is of regional importance.

Citizen advisors will participate in combined project meetings that will be held quarterly through the life of the projects, which are scheduled for completion by the Fall of 2003. As a citizen advisor, you will act as a sounding board, offer advice from the public perspective, and help us communicate to the public the

watershed association will naturally form to continue the efforts included in these projects, such as monitoring and protecting the water resource, for this treasured community for years to come.

Pure drinking water is something most Americans take for granted, but it doesn't happen by chance. We hope you will invest a few hours of your time over the next 24 months to help protect our essential natural resource.

Should you have any questions or for further information please call me at (610) 965-9288 or e-mail to **dandelong@earthlin.net**.

Sincerely,

Dan DeLong
Public Works Coordinator

DD/jv

Cc: Public Works Committee
Utility Authority
Jill Heller, Barry Isett and Associates, Inc.
Kathy Gorr, Interim Borough Manager
Upper Milford Township, B.O.S.

Get to Know Your Watershed

Leibert Creek Watershed & Emmaus Wellhead Protection Project
Public Meeting

Tuesday August 13, 2002

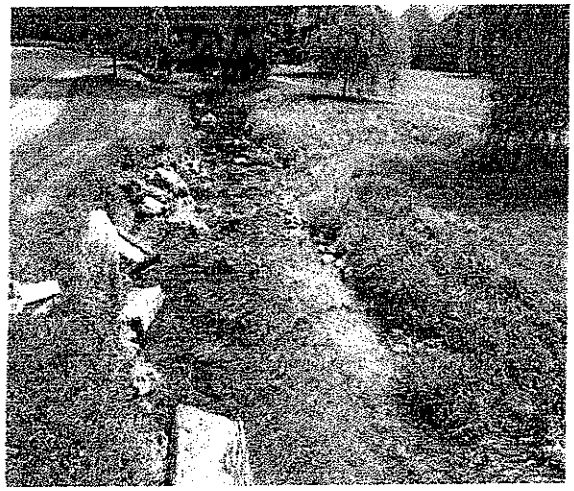
When: 7:00 PM to 9:00 PM
Where: Emmaus Borough Hall
28 S. 4th St.
Emmaus, PA 18049
For Additional Information Contact Dan Delong @ (610) 965-9288

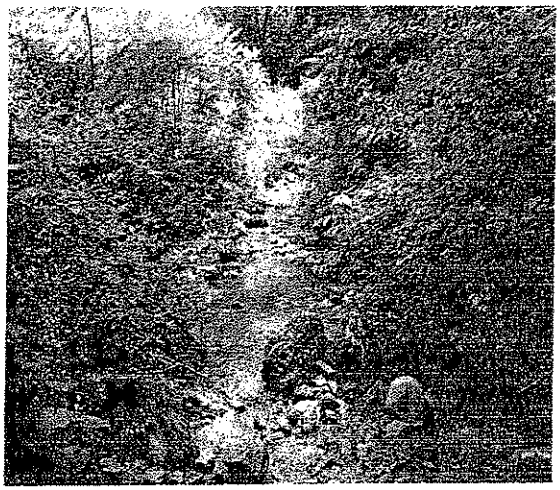
Topics: Overview of Projects:

- Leibert Creek Watershed Assessment
- Emmaus Public Water System Wellhead Protection

Update & Information on the Progress of the Rodale Manufacturing Superfund Site Remediation Work

(Representatives from the E.P.A. & The Square D Company will be present to give a brief overview and answer questions related to the Rodale Manufacturing Superfund Site)

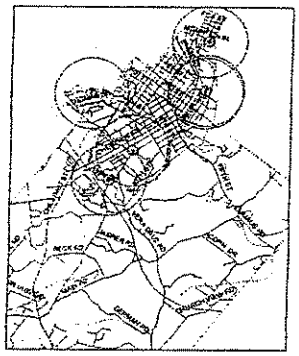




Leibert Creek Watershed Assessment

Background

- Leibert Creek is a tributary to the Little Lehigh Creek
- Watershed area of ~ 7 square miles
- Headwaters located in Upper Milford Township
- Creek is ~ 50 feet from Well No. 6



Goals

Conduct a Watershed Assessment of Leibert Creek

Evaluate all available watershed info. to determine the types, location, extent, and impacts of nonpoint source pollution, highlighting all data related to the only uncontaminated well (Well No. 6).

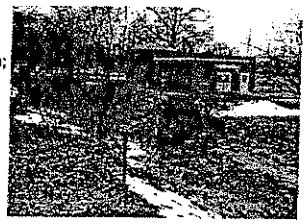
Develop a Watershed Restoration Plan for Leibert Creek

Describe the management practices that should be implemented to reduce nonpoint source pollution throughout the watershed in order to ensure a quality water source for the PWS's citizens.

Objectives

Provide do-it-yourself informational brochure

At-home water resource protection and conservation; to aid and assist in the education process



Provide a common platform for 2 adjacent municipalities

Join in a mutually beneficial endeavor to benefit the local watershed area and the region

Leibert Creek Watershed Assessment
Lehigh County, Pennsylvania

Actions to Date

- Initial GIS Database Development
- Collection and Review of Leibert Creek Watershed Related Reports/Information
- Formation of Watershed Advisory Committee
- Federal and State Government Database Search for Environmental Concerns within the Watershed and Specific Radii of the PWS Wells

Leibert Creek Watershed Assessment
Lehigh County, Pennsylvania

Next Actions

- Develop Study Design for Nonpoint Source Assessment for Leibert Creek
- Macro Invertebrate Sampling at 3 Selected Sites on Leibert Creek
- Hold Public Education and Informational Meeting
- Collection of local input regarding potential contamination sources in the Watershed

Leibert Creek Watershed Assessment
Lehigh County, Pennsylvania

TO: AREA SCOUT LEADERS

FROM: DAN DELONG, DIRECTOR OF PUBLIC WORKS

RE: BADGE OPPORTUNITY FOR YOUR SCOUTS
EMMAUS COMMUNITY PARK
SATURDAY, APRIL 27 10 a.m. – 2 p.m.

Lehigh County and 23 other eastern and south central Pennsylvania counties are in the throes of a drought emergency. Officials of Emmaus Borough in association with Upper Milford Township are taking steps to help the public to learn more about the water supply and water resources we all depend upon by sponsoring a day of family-friendly activities and displays. Watershed Awareness Day will take place from 10 a.m. to 2 p.m. on Saturday, April 27th in Emmaus Community Park, Shimerville Road and So. 14th Street near the banks of the Leibert Creek. The event is designed to help the public understand how individuals, industries, and government each play a role in the quantity and quality of the water resources we all depend upon.

Boy Scouts will have the opportunity to meet requirements for the Soil and Water Conservation Merit Badge by visiting various displays and participating in activities. We plan to have a Boy Scout Badge counselor at the event.

An "Enviro-Scape" model provided by the Lehigh County Extension office of Pennsylvania State University will graphically demonstrate how pollution introduced in one area can affect neighbors down stream. Visitors can introduce substances at one section of the model and track the impact as it penetrates the environment. Youngsters can meet Dewey, the mascot from the Lehigh Valley Water Suppliers, and run a water-related obstacle course courtesy of the Wildlands Conservancy. Other expected participants include: Retired Seniors Volunteer Program (RSVP), Department of Environmental Protection (DEP), and the Berks County Conservancy.

You can plan to come to the event as a troop activity, or let Scouts know about the event and they can come on their own.

If Scouts from your troop plan to attend, could you please let us know by calling me at 610-965-9288 on or before April 25?

Dan W. DeLong

Borough of Emmaus

Public Works Department

From: Dan Delong

To: Leibert Creek Watershed/Emmaus Wellhead Protection Citizen's Advisory Committee

March 13, 2002

We have begun to research ways to raise public awareness of watershed issues, a primary goal of our Leibert Creek Watershed/Emmaus Wellhead Protection Citizens Advisory Committee that is even more vital now that Pennsylvania is in the midst of a rare winter drought emergency. **Your input and ideas are sought for an event we would like to schedule on Saturday, April 27 from 10 a.m. to 2 p.m. in Emmaus Community Park along the banks of the Leibert Creek.**

Our consultant, Barry Isett & Associates, has begun to put out feelers to interested groups who might like to participate in a Watershed Awareness Day. Jill Heller, project manager, has started the ball rolling by speaking with a number of potential participants and attendees. They include:

Lehigh County Authority
Penn State Extension
Wildlands Conservancy
Department of Environmental Protection
Girl Scouts
Retired Seniors Volunteer Program
Boy Scout Council
Delaware River Basin Commission
Emmaus High School Science Dept.
Delaware Riverkeeper
Berks County Conservancy
Lehigh County Conservation District

It seems as if we have the material to make a day of community fun as well as education. Ideas discussed include a water obstacle course provided by the Wildlands Conservancy, displays and events by various organizations that would give Boy Scouts and Girl Scouts the opportunity to fulfill water/environmental-related merit badge requirements, games for children that promote water awareness, and literature for people of all ages. The Minsi Trails Council of the Boy Scouts has agreed to promote the event in its next mailing to all scout troops throughout the area. We are planning press releases to all area media and will investigate if the East Penn School District will send home fliers with students.

More ideas are being developed every day but I think that your assistance would build a more successful event. Would you be interested in serving on a subcommittee to help organize and participate in the Watershed Awareness Day? **I'd like to schedule a meeting for March 26th at 7:00 p.m. at Emmaus Borough Hall in the meeting room on the second floor. If you are interested in attending---or interested in helping, but can't make the date, please give me a call at 610-965-9288. Thank you for your input.**

Emmaus aims to avoid water woes

Meeting centers on making sure clean well stays that way.

By Mike Frassinelli
Of The Morning Call

It was a terrible way to do a fish count.

But when 1,000 fish, including many large trout, were found dead after an accidental chlorine spill in Emmaus' Leibert Creek three weeks ago, creek watershed representatives had proof of just how healthy the waterway had become.

Maintaining the vitality of the watershed, the site of the only uncontaminated well in Emmaus, was the main topic during a public meeting Tuesday night in borough hall.

Attended by 53, the meeting was called to alert residents about steps to clean up the borough's contaminated well water and explain the $104,000 state "Growing Greener" grant Emmaus and Upper Milford Township have received to assess Leibert Creek.

Rebecca Hayden, a watershed specialist with the Lehigh County Conservation District, said that although the creek is in fairly good shape compared with other creeks, high creek temperatures suggest a storm-water runoff problem.

"It is an excellent and valuable resource," she said, "but it is not going to be such unless we take care of it."

Jackson Stoss, a University of Pittsburgh student studying the watershed as part of

EMMAUS PAGE B2

EMMAUS

FROM PAGE B1

an internship, spoke of the importance of riparian buffers — weeds and other barriers that hold soil in place and filter sediment.

"The general public's idea of a nice stream is one that is mowed to the edge of the water," borough Public Works Director Dan DeLong said. "A watershed specialist will look at the weeds and say, 'Yes, that's beautiful.' "

Emmaus is a borough with good reason to be concerned about water. Giant filtering towers, which DeLong likens to SCUD missiles filled with Wiffle balls, stand as reminders of the steps the borough has had to take to purify its contaminated well water.

The former Rodale Manufacturing site at Sixth and Minor streets is linked to contamination in four of the borough's six public wells. Owned by Square D Co. since 1975, it was used for manufacturing electrical wiring devices. Rodale Manufacturing workers dumped degreaser solvents containing trichloroethylene into onsite wells.

The site was declared a Superfund hazardous waste site, and Square D last year agreed to a $4.2 million cleanup.

mike.frassinelli@mcall.com
610-820-6595

Emmaus, Upper Milford plan Water Awareness Day, April 27

Lehigh County and 23 other eastern and south central Pennsylvania counties are in the throes of a drought emergency. Officials of Emmaus Borough, in association with Upper Milford Township, are taking steps to help the public learn more about the water supply and water resources everyone depends on by sponsoring a day of family-friendly activities and displays.

Watershed Awareness Day will take place Saturday, April 27, 10 a.m.-2 p.m., in Emmaus Community Park, Shimerville Road and South 14th Street, near the banks of Leibert Creek.

The event is designed to help the public understand how individuals, industries and government each play a role in the quantity and quality of the water resources we all depend upon, according to the Emmaus Borough's Director of Public Works, Dan DeLong.

"It is very rare to have a drought emergency declared as early as February as happened this year," said DeLong. "If the needed rains don't come, we will all be in big trouble. Everyone should gain a better understanding of the water cycle and the effect our actions have upon the water resources we all share.

"With the help of our consultant, Barry Isett & Associates, we are developing a day that brings home that message for kids and adults, while they enjoy the park and have fun learning."

An "Enviro-Scape" model provided by the Lehigh County Extension office of Pennsylvania State University will graphically demonstrate how pollution introduced in one area can affect neighbors down stream. Visitors can introduce substances at one section of the model and track the impact as it penetrates the environment. Youngsters can meet Dewey, the mascot from the Lehigh Valley Water Suppliers, and run a water-related obstacle course, courtesy of the Wildlands Conservancy.

Other expected participants include: Retired Seniors Volunteer Program (RSVP), Department of Environmental Protection (DEP), and the Berks County Conservancy. Boy Scouts and Girl Scouts will have the opportunity to meet requirements for related merit badges by visiting various displays and participating in activities.

The Watershed Awareness Day is an outgrowth of the Leibert Creek Watershed/Emmaus Wellhead Protection Citizens Advisory Committee, the public comment portion of two studies funded by Growing Greener Environmental Stewardship & Watershed Protection grants provided through the PA DEP. The studies involve identifying potential points of non-source pollution along the Leibert Creek, which headwaters lie in Upper Milford Township, and developing a watershed restoration plan. The grants also provide for the development of a wellhead protection plan for Emmaus' municipal wells, the source of water for borough residents and businesses, as well as for customers in the neighboring Lehigh County townships of Upper Milford, Lower Macungie and Salisbury. One of the borough's wells lies within 50 feet of Leibert Creek, and the two are hydrogeologically linked.

Other groups interested in environmental preservation are encouraged to participate in Watershed Awareness Day. For more information, call Dan Delong at 610-965-9288.

East Penn Press April 8-14, 2002

BRIEFING

EMMAUS, UPPER MILFORD TWP.

EVENT TO FOSTER WATERSHED AWARENESS

The drought emergency has led officials in Emmaus and Upper Milford Township to sponsor Watershed Awareness Day from 10 a.m. to 2 p.m. Saturday in Emmaus Community Park, Shimerville Road and S. 14th Street.

The event will explore the roles individuals, industries and government play in determining water quality and quantity. An Enviro-Scape provided by Penn State Lehigh County Extension will demonstrate how pollution introduced upstream affects waters downstream.

Children can meet Dewey, a mascot of Lehigh Valley Water Suppliers, and run a water-related obstacle course. Boy and Girl Scouts will be able to earn merit badges by visiting various displays and participating in activities.

The Morning Call Sunday, April 21, 2002

Drought survival tips for home, garden at Emmaus Watershed Awareness Day

The recent few good days of rain have not eradicated the drought in southeastern Pennsylvania. To help the public understand how everyone can meet the water shortage challenge, a dozen organizations have joined together with Emmaus Borough, in association with Upper Milford Township, to present Watershed Awareness Day on Saturday, April 27, 10 a.m.-2 p.m., at Emmaus Community Park, Shimerville Road and South 14th Street, near the banks of Leibert Creek.

In a fun and informative way, the event is designed to help the public understand how individuals, industries and government each play a role in the quantity and quality of the water resources everyone depends on.

"Everyone lives downstream of someone else," said Dan Delong, director, Emmaus Public Works. "We hope to help people understand that actions that they might think are minor in scope can have a powerful impact on their downstream neighbors."

Highlights will include a water-related obstacle course especially for children, hands-on demonstrations about activities that affect water quality and quantity, a tour of the Emmaus water pumping station, a display of water-saving devices for homeowners, a groundwater model, information about watersheds and their function and water safety.

Homeowners can pick up information about watering devices for gardens that meet PA Department of Environmental Protection approval. Boy Scouts and Girl Scouts will have the opportunity to meet requirements for related merit badges by visiting various displays and participating in activities.

Participating groups include: Wildlands Conservancy (Water Cycle Obstacle Course), Retired Seniors Volunteer Program (Groundwater Model and Household Hazardous Waste Information), Berks County Conservancy (Basic Watershed information), Joanne Kostecky Garden Design (Landscape Conservation equipment and information), Lehigh County Authority (water-saving devices), the Borough of Emmaus Public Works Department (Street Cleaning and Public Drinking Water Supply information), and Emmaus Community Pool.

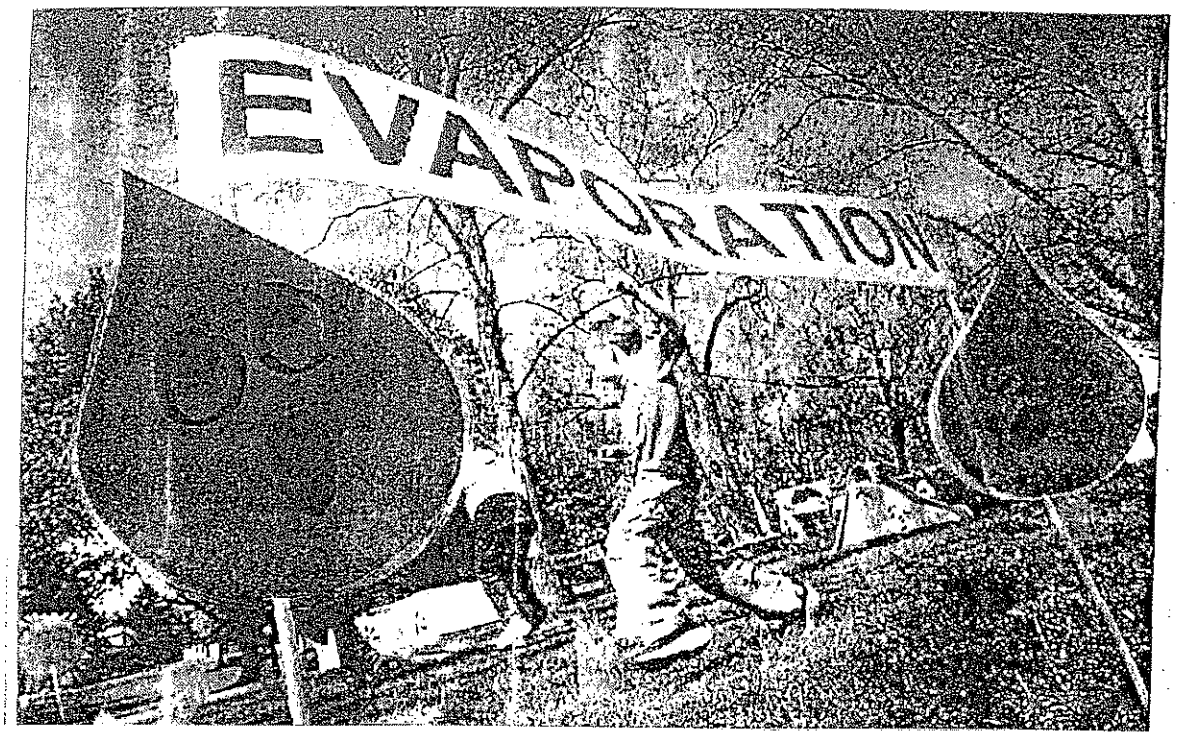
Informational materials will be provided by: Pennsylvania Department of Environmental Protection, Penn State Lehigh County Cooperative Extension (Watershed and Water Quality information), Delaware River Basin Commission (Larger Watershed picture), Department of Community and Economic Development (Land Use and Water Resource information for Municipal Officials and Interested Citizens), PA Fish & Boat Commission (Water Safety, Aquatic Life), and Lehigh County Conservation District (Soil Erosion and Conservation Practices.

The Watershed Awareness Day is an outgrowth of the Leibert Creek Watershed and Emmaus Wellhead Protection Citizens Advisory Committee, the public comment portion of two studies funded by Growing Greener Environmental Stewardship & Watershed Protection grants provided through the PA DEP.

Conducted by Barry Isett & Associates, the borough's engineer, the studies involve identifying potential points of non-source pollution along the Leibert Creek (whose headwaters lie in Upper Milford Township) and developing a watershed restoration plan. The grants also provide for the development of a wellhead protection plan for Emmaus' municipal wells, the source of water for borough residents and businesses, as well as for customers in the neighboring Lehigh County Townships of Upper Milford, Lower Macungie and Salisbury. One of the borough's wells lies within 50 feet of Leibert Creek, and the two are hydro-geologically linked.

For more information about the event, call Dan Delong at 610-965-9288.

East Penn Press April 22-28, 2002



Watershed Awareness Day held at park

Zak Klass, 7, of Emmaus, above, runs through an obstacle course tracing the path of a water molecule during Watershed Awareness Day on Saturday at Emmaus Community Park. The path included evaporation, condensation, precipitation and consumption by a human. Left, Earl Ostrander (left) gives pointers to Marissa Vestich, 11, and her brother, Marco, 10 during a water safety demonstration at the park. Watershed Awareness Day explored factors that affect water quality and quantity. The event was sponsored by officials in Emmaus and Upper Milford Township.

Douglas Benedict
The Morning Call

The Morning Call Sunday, April 28, 2002

PRESS PHOTO BY CHERYL BAKER

Learning water and boat safety

Earl Ostrander, Emmaus Community Park's pool manager, shows Bethlehem residents Marco, 8, and his sister Marissa, 10, (mom, Isabelle Vestich, is learning, too) the importance of water and boat safety. Watershed Awareness Day was held recently at the Emmaus Community Park in conjunction with the state's month-long activities to increase public awareness on issues affecting water and ways to reduce pollutants entering our streams. Other activities included an obstacle course for children to simulate being a water molecule and demonstrations on how water can become polluted. The event was sponsored by the borough of Emmaus, Upper Milford Township and the Leibert Creek Watershed Study Committee.

East Penn Press Wednesday, May 1, 2002

LEIBERT'S CREEK

Emmaus to host watershed program

The Borough of Emmaus will host a public meeting March 13 to discuss the Leibert Creek watershed and wellhead protection for Emmaus public wells. The meeting will be held in borough council chambers at borough hall, 28 S. 4th St., beginning at 7 p.m.

Any interested individuals who live or have businesses in Upper Milford, Salisbury and Lower Macungie townships, as well as Emmaus, are encouraged to attend.

The meeting will present information gathered to date on these projects and a citizen advisory group will be formed to further develop a restoration plan for Leibert Creek Watershed and a wellhead protection plan for Emmaus public wells.

For more information, call Jeff Clapper, public works director, at 610-965-9288.

East Penn Press

Watershed Awareness Day held at park; [FIRST Edition]

The Morning Call. **Morning Call.** Allentown, Pa.: Apr 28, 2002. pg. B.5

Full Text (93 words)

Copyright Morning Call Apr 28, 2002

Zak Klass, 7, of Emmaus, above, runs through an obstacle course tracing the path of a water molecule during Watershed Awareness Day on Saturday at Emmaus Community Park. The path included evaporation, condensation, precipitation and consumption by a human. Left, Earl Ostrander (left) gives pointers to Marissa Vestich, 11, and her brother, Marco, 10 during a water safety demonstration at the park. Watershed Awareness Day explored factors that affect water quality and quantity. The event was sponsored by officials in Emmaus and Upper Milford Township.

[Illustration]

2 Photos by Douglas Benedict, The Morning Call

Crawling, laughing, learning; [SIXTH Edition]

The Morning Call. **Morning Call.** Allentown, Pa.: May 16, 2003. pg. B.2

Full Text (60 words)

Copyright Morning Call May 16, 2003

Nicole Popoff, 14, followed by Rachel Yany, 14, both of Lower Macungie Middle School, crawls through a tent that represents the condensation phase of the Water Cycle Obstacle Course, sponsored by Wildlands Conservatory. The course was part of activities held at Community Park in Emmaus during Watershed Awareness Day.

[Illustration]

PHOTO by Amanda Lucidon, Special to The Morning Call -- Freelance

East Penn students take an educational walk in the park; [FIFTH Edition]

The Morning Call. **Morning Call.** Allentown, Pa.: May 20, 2004. pg. B.3

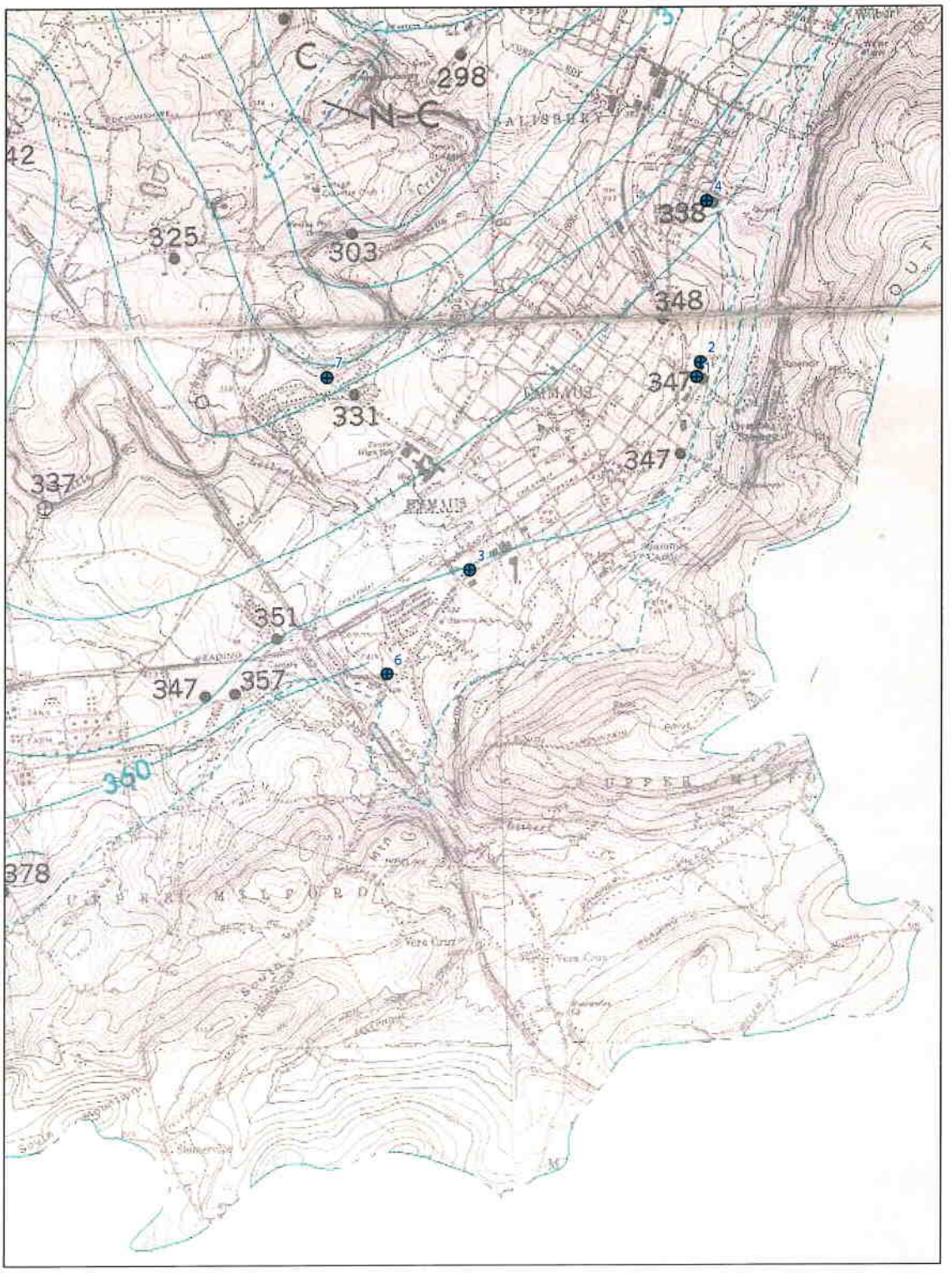
Full Text (50 words)

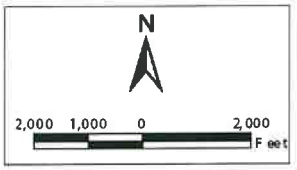
Copyright Morning Call May 20, 2004

On Watershed Awareness Day, East Penn eighth-graders hike through Emmaus Community Park, above, to study the environment. At left, Sam Kratzer (left) and Mike Wieder, both 14, Lower Macungie Middle School students, talk about the mosquitoes that carry the West Nile virus.

[Illustration]

2 Photos by Wiqan Ang, The Morning Call





Legend

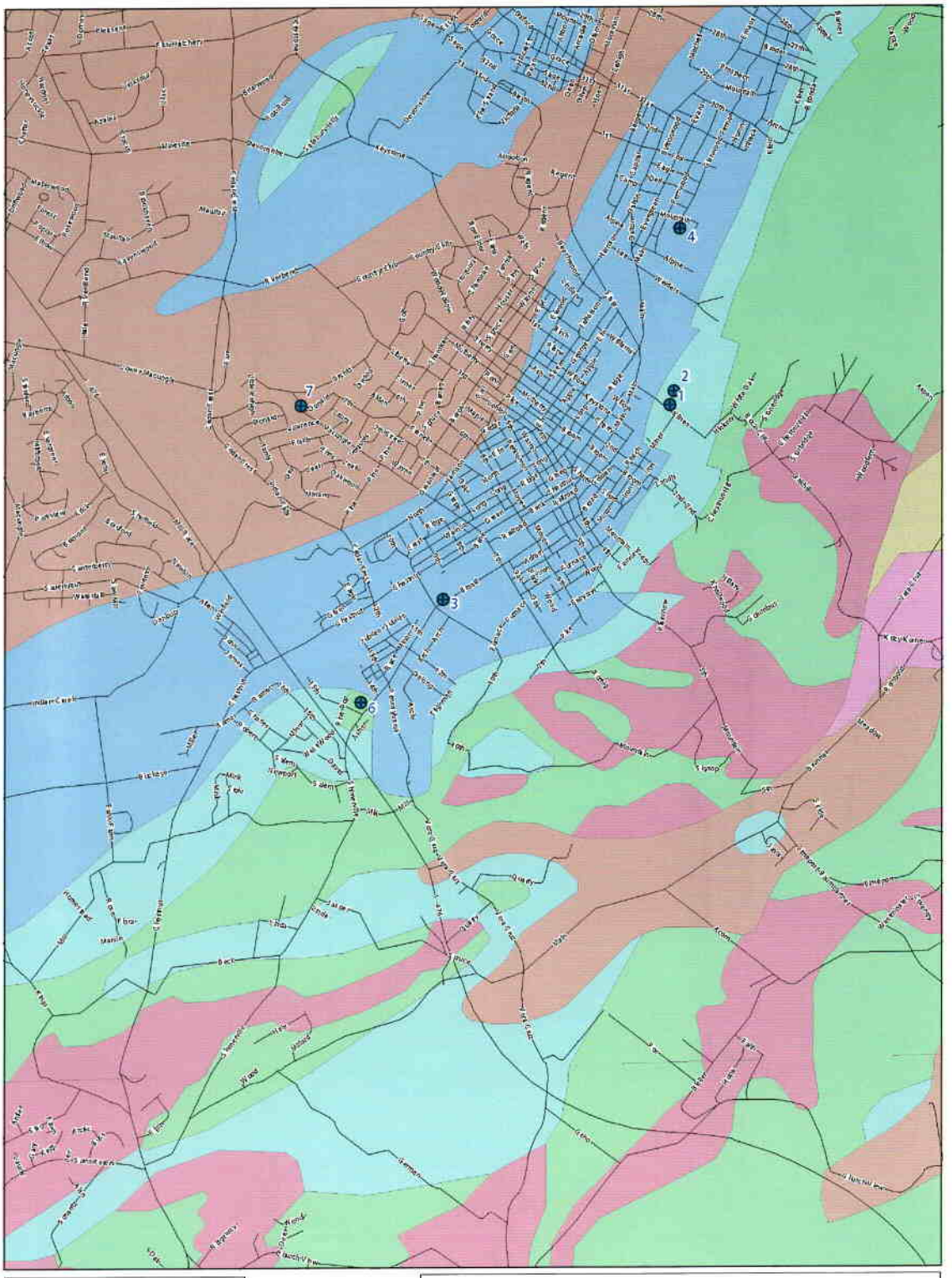
● Emmaus Borough Wells

Groundwater Contour Map: Plate 4A Map Showing Water Lever Contours Mid April 1968...
Lehigh County Water Resources Report 31, 1972

Layout created by Barry Isset & Associated, 2003

Figure 5: Emmaus Borough Public Supply Wells Ground Water Contour Map

BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors
855 Route 100 & Kressler Lane
Trexlertown, PA 18087-0147
610-398-0904



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Legend

- Emmaus Wells
- Streets

Geologic Formation

- Allentown Formation
- Epler Formation
- Felsic to mafic gneiss
- Hardyston Foundation
- Hornblende gneiss
- Leithsville Formation
- Rickenbach Formation

-PA Geologic Map: PA Geologic Survey, 2001
Allentown and Reading 30' by 60' Quadrangles
-Streets from the Lehigh Valley Planning Commission, 2001
Layout created by Barry Isset & Associates, 2003

Figure 3: Geology of Emmaus Borough Public Supply Wells

BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors
855 Route 100 & Kressler Lane
Trexlertown, PA 18087-0147
610-395-0904

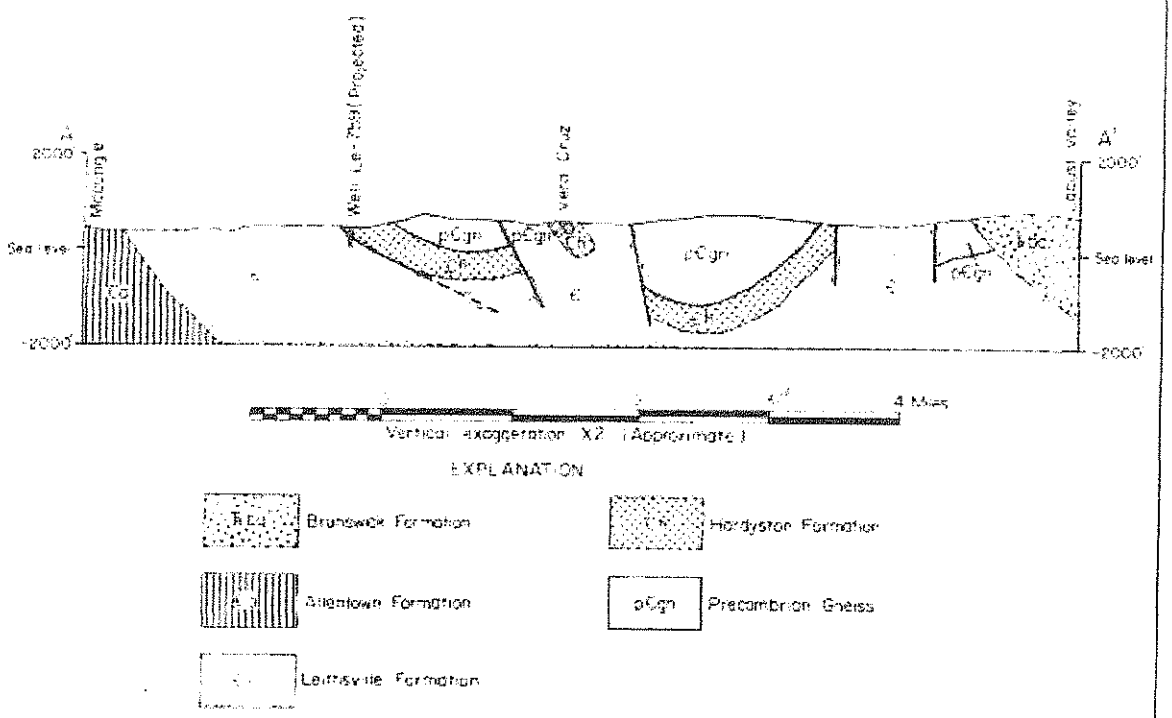

Figure 38. Geologic section of the Reading Prong between Locust Valley and Macungie.

Figure 2a: Geologic Section of the Reading Prong

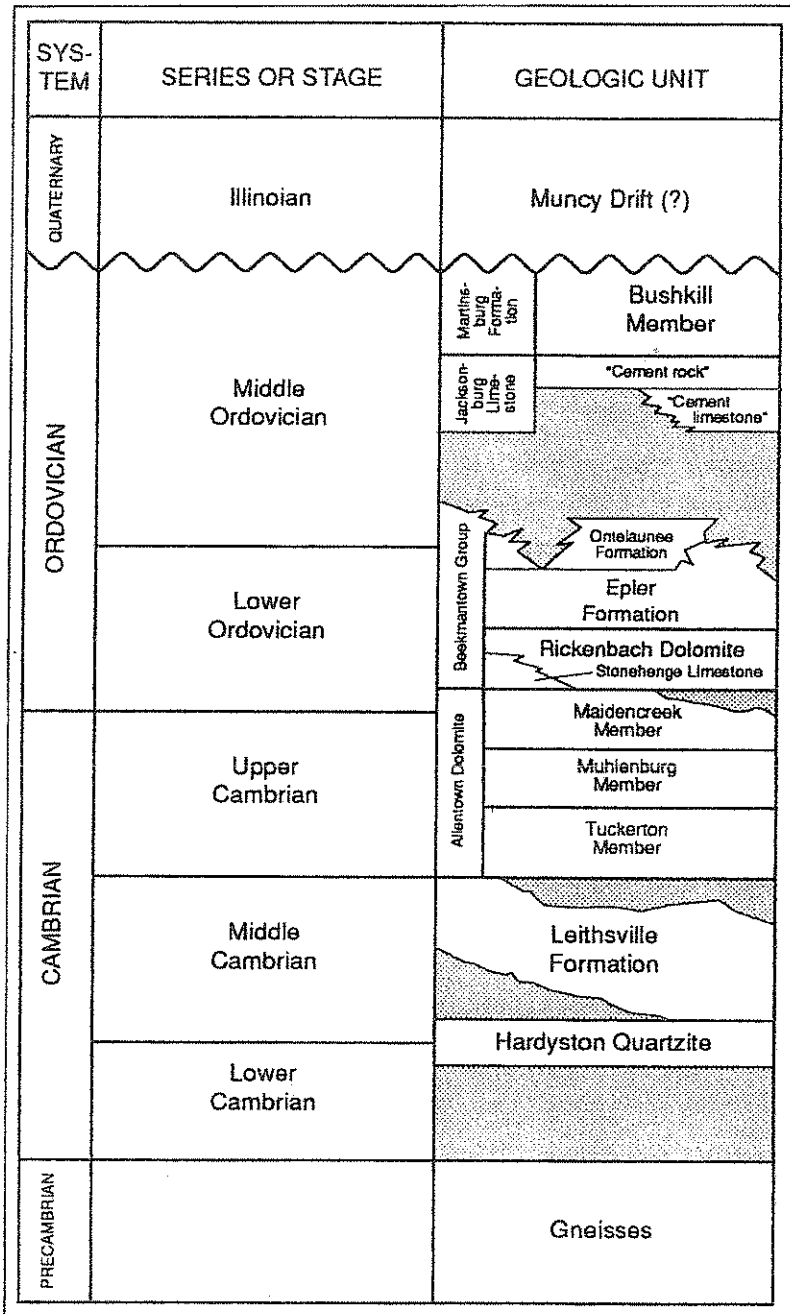

Figure 3.--Generalized stratigraphic column for Schuylkill and Lehigh Valley sequences. (Modified from Lash and Drake 1985, and Lyttle and Epstien 1987).

Figure 2b: Stratigraphic Column

Ongoing processes of physical and chemical weathering and past glacial processes are responsible for the reshaping of landforms following the major mountain-building events that occurred during the Paleozoic. To the south of the Lehigh valley, the Reading Prong complex forms rolling highlands. The carbonate rocks of the Lehigh Valley are more susceptible to erosion and form gently rolling to nearly flat lowlands of the valley. Windows of rock units often expose rocks of more or less resistant to erosion and create knobs or depressions in the valley terrain.

Stratigraphy

Stratigraphy of the study area is divided into two separate sections which include carbonate and non-carbonate rocks.

Carbonate Rocks – The carbonate rocks of the Little Lehigh Creek basin lie within the eastern end of the Great Valley section of the Valley and Ridge Province and have been divided into two related stratigraphic sequences (Sloto *et al.*). These sequences include the Schuylkill Valley sequence (not part of the study area) and the Lehigh Valley sequence. Generally, the ages of the carbonate rocks exposed in the Lehigh Valley are progressively younger from south to north, and where not structurally dislocated, represent a continuous stratigraphic sequence from Lower Cambrian to Middle Ordovician. A generalized stratigraphic column is shown in Figure 2b, which has been adapted from Sloto *et al.* (modified from Lash and Drake 1985, and Lyttle and Epstein 1987).

The Lower to Middle Cambrian Leithsville Formation is the oldest carbonate unit exposed in the study area and is conformable or in faults contact with the underlying Lower Cambrian Hardyston Quartzite. The formation is approximately 400 ft. thick. (Sloto *et al.*, p. 8).

The Allentown Formation, described by Sloto *et al.* (p. 9) as the Allentown Dolomite, has three separate members: the Tuckertown (Lower), Muhlenberg (middle), and Maidencreek (upper). The total thickness of the Allentown Dolomite is about 2,500 ft. The Tuckertown Member is a light to dark medium gray, medium to thick bedded dolomite. In the Schuylkill Valley sequence, it contains magnesium limestone and limestone with limey beds having silty or shaly partings. The Tuckertown member is 500 to 650 ft. thick. The Muhlenberg member is a medium gray, thick bedded dolomite and magnesium limestone containing interbedded calcareous and limonitic sandstone. The Muhlenberg member is about 800 ft. thick. The Maidencreek Member is a medium to dark-medium gray, thick bedded dolomite and magnesium limestone containing chert stringers and nodules. The Maidencreek member is approximately 1, 200 ft. thick (Sloto *et al.*).

Non-Carbonate Rocks – The Precambrian crystalline rocks of the Reading Prong and the Lower Cambrian Hardyston Quartzite form the southern boundary of the Lehigh Valley. The Reading Prong is comprised of a structurally-complex series of metamorphosed gneisses of different compositions. The Hardyston Quartzite unconformably overlies the gneiss. It is light gray, medium to thick bedded quartzite and feldspathic sandstone with a basal quartz-pebble conglomerate. The thickness ranges from 100 to approximately 800 ft. (Sloto *et al.*, p. 10).

Hydrogeology

This section describes the hydrogeology of the carbonate and non-carbonate rocks in the study area.

Carbonate Rocks

According to Fetter (p. 345), the primary porosity of limestone and dolomite is variable; if the rock is clastic, the primary porosity can be high. However, chemically precipitated rocks can have a very low porosity and permeability. Sloto *et al.* (p. 15) reported that the yield and specific capacity of wells completed in carbonate rocks are highly variable because the secondary porosity is highly variable.

Allentown Formation – Wood *et al.* provide a description of the hydrogeology of the Allentown Formation:

> The Allentown Formation provides good subsurface drainage with little surface runoff. Water percolates through soils varying in depth from a few feet to 170 ft. The infiltrating water enters the bedrock via pore spaces, joints, crevices, open bedding planes, channels, and caverns resulting from dissolution of limestone and dolomite. The primary porosity of the Allentown Formation is low. However, joints, fractures, and solution channels produce a moderate to high secondary porosity. The water bearing zones tend to be secondary openings, joints, fractures, and solution channels. The permeability of this formation is generally low (Wood *et al.*, p. 115-116).
>
> Adequate supplies of water for domestic use are available from nearly all wells drilled in the Allentown Formation. The reported groundwater yield for specific study areas ranged from 60 gallons per minute (gpm) to 210 gpm or greater. Commercial and industrial wells are capable of yielding a 1,000 gpm or more. The average well depth is 220 feet, with depths ranging from 50 feet to 1,023 feet. Approximately 5% of wells penetrate water-bearing zones between 1 feet and 15 feet wide. Most of these large water-bearing zones are located within 100 feet of the surface and near drainage ways. The specific capacity of wells in the Allentown Formation

appears to be inversely related to topography. The static water level, approximated from the mean depth to water in completed domestic wells, is 67 feet (Wood *et al.*, 114-115). In some portions of the Allentown Formation, the aquifer is partially artesian. The pressure in these wells is usually not sufficient to make the well flow, but will raise the water level several feet.

Water quality within in the Allentown Formation is generally acceptable for potable water supplies. The water is hard with a high dissolved solids content. Turbidity is a common water quality problem and about 5% of all wells never clear up. Additionally, 15-20% of wells provide water that exceeds the Safe Drinking Water Standards for iron and manganese. Due to the potential for sinkholes and solution channels, this aquifer can easily become contaminated. Failing septic system, industrial releases, and urbanization can cause widespread pollution of this aquifer due to the potential for direct connection to the water table through sinkholes and solution channels (Wood *et al.*, p. 114-115).

Leithsville Formation – Wood *et al.* provide a description of the hydrogeology of the Leithsville Formation:

The Leithsville Formation provides good surface drainage with little subsurface drainage. Water percolates through the soils entering the bedrock via pore spaces, joints, crevices, open bedding planes, channels, and caverns. The primary porosity of the Leithsville Formation is low; however, joints, fractures, and solution channels produce a high secondary porosity. The permeability of this formation is moderate to high (Wood *et al.*, p. 116-117).

About 98% of wells drilled in the Leithsville Formation provide adequate supplies of water for domestic use. There are few reported yields of wells in this formation. Public supply and industrial wells are capable of yielding a 1,000 gpm or more. The median depth of these wells is 245 feet. Overall, the median well depth in this formation is 200 feet, but wells range from 60 to 903 feet. While there is no relationship between topography and well yield, the deepest wells are located at topographic highs. The median depth to the water table is 90 feet, but range from a few feet below the land surface to over 200 feet. Approximately 10% of wells have low yields for wells in a carbonate aquifer; these wells are often located in shaly zones and in argillaceous and arenaceous dolomites (Wood *et al.*, p. 116-117).

Water quality within in the Leithsville Formation is generally acceptable for potable water supplies. The water is hard with a high dissolved solids content. Turbidity is a common water

quality problem, and about 5% of all wells never clear up. Additionally, 15-20% of wells provide water that exceeds the Safe Drinking Water Standards for Iron and Manganese. Due to the potential for sinkholes and solution channels, this aquifer can easily become contaminated. Failing septic system, industrial releases, and urbanization can cause widespread pollution of this aquifer due to the potential for direct connection to the water table through sinkholes and solution channels (Wood, *et al.*, p. 116-117).

Non-Carbonate Rocks

Fractures in crystalline rock generally decrease with depth. According to Fetter (p. 357), chemical weathering of crystalline rock can produce a weathered product called saprolite. He reports this material to have porosities of 40 to 50 percent with a specific yield of 15 to 30 percent. The saprolite acts as a reservoir, storing infiltrated water and releasing it to wells intersecting fractures in the underlying crystalline rock. Fetter (p. 357) reported that well yields in some areas of crystalline rock are greater when the wells are located on valley bottoms since many of the valley bottoms are developed along fracture traces.

Hardyston Formation – The Hardyston Formation, as described by Geyer and Wilshusen (1982), has good surface drainage; the joint and cleavage plane openings in the formation produce a secondary porosity of low magnitude and low permeability. In the Hardyston Formation, groundwater is stored in and moves through relatively narrow openings along vertical joints, bedding planes, and fault zones. These openings tend to close as the depth below the land surface increases (Wood, Flippo, Lescinsky, and Barker, 1972). Fractures that yield water are not usually found below 200 feet.

Biesecker and others (1968), who studied the Schuylkill River basin immediately west of Lehigh County, observed that in the Hardyston Formation most water-bearing zones lie above 200 ft. This formation has a maximum thickness of about 200 ft. in Lehigh County. Therefore, except those areas where the dip of the formation is nearly vertical, the thickness that is expected to be penetrated by most wells is somewhat less than 400 ft. (Wood, Flippo, Lescinsky, and Barker, 1972).

The median reported yield for 13 wells in the Hardyston Formation is 30 gpm. Only 2 of the 18 wells for which yield or specific capacity data are available produce less than 6 gpm (Wood, Flippo, Lescinsky, and Barker, 1972). Specific capacities (based on 1-hour tests) for five wells having a median depth of 220 ft. range from 0.20 to 0.62, and the median specific capacity is 0.58 gpm per foot of drawdown (Wood, Flippo, Lescinsky, and Barker, 1972). The water is usually soft and of good quality, except for occasional high iron concentrations.

Hornblende Gneiss – Hornblende Gneiss, as described by Geyer and Wilshusen (1982), provides good surface drainage and extremely low primary porosity with joint openings providing a low secondary porosity. Higher porosity may be found in highly weathered rocks near the surface. The permeability of this formation is also low. Wells in this rock formation have a reported yield of 10 gpm. Properly developed and sited wells can have a yield of 35 gpm or more.

Wood, Flippo, Lescinsky, and Barker (1972) report that hornblende gneiss, pyroxene gneiss, and amphibolite are among the poorest yielding in Lehigh County. They report the 1-hour specific capacities for eight domestic wells range from 0.03 (exceeded in 90 percent of the wells) to 1.6 (exceeded in 10 percent of the wells), and the median is 0.17 gpm per foot of drawdown. Yield or specific capacity data are available for 11 domestic wells, and 3 of these 11 wells yield 1 gpm or less (Wood, Flippo, Lescinsky, and Barker, 1972). These low yields and specific capacities indicate that it is nearly impossible to obtain water in sufficient quantity for other than domestic use. In fact, 20 to 30 percent of the wells drilled in those rocks will not yield enough water for domestic use (Wood, Flippo, Lescinsky, and Barker, 1972).

The water from wells in this formation generally meet the Drinking Water Standards. High iron concentrations can be a problem in this area and bacterial pollution is less common than in other formations in the Lehigh Valley.

Local and Regional Hydrogeological Setting

The contributing area (Zones I, II, and III) to the six wells in the Emmaus Borough Public Water System is approximately 7 square miles, which includes 4 square miles within the Leibert Creek drainage basin (see Figure 4) and approximately 3 square miles within the Little Lehigh Creek drainage basin.

TABLE 6: HYDROGEOLOGIC PROPERTIES FOR THE EMMAUS PUBLIC SUPPLY WELLS

Well #	Geologic Unit	Average Annual Ground Water Recharge (gpd/mi^2)	Depth Drilled (ft)	Casing Depth (ft)	Open Interval (ft)	Aqifer Thickness (ft)	Maximum Permitted Pump Rate (ft/day)	Gradient	Porosity %	Hydraulic Conductivity (gpd/ft^2)
1	Hardyston	830,000	315	90	225	315	81,626	0.0033	10	51.6
2	Hardyston	830,000	385	110	265	385	81,626	0.0033	10	51.6
3	Leithsville	990,000	526	146	380	526	36,845	0.0057	5	935
4	Leithsville	990,000	183	120	75	183	97,952	0.008	5	935
6	Hardyston/Granite	830,000	358	106	244	358	87,294	0.01	5	51.6
7	Allentown	990,000	400	150	250	400	70,970	0.0063	5	351.6

TABLE 7: ZONE II FLOW BOUNDARIES FOR THE EMMAUS PUBLIC SUPPLY WELLS

	Calculated Fixed Radius Method	Simplified Variable Shapes Uniform Flow Equations			Mass Balance Equation
Well #	Zone II Radius ft	Zone II Downgradient Flow Boundary ft	Zone II Upgradient Flow Boundary ft	Zone II Upgradient Max Width ft	Zone II min. radius
1	1,452	2,136	13,423	6,711	0.53
2	1,339	1,748	10,983	5,491	0.53
3	1053	19	116	58	0.32
4	3895	100	316	632	0.53
6	2,039	664	4184	2086	0.54
7	1816	113	707	353	0.45

Conceptual Groundwater Flow Model

A conceptual groundwater flow model is "an idealized and simplified visualization of the physical system" (Witten *et al.*, p. 11). A conceptual model has two fundamental objectives. First, it provides a means to develop an informed understanding of the area's hydrogeology, its natural hydraulic character, and the chemical evolution of the groundwater system. Second, a conceptual model begins the process of predicting the nature, rate, and types of changes within the system resulting from specific stresses (Witten *et al.*, p. 11)

This section presents general principles of groundwater flow, followed by a conceptual groundwater flow model for the Emmaus water supply wells and the geologic and hydrogeologic properties of the aquifer that underlies the Emmaus public supply wells. These properties will form the basis for the model developed in this section.

Groundwater Flow Principles

Groundwater aquifers can be *confined* or *unconfined.* A confined aquifer is overlain by a layer of low permeability (*i.e.*, a sandstone layer overlain by a relatively impermeable shale layer). The water pressure in a confined aquifer is greater than atmospheric pressure because of the confining bed. The water level in a well in a confined aquifer is known as the pressure surface or pieziometric surface. An unconfined aquifer does not have a confining unit (*i.e.*, an unconfined limestone unit). An unconfined aquifer is in contact with the atmosphere and the water level in a well of an unconfined aquifer is the "water table."

The source of all groundwater is precipitation or surface water that percolates downward through the aquifer (called *recharge*). Depending on local conditions, approximately 5 to 50 percent of annual precipitation percolates into the ground to add to the groundwater supply (Witten *et al.*, p. 8). Published recharge estimates for the geologic units underlying the study area are also discussed. Recharge areas are usually in topographically high areas, and discharge areas are usually located in topographic low areas. In the recharge area, there is often a deep unsaturated zone between the water table and the land surface. However, the water table is found either close to or at the land surface in discharge areas. Vegetation and surface water are indicators of discharge areas. Manifestations of discharging groundwater include springs, seeps, lakes, and streams; the presence of vegetation common to wet soils may be an indicator of a discharge area (Fetter, p. 275-276).

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Many field studies conducted in humid regions note that the water table in unconfined aquifers usually has the same general shape as surface topography (Fetter, p. 276). In addition to Topographic Maps, Water Table Contour Maps are a useful tool in predicting both recharge and discharge areas. The elevation of the water table can be measured in any well and used to construct a Water Table Contour Map. A Water Table Contour Map is a series of contours of equal groundwater elevation that look like a Topographic Map (Witten *et al., p.* 9). Groundwater flows in a direction perpendicular to these contour lines and moves from areas of higher water table elevations to areas of lower water table elevations. Flow lines can be drawn on the basis of Groundwater Contour Maps; flow lines diverge from recharge areas and converge toward discharge areas.

Groundwater flow in porous media is described by a fundamental equation called Darcy's Law. The equation states that the quantity (Q) of groundwater flowing through an aquifer is equal to the ability of the aquifer material to conduct water (hydraulic conductivity (K)), multiplied by the force driving the water through the gradient (I), and multiplied by the cross sectional area (A) of the aquifer (Witten *et al.*, p. 10).

Darcy's Law Flow Equation can be written as:

$$Q = KIA$$

Where

Q = quantity, in cubic feet per day
K = hydraulic conductivity, in cubic feet per square foot per day
I = gradient (Change in hydraulic head/change in length)
A = cross sectional area, in square feet

The rate of groundwater flow varies tremendously from a few feet per year (in, for example, water under a low gradient in silt or sand) to a few feet per day (water under high hydraulic gradients in highly permeable gravel). Faster flow rates are possible in solution fractures and channels (Witten *et al.*, p. 10). Flow velocities can be estimated using a simple mathematical equation based on Darcy's Law, as follows:

$$V = Ki/n$$

Where

v = the average linear pore velocity of groundwater flow
K = the permeability of hydraulic conductivity of the aquifer

I = water table slope or hydraulic gradient (measured from Groundwater Contour Map)

n = porosity

Characteristics of Carbonate Rocks

The study area is part of a limestone belt that crosses southeastern Pennsylvania. The intensely fractured and weathered carbonates are characterized by hydrologic features such as springs, solution sinks, disappearing streams, artesian groundwater conditions, deep soils and saprolite, and large volumes of groundwater in storage (Wood *et al.*, p. 103). In carbonate aquifers, groundwater typically flows through the larger fractures and bedding planes, which have a greater hydraulic conductivity; these become enlarged with respect to lesser fractures and even more water flows through them (Fetter, p. 346). Larger openings will then develop at the expense of the smaller openings. Carbonate aquifers can be highly anisotropic and non-homogeneous if water moves only through fractures and bedding planes that have been preferentially enlarged (Fetter, p. 346).

The low lying part of the Great Valley in Lehigh County is underlain primarily by carbonate rocks (limestone and dolomite). Wood *et al.* reported that surface drainage in this broad area of gently rolling hills is affected by a few irregularly spaced and shallowly entrenched streams that have gentle valley slopes. There are relatively few tributaries to the principal streams because most of the drainage is by subsurface routes. In karst regions (*i.e.,* limestone region with sinks, underground streams, and caverns), flow in valleys with permanent streams is usually discharged from carbonate aquifers that are recharged beneath highlands. Water tables in many karst areas are almost flat because of the high hydraulic conductivity (Fetter, 346).

Characteristics of Igneous and Metamorphic Rock

The primary porosity in igneous and metamorphic crystalline rock is low. For groundwater flow to occur, openings (secondary porosity) must be developed through fracturing, faulting, and weathering. Unlike those in the carbonate rocks, these fractures are not enlarged by solution, and the non-carbonate rocks have a much lower hydraulic conductivity than carbonate rocks (Sloto *et al.*, 17).

In the non-carbonate rocks, local streams act as drains for the groundwater systems. Groundwater flow is local, flow paths are short, and groundwater discharges to nearby streams draining the non-carbonated rocks (Sloto *et al.*, 17). Wood, *et al.,* reported that because of the low-lying topographic position that the carbonate rocks occupy in relation to the surrounding and less permeable non-carbonate rocks, the carbonates receive part of their recharge as runoff from non-carbonated areas.

Conceptual Groundwater Model

A conceptual groundwater flow model for the study area and each wellhead is presented below. In addition to the references already cited, the following maps were used:

- Allentown West Quadrangle Pennsylvania 7.5 Minute Series Topographic Map (Department of Environmental Resources Topographic and Geologic Survey, 1964-revised 1992)
- Allentown East Quadrangle Pennsylvania 7.5 Minute Series Topographic Map (Department of Environmental Resources Topographic and Geologic Survey, 1964-revised 1992)
- Map Showing Water-Level Contours, in Mid-April, 1968, In Areas Underlain by Carbonate Rocks in the Great Valley in Lehigh County, Pennsylvania (Plate 4A of Water Resources Report of Lehigh County, Pennsylvania, 1972).
- Groundwater Elevation Contour Map September 1993 (Plate 2 of the Well Survey Evaluation Summary Report for the Rodale Manufacturing Site Emmaus, Pennsylvania).
- Shallow Groundwater Contour Map – SWAP Geology Delineation, Emmaus Borough Public Water (PA DEP (unpublished)).

Wells 3, 4, and 7

Well logs and/or geologic mapping show Wells 3, 4, and 7 to be completed in the Allentown and Leithsville Formations. These formations are composed of medium to dark gray, thick bedded dolomite. Because impermeable (confining) units were not noted in either the logs or mapping, BIA considered these aquifers to be unconfined. Because the lithologies of these two formations are similar, they were considered to be one hydrologic unit for the purpose of this model.

Regionally, the strike of the structures and geologic units is northeast, with folded beds, thrust faults, and thrust slices dipping to the south or southeast. The maximum vertical extent (thickness) of these aquifers range from 1,500 to 2,000 feet. The lateral extent of these formations ranges from several thousand feet to several miles to the north, west, and east. Sloto *et al.* reported the carbonate rocks exposed in the Lehigh Valley represent a continuous stratigraphic sequence from Lower Cambrian to Middle Ordovician (where not structurally dislocated). The southern extent of these aquifers terminate at the base of the South Mountain. However, due to the folding, faulting, weathering, and solubility, these aquifers are not continuous. Therefore, BIA has considered these aquifers to be heterogenous and anisotropic.

Based upon both the well logs and published data, most of the water bearing fractures are located in the top 100 feet of the wells and near drainage ways. Static water levels (at the time the wells were drilled) ranged from 45 feet to 107 feet below ground surface. Wood *et al.* reported the mean depth to water in the Allentown Formation (domestic wells) to be 67 feet, and 90 feet in the Leithsville Formation. BIA

considered the water table to be a regional water table, although there may be some isolated perched water tables due to the significant amount of clay in the Washington series soils and topographic positioning. Groundwater flow with these aquifers will be primarily through secondary openings including fractures traces, joints, bedding planes, etc. The reported groundwater yield for wells in the study area ranged from 60 gallons per minute (gpm) to 210 gpm or greater. Yields of Wells 3, 4, and 7, range from 200 to 250 gpm.

Wells 1, 2, and 6

Geologic Maps show that Wells 1 and 2 are underlain by the Hardyston Formation. The Hardyston Formation, as described by Geyer and Wilshusen, is a light-gray quartzite with quartz-pebble conglomerate at the base. Well logs and geologic mapping show Well No. 6 to be completed in two separate formations, including the Hardyston quartzite (sandstone) and felsic and mafic gneiss (granite). According to Geyer and Wilshusen, granitic gneiss is composed of a light buff to light pink quartz, microcline, and hornblende; the hornblende gneiss is dark gray to black and composed of approximately 50% hornblende and approximately 50% labradorite (feldspar).

The maximum vertical extent (thickness) of the Hardyston was reported to be 800 feet; the maximum vertical extent (thickness) of the granitic and hornblende gneiss was not reported. Laterally, the Hardyston Formation is not very wide (ranging from approximately 500 to 2,500 feet); however, it extends in a northeast-southwest trending band along South Mountain that is several miles long. The lateral extent of the granitic and hornblende gneiss mirrors South Mountain. Regionally, the strike of the structures and geologic units is northeast, with folded beds, thrust faults, and thrust slices dipping to the south or southeast. The Reading Prong units and the overlying Hardyston Formation are commonly in thrust fault contact with the Leithsville Formation. The rocks that outcrop in the Reading Prong are overturned in some places, as older gneiss rests on top of the younger Hardyston, which overlies still younger carbonate rocks (Wood *et al.*, 1972). According to Shultz (1999), arkosic conglomerate and arkose occur at different stratigraphic positions, suggesting intraformational unconformities. Based upon this information, BIA has considered these aquifers to be discontinuous, heterogeneous, and anisotropic. Both of these aquifers are considered unconfined; however, in places where the older gneiss rests upon the younger Hardyston, the dense crystalline gneiss may act as a confining layer.

The review of published literature revealed most of the water-bearing fractures are not usually found below 200 feet in the Hardyston Formation. Wood *et al.* reported it is unusual for wells within the principal metamorphic and igneous rocks of the Reading Prong to penetrate water-bearing zones below 150 feet. Water levels (at the time the wells were drilled) ranged from 45 feet to 65 feet below ground surface. The median depth to water was not reported. Wood *et al.* reported large depths to water in some wells near the

contact of the relatively permeable carbonate rocks along the north flank of South Mountain. In the Hardyston Formation, groundwater is stored in and moves through relatively narrow openings along vertical joints, bedding planes, and fault zones. These openings tend to close as the depth below the land surface increases (Wood *et al.*, 1972). Almost all of the water in the principal metamorphic and igneous rocks of the Reading Prong is stored and transmitted through the weathered zone near the surface and in fractures in the relatively unweathered rock (Wood *et al.*). The median reported yield for 13 wells in the Hardyston Formation is 30 gpm. Only 2 of the 18 wells for which yield or specific capacity data are available produce less than 6 gpm (Wood *et al.*, 1972). The median yield for public supply and institutional wells within granite or granitic gneiss is 50 gpm. The hornblende gneiss is among the poorest yielding in Lehigh County; 3 out of 11 wells had reported yields of 1 gpm or less (Wood *et al.*). Yields of Wells 1, 2, and 6, derived from the reported maximum pump rates, range from 530 to 550 gpm.

Groundwater Recharge and Discharge Zones

The prominent recharge area in the study area is South Mountain, which adjoins the entire southern and eastern side of the study area. Due to the high topographic position and underlying dense crystalline rock, a significant amount of the runoff is available for recharge to the valley. Almost the entire Borough of Emmaus is located in this valley, which is underlain by quartzite rocks of the Hardyston Formation and carbonate rocks of the Leithsville Formation. Recharge occurs primarily through the secondary openings, including bedding planes, joints, fractures, faults, and caverns. Leibert Creek flows from south to north through the water gap in South Mountain. This water gap represents a fracture zone trending to the northwest-southeast. Leibert Creek flows into the Little Lehigh Creek at the northwestern corner of the Borough. Leibert Creek represents a primary discharge zone and a groundwater divide within the study area. It is believed there are many areas of subsurface drainage due to the karstic nature of the valley; some of these areas may also represent groundwater divides. Many of these areas of subsurface flow cannot be accurately determined without additional study (*i.e.*, fracture trace analysis, field study, etc.).

Groundwater Flow Patterns

The groundwater flow direction in the Borough of Emmaus is north-northwest. The hydraulic gradients for each of the wellheads range from 0.0033 to 0.02. The gradient for each individual wellhead was reported in Section 3. In general, the northwesterly groundwater flow direction is not exactly along the strike, which is reportedly northeast-southwest. This is expected in an aquifer where the beds have been tilted, overturned, and faulted. These structural features also have an influence of the direction of groundwater flow. The water-bearing fractures are concentrated in the upper 200 feet.

The Borough of Emmaus public supply wells are located in an aquifer dominated by carbonate and quartzite rocks that have undergone significant deformation and dissolution. Groundwater flow in this aquifer would be dominated by a fracture-flow system. The wells are completed in lithologies that have a

significant amount of water in storage in water table conditions. This aquifer is also believed to have significant hydrologic interconnections that will draw water from a large area. The metamorphic and igneous rock underlying South Mountain provide a medium for recharge of the carbonate and quartzite aquifers in the valley.

The drawbacks to a fractured, limestone aquifer include the possible hydraulic connection of wells during drawdown, short circuits to surface water contamination, and dewatering of fracture zones. A detailed hydrologic investigation would be necessary to model the micro flows systems with each wellhead, based upon the geologic complexity of this system. A detailed hydrologic investigation would also be necessary to accurately map contaminant migration within this aquifer.

Wellhead Protection Area Delineation

BIA used three methods to estimate the extent of Zone II wellhead protection for the Emmaus public supply Wells 1, 2, 3, 4, 6, and 7. These methods included the calculated fixed radius method, simplified variable shapes, and mass balance calculations. The DEP formally requested the fixed radius calculations and the simplified variable shape methods in a letter dated March 8, 2002, from Mr. Andrew Augustine. The results of these three methods were then compared. The results of the calculations for Wells 6 and 7 were also compared to the delineations prepared by Meiser & Earl, Inc.

Mr. Alexander Ulmer (PA License 001720-G) and Mr. Chris Kotch (PA License PG003889) performed all calculations for this study.

Summary of Meiser & Earl Delineation

Meiser & Earl prepared a delineation of Zones I, II, and III for Wells 6 and 7. An explanation of the methodologies used for the delineation of each zone is summarized below.

Zone I

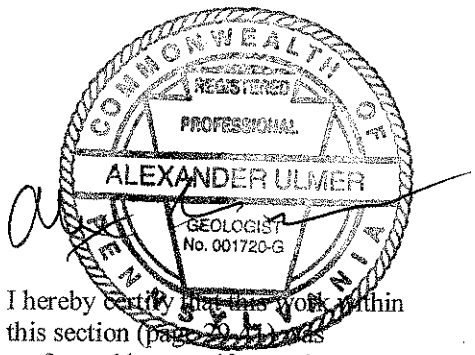
Meiser & Earl calculated Zone I for Wells 6 and 7 using the EPA's volumetric flow equation. This simple equation uses the well pumping rate, time of travel threshold, porosity of the rock, uncased length of well, and the radius of the well. The DEP set a minimum of 100 ft. and a maximum of 400 ft. for the Zone I around a well.

The volumetric flow equation is

$$R = \sqrt{Qt/\pi nH}$$

where

Q = pumping rate of well
t = time of travel threshold
n = aquifer (rock) porosity
H = uncased section (depth) of well
R = Zone I radius



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The porosity of the rock and the length of the uncased section of the well are fixed parameters and do not change with time. Although the maximum pumping rate of the well can vary, a highly conservative estimate (*e.g.*, maximum permitted pump rate of the well) can be used so the calculated Zone I is valid for a wide range of conditions. The time of travel parameter can either be a fixed value (*e.g.*, 90 days - time interval between quarterly water sampling required by the PA DEP) or it can be estimated with hydrogeologic calculations.

The time of travel (*i.e.*, velocity of groundwater movement) is computed with a second simple equation:

$$V = KI/n$$

where

K = Hydraulic conductivity
I = Hydraulic gradient (slope of groundwater)
n = porosity

The porosity was obtained from published data (R.E. Wright Groundwater Report). The hydraulic gradient was calculated from a Water Table Map (Lehigh County Groundwater Report). The hydraulic conductivity was derived from pump test data.

Example calculations using the EPA's volumetric flow equation and time of travel equations are shown in both the Meiser & Earl Report and in this report.

Zone II

Meiser & Earl used a combination of analytical and map interpretation techniques to estimate Zone II for Emmaus Wells 6 and 7.

Pump Test Analysis

One analytical method used by Meiser & Earl to estimate the Zone II was analysis of pump test data (done by others) from Wells 6 and 7. This method yields a radial distance (distance from well to edge of cone of depression) to estimate the extent of the cone of depression; it assumes the shape of the cone is perfectly circular. For a pump test, a well is pumped at a specified pump rate for a specified time (*e.g.*, 48 hrs.). The depth to water (drawdown) is also measured throughout the time period. The drawdown is then plotted against the elapsed time. Analytical analysis of these graphs yields the radial distance from the well to the edge of the cone of depression.

Meiser & Earl found that Zone II values calculated from analysis of pump test data was unrealistically small (20 ft.) for Well 6 and unrealistically large (23 miles) for Well 7. Therefore, Meiser & Earl used the methodologies described below to estimate Zone II for Wells 6 and 7.

Mass Balance Calculations

R.E. Wright Associates prepared a "Special Groundwater Study of the Upper Delaware River Basin" in 1992. This study includes recharge estimates for different types of rock. These recharge rates are the amount of groundwater that is recharged per a fixed area of land (commonly reported as gallons per minute per acre). The pump rate of the well is then divided by the recharge rate to determine the approximate area necessary to recharge a well pumping at the given rate. An example mass balance equation is included in Section 3.5 of this report, as well as the Meiser & Earl Reports. However, this method only yields the total area of Zone II; it does not take the shape of Zone II into account.

Meiser & Earl then used several methods to collectively estimate the shape of Zone II. These methods include the review of Topographic Maps to estimate drainage divides, reviewing aerial photographs to determine orientation of major fracture zones, and use of the uniform flow equation to estimate the extent of Zone I down-gradient of the well. Additional explanations of these methodologies are included in the Meiser & Earl reports. An example of the uniform flow equation is included in this report.

Zone III

Zone III is the entire drainage area that contributes recharge to a well. Delineation of this area is done by review of a Topographic Map to determine topographic divides influencing surface water drainage. It is assumed that subsurface groundwater divides mirror the surface topographic divides.

Summary of Meiser & Earl Reports

To evaluate the relevance of the Meiser a& Earl report for this study, BIA determined:

(1) whether any of the data used in the calculations is significantly different from current conditions in the Borough of Emmaus;
(2) whether the methodologies selected by Meiser & Earl to estimate Zones I, II, and III are credible from the standpoint of a Registered Professional Geologist; and
(3) whether the methodologies selected by Meiser & Earl to estimate Zones I, II, and III were appropriate when compared to the scope of this study and anticipated management options.

The geologic data used in the calculations by Meiser & Earl are from both published sources and from actual data from the municipal supply wells. This data (*e.g.*, geology, depth of casing, porosity of rock, etc.) does not vary with time. Although the pump rate can change, Meiser & Earl used relatively

conservative pump rates. BIA also performed calculations, using the maximum permitted pump rates (supplied by the Emmaus Public Works Director), which mirrored Meiser & Earl's calculations. It is the opinion of BIA that the data used in Meiser and Earl's calculations are still valid based upon current conditions in the Borough of Emmaus.

It is also our opinion that the types of calculations used by Meiser & Earl are standard in the field of hydrogeology; however, it should be noted that it was not part of the scope of this study for BIA to evaluate each and every calculation (including pump curve analysis) used by Meiser & Earl to determine accuracy. The DEP requested BIA use many of the same methods as Meiser & Earl to estimate Zone II for the remaining public supply wells. Field studies on the wells/aquifer were not part of the scope of this study.

For these reasons, BIA concluded the methodologies used by Meiser & Earl were appropriate when compared to the scope of this study.

Delineation Input Data

This section describes the common hydrologic input data required for all three calculated methods used by BIA to delineate the Zone II wellhead protection areas. The Borough supplied site-specific data for the wells, including well registration forms, well logs, pump test data, and pump rates. All remaining hydrologic data was obtained from published information. Table 6 includes the input data for all calculations.

Recharge Rates

Recharge rates describe an aquifer's ability to resupply itself with water that infiltrates from precipitation. Annual groundwater recharge rates were adapted from the "Special Groundwater Study of the Upper Delaware River Basin Study Area II," 1992, by R.E. Wright Associates, Inc. The greater the recharge rate, the more water that is generally available for use. As the recharge rate increases the size of protective radius decreases.

Pump Rates

The pump rate is the amount of water that can be withdrawn from the well over a given time period (often expressed as gallons per minute, gallons per day, or million gallons per year). The state permits each well with a maximum withdrawal rate to ensure that the well does not take more water than can be recharged from precipitation. The maximum permitted pump rates were supplied for all six wells and were used in the calculations. As the withdrawal rate increases, the protective radius also increases.

Hydraulic Gradient

The hydraulic gradient is the slope of the water table and describes how fast water travels from one location to another. The hydraulic gradient for the Emmaus wells was calculated from Groundwater Contour Maps reviewed as part of this study. The "Lehigh Valley Map" prepared by Wood *et al.* (1972) was used to calculate gradients for Wells 1, 2, 4, 6, and 7. The "Rodale Map" prepared by GeoEnvironmental Consultants (1993) was used to calculate the gradient for Well 3. The Lehigh Valley Map had limited groundwater elevation data in the southern portion of Emmaus, and no groundwater elevation data in Upper Milford Township. The Rodale Map had almost all of the groundwater elevation data in the southern portion of Emmaus and Upper Milford Township. Sections of both maps are included in Figures 5 and 6. As the gradient increases, so does the velocity of the water; a higher velocity reduces the time of travel, which decreases the area needed to protect the water supply.

Aquifer Thickness

The aquifer thickness refers to the vertical extent of the rock formation that holds the water supplying a given well. Values for aquifer thickness were reported in three sources. Because of the large range in aquifer thickness, the depth of each well was used for the thickness. It was assumed that although these wells are probably only partially penetrating the aquifer, only the drilled sections would be contributing water to the well. BIA chose to use the depth of the well as being representative of the aquifer thickness or the open interval of the bore hole in our calculations because of the variability in the reported aquifer thicknesses and a lack of specific well construction information for several of the wells.

As the aquifer thickness or open interval (depending upon the calculation) increases, the protective radius will decrease. A smaller aquifer thickness or open interval will provide a more conservative wellhead protection zone. However, BIA was unable to provide a smaller but still defensible value for the aquifer thickness or open interval with available information.

Porosity

Porosity is the portion of the aquifer that is not rock; it refers to the small open spaces between rock grains and is reported in percentage of open space. Geologic texts provide estimates of porosity for various rock types but due to the general nature of these texts the porosity is reported in a range. When the underlying

geologic formation is sandstone the porosity ranges from 5-30%. When the aquifer is carbonate rock, the porosity ranges from 1-20%. Shale and fractured crystalline rock have porosity ranges of 0-10%. BIA selected porosity values that are conservative and are within the range for reported values in theses types of aquifers. As porosity increases, the available water within a given area increases and the radius required to protect a given volume of water decreases.

Hydraulic Conductivity

Hydraulic conductivity is a measure of water's ability to move through a specific kind rock. The USGS has reported a large range (six orders of magnitude) for hydraulic conductivities in the various formations present within the geologic formations of the Lehigh Valley. Sloto *et al.* performed groundwater modeling using mean values, median values, and the average of the mean and median values. The modeling results were compared to actual data observed in the field. This investigation found that the average of the mean and median values best matched the observed field data. Therefore, BIA used the average of the mean and median hydraulic conductivity values as reported by Sloto *et al.* An increase in the hydraulic conductivity of the rock will decrease the area of the protective zone.

Calculated Fixed Radius Method

The EPA defines the calculated fixed radius method (cylindrical method) as "a volumetric flow equation to calculate a fixed radius around a well through which water will flow at a specified time of travel." The radius, in effect, defines a circular time of travel isochrone around the well, which, extended through the aquifer, delimits a cylinder with a pore volume equal to the volume of water pumped during the specified period (EPA, 1994).

The equation is:

$$r = \sqrt{(QT/\pi nH)}$$

where

Q = pumping rate of the well
T = time of travel threshold
n = aquifer porosity
H = open interval or length of well screen

The time of travel (TOT) indicates how long water or a contaminant will take to reach a well from a point within the zone of contribution. The TOT criterion can either be selected (*e.g.*, using 90 days as a

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management goal, which is the DEP-mandated interval between well sampling) or it can be calculated from the average velocity and distance over which the hydraulic gradient was calculated.

BIA made preliminary calculations for time of travel for each of the wellheads. The results ranged from 25 days to 12.5 years. Because of the large range, BIA selected a set time of travel to maintain a uniform management goal and a uniform basis for comparison of the WHPA radii. A 5-year time of travel was selected, which is much more conservative than a 90-day time of travel.
The following example shows the calculation for the Zone II radius for Well 1. The results of the calculations for Zone II for each well using the calculated fixed radius are shown in Table 7.

$r = \sqrt{(QT/\pi nH)}$

$r = \sqrt{(81{,}626\ ft^3/day) \times (1{,}825\ days) / (3.1416) \times (0.10) \times (225\ ft.)}$

$r = 1{,}452$ ft.

Simplified Variable Shape Method

The simplified variable shape method uses a combination of analytical solutions using time of travel and drawdown equations to establish the up-gradient and down-gradient cone of depression boundaries (null points). After the null points are established, the shape of the zone is then created based upon specific groundwater flow patterns developed for specific aquifer characteristics and pumping rates. Standardized shapes are then developed by modeling different pumping rates for the characteristics of a specific aquifer. It may take hundreds of calculations to develop the standard shape for any given set of well characteristics.

The uniform flow equation was used to calculate the down-gradient flow boundary of the cone of depression. This equation can also be used to calculate the maximum width of the cone of depression in the up-gradient direction. The uniform flow equation is:

$-y/x = \tan[2\pi Kbi/Q)y]$

The uniform flow equation, solved for x and y, is as follows:

$x = -Q/2\pi Kbi$

$y = +-Q/2Kbi$

where

x = the down-gradient flow boundary

y = the maximum width of the up-gradient zone of contribution

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Q = pumping rate of the well

K = horizontal hydraulic conductivity

i = horizontal hydraulic gradient

b = aquifer thickness

According to EPA, the up-gradient zone can be delimited by several methods, including:

- calculating the divide up-gradient with the formula $Y_{up} = Q/Kbi$
- delineating the entire up-gradient zone of contribution using +-y as the width at the up-gradient limit of the cone of depression and using a Potentiometric Map to extend the flow lines to a groundwater divide or other aquifer boundary
- using time of travel equations

BIA estimated the flow boundary using time of travel criterion in the calculated fixed radius method. The method of using the Potentiometric Map is more of a qualitative approach based on topography, rather than a calculated estimate of length. Therefore, BIA calculated the divide up-gradient with the formula: $Y_{up} = Q/Kbi$; this value was compared to the values calculated by using the time of travel criterion.

The following example shows the calculation for the Zone II radius for Well 1. The Zone II results using the simplified variable shape method are shown in Table 7.

$x = -Q/2\pi Kbi$

$x = 720{,}000gpd/2\pi(51.6\ gpd/ft2)(315ft)(.0033)$

$x = 2{,}136$ ft.

$Y_{up} = Q/Kbi$

$Y_{up} = 720{,}000gpd/\ (51.6\ gpd/ft2)(315ft.)(.0033)$

$Y_{up} = 13{,}423$ ft.

$y = +-Q/2Kbi$

$y = 720{,}000gpd/\ 2(51.6\ gpd/ft2)(315ft)(.0033)$

$y = 6{,}711$ ft.

These values establish the boundaries of the wellhead protection zone. The shape of this zone is determined using geologic and topographic controls that impact the flow of groundwater within the aquifer at given pump rates. Insufficient data currently exists to accurately modify the shape of the zones. Without

accurate data on the nature and impact of various geologic and topographic controls on groundwater flow, BIA is hesitant to make assumptions regarding the shape of these zones.

Mass Balance Equations

The use of mass balance equations was one of the methodologies BIA used to estimate the Zone II areas for the public supply wells. A description of this methodology was provided in this report. The step-by-step procedure for calculating Zone II for each of the municipal supply wells is provided below.

Table 6-6 in the Wright Associates report (1992) shows the estimated annual groundwater recharge rate (for an average frequency of one year in every two years) for several different aquifers. The maximum permitted withdrawal rates for the public supply wells were provided by the Emmaus Public Works Director. These tables are included in Appendix 7.

Step 1: Divide the maximum permitted withdrawal rate of the well by the recharge rate listed for the aquifer in which the well is drilled.

Example for Wells 1 and 2:

Maximum permitted pump rate: 720,000 gpd
Recharge Rate (Hardyston Sandstone): 830,000 gpd

720,000 gpd / 830,000 gpd/mi^2 = 0.87 mi^2

Step 2: The value generated in Step 1 is the minimum area necessary to recharge a well that pumps at the above-listed maximum withdrawal rate. The theoretical shape of a cone of depression is circular. Therefore, BIA assumed the area recharging the well is circular for the purposes of this study (using mass balance method). The formula for the area of a circle can be solved for the radius of the circle because the area is already known (calculated in Step 1 above).

Example for Wells 1 and 2:

$A = \pi r^2$
$r = \sqrt{A/\pi}$

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Where

A= Area of a circle

r= Radius of a circle

π= (approximately 3.14)

$r = \sqrt{0.87 mi^2/3.14}$

r=0.53 mi

Wells 1 and 2

Wells 1 and 2 are located in an area underlain by the Hardyston Quartzite. There are no well logs for these wells to confirm the underlying geology throughout the entire depth of the well.

Based upon a recharge rate of 830,000 gpd/mi^2 for the Hardyston Quartzite (sandstone) and a maximum permitted withdrawal rate of 720,000 gpd, the Zone II radius is approximately 0.53 mile. The Leithsville Formation (carbonates) is mapped directly to the west. Although there are no existing well logs for Wells 1 and 2, it is likely these wells may partially penetrate the Leithsville Formation. A well yield of 500 gpm is not typical of a well that is completely in a quartzite formation; the JPC Wellhead Protection Demonstration Project reported a median well yield in the Hardyston Formation of 30 gpm. However, the estimated annual groundwater recharge rate for a carbonate formation (990,000 gpd/mi^2) is less conservative than the recharge rate for the sandstone aquifer. Thus, the recharge rate for the Hardyston Quartzite was used for the calculation of Zone II for both Wells 1 and 2.

Well 3

Well 3 is located in an area underlain by the Leithsville Formation. There is no well log record for this well to confirm the underlying geology throughout the entire depth of the well. Based upon a recharge of 990,000 gpd/mi^2 for the Leithsville Formation (carbonate) and a maximum permitted withdrawal rate of 325,000 gpd, the Zone II radius is approximately 0.32 mile.

Well 4

Well 4 is located in an area underlain by the Leithsville Formation. There is no well log record for this well to confirm the underlying geology throughout the entire depth of the well. Based upon a recharge of 990,000 gpd/mi^2 for the Leithsville Formation (carbonate) and a maximum permitted withdrawal rate of 864,000 gpd, the Zone II radius is approximately 0.53 mile.

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The Hardyston Quartzite Formation is mapped directly east of the site. Although it is possible that there is some contribution from the quartzite, it is likely the primary aquifer is the Leithsville (carbonate). A well yield of 665 gpm is not typical of a well that is completed in a quartzite formation; the JPC Wellhead Protection Demonstration Project reported a median well yield in the Hardyston Formation of 30 gpm. Based upon this information, the recharge of 990,000 gpd/mi^2 for the Leithsville Formation (carbonate) will be used for the calculation of the Well 4 Zone II.

Well 6

Geologic mapping shows Well 6 is located in felsic and mafic gneiss but the well log shows this well in sandstone and granite. Therefore, the recharge rate for sandstone was selected. Base upon a recharge rate of 830,000 gpd/mi^2 for the Hardyston Quartzite (Sandstone) and a maximum permitted withdrawal rate of 770,000 gpd, the Zone II radius is approximately 0.54 mile.

Well 7

Geologic mapping shows Well 7 is located in the Allentown Formation (dolomitic limestone); the well log for Well 7 confirms this well was completed in limestone. Therefore, the recharge rate of 990,000 gpd/mi^2 for carbonate rock was used for the calculation of Zone II. Based upon a recharge rate of 990,000 gpd/mi^2 and a maximum permitted withdrawal rate of 626,000 gpd, the Zone II radius for Well 7 is approximately 0.45 mile.

Findings

Table 7 includes the analytical results for the calculations of Zone II for all of the municipal water supply wells. These results include the calculated fixed radius method, simplified variable shape method, and the mass balance equation. This section compares the results of the three different methods against the EPA's .5-mile default radius. The final map created for this report (see Figure 7) shows only the Zone II areas selected—the EPA's default .5-mile radius for all wells except Wells 6 and 7. However, Figures 8a and 8b includes example maps that show the three different calculated Zone II areas and the EPA .5-mile default radius for Wells 1 and 4.

As Table 7 shows, the delineation methodologies produced considerably different protective areas for each well. Additionally, there is considerable variation between the protective zones of individual wells within each methodology. This section discusses the protective zones and applicability of each method, and provides an explanation for selecting the EPA's default .5-mile radius for all wells except Wells 6 and 7.

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Calculated Fixed Radius

The calculated fixed radius method provided protective areas with radii ranging from 0.2 mile to 0.74 mile. With the exception of Well 4, all of these radii were smaller than the EPA default radius. The radius for Well 4 was nearly 50% larger than the default radius. The variations in protective radii result from the different pump rates and well depths used in the calculations. Because the EPA's default .5-mile radius provides a more protective Zone II for most of the wells, it was selected over the calculated fixed radius.

Simplified Variable Shape & Uniform Flow Equations

This method applies standardized shapes to each well within a given aquifer type. The standardized shapes are developed based upon representative aquifer characteristics and specific pumping rates. In areas where the aquifer characteristics are variable, including the carbonate bedrock of the Lehigh Valley, hundreds of calculations may be required to establish "typical shapes." Without detailed data for aquifer characteristics, it is impossible to establish these typical shapes. Even though BIA could not apply specific shapes to the zones, BIA did calculate the up-gradient and down-gradient extents of these areas. These calculations were performed to help determine reasonable extents for the protection areas.

The extents determined using the uniform flow equations varied widely. The up-gradient extent ranged from 2.5 miles for Well 1 to 0.02 mile for Well 3. The down-gradient extents for these same wells are 0.4 mile and 0.004 mile respectively. The up-gradient widths of the protective areas ranged from over a mile to less than 0.01 mile. The great variability of the results of these calculations was most likely due to the need to estimate most of the aquifer characteristics—hydraulic conductivity, hydraulic gradient, and aquifer thickness.

These calculations generated protective areas that appear to be either extremely large or extremely small when compared to the EPA's default .5-mile radius. These calculations are not recommended for establishing the Zone II wellhead protection zones because of the lack of necessary information to create typical shapes and the extents of deviation of the protective zones from the default radius.

Mass Balance

The Zone II areas calculated with the mass balance equation was almost identical to EPA's default radius for most wells. In general, the mass balance calculations provided for wellhead protection radii are just a few hundredths of a mile larger than the default radius. Only Well 3 had a smaller radius of 0.32 mile. This difference from the other wells is caused by the low pumping rate of Well 3, which is between one-half and one-third of the other wells. Although the mass balance calculations provided for a slightly larger

wellhead protection radius than the default value for most wells, it provided only 60% of the default for Well 3. Because the mass balance calculations provided substantially less protection around Well 3, EPA's default .5-mile radius was selected.

Conclusions

The Zone II previously delineated by Meiser & Earl should be used for Wells 6 and 7; these zones were determined using well-specific data and are sufficiently protective of these wells.

With the exception of Wells 6 and 7, the fixed radius was chosen for Zone II wellhead protection. BIA has selected the fixed radius as it consistently provides the most protective radius. The more detailed simplified variable shape and mass balance calculations require that the shapes be modified based upon specific geologic and hydraulic control information that was not available during this study. A fixed time of travel was used in calculating the fixed radius because the aquifer information needed to accurately calculate the time of travel was not readily available.

The extremely variable nature of fractured bedrock aquifers in general, and karst aquifers in particular, makes generalization nearly impossible. The extreme variability of aquifer characteristics over short distances prohibits the development of reasonably accurate models (delineations). Before calculating more rigorous wellhead protection zones for the remaining wells, a hydrogeologic study should be performed to obtain site specific information for these well.

The Zone II Wellhead Protection Zone Map in Figure 7 shows the Zone II areas delineated based upon the fixed radius for Wells 1, 2, 3, and 4. This maps shows that there is overlap between the radii for Well 1, 2, and 4 and also between Well 3 and the delineated Zone II areas for Wells 6 and 7. These areas cover the majority of the Borough's main commercial corridor, State Route 29 (a.k.a. Chestnut Street, Main Street, State Street, and Lehigh Street). The combined Zone II areas also cover most of the rail lines that run through Emmaus.

The map also shows that these zones encompass most of the potential contaminant sites with high and medium risk potential. The only areas that have an increased density of high potential risk sites and are not covered by a Zone II protective area are:

- The area around the intersection of 4th and Adrian Streets within the Borough of Emmaus.
- The area around the intersection of Lehigh and 31st Streets in the City of Allentown.

In general, the selected Zone II wellhead protection zones provide good protection for the Borough of Emmaus' water supply system.

SEP 15 1995

MEISER & EARL, INC. Hydrogeologists

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September 14, 1995

Mr. Geoffrey A. Reese, P.E.
Joint Planning Commission
Lehigh-Northampton Counties
961 Marcon Boulevard, Suite 310
Allentown, PA 18103-9397

Re: Task A. Detailed WHPA Delineation
Borough of Emmaus Well No. 6

Dear Geoff:

Enclosed is our WHPA delineation for the Borough of Emmaus Well No. 6 in Lehigh County.

If you have any questions or comments, please do not hesitate to contact me.

Sincerely,

James R. Eby

James R. Eby, P.G.
Project Hydrogeologist

JRE/mlr

Enclosures

cc: Allen O'Dell, P.E.

EMMAUS.JRE

Working Paper Prepared

For

Joint Planning Commission (JPC)
Lehigh-Northampton Counties

By Meiser & Earl, Inc.

September 1995

Task A

Detailed WHPA Delineation

Borough of Emmaus
Well No. 6

EMMAUS.RE

BOROUGH OF EMMAUS WELL NO. 6

1. **Regional Hydrogeologic Assessment**

a. Location

The well is located along Leibert Creek, just north of Shimerville Road, within the southern end of the Borough of Emmaus, Lehigh County, Pennsylvania. The location of the well is shown on Figure 1. The well is in the Great Valley Physiographic Section of the Ridge and Valley Province, approximately 500 feet from the Reading Prong Section of the New England Province, according to Figure 5-1 in the JPC "Wellhead Protection Demonstration Project" report, December 1992.

b. Environmental landscape unit and subunit in which the well is located

The well site is mapped as being located within the Carbonate Valley Landscape Unit and falling within the Leithsville Dolomite Subunit, according to Table 5-2 and Plate 6 in the JPC "Wellhead Protection Demonstration Project" report, December 1992, and the Pennsylvania Geologic Survey's "Water Resources of Lehigh County" report W-31, 1972. However, the driller's log shows that this well is drilled entirely in sandstones and granites, which comprise the Hardyston Quartzite Subunit and Igneous-Metamorphic Subunit of the Reading Prong Landscape Unit.

c. General geology and average hydrogeologic parameters of the bedrock aquifer

Based on the driller's log, the well apparently is completed within the Hardyston Formation of Cambrian age and the underlying granites and gneisses of Pre-Cambrian age. The Hardyston Formation consists of white to dark gray quartzite interbedded with arkose, quartz pebble conglomerate and silty shale or phyllite.

Ground water in the Hardyston Quartzite moves through relatively narrow and some enlarged joints, bedding planes and fault zones. Ground water in the granites and gneiss moves through relatively narrow joints and faults.

From Table 5.5 in the JPC "Wellhead Protection Demonstration Project" report, the Reading Prong bedrock units have the following characteristics:

Hardyston Quartzite

Median well yield = 30 gpm

Median specific capacity = 0.58 gpm/ft

Igneous - Metamorphic Unit

Median well yield = 50 gpm

Median specific capacity = 1.2 gpm/ft

2. **Detailed WHPA Delineation**

a. Well Information

* Drilled: January 1963
* Depth: 350 feet
* Casing depth and diameter: 16 inch diameter to 29 feet below ground
  12 inch diameter to 106 feet below ground
* Open Hole Diameter: nominal 12 inches from 106 feet to 150 feet
  nominal 10 inches from 150 feet to 350 feet
* Static Water Level: 65 feet below pump base on June 8, 1995
* Pumping rate (Q): 465 gpm for 8-hour test on June 8, 1995; permitted pumping rate = 530 gpm; pump capacity = 450 gpm at 116 feet of head
* Drawdown (s): 20 feet at end of 8-hour test
* Specific Capacity: 23 gpm/ft at end of 8-hour test

b. Zone I - Wellhead Protection Zone (WHZ)

(1) Per PADEP's regulations: Calculate a fixed radius using the volumetric flow equation and travel time (t) of 90 days, which is the time interval between the quarterly water-quality sampling required by PADEP. In the following equation, the length of the uncased borehole is H and the effective aquifer porosity (n) or specific yield is 0.05. This value is based on published specific yield values of 0.04 to 0.05 for the carbonate formations in Lebanon and Lehigh Valleys, as found in the "Special Groundwater

Study of the Middle Delaware River Basin, Study Area II," R.E. Wright Associates, Inc., 1980, p. 8-8, Table 4.2, and a specific yield value of 0.05 used by the U.S. Geological Survey in "Hydrogeology and Ground-Water Flow in the Carbonate Rocks of the Little Lehigh Creek Basin, Lehigh County, Pa.," Water-Resources Investigation Report 90-4076, p. 51. Although the bedrock at the well is not carbonate, the yield and specific capacity of the well are similar to those wells in the carbonates, thus a specific yield of 0.05 has been assumed. Furthermore, the Pennsylvania Geologic Survey's water resource report W-31, page 159, states that "the specific yield of the metamorphic and igneous rocks in Lehigh County probably is about the same as in the Brandywine Creek basin;" i.e., 0.075 to 10, which is higher than expected, considering the relatively low median specific capacity. Using the values above, the volumetric flow equation calculates the radius of Zone I to be:

$$r = \sqrt{\frac{Q\ t}{\pi\ n\ H}} = \sqrt{\frac{102{,}032\ ft^3/d\ x\ 90\ d}{3.14\ x\ 0.05\ x\ 244\ ft}} = 490\ ft.$$

$$Q = permitted\ \ pumping\ \ rate = 530\ gpm$$

PADEP's minimum and maximum radii for Zone I are 100 and 400 feet, respectively, per PADEP's wellhead protection regulations. Therefore, a radius of 400 feet for the boundary of Zone I is appropriate.

(2) Time-of-travel: Actual ground-water flow rates within fractured rocks may be much faster than those calculated by using the volumetric flow equation. PADEP suggests that time-of-travel subzones be considered in Zones II and III based on management goals and methods. For example, if a management goal is to provide a time-of-travel

zone which will allow 30 days to react to a contamination event, such a subzone could be delineated in Zones II and III; and more stringent controls could be placed on that subzone than on the remainder of the zone. Time-of-travel will be discussed further in the following section.

c. Time-of Travel Estimates (Ground-Water Flow Rates)

Transmissivity (T) Calculation:

(1) Method 1: Time-Drawdown Data

Using a semi-log plot of water-level drawdown vs. elapsed time data from the June 8, 1995 pumping test, and applying the Cooper-Jacob straight-line analysis method (Lohman, 1979, p. 19-23), T is calculated as follows:

$$T = \frac{(264)(Q)}{\Delta s}$$

where: T = transmissivity (gpd/ft)
Q = pumping rate (gpm) and
Δs = drawdown (ft) per log cycle

$$T = \frac{(264)(465)}{6} = 20{,}500 \text{ gpd/ft}$$

(2) Method 2: Water-Level Recovery Data

After the end of the 8-hour pumping test, the water level in the well recovered to the static water level within a period of 105 minutes. Using a semi-log plot of the recovery data, and applying the calculated recovery method (Driscoll, 1986, p. 254-260), T is calculated as follows:

$$T = \frac{264\,Q}{\Delta s}$$

where: T = transmissivity (gpd/ft)
Q = pumping rate (gpm)
Δs = residual drawdown (ft) per log cycle

$$T = \frac{(264)\,(465)}{12} = 10{,}200 \text{ gpd/ft}$$

Although Methods (1) and (2) provide an apparent wide range in T values, these results are comparable within the accuracy of these calculations for flow in fractured rock. The higher T value of 20,500 gpd/ft will be used for conservative estimation of the radius of pumping influence and flow velocity.

Hydraulic Conductivity (K):

$$K = \frac{T}{m},$$ where m = saturated thickness (ft); K = gpd/ft^2

Using the uncased borehole, where m = 244 feet:

$$K = \frac{20{,}500 \text{ gpd/ft}}{244 \text{ ft}} = 85 \text{ gpd/ft}^2$$

then:

$$K = \frac{85 \text{ gpd/ft}}{7.48 \text{ gal/ft}^3} = 11 \text{ ft/day}$$

For fractured-rock flow, assume m = 10 ft to calculate a conservatively high estimate of K, i.e. the water-bearing zones are limited to 10 feet of total well bore.

$$K = \frac{20{,}500 \text{ gpd/ft}}{10 \text{ ft}} = 2{,}050 \text{ gpd/ft}^2$$

then:

$$K = \frac{2{,}050 \text{ gpd/ft}^2}{7.48 \text{ gal/ft}^3} = 275 \text{ ft/day}$$

Water-Table Gradient (I):

The Borough of Emmaus Well No. 6 is located along Leibert Creek about 1.2 miles south of the confluence with Lehigh Creek. The Pennsylvania Topographic and Geologic Survey's "Water Resources of Lehigh County" report, W-31, shows a water-table gradient of approximately 0.007 toward the northwest in the vicinity of Well 6. The U.S.G.S. map shows a gradient of approximately 0.01, based on the gradient of Leibert Creek near Well 6; therefore, a water-table gradient of 0.01 appears to be appropriate to provide a conservatively high calculation of ground-water velocity.

Ground-Water Velocity (v):

$$v = \frac{KI}{n} \text{ where } n = \text{porosity}$$

Porosity is slightly to significantly larger than specific yield. For fractured rocks, assume specific yield (Sy), which is the ratio of the volume of water that can freely drain from the pores in the aquifer to the volume of the aquifer, is an estimate of effective porosity and, therefore, allows an estimate of "effective" velocity. Use a value for Sy of 0.05, as discussed previously in this paper.

For the uncased borehole and uniform "n":

$$v = \frac{KI}{n} = \frac{(11\text{ft/day})\,(0.01)}{0.05} = 2 \text{ ft/day or } 15 \text{ ft/week}$$

For fractured-rock flow and a conservatively higher estimate of v, use the K calculated where m = 10 feet. Because the porosity within the 10 feet of water bearing zones is greater than for the total saturated thickness of the borehole, assume a porosity of 0.10:

$$v = \frac{(275 \text{ ft/day})(0.01)}{0.10} = 28 \text{ ft/day or } 200 \text{ ft/week}$$

These calculations indicate that a one-week, time-of-travel distance could range from approximately 15 to 200 feet or more, depending upon the nature and distribution of fractures in the bedrock. For example, the one-week, time-of-travel distance from this well may be greater in some directions along more developed fractures than in other directions where fractures are small or non-existent. Defining the actual ground-water velocities in different directions is virtually impossible, even with extensive field work; however, a water supplier may wish to use a certain calculated distance based on management goals to establish a zone in which specific activities are prohibited or more strictly controlled than elsewhere.

d. Zone II - Area through which water is diverted to the well determined from a calculated "cone of depression"

In an idealized, isotropic, homogeneous aquifer (e.g., sand) with a flat water table, the cone of depression is a circle centered around the well. During pumping of the Borough of Emmaus Well No. 6, the water level was drawn down approximately 20 feet after 8 hours of pumping at 465 gpm. Using the Cooper-Jacob distance-drawdown formula and

assuming T = 20,500 gpd/ft, the slope of a distance-drawdown straight-line plot for this well is calculated to be approximately 12 feet per log cycle (Δs):

$$\Delta s = \frac{528\,(Q)}{T} = \frac{(528)\,(465\text{ gpm})}{20{,}500\text{ gpd/ft}} = 12\text{ ft/log cycle of distance}$$

Based on a graphical plot using a total drawdown of 20 feet, a water-table slope of 12 feet per log cycle of distance during pumping at 465 gpm, and a well diameter of 10 inches, the zero drawdown boundary of a circular cone of depression projects to occur at 20 feet from the well, which is unrealistically small.

In fractured, dipping bedrock, the cone of depression is typically elongated along paths of higher transmissivity, such as major stream valleys, bedding plane partings parallel to bedrock strike and fracture zones often associated with fracture traces. At the Borough of Emmaus Well No. 6, bedrock strike apparently is oriented northeast-southwest; the strike of the carbonate bedrock 4,500 feet north of the well is mapped by the U.S.G.S. as being N70°E. The Leibert Creek Valley is oriented northwest-southeast. The shape of the cone of depression in this setting is likely to be irregular, extending farther up the valley and along bedrock strike than in other directions and would only be approximated by a circular shape.

The calculated 20-foot radius obviously is too small to provide adequate protection of this high-yield well in a terrain where rapid ground-water flow rates probably occur, especially in conduits parallel to the stream valley in which significant underflow is expected.

Therefore, the area for Zone II was determined using average annual ground-water recharge rates and calculating the area which provides sufficient recharge to sustain a continuous pumping rate of 530 gpm, which is the rate the well is permitted to pump.

Based on a recharge rate for the Reading Prong of 0.67 gpm/ac, as determined from the "Special Groundwater Study of the Upper Delaware River Basin - Study Area III," 1992, by R.E. Wright Associates, Inc., Zone II is calculated to be approximately 790 acres. Some carbonate bedrock, having a recharge rate of 0.77 gpm/acre, is mapped within the surface watershed of the well, including the site of the well where the driller's log indicates that sandstones and granites exist. To be conservative and because the presence and thickness of the carbonates is uncertain within this 790 acres, the areas mapped as carbonates were considered to also have a recharge rate of 0.67 gpm/acre. The effects of topography on ground-water flow patterns and the rate at which potential contaminants could reach the well were considered in establishing the upgradient boundaries of Zone II. The boundary for the Zone II shown on Figure 1 follows topographic divides upgradient from the well and a local topographic divide within the watershed of the well. As a basis for establishing the downgradient extent of Zone II, the downgradient null point of a cone of depression was calculated using the uniform flow equation, even though the size of Zone II is based on the recharge-balance method. The downgradient null point is calculated to be approximately 600 feet from the well.

e. Zone II enhancement with fracture-trace analysis and hydrogeologic mapping

Meiser & Earl, Inc. mapped fracture traces in the vicinity of the well as shown on aerial photograph 3-46 (Figure 2). Several of these fracture traces occur within a few hundred feet of the well. In addition, the well is located at the mouth of a prominent topographic gap, which lines up with several other topographic features northwest and southeast of the well, suggesting the presence of a longer, northwest-trending fracture zone (i.e., a lineament). The shape of Zone II was not modified based on these fracture traces and potential lineament because the recharge-balance method was used to delineate Zone II and because no detailed information (e.g., observation well data) was available concerning the impact on pumping water levels of fracture zones which may underlie the fracture traces seen on aerial photographs.

The Zone II boundary is an approximation and is no substitution for actual field demonstration. The actual cone of depression or area in which water is diverted to the well may be larger or smaller than Zone II due to the influence of fracture and conduit flow. Individuals proposing certain activities within the mapped Zone II may be able to demonstrate that it is not within the actual zone by installing a well or wells at the site of the proposed activity and monitoring the water level for changes in response to pumping the Borough of Emmaus Well No. 6 or by using some other appropriate method (e.g., showing the hydraulic gradient is not toward the No. 6 well). Conversely, it is possible that the area in which water is diverted to the well extends beyond the mapped Zone II boundary, particularly in the vicinity of the well where conduit flow can allow ground-

water movement across topographic divides. The water supplier may wish to require that proposed activities outside, but near the mapped Zone II, especially those near fracture traces, demonstrate that the activity is not within this zone.

f. Zone III - Zone of Contribution (ZOC)

The ZOC includes the natural surface and inferred ground-water drainage area contributing water to this well; therefore, the boundary of the ZOC is based on the topographic divide as shown on Figure 1.

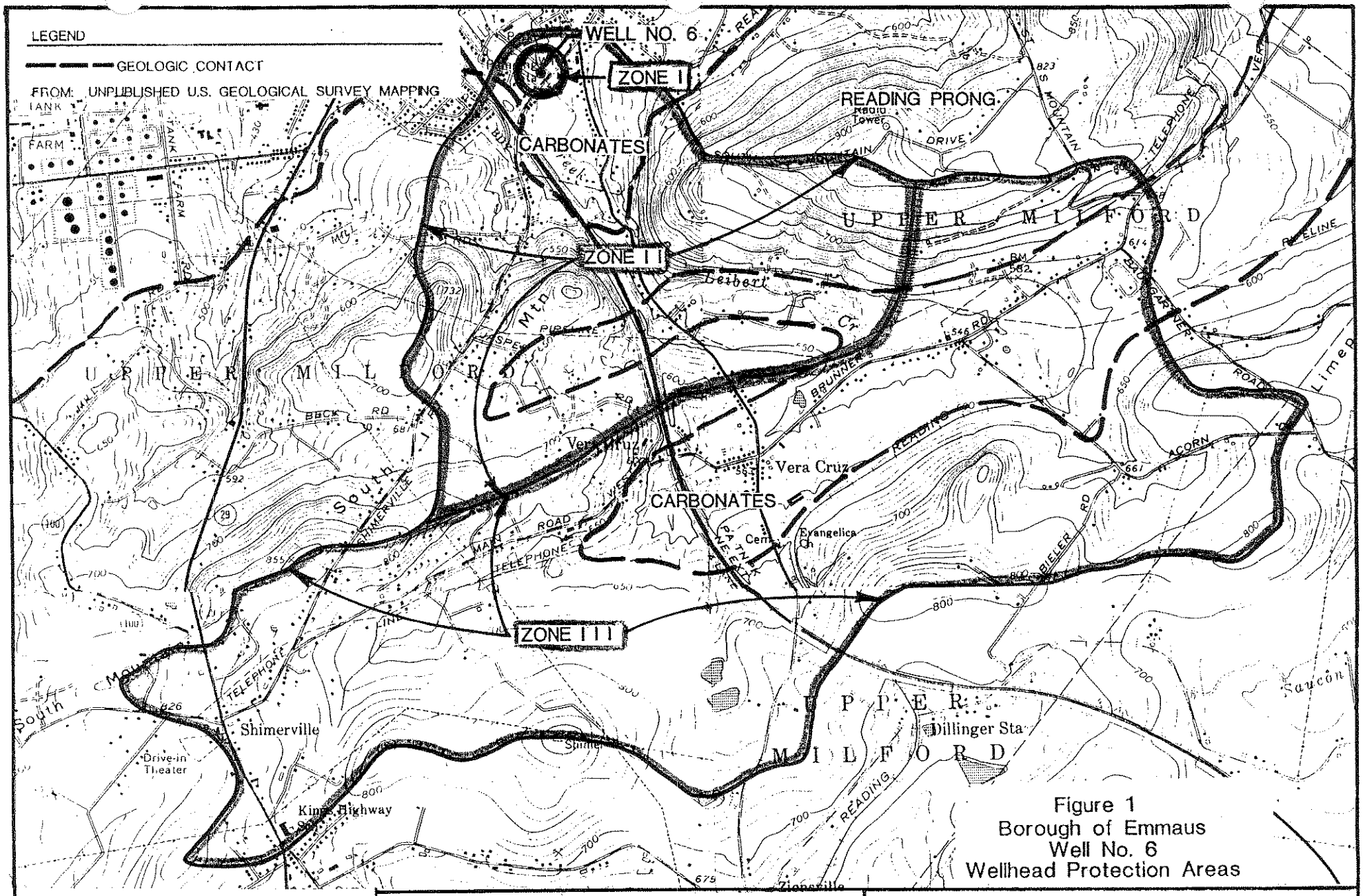


Figure 1
Borough of Emmaus
Well No. 6
Wellhead Protection Areas

From: USGS 7.5 min. Allentown West, R 1992; Allentown East, PR 1972; Milford Square, PR 1973; and East Greenville, PR 1973, PA quadrangles.

Scale: 0 2000 Feet

N

Meiser & Earl, Inc. / Hydrogeologists
1512 W. College Ave.
State College, PA 16801
(814) 234-0813

Figure 2
Borough of Emmaus
Well No. 6
Fracture Traces

LEGEND

FRACTURE TRACE

WELL

MEISER & EARL, INC. / Hydrogeologists

1512 W. COLLEGE AVE.
STATE COLLEGE, PA 16801

MAY - 8 1995

MEISER & EARL, INC.

Hydrogeologists

1512 WEST COLLEGE AVENUE
STATE COLLEGE, PENNSYLVANIA 16801

814 234-0813 Phone
814 234-1693 Fax

May 5, 1995

Mr. Geoffrey A. Reese, P.E.
Joint Planning Commission
Lehigh-Northampton Counties
961 Marcon Boulevard, Suite 310
Allentown, PA 18103-9397

Re: Task A. Detailed WHPA Delineation
Borough of Emmaus

Dear Geoff:

Enclosed is our WHPA delineation for the Borough of Emmaus Well No. 7 in Lower Macungie Township, Lehigh County.

If you have any questions or comments, please do not hesitate to contact me.

Respectfully submitted,

Jay F. Lynch, P.G.
Project Hydrogeologist

JFL/mlr

Enclosures

cc: Allen O'Dell, P.E.

EMMAUS.JFL

Working Paper Prepared

For

Joint Planning Commission (JPC)
Lehigh-Northampton Counties

By Meiser & Earl, Inc.

May 1995

Task A

Detailed WHPA Delineation

Borough of Emmaus
Well No. 7

EMMAUS.PL

BOROUGH OF EMMAUS WELL NO. 7

1. Regional Hydrogeologic Assessment

a. Location

The well is located 250 feet south of Little Lehigh Creek, just north of Macungie Avenue, in the Borough of Emmaus, Lehigh County, Pennsylvania. The location of the well is shown on Figure 1. The well is in the Great Valley Physiographic Section of the Ridge and Valley Province.

b. Environmental landscape unit and subunit in which the well is located

The well site is located within the Carbonate Valley Landscape Unit and falls within the Allentown Dolomite (Allentown Formation) Subunit (from Table 5-2 and Plate 6).

c. General geology and average hydrogeologic parameters of the bedrock aquifer

The well is completed within the Allentown Formation (Cambrian), which is a light- to dark-gray dolomite with some interbedded limestone.

Ground-water flows through solutionally enlarged fractures, joints and bedding-plane openings as well as conduits.

From Table 5.5:

Average well yield (non-domestic) - 1,000 gallons per minute (gpm)

Median specific capacity -

Hilltop well - 1.2 gpm/ft
Upland Well - 8.2 gpm/ft
Valley Well - 33 gpm/ft
From: Lehigh County Water Resources Report (WRR) 31, 1972, Table 30, page 117

2. **Detailed WHPA Delineation**

a. Well Information

* Drilled: May 1974
* Depth: 400 feet
* Casing depth and diameter: 12 inch to 24 feet
  10 inch to 150 feet
* Open Hole Diameter: nominal 10 inches from 150 feet to 400 feet
* Static Water Level: 45 feet on May 20, 1974
* Pumping rate (Q): 554 gpm for 48-hour test on May 20-22, 1974; permitted pumping rate = 595 gpm; pump capacity = 450 gpm
* Drawdown (s): 31 feet after 30 minutes; no additional drawdown for remainder of 48-hour test
* Specific Capacity: 17.9 gpm/ft after 30 minutes

b. Zone I - Wellhead Protection Zone (WHZ)

(1) Per PADER's regulations: Calculate a fixed radius using the volumetric flow equation and travel time (t) of 90 days, which is the time interval between the quarterly water-quality sampling required by PADER. In the following equation, the length of the uncased and slotted casing borehole is H and the effective aquifer porosity (n) or specific yield is 0.05. This value is based on published specific yield values of 0.04 to 0.05 for the Carbonate Formation in Lebanon and Lehigh Valleys, as found in the "Special Groundwater Study of the Middle Delaware River Basin, Study Area II," R.E. Wright Associates, Inc., 1980, p. 8-8, Table 4.2, and a specific yield value of 0.05 used by the U.S. Geological Survey in "Hydrogeology and Ground-Water Flow in the Carbonate Rocks of the Little Lehigh Creek Basin, Lehigh County, Pa.," Water-Resources Investigation Report 90-4076, p. 51. Using the values above, the volumetric flow equation calculates the radius of Zone 1 to be:

$$r = \sqrt{\frac{Q\ t}{\pi\ n\ H}} = \sqrt{\frac{114{,}545\ ft^3/d\ x\ 90\ d}{3.14\ x\ 0.05\ x\ 250\ ft}} = 512\ ft.$$

$$Q = permitted\ pumping\ rate = 595\ gpm$$

PADER's minimum and maximum radii for Zone I are 100 and 400 feet, respectively, per PADER's wellhead protection regulations. Therefore, a radius of 400 feet for the boundary of Zone I is appropriate.

(2) Time-of-travel: Actual ground-water flow rates within fractured rocks may be much faster than those calculated by using the volumetric flow equation. PADER suggests that time-of-travel subzones be considered in Zones II and III based on management goals and methods. For example, if a management goal is to provide a time-of-travel zone which will allow 30 days to react to a contamination event, such a subzone could be delineated in Zones II and III; and more stringent controls could be placed on that subzone than on the remainder of the zone. Time-of-travel will be discussed further in the following section.

c. Time-of Travel Estimates (Ground-Water Flow Rates)

Transmissivity Calculation (T):

(1) Calculated Recovery

Layne-New York Co., Inc. conducted a 48-hour pumping test on this well. No drawdown occurred after 30 minutes into the test. Therefore, the recovery data was utilized. Using the recovery portion of a 48-hour test, and applying the Calculated Recovery method (Driscol, 1986, p. 254-260), two slopes were identified and two transmissivity values were calculated as follows:

Slope 1:

$$T = \frac{(264)(Q)}{\Delta s}$$

where: T = transmissivity (gpd/ft)
Q = pumping rate (gpm) and
Δs = drawdown (ft) per log cycle

$$T = \frac{(264)(554)}{5.8} = 25{,}000 \text{ gpd/ft}$$

Slope 2:

$$T = \frac{264\,Q}{\Delta s}$$

where: T = transmissivity (gpd/ft)
Q = pumping rate (gpm)
Δs = drawdown (ft) per log cycle

$$T = \frac{(264)\,(554)}{2.7} = 54{,}000 \text{ gpd/ft}$$

The two results of the Calculated Recovery method do not compare well; therefore, the higher T value of 54,000 gpd/ft was used for conservative estimation of the radius of pumping influence and flow velocity.

Hydraulic Conductivity (K):

$$K = \frac{T}{m},$$ where m = saturated thickness (ft); K = gpd/ft^2

Using uncased borehole, where m = 250 feet:

$$K = \frac{54{,}000 \text{ gpd/ft}}{250 \text{ ft}} = 220 \text{ gpd/ft}^2$$

$$K = \frac{220 \text{ gpd/ft}}{7.48 \text{ gal/ft}^3} = 29 \text{ ft/day}$$

For fractured -rock flow, assume m = 10 ft to calculate a conservatively high estimate of K, i.e. the water-bearing zones are limited to 10 feet of total well bore.

$$K = \frac{54{,}000 \text{ gpd/ft}}{10 \text{ ft}} = 5{,}400 \text{ gpd/ft}^2$$

$$K = \frac{5{,}400 \text{ gpd/ft}^2}{7.48 \text{ gal/ft}^3} = 700 \text{ ft/day}$$

Water-Table Gradient (I):

Borough of Emmaus Well No. 7 is located along Little Lehigh Creek about half a mile northeast of the confluence with Leibert Creek. The Pennsylvania Topographic and Geologic Survey's "Water Resources of Lehigh County" report, W-31, shows a regional water-table gradient of approximately 0.004 in the vicinity of Well 7. However, the U.S.G.S. map shows a gradient of 0.011, based on the known positions and static water levels for Emmaus Well Nos. 6 and 7. To provide a conservatively high estimate of ground-water flow rates, use a gradient of 0.011.

Ground-Water Velocity (v):

$$v = \frac{KI}{n} \text{ where } n = \text{porosity}$$

Porosity is slightly to significantly larger than specific yield. For fractured rocks, assume specific yield (Sy), which is the ratio of the volume of water that can freely drain from the pores in the aquifer to the volume of the aquifer, is an estimate of effective porosity and, therefore, allows an estimate of "effective" velocity. Use a value for Sy of 0.05, as discussed previously in this paper.

For uncased borehole:

$$v = \frac{KI}{n} = \frac{(29 \text{ ft/day})(0.011)}{0.05} = 6 \text{ ft/day or } 42 \text{ ft/week}$$

For fractured-rock flow and a conservatively higher estimate of v, use the K calculated where m = 10 feet. Because the porosity within the 10 feet of water bearing zones is greater than for the total saturated thickness of the borehole, assume a porosity of 0.10:

$$v = \frac{(700 \text{ ft/day})(0.011)}{0.10} = 77 \text{ ft/day or } 539 \text{ ft/week}$$

These calculations indicate that a one-week, time-of-travel distance could range from approximately 42 to 539 feet or more, depending upon the nature and distribution of fractures in the bedrock. For example, the one-week, time-of-travel distance from this well may be greater in some directions along more developed fractures than in other directions where fractures are small or non-existent. Defining the actual ground-water velocities in different directions is virtually impossible, even with extensive field work; however, a water supplier may wish to use a certain calculated distance based on management goals to establish a zone in which specific activities are prohibited or more strictly controlled than elsewhere.

d. Zone II - Area through which water is diverted to the well determined from a calculated "cone of depression"

In an idealized, isotropic, homogeneous aquifer (e.g., sand) with a flat water table, the cone of depression is a circle centered around the well. During pumping of the Borough of Emmaus Well No. 7, the water level was drawn down approximately 31 feet after 48 hours of pumping at 554 gpm. Using the Cooper-Jacob distance-drawdown formula and

assuming T = 25,000 gpd/ft (Slope 1), the slope of a distance-drawdown straight-line plot (Δs) for this well is calculated to be approximately 11.7 feet per log cycle:

$$\Delta s = \frac{528\ (Q)}{T} = \frac{(528)\ (554\ \text{gpm})}{25{,}000\ \text{gpd/ft}} = 11.7\ \text{ft/log cycle of distance}$$

Based on a graphical plot using a total drawdown of 31 feet, a water-table slope of 11.7 feet per log cycle of distance during pumping at 554 gpm, and a well diameter of 10 inches, the zero drawdown boundary of a circular cone of depression projects to occur at 180 feet.

Using a T of 54,000 gpd/ft calculated from Slope 2 yields a Δs of 5.4 feet per log cycle of distance.

$$\Delta s = \frac{528\ (Q)}{T} = \frac{(528)\ (554\ \text{gpm})}{54{,}000\ \text{gpd/ft}} = 5.4\ \text{ft/log cycle of distance}$$

Based on a graphical plot using 31 feet of total drawdown, a water-table slope of 5.4 feet per log cycle during pumping at 554 gpm and a well diameter of 10 inches, the zero drawdown boundary of a circular cone of depression projects to a radius of approximately 120,000 feet or nearly 23 miles from the well.

The 180-foot radius seems to be too small to provide adequate protection of this high-yield well in a carbonate terrain where rapid ground-water flow rates probably occur, especially in conduits parallel to the stream valley in which significant underflow is

expected. The 23-mile radius is obviously too large to be reasonable. Therefore, the area for Zone II was determined using average annual ground-water recharge rates and calculating the area which provides sufficient recharge to sustain a continuous pumping rate of 595 gpm (856,800 gallons per day), which is the rate the well is permitted to pump.

Based on a recharge rate for the Allentown Formation of 490 gpm/ sq. mile or 0.77 gpm/ac, as determined from the U.S.G.S. Water-Resources Investigations Report 90-4076 for the Little Lehigh Creek Basin, Zone II is calculated to be approximately 1.2 square miles or 768 acres. The effects of topography on ground-water flow patterns and the rate at which potential contaminants could reach the well were considered in establishing the upgradient and downgradient boundaries. The Little Lehigh Creek and lowermost section of Leibert Creek were used as part of the Zone II boundary because ground water is not likely to flow naturally toward the well from beyond those streams, nor is a pumping cone of depression expected to extend beyond the streams. The northeastern boundary of Zone II was drawn along a local topographic divide. The upgradient (southeastern) limit of Zone II was placed along a topographic contour near the geologic contact with the Reading Prong Landscape Unit to achieve the approximately 770-acre recharge area. The southwestern section of the Zone II boundary was drawn roughly perpendicular to water-table contours shown on Plate 4A in the Pennsylvania Topographic and Geologic Survey's Water Resources Report 31 and extends from a topographic divide in the Reading Prong hills toward the northwest to Liebert Creek.

e. Zone II enhancement with fracture-trace analysis and hydrogeologic mapping

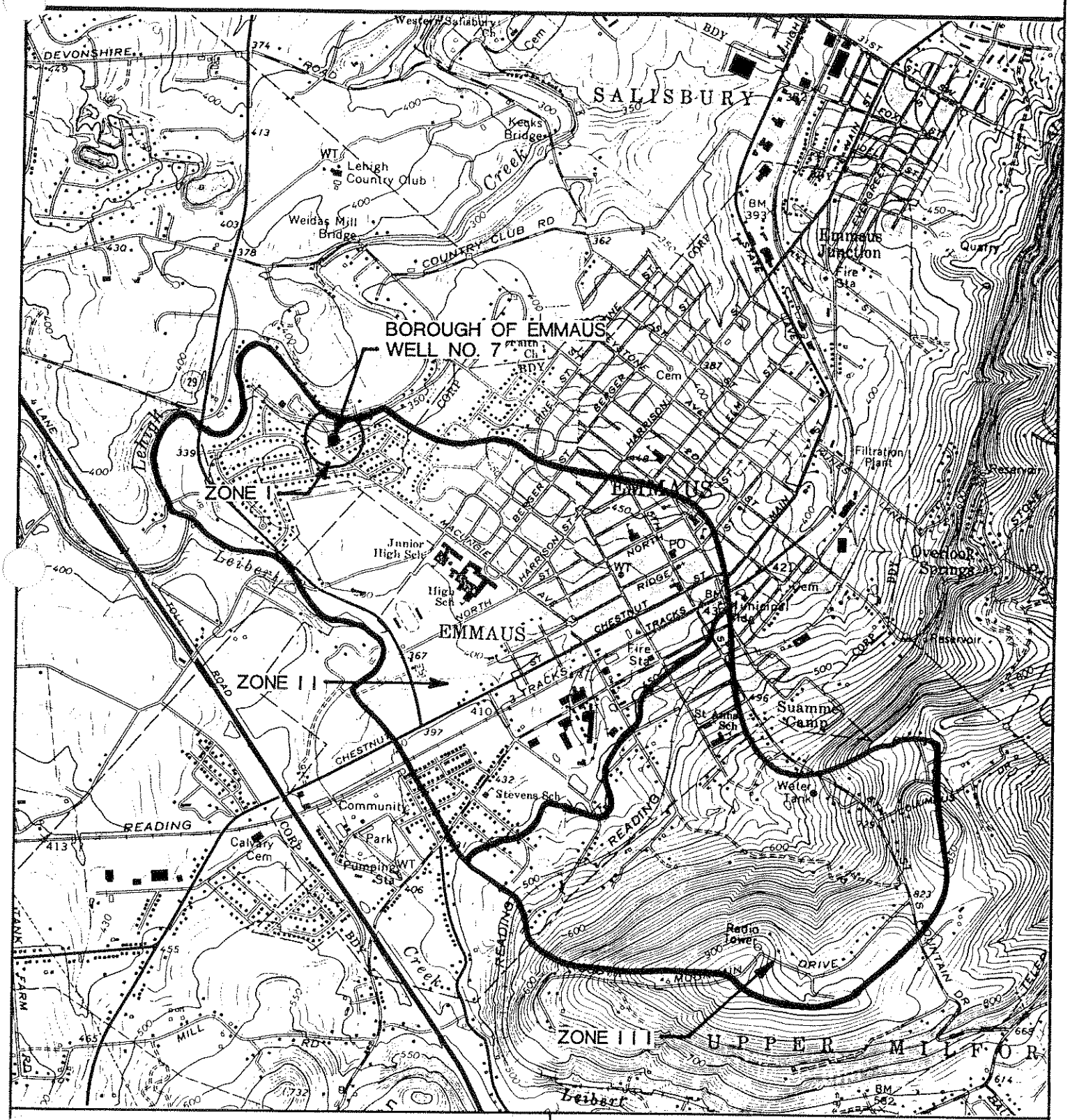
Meiser & Earl, Inc. mapped fracture traces in the vicinity of the well as shown on aerial photograph 3-47 (Figure 2). Several of these fracture traces occur within a few hundred feet of the well. These fracture traces are not expected to affect the shape of Zone II because the recharge-balance method was used to delineate Zone II.

The Zone II boundary is an approximation and is no substitution for actual field demonstration. The actual cone of depression or area in which water is diverted to the well may be larger or smaller than Zone II due to the influence of fracture and conduit flow. Individuals proposing certain activities within the mapped Zone II may be able to demonstrate that it is not within the actual zone by installing a well or wells at the site of the proposed activity and monitoring the water level for changes in response to pumping the Borough of Emmaus Well No. 7 or by using some other appropriate method (e.g. show hydraulic gradient not toward the No. 7 well). Conversely, it is possible that the area in which water is diverted to the well extends beyond the mapped Zone II boundary. The water supplier may wish to require that proposed activities outside, but near the mapped Zone II, especially those near fracture traces, demonstrate that the activity is not within this zone.

f. Zone III - Zone of Contribution (ZOC)

The ZOC includes the natural surface and inferred ground-water drainage area contributing water to this well; therefore, the boundary of the ZOC is based on the topographic divide as shown on Figure 1. The actual ZOC may be larger than shown due to the solution-prone nature of the carbonate bedrock which can allow ground-water movement across topographic divides.

Figure 1
Borough of Emmaus
Well No. 7
Wellhead Protection Areas



From: U.S.G.S. 7.5 min. Allentown East and Allentown West, PA quadrangles PR 1972.

Scale: 0 2000 Feet

MEISER & EARL, INC. / Hydrogeologists

1512 W. COLLEGE AVE.
STATE COLLEGE, PA 16801

Figure 2
Borough of Emmaus
Well No. 7
Fracture Traces

LEGEND

FRACTURE TRACE

WELL

MEISER & EARL, INC. / Hydrogeologists

1512 W. COLLEGE AVE.
STATE COLLEGE, PA 16801

Well Information

Well # 1 WUSID #8806			GPS Verified?*
Location: (latitude; longitude)	40° 32' 23"	75° 29' 02"	N
Total Depth of Well: (feet)	315 ft.		
Depth of Casing: (feet)	90'		
Casing – Diameter (inches)	10"		
Capacity: (permitted yield - gpd)	720,000 gpd		
Daily Use: (gpd)	249,821		
Surface Elevation: (feet)	420 ft.		N
Year Developed:	1929		
Aquifer Name:	Allentown Formation		
Static Water Level (below top of casing - in feet):	75'	8/24/04	

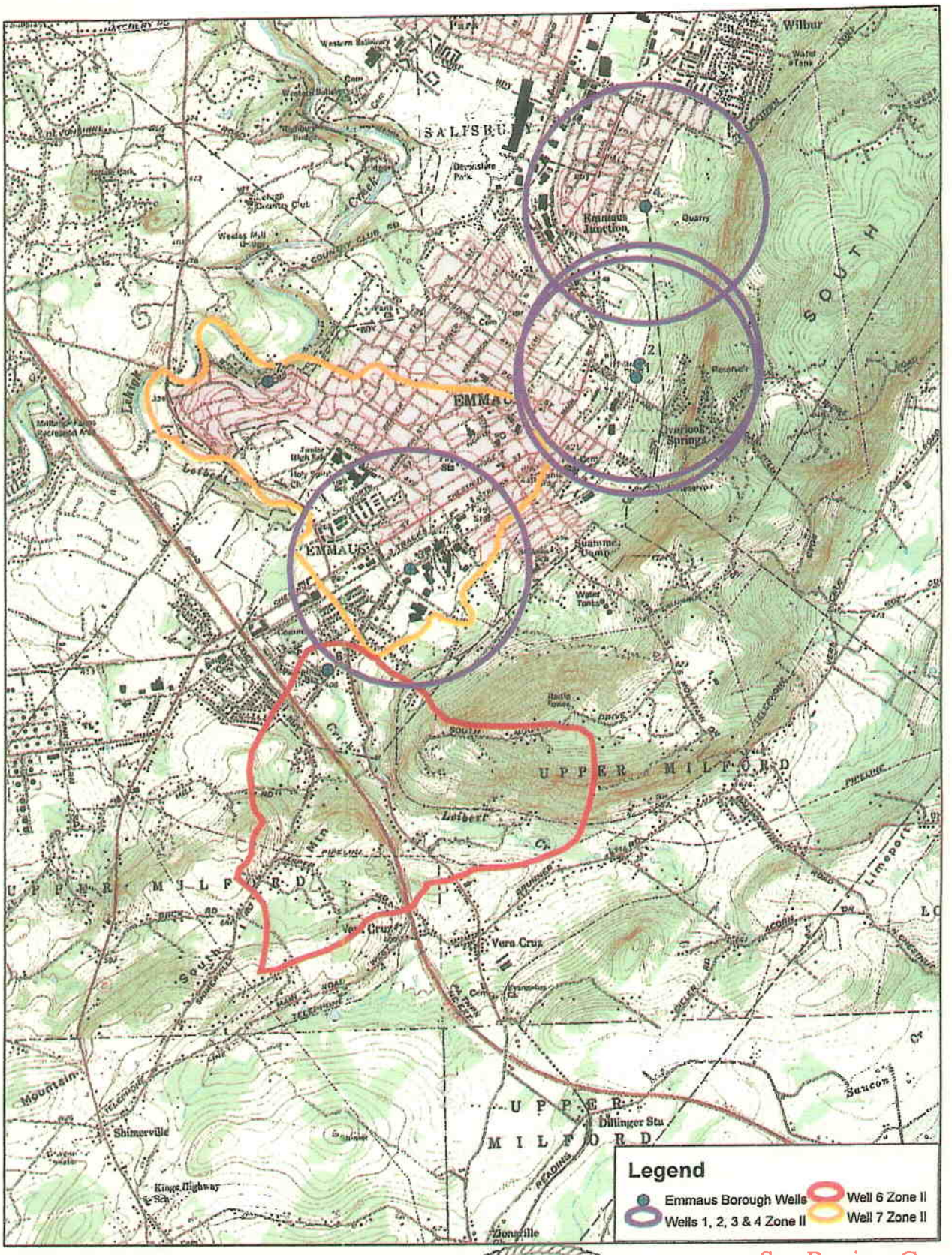
Well # 2 WUSID #8807			GPS Verified?*
Location: (latitude; longitude)	40° 32' 33"	75° 29' 02"	N
Total Depth of Well: (feet)	385 ft.		
Depth of Casing: (feet)	110'		
Casing – Diameter (inches)	10"		
Capacity: (permitted yield - gpd)	720,000		
Daily Use: (gpd)	239,412		
Surface Elevation: (feet)	420 ft.		N
Year Developed:	1929		
Aquifer Name:	Allentown Formation		
Static Water Level (below top of casing - in feet):	68.5	8/24/04	

Well # 3 WUSID #8808			GPS Verified?*
Location: (latitude; longitude)	40° 31' 49"	75° 29' 51"	
Total Depth of Well: (feet)	526 ft.		
Depth of Casing: (feet)	120'		
Casing – Diameter (inches)	10"		
Capacity: (permitted yield - gpd)	325,000		
Daily Use: (gpd)	11,076		
Surface Elevation: (feet)	410 ft.		N
Year Developed:	1950		
Aquifer Name:	Allentown Formation		
Static Water Level (below top of casing - in feet):	61	8/24/04	

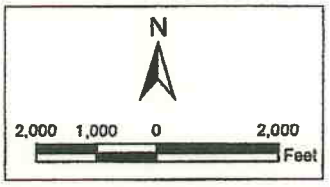
Well # 4 WUSID #8809			GPS Verified?*
Location: (latitude; longitude)	40° 33' 00"	75° 28' 58"	N
Total Depth of Well: (feet)	183 ft.		
Depth of Casing: (feet)	120'		
Casing – Diameter (inches)	10"		
Capacity: (permitted yield - gpd)	864,000		
Daily Use: (gpd)	447,718		
Surface Elevation: (feet)	460 ft.		N
Year Developed:	1953		
Aquifer Name:	Allentown Formation		
Static Water Level (below top of casing - in feet):	118.5	8/24/04	

Well # 6 WUSID #8811			GPS Verified?*
Location: (latitude; longitude)	40° 31' 20"	75° 30' 33"	N
Total Depth of Well: (feet)	358 ft.		
Depth of Casing: (feet)	25'		
Casing – Diameter (inches)	16"		
Capacity: (permitted yield - gpd)	770,000		
Daily Use: (gpd)	462,298		
Surface Elevation: (feet)	400 ft.		N
Year Developed:	1963		
Aquifer Name:	Allentown Formation		
Static Water Level (below top of casing - in feet):	43.5	8/24/04	

Well # 7 WUSID #8812			GPS Verified?*
Location: (latitude; longitude)	40° 32' 26"	75° 30' 48"	N
Total Depth of Well: (feet)	400		
Depth of Casing: (feet)	24'		
Casing – Diameter (inches)	12"		
Capacity: (permitted yield - gpd)	626,000		
Daily Use: (gpd)	93,503		
Surface Elevation: (feet)	350 ft.		N
Year Developed:	1976		
Aquifer Name:	Allentown Formation		
Static Water Level (below top of casing - in feet):	52.5	8/24/04	



See Review Comment No. 4 in Report Foreword

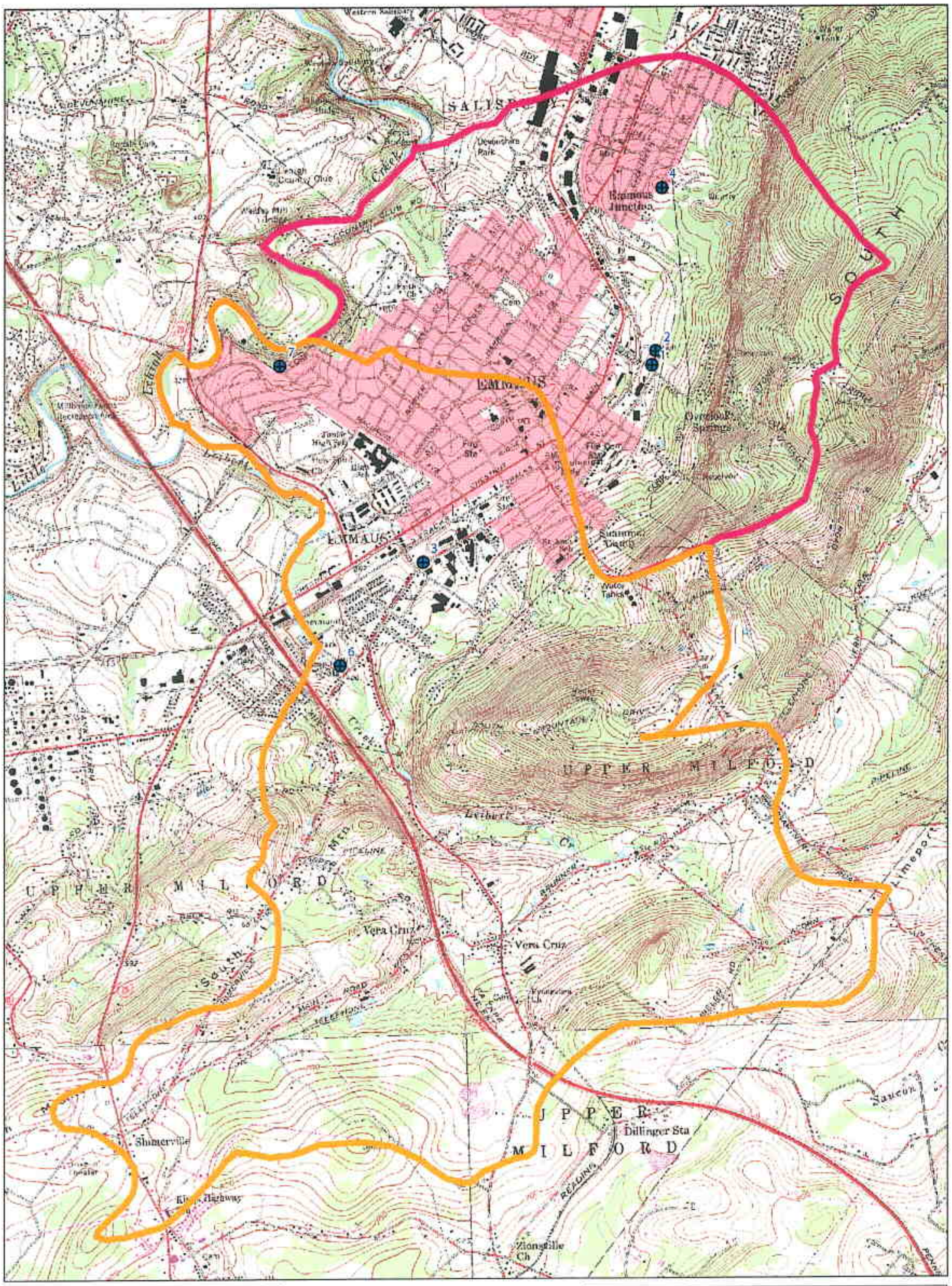


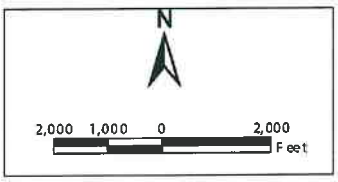
USGS Topographic Map: Allentown East, Allentown West, East Greenville and Milford Square Quadrangles
Layout Created by Barry Isett & Associates, 2003

Figure 7: Zone II Delineation for Emmaus

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ALEXANDER PULMER
GEOLOGIST
No. 001720-G

BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors
85 S. Route 100 & Kressler Lane
Trexlertown, PA 18087-0147





Legend

- Emmaus Borough Wells
- Approximated Well 1, 2 and 4 Contributing Area
- Well 6 and 7 Contributing Area from Meiser and Earl

USGS Topographic Map: Allentown East, Allentown West, East Greenville and Milford Square Quadrangles

Layout created by Barry Isset & Associates, 2003

Figure 4: Contributing Area to Public Supply Wells

BARRY ISETT & ASSOCIATES
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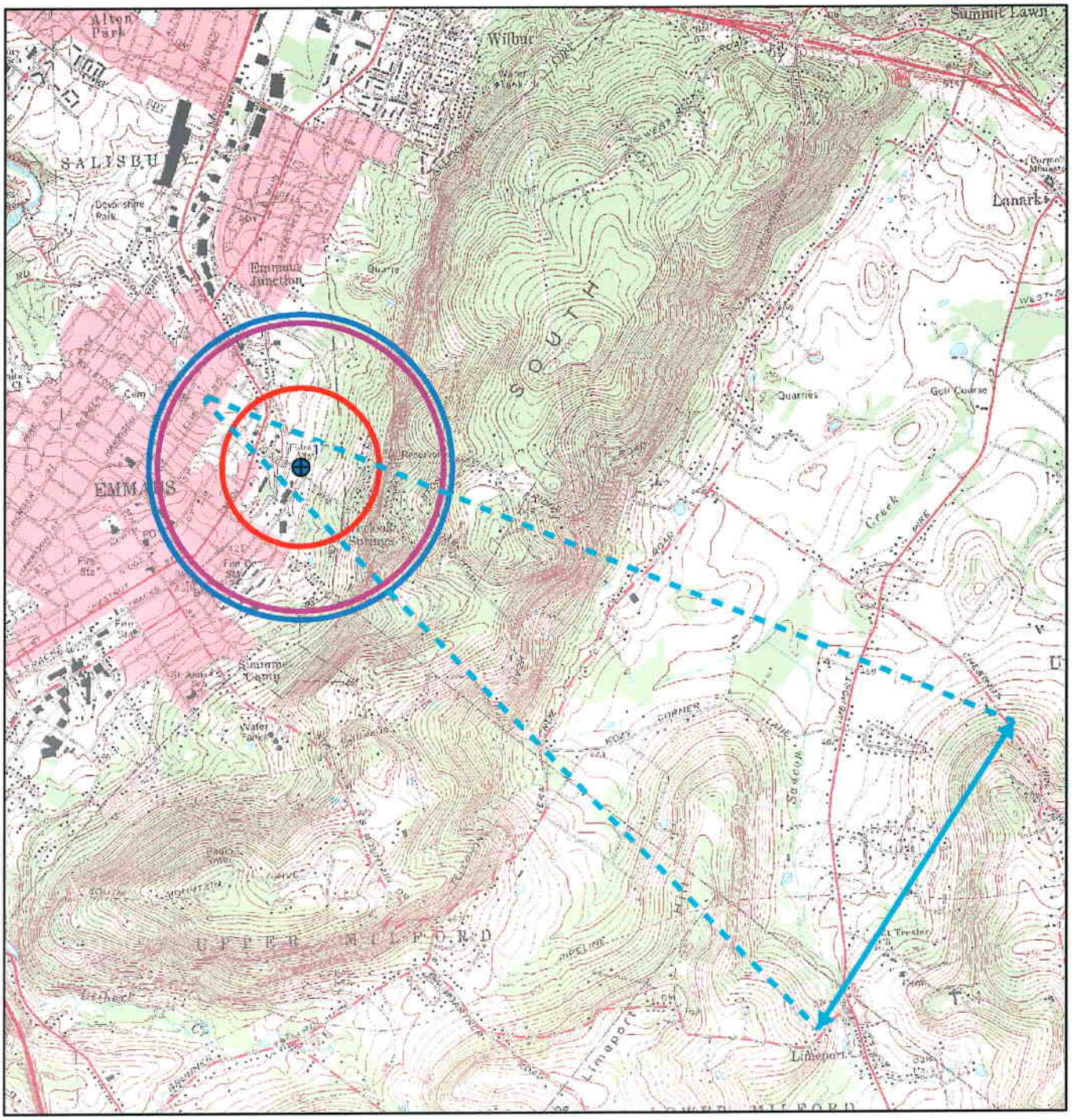
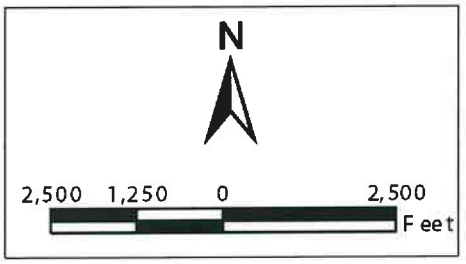
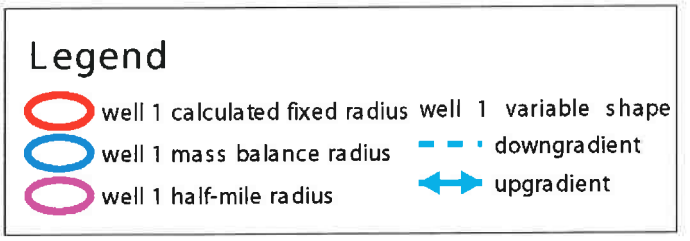
85 S. Route 100 & Kressler Lane
Trexlertown, PA 18087-0147
610-398-0904

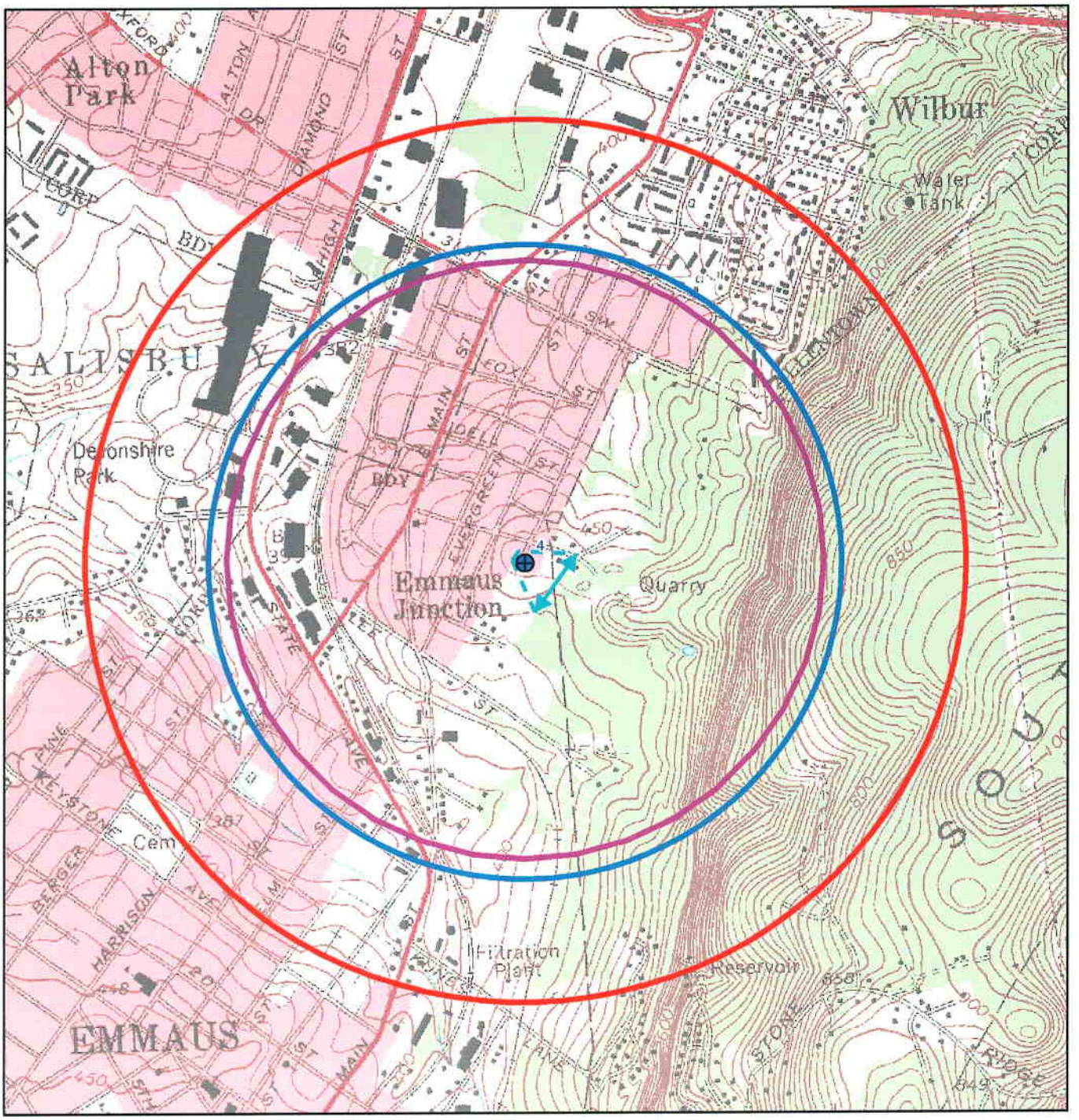






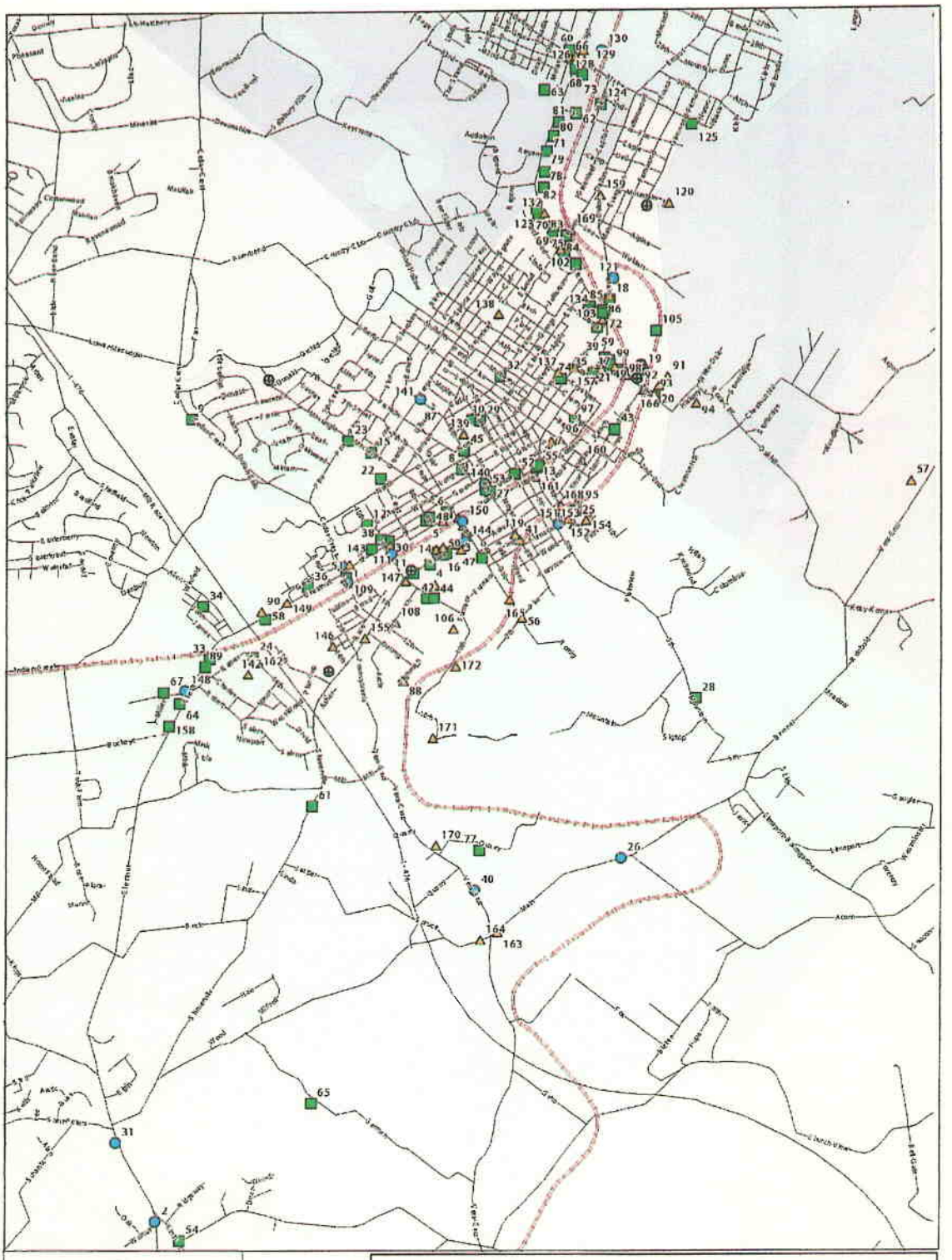
BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors
85 S. Route 100 & Kressler Lane
Trexlertown, PA 18087-0147
610-398-0904

Figure 8a: Example of calculated Zone 2 radii for Well #1



BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors
85 S. Route 100 & Kressler Lane
Trexlertown, PA 18087-0147
610-398-0904

Figure 8b: Example of calculated Zone 2 radii for Well #4



N

2,000 1,000 0 2,000 Feet

Legend

Emmaus Wells
Railroads
Potential Sources
SWAP Rank
high
medium
low

Municipality
ALLENTOWN CITY
EMMAUS BOROUGH
LOWER MACUNGIE TWP
LOWER MILFORD TOWNSHIP
SALISBURY TOWNSHIP
UPPER MILFORD TOWNSHIP
UPPER SAUCON TOWNSHIP

BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors

Municipalities & Streets from Lehigh Valley Planning Commission, 2001
Leibert Creek Watershed Data from Meiser and Earl Study, 1995
Potential Contaminant Points from InfoMap database search, Borough of Emmaus and BIA field survey, 2001-2002
Layout Created by Barry Isset & Associates, 2003

Figure 9: Potential Contaminant Source Map

See Review Comment No. 10 in Report Foreword

EMMAUS WELLHEAD PROTECTION: POTENTIAL CONTAMINANT SOURCE INVENTORY DATABASE

Database Glossary

NPL – National Priority List - The EPA's list of confirmed or proposed Superfund sites.

CERCLIS – Comprehensive Environmental Response Compensation and Liability Information System – The EPA's list of potential Superfund sites currently or previously under investigation.

RCRA – Resource Conservation and Recovery Act – The EPA's list of registered hazardous waste generators and treatment, storage and disposal facilities.

UST – The PA DEP list of registered Underground Storage Tanks (registered above ground storage tanks may also be included in this list.)

LUST – The PA DEP list of Leaking Underground Storage Tanks (leaking above ground storage tanks may also be included in this list.)

SWL – Solid Waste Landfills that are regulated by the PA DEP.

OTHER – Sites identified by Emmaus Borough or BIA personnel. These sites were not listed in the government database, but were identified by their current or previous use as a potential environmental impact.

Source Water Assessment and Protection (SWAP) Ranking System

The SWAP rankings were completed using readily available information. The SWAP ranking system takes into account the well construction, time of travel of a potential contaminant (how fast would a contaminant flow toward the well), the persistence of the potential contaminant, the quantity of the potential contaminant stored, and the potential for a release to occur from the identified site. The final ranking is given a letter value; A – B indicates a high protection priority; C – D indicates a medium protection priority; E – F indicates a low protection priority.

SITE ID	NAME	ADDRESS	GOVERNMENT DATABASE LISTING						SWAP Potential Risk Level		
			UST	LUST	RCRA	SWL	CERCLIS/NPL	OTHER	HIGH	MEDIUM	LOW
1	7 Eleven 21110	1146 Chestnut & Twelfth St	X		X					X	
2	A&M Total Auto Body	5722 Old Kings Hwy			X						X
3	Air Prod & Chem	733 W. Broad St.	X	X						X	
4	Atlantis Aquaculture	840 Broad St.	X							X	
5	Britts Tire Service	801 Chestnut St.	X							X	
6	Bud Friend (NAPA)	700 Chestnut St.			X					X	
7	Buss Paint & Wallpaper	332 Main St.			X				X		
8	Caffrey Auto Supply of Allentown	621 Long St.	X							X	
9	Camp Olympic Inc.	3050 Cedar Crest Blvd.	X							X	
10	Christine Dyche Residence	525 Elm St.		X						X	
11	Cita Technology Inc	860 Broad St.	X							X	
12	Colonial Crest	Cold Stream Circle		X						X	
13	Contel of PA Emmaus DCO CT 187	409-417 Railroad St.		X						X	
14	CVIP Inc.	801 Broad St.			X					X	
15	East Penn Sch District	640 Macungie Ave.			X					X	
16	Electro Chem Eng & MFG CO	750 Broad St.		X	X					X	
17	Emmaus Borough Maintenance Garage	44 Kleins Ln.	X	X						X	
18	Emmaus Boro Marks House	Main St.		X						X	
19	Emmaus Borough Main Pumping Station	101 Kleins Ln.		X						X	
20	Emmaus Borough Main Pumping Station	202 Kleins Ln.		X						X	
21	Emmaus Borough Municipal Garage	33 Kleins Ln.		X						X	
22	Emmaus High School	851 North St.	X							X	
23	Emmaus JR High Sch	660 Macunige Ave.	X							X	
24	fmr Rohrbach Ready Mix /current TJ Cougle	122 S. Sixteenth St.	X							X	
25	General Machine Corp.	4TH & Furnace Sts.			X					X	
26	Hasik Auto Body (Hydrex) (R&B?)	3295 Main Rd.			X						X
27	Hausmans Welding Inc.	19 S. 6TH St.			X						X
28	Heussman Gunther Inc	4801 S. Fifth St.			X					X	
29	Jefferson Elem Sch	525 North St.	X							X	
30	Jims Chestnut St Station	945 Chestnut St	X		X					X	
31	Kehs Svc and Repair	5421 Chestnut St & Rt. 29			X						X
32	Lincoln Elementary Sch	225 Seem St.	X	X						X	
33	Maiers Bakery Emmaus	1967 Ramer Rd.		X						X	
34	Mikes Auto Collision	3720 Allen St.			X					X	
35	Motorworks	121 Main St.			X					X	
36	Plaza Country Cleaners	1325 Chestnut St.			X					X	
37	Randy's Gulf SVC	506 State Rd.		X					X		
38	Reiters Radiator	11 N. 10th St.			X					X	
39	Renningers SVC Station (Mobil)	12-14 E. Main St.		X						X	
40	Rinker Enterprises Inc	5093 Vera Cruz Rd.	X								X
41	Rodale Manufacturing Co., Inc.(Square D Co. Emmaus Plant)	Sixth & Minor			X		X		X		
42	Rodale Press Inc-Customer CTR	400 S. 10th St.		X						X	
43	Rodale Press Inc.	154 E. Minor St.	X		X					X	
44	Rodale Press Inc.	375 S. 10th St.			X					X	
45	Rodale Press Inc.	135 N. Sixth St.	X							X	
47	Schmoyers Inc.	202 S 7TH			X					X	
48	Stroh property	747 Chestnut St.		X						X	
49	Swann Gasoline Terminal (Top Star)	14 E. Main St.	X							X	
50	TBA Auto	808 Broad St., P.O. Box 220		X						X	
51	Texaco Svc Station	1137 Chestnut St.	X		X				X		
52	Total Imaging Inc.	518 Bank St.			X					X	
53	Turkey Hill 110 (Exxon)	602 Chestnut St.	X							X	
54	Upper Milford Twp. Bldg	5831Kings Highway S		X						X	
55	Verizon	417 S. Railroad St.	X							X	
56	Volney Felt Co.	South Seventh St.					X		X		
57	Voortman Farm	Vera Cruz Rd.					X		X		
58	Wilmer R. Schultz	1540 Chestnut St.	X							X	

SITE ID	NAME	ADDRESS	GOVERNMENT DATABASE LISTING						SWAP Potential Rick Level		
			UST	LUST	RCRA	SWL	CERCLIS/NPL	OTHER	HIGH	MEDIUM	LOW
59	WM ME Yeakel & Sons Inc.	Ridge & Williams St.	X							X	
60	7 Eleven Gas Station 11388 (EZ Shoppe)	3026 Moravian St.		X						X	
61	A.P. Houser Inc. Landfill	Stone entrance Landis Property from Mill Rd.				X				X	
62	Allentown Mazda Volvo	3209 Lehigh St.			X					X	
63	Bon Ton Store 73 Auto Center	3300 Lehigh St.		X						X	
64	CRS Friendly Market 17 (Hess Express)	Route 29 & Colebrook		X						X	
65	David Hanssen Prop	RR 2 Box 211		X						X	
66	Getty Gas Station 67227	3050 Lehigh St.		X					X		
67	Hatfield Quality Meats	4591 Colebrook Ave.		X						X	
68	Jiffy Lube 601	3111 Lehigh St.		X						X	
69	Kelly Buick AMC Renault	501-23 State Rd.			X					X	
70	Kelly Mitsubishi	536-540 State Rd.			X					X	
71	Knopf Automotive	3401 Lehigh St.			X					X	
72	Lexus of Lehigh Valley	133 State Ave.			X					X	
73	Mobil Oil Gas Station 15 DMP	3101 Lehigh St. & 31st St.		X	X					X	
74	Rileigh Gander & Showalter Inc.	100 Keystone Ave.			X					X	
75	Roberts Professional Cleaners	436 State Ave.			X					X	
76	Spirax Sarco Inc.	1951 Glenwood St. SW		X						X	
77	Upper Milford Township Landfill	Right side of Quarry Rd. driveway by barn, E				X				X	
78	Vinart Dealers	333 State Rd.			X					X	
79	Vinart Dealerships	675 State Ave.			X					X	
80	Scott Chevrolet Dealship	3333 Lehigh St.						X		X	
81	Scott Chrysler Dealership	3333 Lehigh St.						X		X	
82	Scott Used Car Dealership	606 State St.						X		X	
83	Jeep Dealership	State St.						X		X	
84	Sunoco	State St.	X						X		
85	Vinart Used Car Dealership	State St.						X		X	
86	Emmaus Auto Repair	State St.						X	X		
87	Abandoned Brickyard	Franklin & Greenleaf Sts.						X	X		
88	Abandoned Junkyard	1267 Tilghman St.						X	X		
89	Sell's Truck Repair	4393 Ramer St						X		X	
90	Indian Creek Golf Course	1449 Chestnut St.						X	X		
91	Old Borough Dump	Klines Ln.						X	X		
92	Borough Snow Dump	Klines Ln.						X	X		
93	Abandoned Brickyard	Klines Ln.						X	X		
94	Residential Housing	Overlook Springs						X	X		
95	Emmaus Foundry	Mountain Rd.						X	X		
96	Schantz Funeral Home	250 Main						X	X		
97	Hendrick's Gas Station (Citgo)	202 Main						X		X	
98	Road Salt Storage	44 Klines Ln.						X		X	
99	Pesticide Storage	33 Klines Ln.						X		X	
100	Flexer Concrete (abandoned mixing site)	Klines Ln.						X	X		
101	Emmaus Fire Training	Klines Ln.						X	X		
102	Andy's Repair (Pine Ridge)	118 State						X		X	
103	Lexus Detailing and Car Wash	121 State						X		X	
104	Microwave Oven	155 E. Main						X	X		
105	Emmaus Composting Facility	Klines Ln.						X		X	
106	Abandoned Dump	South Tenth St.						X	X		
107	former Rodale (aka Square D) lagoon	South Tenth St.						X	X		
108	Faustner Auto Body	301 South Twelfth St.						X	X		
109	Bubbles Car Wash (Emmaus Car Wash)	17 South Twelfth St.						X			X
110	Rudy's Car WAsh	1137 Chestnut St.						X			X
111	Cottman Transmission	950 Chestnut St.						X	X		
112	Gerlette's Car Wash	15 South Tenth St.						X			X
113	Suburban Propane	15 South Eighth St.						X	X		
114	Wieand's Block (abandoned concrete plant)	17-25 South Seventh St.						X	X		
115	Thermoplastic Valves	55 South Seventh St.						X	X		

SITE ID	NAME	ADDRESS	GOVERNMENT DATABASE LISTING						SWAP Potential Rick Level		
			UST	LUST	RCRA	SWL	CERCLIS/NPL	OTHER	HIGH	MEDIUM	LOW
116	Handwerk Photo Lab	63 South Seventh St.						X	X		
117	Oak Street (furniture refinishing)	803 Broad St.						X	X		
118	Impress Industries	726 Broad St.						X	X		
119	Sharp Steel Rule & Die	202 South Sixth St.						X	X		
120	Abandoned Sand Quarry	Mountain Blvd						X	X		
121	R.U.S. Laundry Service	164 East Main St.						X			X
122	Feher Color Lab (Photo Lab)	626 State St.						X		X	
123	White Rose (Susquehanna) Dry Cleaners	630 State St.						X		X	
124	Lamm's Machine Shop	3216 Berger St.						X		X	
125	KJ Automotive Shop	2550 SW Thirty First St.						X		X	
126	Texaco	Lehigh St.						X	X		
127	Lehigh Tire Auto Service	Thirty-first St.						X	X		
128	REBCO Kwik Print	Lehigh St.						X	X		
129	Pacific Pride Gas Station	Thirty-first St.						X	X		
130	Mr. T Car Wash	Thirty-first St.						X			X
131	Jack Williams Tire and Auto Svc	3300 Lehigh St.						X	X		
132	Kelly Saturn	Lehigh St.						X	X		
133	Kelly Used Cars	Lehigh St.						X	X		
134	VinArt Used Cars	State St.						X		X	
135	Cemetary	Ridge St.						X	X		
136	Cemetary	Ridge St.						X	X		
137	Cemetary	between Long & Ridge Sts.						X	X		
138	Cemetary	Berger & 1st Sts.						X	X		
139	HAPCO Screen Printing	Elm St.						X	X		
140	Emmaus Laundry	Chestnut St.						X			X
141	Boro Well #5 (abandoned)	Berger & Sixth Sts.						X			X
142	Cemetary	Sixteenth St.						X	X		
143	Blue Plum Dry Cleaners	Chestnut St.						X		X	
144	Dick Blick Warehouse	Broad & Seventh Sts.						X			X
145	East Penn Machining	Broad St.						X	X		
146	Former Dry Cleaners	Fourteenth St.						X	X		
147	West End Distributers (former auto repair shop)	Tenth & Pennsylvania Sts.						X	X		
148	JAS Wholesale	Colebrook St.						X			X
149	Emmaus Auto Parts	Chestnut St.						X	X		
150	Hospital Central Services	Seventh St.						X			X
151	Republic International	302 S. 4th St.						X			X
152	Lehigh Valley Elastic	302 S. 4th St.						X	X		
153	EFM Automatic Heat	302 S. 4th St.						X	X		
154	Mike's Auto Body	Wood St.						X	X		
155	Former Auto Shop (1930s)	Shimerville Rd.						X	X		
156	Pioneer Glass and Mirror	Main and First Sts.						X			X
157	Colours Paint Shop	Main and First Sts.						X	X		
158	Texaco/East Penn Tire	Chestnut & Buckeye Sts.	X							X	
159	Reinnart Awning Co.	Dalton St.						X	X		
160	Abandoned Auto Garage	Adrain St.						X	X		
161	Abandoned Auto Garage	Jubilee St						X	X		
162	Abandoned Auto Garage	Sixteenth St.						X	X		
163	Auto Repair Garage	Main St.						X	X		
164	Failing Septic (Vera Cruz)	(Vera Cruz)						X	X		
165	Railroad Tracks	7th St.						X	X		
166	Railroad Tracks	Kleins St.						X	X		
167	Railroad Tracks	Kleins St.						X	X		
168	Railroad Tracks	Fourth St.						X	X		
169	Railroad Tracks	Harrison St.						X	X		
170	fmr Rodale Manufacturing Dump	3471 Quarry Dr.						X	X		
171	fmr private dump (household waste 1950-1960)	4502 S. Mountain Dr.						X	X		
172	fmr private dump (household waste prior to 1950)	1202-1206 S. 10th St.						X	X		

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT SOURCE LOCATION | SITE ACTIVITY

DB	STATUS	ID	SITE ID	NAME	FULL ADDRESS	CITY	SWAP	POTENTIAL FOR IMPACT	ACTIVITY	ACTIVITY NUMBER
RCRA-VGN		PAD014069538	7	Buss Paint & Wallpaper	332 Main St.	Emmaus	A	high	RCRA facility	i20
LUST	closed 2/5/1996	3226	37	Randys Gulf SVC	506 STATE RD	Emmaus	A	high	Gas service station	c09
NPL/CERCLIS(final)/RCRA-SGN		PAD981033285/PAD089169437	41	Rodale Mfg.Co.(Square D Co. Emmaus Pit)	Sixth & Minor	Emmaus	A	high	RCRA facility/Large qty. hazardous waste generator	i20/m13
UST/RCRA-SGN		39-21076/PAD987280831	51	Texaco Svc Station	1137 Chestnut St.	Emmaus	A	high	RCRA facility	i20
CERCLIS	NFRAP	PAD981033343	56	Volney Felt Co.	South Seventh St.	Upper Milford	A	high	Large quantity hazardous waste generator	m13
CERCLIS		PAD980692719	57	Voortman Farm	Vera Cruz Rd.	Upper Saucon	A	high	Large quantity hazardous waste generator	m13
LUST	open	214	66	Getty Gas Station 67227	3050 LEHIGH ST	Allentown	A	high	Gas service station	c09
UST			84	Sunoco	State	Emmaus	A	high	Gas service station	c09
other			86	Emmaus Auto Repair	State	Emmaus	A	high	Auto repair shop	c02
SWL	unpermitted		87	Abandoned Brickyard (filled with household wastes)	Franklin & Greenleaf	Emmaus	A	high	Asphalt coal tar or concrete plant	i01
SWL	unpermitted		88	Abandoned Junkyard (Schmeltzle Bros.)	1267 Tilghman	Emmaus	A	high	Landfill or dump	m11
Borough			90	Indian Creek Golf Course	1449 Chestnut	Emmaus	A	high	Golf course	c10
SWL	unpermitted		91	Old Borough Dump (unknown materials)	Klines	Emmaus	A	high	Landfill or dump	m11
Borough			92	Borough Snow Dump	Klines	Emmaus	A	high	Snow dump	m23
Borough			93	Abandoned Brickyard	Klines	Emmaus	A	high	Asphalt coal tar or concrete plant	i01
Borough			94	Residential Housing	Overlook Springs		A	high	Fuel oil storage	r01
Borough			95	Emmaus Foundry	Mountain		A	high	Foundry or metal fabricator	i08
Borough			96	Schantz Funeral Home	250 Main	Emmaus	A	high	Funeral home	c07
Borough			100	Flexer Concrete (abandoned mixing site)	Klines	Emmaus	A	high	Asphalt coal tar or concrete plant	i01
Borough			101	Emmaus Fire Training	Klines	Emmaus	A	high	Fire training facility	m09
SWL	unpermitted		106	Abandoned Dump	South Tenth	Emmaus	A	high	Landfill or dump	m11
SWL	unpermitted		107	former Rodale lagoon (aka Square D/Lwr Furnace Dam)	South Tenth	Emmaus	A	high	Industrial lagoon or pit	i11
Borough			108	Faustner Auto Body	301 South Twelfth	Emmaus	A	high	Auto repair shop	c02
Borough			111	Cottman Transmission	950 Chestnut	Emmaus	A	high	Auto repair shop	c02
Borough			113	Suburban Propane	15 South Eighth	Emmaus	A	high	Storage facility petroleum or chemical	i21
Borough			114	Wieand's Block (abandoned concrete plant)	17-25 South Seventh	Emmaus	A	high	Asphalt coal tar or concrete plant	i01
Borough			115	Thermoplastic Valves	55 South Seventh	Emmaus	A	high	Plastic manufacturing	i18
Borough			116	Handwerk Photo Lab	63 South Seventh	Emmaus	A	high	Photo processor	c17
Borough			117	Oak Street (furniture refinishing)	803 Broad	Emmaus	A	high	Furniture Refinishing	
Borough			118	Impress Industries	726 Broad	Emmaus	A	high	Industrial park	i12
Borough			119	Sharp Steel Rule & Die	202 South Sixth	Emmaus	A	high	Machine metal working shop	i14
Borough			120	Abandoned Sand Quarry	Mountain Blvd	Emmaus	A	high	Quarry	i26
other			126	Texaco	Lehigh	Allentown	A	high	Gas service station	c09
other			127	Lehigh Tire Auto Service	Thirty-first	Allentown	A	high	Auto repair shop	c02
other			128	REBCO Kwik Print	Lehigh	Allentown	A	high	Printer or blueprint shop	c18
other			129	Pacific Pride Gas Station	Thirty-first	Allentown	A	high	Gas service station	c09
other			131	Jack Williams Tire and Auto Svc	3300 Lehigh	Allentown	A	high	Auto repair shop	c02
other			132	Kelly Saturn	Lehigh	Allentown	A	high	Auto repair shop	c02
other			133	Kelly Used Cars	Lehigh	Allentown	A	high	Auto repair shop	c02
other			135	Cemetary	Ridge	Emmaus	A	high	Cemetery	m04
other			136	Cemetary	Ridge	Emmaus	A	high	Cemetery	m04
other			137	Cemetary	Keystone & Long	Emmaus	A	high	Cemetery	m04
other			138	Cemetary	Harrison, Keystone, Berger & First	Emmaus	A	high	Cemetery	m04
other			139	HAPCO Screen Printing	Elm	Emmaus	A	high	Printer or blueprint shop	c18
other			142	Cemetary	Sixteenth	Emmaus	A	high	Cemetery	m04
other			145	East Penn Machining	Broad	Emmaus	A	high	Machine metal working shop	i14
other			146	Former Dry Cleaners	Fourteenth	Emmaus	A	high	Dry cleaner	c06
other			147	West End Distributers (former auto repair shop)	Tenth & Pennsylvania	Emmaus	A	high	Auto repair shop	c02
other			149	Emmaus Auto Parts	Chestnut	Emmaus	A	high	Auto repair shop	c02
other			152	Lehigh Valley Elastic	Fourth St	Emmaus	A	high	Industrial park	i12
other			153	EFM Automatic Heat	Fourth St	Emmaus	A	high	Industrial park	i12

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT SOURCE LOCATION | SITE ACTIVITY

DB	STATUS	ID	SITE ID	NAME	FULL ADDRESS	CITY	SWAP	POTENTIAL FOR IMPACT	ACTIVITY	ACTIVITY NUMBER
other			154	Mike's Auto Body	Wood St	Emmaus	A	high	Auto repair shop	c02
other			155	Former Auto Shop (1930s)	Shimerville	Emmaus	A	high	Auto repair shop	c02
other			157	Colours Paint Shop	Main and First	Emmaus	A	high	Paint shop	c16
other			159	Reinnart Awning Co.	Dalton		A	high	Auto repair shop	c02
other			160	Abandoned Auto Garage	Adrain	Emmaus	A	high	Auto repair shop	c02
other			161	Abandoned Auto Garage	Jubilee	Emmaus	A	high	Auto repair shop	c02
other			162	Abandoned Auto Garage	Sixteenth	Emmaus	A	high	Auto repair shop	c02
other			163	Auto Repair Garage	Main	Upper Milford	A	high	Auto repair shop	c02
Borough			164	Vera Crua (failing septic systems)			A	high	On lot waste disposal	r04
DEP			165	Railroad track	Seventh St	Emmaus	A	high	Railroad track or yard	c19
DEP			166	Railroad track	Klines Ln	Emmaus	A	high	Railroad track or yard	c19
DEP			167	Railroad track	Klines Ln	Emmaus	A	high	Railroad track or yard	c19
DEP			168	Railroad track	Fourth St	Emmaus	A	high	Railroad track or yard	c19
DEP			169	Railroad Track	Harrison St	Emmaus	A	high	Railroad track or yard	c19
SWL	unpermitted		170	former Rodale Manufacturing dump	3471 Quarry Dr	Upper Milford	A	high	unpermitted landfill or dump	
SWL	unpermitted		171	former private dump (household waste 1950-1960)	4502 S Mountain Dr	Upper Milford	A	high	unpermitted landfill or dump	
SWL	unpermitted		172	former private dump (household waste prior to 1950)	1202-1206 S 10th St	Upper Milford	A	high	unpermitted landfill or dump	

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT CHARACTERISTICS | MATRIX COMPARISONS

SITE ID	NAME	TRAVEL TIME	PERSISTENCE	QUANTITY	SENSITIVITY	CONTROL PRACTICE	CONTROL PRACTICE VALUE	MATRIX A RESULT	MATRIX B RESULT	MATRIX C RESULT	FINAL RATING	COMMENT 1
7	Buss Paint & Wallpaper	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	A	
37	Randys Gulf SVC	medium	high	low	high	Unknown	high	high	medium	high	A	
41	Rodale Mfg.Co.(Square D Co. Emmaus Plt)	medium	high	medium	high	Containment &/or ERP Regulated/No Control Pract	low/high	high	high	high	A	(CERCLIS/NPL)
51	Texaco Svc Station	medium	high	medium	high	Unknown	high	high	high	high	A	
56	Volney Felt Co.	medium	high	medium	high	Unknown	high	high	high	high	A	(CERC)
57	Voortman Farm	medium	high	medium	high	Unknown	high	high	high	high	A	(J&J) (CERC)
66	Getty Gas Station 67227	medium	high	medium	high	Unknown	high	high	high	high	A	(LUST)
84	Sunoco	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	A	
86	Emmaus Auto Repair	medium	high	low	high	Unknown	high	high	medium	high	A	
87	Abandoned Brickyard (filled with household wastes)	medium	high	medium	high	Unknown	high	high	high	high	A	(Abandon)
88	Abandoned Junkyard (Schmeltzle Bros.)	medium	high	high	high	Unknown	high	high	high	high	A	(Abandoned)
90	Indian Creek Golf Course	medium	high	high	high	Unknown	high	high	high	high	A	
91	Old Borough Dump (unknown materials)	medium	high	medium	high	Unknown	high	high	high	high	A	(Abandon)
92	Borough Snow Dump	medium	high	medium	high	Unknown	high	high	high	high	A	
93	Abandoned Brickyard	medium	high	medium	high	Unknown	high	high	high	high	A	(Abandon)
94	Residential Housing	medium	high	low	high	Unknown	high	high	medium	high	A	(Houses)
95	Emmaus Foundry	medium	high	medium	high	Unknown	high	high	high	high	A	
96	Schantz Funeral Home	medium	high	low	high	Unknown	high	high	medium	high	A	
100	Flexer Concrete (abandoned mixing site)	medium	high	medium	high	Unknown	high	high	high	high	A	(Abandon)
101	Emmaus Fire Training	medium	high	medium	high	Unknown	high	high	high	high	A	
106	Abandoned Dump	medium	high	medium	high	Unknown	high	high	high	high	A	(Abandoned)
107	former Rodale lagoon (aka Square D/Lwr Furnace Dam)	medium	high	medium	high	Unknown	high	high	high	high	A	abandon
108	Faustner Auto Body	medium	high	low	high	Unknown	high	high	medium	high	A	
111	Cottman Transmission	medium	high	medium	high	Unknown	high	high	high	high	A	
113	Suburban Propane	medium	high	medium	high	Unknown	high	high	high	high	A	
114	Wieand's Block (abandoned concrete plant)	medium	high	low	high	Unknown	high	high	medium	high	A	(Abandon)
115	Thermoplastic Valves	medium	high	low	high	Unknown	high	high	medium	high	A	
116	Handwerk Photo Lab	medium	high	low	high	Unknown	high	high	medium	high	A	
117	Oak Street (furniture refinishing)	medium	high	high	high			high	high	high	A	
118	Impress Industries	medium	high	medium	high	Unknown	high	high	high	high	A	
119	Sharp Steel Rule & Die	medium	high	low	high	Unknown	high	high	medium	high	A	
120	Abandoned Sand Quarry	medium	low	medium	high	Unknown	high	low	low	medium	B	(Abandon)
126	Texaco	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	A	
127	Lehigh Tire Auto Service	medium	high	medium	high	Unknown	high	high	high	high	A	
128	REBCO Kwik Print	medium	medium	medium	high	Unknown	high	medium	medium	high	A	fine art
129	Pacific Pride Gas Station	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	A	
131	Jack Williams Tire and Auto Svc	medium	high	high	high	Unknown	high	high	high	high	A	
132	Kelly Saturn	medium	high	medium	high	Unknown	high	high	high	high	A	
133	Kelly Used Cars	medium	high	medium	high	Unknown	high	high	high	high	A	
135	Cemetary	medium	high	low	high	Unknown	high	high	medium	high	A	
136	Cemetary	medium	high	low	high	Unknown	high	high	medium	high	A	
137	Cemetary	medium	high	high	high	Unknown	high	high	high	high	A	(3)
138	Cemetary	medium	high	medium	high	Unknown	high	high	high	high	A	
139	HAPCO Screen Printing	medium	medium	medium	high	Unknown	high	medium	medium	high	A	
142	Cemetary	medium	high	medium	high	Unknown	high	high	high	high	A	
145	East Penn Machining	medium	high	medium	high	Unknown	high	high	high	high	A	
146	Former Dry Cleaners	medium	high	medium	high	Unknown	high	high	high	high	A	(Abandoned)
147	West End Distributers (former auto repair shop)	medium	high	medium	high	Unknown	high	high	high	high	A	
149	Emmaus Auto Parts	medium	high	low	high	Unknown	high	high	medium	high	A	(Auto Zone)
152	Lehigh Valley Elastic	medium	high	medium	high	Unknown	high	high	high	high	A	
153	EFM Automatic Heat	medium	high	medium	high	Unknown	high	high	high	high	A	

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT CHARACTERISTICS | MATRIX COMPARISONS

SITE ID	NAME	TRAVEL TIME	PERSISTENCE	QUANTITY	SENSITIVITY	CONTROL PRACTICE	CONTROL PRACTICE VALUE	MATRIX A RESULT	MATRIX B RESULT	MATRIX C RESULT	FINAL RATING	COMMENT 1
154	Mike's Auto Body	medium	high	medium	high	Unknown	high	high	high	high	A	
155	Former Auto Shop (1930s)	medium	high	low	high	Unknown	high	high	medium	high	A	(Not Found)
157	Colours Paint Shop	medium	high	low	high	Unknown	high	high	medium	high	A	
159	Reinnart Awning Co.	medium	high	low	high	Unknown	high	high	medium	high	A	(Reinnart)
160	Abandoned Auto Garage	medium	high	low	high	Unknown	high	high	medium	high	A	(Abandon)
161	Abandoned Auto Garage	medium	high	low	high	Unknown	high	high	medium	high	A	(Abandon)
162	Abandoned Auto Garage	medium	high	medium	high	Unknown	high	high	high	high	A	(Cougle Truck)
163	Auto Repair Garage	medium	high	medium	high	Unknown	high	high	high	high	A	
164	Vera Crua (failing septic systems)	medium	high	high	high	Unknown	high	high	high	high	A	
165	Railroad track	medium	high	low	high	Unknown	high	high	medium	high	A	
166	Railroad track	medium	high	low	high	Unknown	high	high	medium	high	A	
167	Railroad track	medium	high	medium	high	Unknown	high	high	high	high	A	
168	Railroad track	medium	high	low	high	Unknown	high	high	medium	high	A	
169	Railroad Track	medium	high	medium	high	Unknown	high	high	high	high	A	(4)
170	former Rodale Manufacturing dump	medium	high	high	high	Unknown	high	high	high	high	A	
171	former private dump (household waste 1950-1960)	medium	high	high	high	Unknown	high	high	high	high	A	
172	former private dump (household waste prior to 1950)	medium	high	high	high	Unknown	high	high	high	high	A	

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT SOURCE MAPPING | CONTAMINANT SOURCE VERIFICATION

SITE ID	NAME	COMMENT 2	LAT	LONG	SOURCE	MAPPED	FIELD CHECKED	FIELD CHECK DATE	CONTAMINANTS	COUNTY	STATE	ZIP
7	Buss Paint & Wallpaper		40.53582	-75.49073	InfoMap	BIA	BIA-LG & JH	3-21-02	Fuel Oil #2	Lehigh	PA	18049
37	Randys Gulf SVC		40.54783	-75.48970	PA DEP	PA DEP-BIA	BIA - LG	3-15-02	none	Lehigh	PA	18049
41	Rodale Mfg.Co.(Square D Co. Emmaus Plt)		40.52989	-75.49338	PA DEP	PA DEP	BIA - LG & JH	3-21-02		Lehigh	PA	18049
51	Texaco Svc Station		40.52869	-75.50693	InfoMap	BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
56	Volney Felt Co.	(Closed)	40.52513	-75.49338	InfoMap	BIA	Boro-DD	4-4-02	Fuel Oil #2	Lehigh	PA	18092
57	Voortman Farm		40.53278	-75.46237	EDR	EDR-BIA	Boro-DD	4-4-02	none	Lehigh	PA	18034
66	Getty Gas Station 67227		40.55892	-75.48838	PA DEP	PA DEP-BIA	BIA-LG	3-15-02	none	Lehigh	PA	18103
84	Sunoco		40.54746	-75.48957	Boro	Boro-BIA	BIA-LG	3-15-02		Lehigh	PA	18049
86	Emmaus Auto Repair		40.54315	-75.48640	Boro	Boro-BIA	BIA-LG	3-15-02		Lehigh	PA	18049
87	Abandoned Brickyard (filled with household wastes)		40.53692	-75.50117	Boro	Boro-BIA	Boro			Lehigh	PA	18049
88	Abandoned Junkyard (Schmeltzle Bros.)		40.52146	-75.50287	Boro	Boro-BIA	Boro-DD	4-4-02		Lehigh	PA	18049
90	Indian Creek Golf Course		40.52595	-75.51398	Boro	Boro-BIA	BIA-LG & CK.	3-12-02		Lehigh	PA	18049
91	Old Borough Dump (unknown materials)		40.53955	-75.48139	Boro	Boro-BIA	Boro			Lehigh	PA	18049
92	Borough Snow Dump		40.53899	-75.48211	Boro	Boro-BIA	Boro			Lehigh	PA	18049
93	Abandoned Brickyard		40.53848	-75.48246	Boro	Boro-BIA	Boro			Lehigh	PA	18049
94	Residential Housing		40.53790	-75.47918	Boro	Boro-BIA	BIA-LG & CK, Boro-DD	3-12-02	septic system leachate	Lehigh	PA	18049
95	Emmaus Foundry		40.53188	-75.48855	Boro	Boro-BIA	BIA-BR	4-2-02		Lehigh	PA	18049
96	Schantz Funeral Home		40.53590	-75.49000	Boro	Boro-BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
100	Flexer Concrete (abandoned mixing site)		40.54025	-75.48553	Boro	Boro-BIA	Boro			Lehigh	PA	18049
101	Emmaus Fire Training		40.54032	-75.48322	Boro	Boro-BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
106	Abandoned Dump	S. 10th Street	40.52397	-75.49791	Boro	Boro-BIA	Boro			Lehigh	PA	18049
107	former Rodale lagoon (aka Square D/Lwr Furnace Dam)		40.52725	-75.50091	Boro	Boro-BIA	BIA-LG & CK, Boro-DD	3-12-02		Lehigh	PA	18049
108	Faustner Auto Body		40.52506	-75.50341	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
111	Cottman Transmission		40.52979	-75.50367	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
113	Suburban Propane		40.53119	-75.49943	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
114	Wieand's Block (abandoned concrete plant)		40.53138	-75.49822	Boro	Boro-BIA	Boro			Lehigh	PA	18049
115	Thermoplastic Valves		40.53088	-75.49783	Boro	Boro-BIA	Boro			Lehigh	PA	18049
116	Handwerk Photo Lab		40.53057	-75.49759	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
117	Oak Street (furniture refinishing)		0.00000	0.00000	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
118	Impress Industries		40.52942	-75.49805	Boro	Boro-BIA	Boro			Lehigh	PA	18049
119	Sharp Steel Rule & Die		40.53026	-75.49376	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
120	Abandoned Sand Quarry		40.55006	-75.48093	Boro	Boro-BIA	Boro			Lehigh	PA	18049
126	Texaco		40.55900	-75.48795	BIA	BIA	BIA-LG	3-15-02		Lehigh	PA	18049
127	Lehigh Tire Auto Service		40.55872	-75.48727	BIA	BIA	BIA-LG	3-15-02		Lehigh	PA	18049
128	REBCO Kwik Print		40.55934	-75.48731	BIA	BIA	BIA-LG	3-15-02		Lehigh	PA	18049
129	Pacific Pride Gas Station		40.55861	-75.48681	BIA	BIA	BIA-LG	3-15-02		Lehigh	PA	18049
131	Jack Williams Tire and Auto Svc		40.55701	-75.48950	BIA	BIA	BIA-LG	3-15-02		Lehigh	PA	18049
132	Kelly Saturn		40.54966	-75.49081	BIA	BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
133	Kelly Used Cars		40.54775	-75.48907	BIA	BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
135	Cemetary		40.54055	-75.48860	BIA	BIA	BIA-LG			Lehigh	PA	18049
136	Cemetary		40.54022	-75.48870	BIA	BIA	BIA-LG			Lehigh	PA	18049
137	Cemetary		40.53997	-75.49004	BIA	BIA	BIA-LG			Lehigh	PA	18049
138	Cemetary		40.54366	-75.49461	BIA	BIA	BIA-LG			Lehigh	PA	18049
139	HAPCO Screen Printing		40.53641	-75.49764	BIA	BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
142	Cemetary		40.52212	-75.51515	BIA	BIA	BIA-LG			Lehigh	PA	18049
145	East Penn Machining		40.52959	-75.49948	BIA	BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
146	Former Dry Cleaners		40.52372	-75.50840	BIA	BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
147	West End Distributers (former auto repair shop)		40.52759	-75.50251	BIA	BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
149	Emmaus Auto Parts		40.52646	-75.51195	BIA	BIA	BIA-BR	4-2-02		Lehigh	PA	18049
152	Lehigh Valley Elastic		40.53110	-75.48952	BIA	BIA	BIA-BR	4-2-02		Lehigh	PA	18049
153	EFM Automatic Heat		40.53077	-75.48906	BIA	BIA	BIA-BR	4-2-02		Lehigh	PA	18049

POTENTIAL CONTAMINANT SOURCE INVENTORY

CONTAMINANT SOURCE MAPPING

CONTAMINANT SOURCE VERIFICATION

SITE ID	NAME	COMMENT 2	LAT	LONG	SOURCE	MAPPED	FIELD CHECKED	FIELD CHECK DATE	CONTAMINANTS	COUNTY	STATE	ZIP
154	Mike's Auto Body		40.53099	-75.48811	BIA	BIA	BIA-BR	4-2-02		Lehigh	PA	18049
155	Former Auto Shop (1930s)		40.52415	-75.50585	Boro	Boro-BIA	BORO	4-4-02		Lehigh	PA	18049
157	Colours Paint Shop		40.54021	-75.48663	BIA	BIA	BIA-BR	4-23-02		Lehigh	PA	18049
159	Reinnart Awning Co.		40.55066	-75.48631	BIA	BIA	BIA-BR	4-23-02		Lehigh	PA	18049
160	Abandoned Auto Garage		40.53459	-75.48835	BIA	BIA	BIA-BR	4-23-02		Lehigh	PA	18049
161	Abandoned Auto Garage		40.53369	-75.49207	BIA	BIA	BIA-BR	4-23-02		Lehigh	PA	18049
162	Abandoned Auto Garage		40.52293	-75.51438	BIA	BIA	BIA-BR	4-23-02		Lehigh	PA	18049
163	Auto Repair Garage		40.50592	-75.49591	BIA	BIA				Lehigh	PA	18049
164	Vera Crua (failing septic systems)		40.50549	-75.49728						Lehigh	PA	18049
165	Railroad track		40.52628	-75.49432						Lehigh	PA	18049
166	Railroad track		40.53879	-75.48325						Lehigh	PA	18049
167	Railroad track		40.53972	-75.48465						Lehigh	PA	18049
168	Railroad track		40.53192	-75.49008						Lehigh	PA	18049
169	Railroad Track		40.54861	-75.48875						Lehigh	PA	18049
170	former Rodale Manufacturing dump		0.00000	0.00000	DeLong	DeLong				Lehigh	PA	18049
171	former private dump (household waste 1950-1960)		0.00000	0.00000	DeLong	Delong				Lehigh	PA	18049
172	former private dump (household waste prior to 1950)		0.00000	0.00000	DeLong	DeLong				Lehigh	PA	18049

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT SOURCE LOCATION | SITE ACTIVITY

DB	STATUS	ID	SITE ID	NAME	FULL ADDRESS	CITY	SWAP	POTENTIAL FOR IMPACT	ACTIVITY	ACTIVITY NUMBER
UST/RCRA-SGN		39-24558/PAD987327590	1	7 Eleven 21110	1146 Chestnut & Twelfth St	Emmaus	D	medium	Gas service station/RCRA facility	c09/i20
UST/LUST	Open	39-40332/2395825	3	Air Prod & Chem	733 W. Broad St.	Emmaus	C	medium	Small qty generator/Underground petroleum storage	m22/m26
UST		39-37417	4	Atlantis Aquaculture	840 Broad St.	Emmaus	D	medium	Underground petroleum storage tank	m26
UST		39-40265	5	Britts Tire Service	801 Chestnut St.	Emmaus	D	medium	Underground petroleum storage tank	m26
RCRA-SGN		PAR000502377	6	Bud Friend (NAPA)	700 Chestnut St.	Emmaus	D	medium	RCRA facility	i20
UST		39-52159	8	Caffrey Auto Supply of Allentown	621 Long St.	Emmaus	D	medium	Underground petroleum storage tank	m26
UST		39-51770	9	Camp Olympic Inc.	3050 Cedar Crest Blvd.	Emmaus	C	medium	Underground petroleum storage tank	m26
LUST	Open	2395858	10	Christine Dyche Residence	525 Elm St.	Emmaus	D	medium	Small quantity hazardous waste generator	m22
UST		39-43489	11	Cita Technology Inc	860 Broad St.	Emmaus	D	medium	Underground petroleum storage tank	m26
LUST	Closed	2395865	12	Colonial Crest	Cold Stream Circle	Emmaus	C	medium	Small quantity hazardous waste generator	m22
LUST	Open	0199-846/0800-303	13	Contel of PA Emmaus DCO CT 187	409-417 Railroad St.	Emmaus	C	medium	Small quantity hazardous waste generator	m22
RCRA-VGN		PAR000036152	14	CVIP Inc.	801 Broad St.	Emmaus	D	medium	RCRA facility	i20
RCRA-VGN		PAD073665234	15	East Penn Sch District	640 Macungie Ave.	Emmaus	D	medium	RCRA facility	i20
LUST/RCRA-SGN	LUST closed 11/29/19	LUST #3221/PAD987301066	16	Electro Chem Eng & Mfg Co.	750 BROAD ST	Emmaus	C	medium	Small quantity generator/RCRA facility	m22/i20
UST/LUST	Open	39-32058/2395877	17	Emmaus Borough Maintenance Garage	44 KLEINS LN	Emmaus	C	medium	Small quantity generator/UST	m22/m26
LUST	Closed	0101-624	18	Emmaus Borough Marks House	Main St	Emmaus	C	medium	Small quantity hazardous waste generator	m22
LUST	Open	0797-206	19	Emmaus Borough Main Pumping Station	101 KLEINS LN	Emmaus	C	medium	Small quantity hazardous waste generator	m22
LUST	Open	2395876	20	Emmaus Borough Main Pumping Station	202 KLEINS LN	Emmaus	C	medium	Small quantity hazardous waste generator	m22
LUST	Open	2395878	21	Emmaus Borough Municipal Garage	33 KLEINS LN	Emmaus	C	medium	Small quantity hazardous waste generator	m22
UST		39-02984	22	Emmaus High School	851 North St.	Emmaus	D	medium	Underground petroleum storage tank	m26
UST		39-40513	23	Emmaus JR High Sch	660 Macunige Ave.	Emmaus	D	medium	Underground petroleum storage tank	m26
UST		39-32281	24	fmr Rohrbach Ready Mix /current TJ Cougle	122 S. Sixteenth St.	Emmaus	D	medium	Underground petroleum storage tank	m26
RCRA-SGN		PAD043391465	25	General Machine Corp.	4TH & FURNACE STS	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN		PAD982709479	27	Hausmans Welding Inc.	19 S 6TH ST	Emmaus	D	medium	RCRA facility	i20
RCRA-VGN		PA0001018993	28	Heussman Gunther Inc	4801 S. Fifth St.	Emmaus	D	medium	Repair shop	c20
UST		39-40515	29	Jefferson Elem Sch	525 North St.	Emmaus	D	medium	Underground petroleum storage tank	m26
UST/RCRA-VGN		39-51027/PAD987339777	30	Jims Chestnut St Station	945 Chestnut St.	Emmaus	D	medium	Underground petroleum storage tank/RCRA facility	m26/i20
UST/LUST	open	39-40517/ LUST #3225	32	Lincoln Elementary Sch	225 Seem St.	Emmaus	C	medium	Small quantity generator/UST	m22/m26
LUST	closed 2/25/1994	12619	33	Maiers Bakery Emmaus	1967 RAMER RD	Upper Milford	C	medium	Small quantity hazardous waste generator	m22
RCRA-VGN		PA0000883553	34	Mikes Auto Collision	3720 Allen St.	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN		PAD987345139	35	Motorworks	121 MAIN ST	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN		PAD982578932	36	Plaza Country Cleaners	1325 CHESTNUT ST	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN		PAD987394905	38	Reiters Radiator	11 N 10	Emmaus	D	medium	RCRA facility	i20
LUST	closed 10/19/199	3227	39	Renningers Svc. Station (Mobil)	12-14 E MAIN ST	Emmaus	C	medium	Gas service station	c09
LUST	open	3228	42	Rodale Press Inc-Customer Center	400 S 10TH ST	Emmaus	C	medium	Small quantity hazardous waste generator	m22
UST/RCRA-SGN		39-52305/PAD982708513	43	Rodale Press Inc.	154 E MINOR ST	Emmaus	D	medium	RCRA facility/UST	i20/m26
RCRA-SGN		PA0002181139	44	Rodale Press Inc.	375 S 10TH ST	Emmaus	D	medium	RCRA facility	i20
UST		39-52307	45	Rodale Press Inc.	135 N. Sixth St.	Emmaus	D	medium	Underground petroleum storage tank	m26
RCRA-SGN		PAD982662512	47	Schmoyers Inc.	202 S 7TH	Emmaus	D	medium	RCRA facility	i20
LUST	open	3229	48	Stroh Property	747 CHESTNUT ST	Emmaus	C	medium	Small quantity hazardous waste generator	m22
UST		39-41533	49	Swann Gasoline Terminal (Top Star)	14 E MAIN ST	Emmaus	C	medium	Fuel oil distributor	i09
LUST	open	3230	50	TBA Auto	808 BROAD ST, PO BOX 220	Emmaus	C	medium	Small quantity hazardous waste generator	m22
RCRA-SGN		PA0001809870	52	Total Imaging Inc.	518 BANK ST	Emmaus	D	medium	RCRA facility	i20
UST		39-08743	53	Turkey Hill 110 (Exxon)	602 Chestnut St.	Emmaus	D	medium	Gas service station	c09
LUST	Open	2395995	54	Upper Milford Twp. Bldg	5831Kings Highway S	Old Zions	D	medium	Small quantity hazardous waste generator	m22
UST		39-50773	55	Verizon	417 S. Railroad St.	Emmaus	D	medium	Underground petroleum storage tank	m26
UST		39-29093	58	Wilmer R. Schultz	1540 Chestnut St.	Emmaus	D	medium	Underground petroleum storage tank	m26
UST		39-06050	59	WM ME Yeakel & Sons Inc.	RIDGE & WILLIAMS ST	Emmaus	D	medium	Underground petroleum storage tank	m26
LUST	open	148	60	7 Eleven Gas Station 11388 (EZ Shoppe)	3026 MORAVIAN ST	Allentown	C	medium	Gas service station	c09
SWL	Permitted	101383	61	A.P. Houser Inc. Landfill	Stone entrance to Landis Property	Upper Mil	D	medium	Landfill or dump	m11
RCRA-SGN		PAD013807136	62	Allentown Mazda Volvo	3209 LEHIGH ST	Allentown	D	medium	RCRA facility	i20
LUST	closed 12/23/199	10734	63	Bon Ton Store 73 Auto Center	3300 LEHIGH ST	Salisbury	C	medium	Small quantity hazardous waste generator	m22
LUST	open	12617	64	CRS Friendly Market 17 (Hess Express)	ROUTE 29 & COLEBROOK	Upper Milford	C	medium	Small quantity hazardous waste generator	m22

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT SOURCE LOCATION | SITE ACTIVITY

DB	STATUS	ID	SITE ID	NAME	FULL ADDRESS	CITY	SWAP	POTENTIAL FOR IMPACT	ACTIVITY	ACTIVITY NUMBER
LUST	open	10735	65	David Hanssen Prop	RR 2 BOX 211	Salisbury	D	medium	Small quantity hazardous waste generator	m22
LUST	closed 2/3/1995	12618	67	Hatfields Quality Meats	4591 COLEBROOK AVE	Upper Milford	C	medium	Small quantity hazardous waste generator	m22
LUST	open	10737	68	Jiffy Lube 601	3111 LEHIGH ST	Salisbury	C	medium	Small quantity hazardous waste generator	m22
RCRA-SGN		PAD041363003	69	Kelly Buick AMC RENAULT	501-23 STATE RD	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN		PAD987353067	70	Kelly Mitsubishi	536-540 STATE RD	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN		PAD045133899	71	Knopf Automotive	3401 LEHIGH STREET	Allentown	D	medium	RCRA facility	i20
RCRA-SGN		PAD987352051	72	Lexus of Lehigh Valley	133 STATE AVE	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN/LUST	open	PAD987334620/262	73	Mobil Oil Gas Station 15 DMP	3101 LEHIGH ST & 31ST ST	Allentown	C	medium	Gas Station/RCRA facility	c09/i20
RCRA-SGN		PAD064030810	74	Rileigh Gander & Showalter Inc.	100 KEYSTONE AVE	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN		PAD040945966	75	Roberts Professional Cleaners	436 STATE AVE	Emmaus	D	medium	RCRA facility	i20
TRI		PAD002517274	76	Spirax Sarco Inc.	1951 GLENWOOD ST. S.W.	Allentown	D	medium	Large quantity hazardous waste generator	m13
SWL	unpermitted	100438	77	Upper Milford Township Landfill	Right hand side of Quarry Rd in dr	Upper Mil	D	medium	Landfill or dump	m11
RCRA-SGN		PAD987285574	78	Vinart Dealerships	333 STATE RD	Emmaus	D	medium	RCRA facility	i20
RCRA-SGN		PAD987285582	79	Vinart Dealerships	675 STATE AVE	Emmaus	D	medium	RCRA facility	i20
other			80	Scott Chevrolet Dealship	State	Emmaus	D	medium	Auto repair shop	c02
other			81	Scott Chrysler Dealership	State	Emmaus	D	medium	Auto repair shop	c02
other			82	Scott Used Car Dealership	State	Emmaus	D	medium	Auto repair shop	c02
other			83	Jeep Dealership	State	Emmaus	D	medium	Auto repair shop	c02
other			85	Vinart Used Car Dealership	State	Emmaus	D	medium	Auto repair shop	c02
Borough			89	Sell's Truck Repair	4393 Ramer St	Emmaus	D	medium	Auto repair shop	c02
Borough			97	Hendrick's Gas Station (Citgo)	202 Main	Emmaus	D	medium	Gas service station	c09
Borough			98	Road Salt Storage	44 Klines	Emmaus	C	medium	Road salt storage	m21
Borough			99	Pesticide Storage	33 Klines	Emmaus	C	medium	Pesticide storage or use	a05
Borough			102	Andy's Repair (Pine Ridge)	118 State	Emmaus	C	medium	Auto repair shop	c02
Borough			103	Lexus Detailing and Car Wash	121 State	Emmaus	D	medium	Car wash	c05
Borough			105	Emmaus Composting Facility	Klines	Emmaus	D	medium	Composting facility	m06
other			122	Feher Color Lab (Photo Lab)	626 State	Emmaus	D	medium	Photo processor	c17
other			123	White Rose (Susquehanna) Dry Cleaners	630 State	Emmaus	D	medium	Dry cleaner	c06
other			124	Lamm's Machine Shop	3216 Berger	Allentown	C	medium	Machine metal working shop	i14
other			125	KJ Automotive Shop	2550 SW Thirty First	Allentown	D	medium	Auto repair shop	c02
other			134	VinArt Used Cars	State	Emmaus	D	medium	Auto repair shop	c02
other			143	Blue Plum Dry Cleaners	Chestnut	Emmaus	D	medium	Dry cleaner	c06
UST			158	Texaco/East Penn Tire	Chestnut & Buckeye		D	medium	Gas service station	c09

DB	STATUS	ID	SITE ID	NAME	FULL ADDRESS	CITY	SWAP	POTENTIAL FOR IMPACT	ACTIVITY	ACTIVITY NUMBER
RCRA-SGN		PAR000018168	2	A&M Total Auto Body	5722 Old Kings Hwy	Zionsville	E	low	RCRA facility	i20
RCRA-VGN		PA0000899583	26	Hasik Auto Body (Hydrex) (R&B?)	3295 Main Rd.	Emmaus	E	low	RCRA facility	i20
RCRA-VGN		PAR000007435	31	Kehs Svc and Repair	5421 Chestnut St & rt. 29	Emmaus	E	low	RCRA facility	i20
UST		39-40514	40	Rinker Enterprises Inc	5093 Vera Cruz Rd.	Emmaus	E	low	Underground petroleum storage tank	m26
Borough			109	Bubbles Car Wash (Emmaus Car Wash)	17 South Twelfth	Emmaus	E	low	Car wash	c05
Borough			110	Rudy's Car WAsh	1137 Chestnut	Emmaus	E	low	Car wash	c05
Borough			112	Gerlette's Car Wash	15 South Tenth	Emmaus	E	low	Car wash	c05
Borough			121	R.U.S. Laundry Service	164 East Main	Emmaus	E	low	Laundromat	c12
other			130	Mr. T Car Wash	Thirty-first		E	low	Car wash	c05
other			140	Emmaus Laundry	Chestnut	Emmaus	E	low	Laundromat	c12
other			141	Boro Well #5 (abandoned)	Berger & Sixth	Emmaus	D	low	Abandoned well	m31
other			144	Dick Blick Warehouse	Broad & Seventh	Emmaus	D	low	Industrial park	i12
other			148	JAS Wholesale	Colebrook		E	low	Industrial park	i12
other			150	Hospital Central Services	Seventh	Emmaus	D	low	Medical facility	c14
other			151	Republic International	Furnace St	Emmaus	D	low	Industrial park	i12
other			156	Pioneer Glass and Mirror	Main and First	Emmaus	D	low	Repair shop	c20

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT CHARACTERISTICS | MATRIX COMPARISONS

SITE ID	NAME	Travel Time	Persistence	Quantity	Sensitivity	Control Practice	Control Practice Value	Matrix A Result	Matrix B result	Matrix C Result	Final Rating	Comment 1
1	7 Eleven 21110	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	D	(UST/RCRA)
3	Air Prod & Chem	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST/UST)
4	Atlantis Aquaculture	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
5	Britts Tire Service	medium	high	low	high	Unknown	high	high	medium	high	D	(UST)
6	Bud Friend (NAPA)	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	D	
8	Caffrey Auto Supply of Allentown	medium	high	low	high	Unknown	high	high	medium	high	D	(UST)
9	Camp Olympic Inc.	medium	high	medium	high	Unknown	high	high	high	high	C	(UST)
10	Christine Dyche Residence	medium	high	low	high	Best Management Practices	medium	high	medium	high	D	(LUST)
11	Cita Technology Inc	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
12	Colonial Crest	medium	high	low	high	Best Management Practices	medium	high	medium	high	C	(LUST)
13	Contel of PA Emmaus DCO CT 187	medium	high	low	high	Best Management Practices	medium	high	medium	high	C	(LUST)
14	CVIP Inc.	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
15	East Penn Sch District	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
16	Electro Chem Eng & Mfg Co.	medium	high	medium	high	Best Management Practices	high/low	high	high	high	C	(LUST)
17	Emmaus Borough Maintenance Garage	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)
18	Emmaus Borough Marks House	medium	high	low	high	Best Management Practices	medium	high	medium	high	C	(LUST)
19	Emmaus Borough Main Pumping Station	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)
20	Emmaus Borough Main Pumping Station	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)
21	Emmaus Borough Municipal Garage	medium	high	low	high	Best Management Practices	medium	high	medium	high	C	(LUST)
22	Emmaus High School	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
23	Emmaus JR High Sch	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
24	fmr Rohrbach Ready Mix /current TJ Cougle	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
25	General Machine Corp.	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
27	Hausmans Welding Inc.	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	D	
28	Heussman Gunther Inc	medium	high	medium	high	Unknown	high	high	high	high	D	
29	Jefferson Elem Sch	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
30	Jims Chestnut St Station	medium	high	medium	high	Unknown/Containment &/or ERP Regulated	high/low	high	high	high	D	(UST)
32	Lincoln Elementary Sch	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST/UST)
33	Maiers Bakery Emmaus	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST) (Abandon)
34	Mikes Auto Collision	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
35	Motorworks	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	D	
36	Plaza Country Cleaners	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
38	Reiters Radiator	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	D	
39	Renningers Svc. Station (Mobil)	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)
42	Rodale Press Inc-Customer Center	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)
43	Rodale Press Inc.	medium	high	medium	high	Containment &/or ERP Reg./No Control Practice	low/high	high	high	high	D	(RCRA)
44	Rodale Press Inc.	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	(375 S. Seventh St.)
45	Rodale Press Inc.	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
47	Schmovers Inc.	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
48	Stroh Property	medium	high	low	high	Best Management Practices	medium	high	medium	high	C	(LUST)
49	Swann Gasoline Terminal (Top Star)	medium	high	low	high	Best Management Practices	medium	high	medium	high	C	
50	TBA Auto	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)
52	Total Imaging Inc.	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
53	Turkey Hill 110 (Exxon)	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	D	
54	Upper Milford Twp. Bldg	medium	high	low	high	Best Management Practices	medium	high	medium	high	D	(LUST)
55	Verizon	medium	high	low	high	Unknown	high	high	medium	high	D	(UST)
58	Wilmer R. Schultz	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
59	WM ME Yeakel & Sons Inc.	medium	high	medium	high	Unknown	high	high	high	high	D	(UST)
60	7 Eleven Gas Station 11388 (EZ Shoppe)	medium	high	low	high	Best Management Practices	high	high	medium	high	C	(LUST) (No Pumps)
61	A.P. Houser Inc. Landfill	medium	high	medium	high	Unknown	high	high	high	high	D	(Closed)
62	Allentown Mazda Volvo	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
63	Bon Ton Store 73 Auto Center	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(Abandon) (LUST)
64	CRS Friendly Market 17 (Hess Express)	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT CHARACTERISTICS | MATRIX COMPARISONS

SITE ID	NAME	Travel Time	Persistence	Quantity	Sensitivity	Control Practice	Control Practice Value	Matrix A Result	Matrix B result	Matrix C Result	Final Rating	Comment 1
65	David Hanssen Prop	medium	high	low	high	Best Management Practices	medium	high	medium	high	D	(LUST)
67	Hatfields Quality Meats	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)
68	Jiffy Lube 601	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(LUST)
69	Kelly Buick AMC RENAULT	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
70	Kelly Mitsubishi	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	D	
71	Knopf Automotive	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
72	Lexus of Lehigh Valley	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
73	Mobil Oil Gas Station 15 DMP	medium	high	medium	high	Best Management Practices	medium	high	high	high	C	(Closed) (LUST)
74	Rileigh Gander & Showalter Inc.	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	(Rileigh Gander & Showalter
75	Roberts Professional Cleaners	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	D	
76	Spirax Sarco Inc.	medium	high	medium	high	Unknown	high	high	high	high	D	(TRI)
77	Upper Milford Township Landfill	medium	high	medium	high	Unknown	high	high	high	high	D	
78	Vinart Dealerships	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
79	Vinart Dealerships	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	
80	Scott Chevrolet Dealship	medium	high	medium	high	Unknown	high	high	high	high	D	
81	Scott Chrysler Dealership	medium	high	medium	high	Unknown	high	high	high	high	D	
82	Scott Used Car Dealership	medium	high	low	high	Unknown	high	high	medium	high	D	
83	Jeep Dealership	medium	high	medium	high	Unknown	high	high	high	high	D	
85	Vinart Used Car Dealership	medium	high	medium	high	Unknown	high	high	high	high	D	
89	Sell's Truck Repair	medium	high	medium	high	Unknown	high	high	high	high	D	
97	Hendrick's Gas Station (Citgo)	medium	high	medium	high	Containment &/or ERP Regulated	low	high	high	high	D	(C02)
98	Road Salt Storage	medium	high	low	high	Unknown	high	high	medium	high	C	
99	Pesticide Storage	medium	high	low	high	Unknown	high	high	medium	high	C	(Pesticide)
102	Andy's Repair (Pine Ridge)	medium	high	medium	high	Unknown	high	high	high	high	C	
103	Lexus Detailing and Car Wash	medium	low	medium	high	Unknown	high	low	low	medium	D	
105	Emmaus Composting Facility	medium	medium	medium	high	Unknown	high	medium	medium	high	D	
122	Feher Color Lab (Photo Lab)	medium	high	low	high	Unknown	high	high	medium	high	D	
123	White Rose (Susquehanna) Dry Cleaners	medium	high	low	high	Unknown	high	high	medium	high	D	(Lehigh)
124	Lamm's Machine Shop	medium	high	medium	high	Unknown	high	high	high	high	C	
125	KJ Automotive Shop	medium	high	medium	high	Unknown	high	high	high	high	D	
134	VinArt Used Cars	medium	high	medium	high	Unknown	high	high	high	high	D	
143	Blue Plum Dry Cleaners	medium	high	low	high	Unknown	high	high	medium	high	D	
158	Texaco/East Penn Tire	medium	high	high	high	Containment &/or ERP Regulated	low	high	high	high	D	(C02)

SITE ID	NAME	Travel Time	Persistence	Quantity	Sensitivity	Control Practice	Control Practice Value	Matrix A Result	Matrix B result	Matrix C Result	Final Rating	Comment1
2	A&M Total Auto Body	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	E	
26	Hasik Auto Body (Hydrex) (R&B?)	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	E	
31	Kehs Svc and Repair	medium	high	low	high	Containment &/or ERP Regulated	low	high	medium	high	E	
40	Rinker Enterprises Inc	long	high	low	high	Containment&/or ERP Regulated	high	medium	low	medium	E	(UST)
109	Bubbles Car Wash (Emmaus Car Wash)	medium	low	medium	high	Unknown	high	low	low	medium	E	(Emmaus Car Wash)
110	Rudy's Car WAsh	medium	low	low	high	Unknown	high	low	low	medium	E	
112	Gerlette's Car Wash	medium	low	medium	high	Unknown	high	low	low	medium	E	
121	R.U.S. Laundry Service	medium	low	high	high	Unknown	high	low	medium	high	E	
130	Mr. T Car Wash	medium	low	medium	high	Unknown	high	low	low	medium	E	
140	Emmaus Laundry	medium	low	low	high	Unknown	high	low	low	medium	E	
141	Boro Well #5 (abandoned)	medium	high	low	high	Unknown	high	high	medium	high	D	(Abandon)
144	Dick Blick Warehouse	medium	high	medium	high	Unknown	high	high	high	high	D	
148	JAS Wholesale	medium	high	low	high	Unknown	high	high	medium	high	E	
150	Hospital Central Services	medium	medium	medium	high	Unknown	high	medium	medium	high	D	(Warehouse)
151	Republic International	medium	high	medium	high	Unknown	high	high	high	high	D	
156	Pioneer Glass and Mirror	medium	high	low	high	Unknown	high	high	medium	high	D	

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT SOURCE MAPPING | CONTAMINANT SOURCE VERIFICATION

SITE ID	NAME	Comment 2	LAT	LONG	SOURCE	MAPPED	FIELD CHECKED	FIELD CHECK DATE	CONTAMINANTS	COUNTY	STATE	ZIP
1	7 Eleven 21110		40.52790	-75.50722	InfoMap	BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
3	Air Prod & Chem		40.52977	-75.49829	InfoMap	BIA	BIA-LG & BR	3-26-02	Heavy metals, TCE, Oil, Sodium Phosphate	Lehigh	PA	18049
4	Atlantis Aquaculture		40.52858	-75.50054	InfoMap	BIA	BIA-LG & BR	3-26-02	PHC's	Lehigh	PA	18049
5	Britts Tire Service		40.53124	-75.50076	InfoMap	BIA	BIA-LG & JH	3-21-02	BTEX	Lehigh	PA	18049
6	Bud Friend (NAPA)		40.53169	-75.49915	InfoMap	BIA	BIA-LG & BR	3-26-02	Fuel Oil #2	Lehigh	PA	18049
8	Caffrey Auto Supply of Allentown		40.53427	-75.49785	InfoMap	BIA	BIA-LG & JH	3-21-02	Diesel fuel	Lehigh	PA	18049
9	Camp Olympic Inc.		40.53778	-75.51914	InfoMap	BIA	BIA-BR	4-2-02	Diesel fuel	Lehigh	PA	18049
10	Christine Dyche Residence		40.53724	-75.49693	InfoMap	BIA	BIA-LG & JH	3-21-02	FUEL OIL NO. 2	Lehigh	PA	18049
11	Cita Technology Inc		40.52804	-75.50190	InfoMap	BIA	BIA-LG & BR	3-26-02	BTEX	Lehigh	PA	18049
12	Colonial Crest		40.53109	-75.50547	InfoMap	BIA	BIA-LG & CK, Boro-DD	3-12-02	HEATING OIL (NO. 2)	Lehigh	PA	18049
13	Contel of PA Emmaus DCO CT 187		40.53426	-75.49194	InfoMap	BIA	BIA-LG & JH	3-21-02	FUEL OIL NO. 2	Lehigh	PA	18049
14	CVIP Inc.		40.52927	-75.49992	InfoMap	BIA	BIA-LG & BR	3-26-02	Fuel Oil #2	Lehigh	PA	18049
15	East Penn Sch District		40.53545	-75.50502	InfoMap	BIA	BIA-BR	4-2-02	Fuel Oil #2	Lehigh	PA	18049
16	Electro Chem Eng & Mfg Co.		40.52925	-75.49922	PA DEP	PA DEP-BIA	BIA-LG & BR	3-26-02	Fuel Oil #2	Lehigh	PA	18049
17	Emmaus Borough Maintenance Garage		40.54006	-75.48535	InfoMap	InfoMap	BIA - LG & JH	3-21-02	UNLEADED GASOLINE	Lehigh	PA	18049
18	Emmaus Borough Marks House		40.54434	-75.48581	InfoMap	InfoMap	BIA-BR	4-23-02		Lehigh	PA	18049
19	Emmaus Borough Main Pumping Station		40.53999	-75.48341	InfoMap	InfoMap	BIA - LG & JH	3-21-02	LEAD	Lehigh	PA	18049
20	Emmaus Borough Main Pumping Station		40.53833	-75.48245	InfoMap	InfoMap	BIA - LG & JH	3-21-02	HEATING OIL (NO. 2)	Lehigh	PA	18049
21	Emmaus Borough Municipal Garage		40.54046	-75.48606	InfoMap	InfoMap	BIA - LG & JH	3-21-02	BTEX	Lehigh	PA	18049
22	Emmaus High School		40.53386	-75.50430	InfoMap	BIA	BIA-BR	4-2-02	HEATING OIL (NO. 2)	Lehigh	PA	18049
23	Emmaus JR High Sch		40.53619	-75.50678	InfoMap	BIA	BIA-BR	4-2-02	HEATING OIL (NO. 2)	Lehigh	PA	18049
24	fmr Rohrbach Ready Mix /current TJ Cougle		40.52316	-75.51474	InfoMap	BIA	BIA-BR	4-2-02	FUEL OIL NO. 2	Lehigh	PA	18049
25	General Machine Corp.		40.53159	-75.48892	PA DEP	PA DEP	BIA-BR	4-2-02	DIESEL FUEL	Lehigh	PA	18049
27	Hausmans Welding Inc.		40.53289	-75.49567	PA DEP	PA DEP	BIA-BR	4-2-02	none	Lehigh	PA	18049
28	Heussman Gunther Inc		40.51994	-75.47981	InfoMap	BIA	BIA-JH	4-9-02	none	Lehigh	PA	18049
29	Jefferson Elem Sch		40.53718	-75.49630	InfoMap	BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
30	Jims Chestnut St Station		40.53005	-75.50375	InfoMap	BIA	BIA-LG & BR	3-26-02	none	Lehigh	PA	18049
32	Lincoln Elementary Sch		40.53986	-75.49461	PA DEP	PA DEP-BIA	BIA-BR	4-23-02	Fuel Oil #2	Lehigh	PA	18049
33	Maiers Bakery Emmaus	Now Self Storage	40.52313	-75.51816	PA DEP	PA DEP-BIA	BIA-BR	4-2-02	none	Lehigh	PA	18049
34	Mikes Auto Collision		40.52639	-75.51858	InfoMap	BIA	BIA-BR	4-2-02	none	Lehigh	PA	18049
35	Motorworks		40.53991	-75.48722	PA DEP	PA DEP	BIA-LG & JH	3-21-02	none	Lehigh	PA	18049
36	Plaza Country Cleaners		40.52739	-75.51026	PA DEP	PA DEP	BIA-LG & BR	3-26-02		Lehigh	PA	18049
38	Reiters Radiator		40.53016	-75.50438	PA DEP	PA DEP	BIA-LG & BR	3-26-02	none	Lehigh	PA	18049
39	Renningers Svc. Station (Mobil)		40.54081	-75.48630	PA DEP	PA DEP-BIA	BIA - LG & JH	3-21-02		Lehigh	PA	18049
42	Rodale Press Inc-Customer Center	400 S. 10th St	40.52649	-75.50087	PA DEP	PA DEP-BIA	BIA-LG & CK, Boro-DD	3-12-02	MEDIUM DIESEL FUEL	Lehigh	PA	18049
43	Rodale Press Inc.		40.53843	-75.48568	PA DEP	PA DEP	BIA-BR	4-23-02	none	Lehigh	PA	18098
44	Rodale Press Inc.		40.52650	-75.50031	PA DEP	PA DEP	BIA-LG & CK, Boro-DD	3-12-02		Lehigh	PA	18098
45	Rodale Press Inc		40.53542	-75.49763	InfoMap	BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
47	Schmovers Inc.		40.52886	-75.49642	PA DEP	PA DEP	BIA-LG & BR	3-15-02		Lehigh	PA	18049
48	Stroh Property		40.53146	-75.50049	PA DEP	PA DEP-BIA	BIA-BR	4-23-02		Lehigh	PA	18049
49	Swann Gasoline Terminal (Top Star)		40.54066	-75.48598	InfoMap	InfoMap	BIA-LG & JH	3-21-02		Lehigh	PA	18049
50	TBA Auto		40.52917	-75.49947	PA DEP	PA DEP-BIA				Lehigh	PA	18049
52	Total Imaging Inc.		40.53390	-75.49366	PA DEP	PA DEP	BIA-LG & JH	3-21-02	none	Lehigh	PA	18049
53	Turkey Hill 110 (Exxon)		40.53300	-75.49600	InfoMap	BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
54	Upper Milford Twp. Bldg	Upr Milford Twp	40.48755	-75.52161	InfoMap	BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18066
55	Verizon		40.53435	-75.49176	InfoMap	BIA	BIA - LG & JH	3-21-02	none	Lehigh	PA	18049
58	Wilmer R. Schultz		40.52547	-75.51368	InfoMap	BIA	BIA-LG & BR	3-26-02	none	Lehigh	PA	18049
59	WM ME Yeakel & Sons Inc.		40.54266	-75.48684	InfoMap	InfoMap	BIA-LG & CK	4-4-02	none	Lehigh	PA	18049
60	7 Eleven Gas Station 11388 (EZ Shoppe)		40.55934	-75.48844	PA DEP	PA DEP-BIA	BIA - LG	3-15-02	none	Lehigh	PA	18103
61	A.P. Houser Inc. Landfill		40.51399	-75.51034	PA DEP	PA DEP	Boro-DD	4-4-02	none	Lehigh	PA	18049
62	Allentown Mazda Volvo		40.55561	-75.48804	PA DEP	PA DEP	BIA-LG & CK	4-4-02	BTEX	Lehigh	PA	18103
63	Bon Ton Store 73 Auto Center		40.55704	-75.49053	PA DEP	PA DEP-BIA	BIA-LG	3-15-02	none	Lehigh	PA	18103
64	CRS Friendly Market 17 (Hess Express)		40.52046	-75.52062	PA DEP	PA DEP-BIA	BIA-BR	4-2-02	none	Lehigh	PA	18049

POTENTIAL CONTAMINANT SOURCE INVENTORY | CONTAMINANT SOURCE MAPPING | CONTAMINANT SOURCE VERIFICATION

SITE ID	NAME	Comment 2	LAT	LONG	SOURCE	MAPPED	FIELD CHECKED	FIELD CHECK DATE	CONTAMINANTS	COUNTY	STATE	ZIP
65	David Hanssen Prop		40.49573	-75.51095	PA DEP	PA DEP-BIA			none	Lehigh	PA	18049
67	Hatfields Quality Meats		40.52115	-75.52186	PA DEP	PA DEP-BIA	BIA-BR	4-2-02	none	Lehigh	PA	18049
68	Jiffy Lube 601		40.55825	-75.48801	PA DEP	PA DEP-BIA	BIA-LG	3-15-02	Fuel Oil #2	Lehigh	PA	18103
69	Kelly Buick AMC RENAULT		40.54886	-75.49010	PA DEP	PA DEP	BIA-LG & CK	4-4-02	none	Lehigh	PA	18049
70	Kelly Mitsubishi		40.54823	-75.49022	PA DEP	PA DEP	BIA-LG & JH	3-21-02	Fuel Oil #2	Lehigh	PA	18049
71	Knopf Automotive		40.55339	-75.49048	PA DEP	PA DEP	BIA-LG & CK	4-4-02	Fuel Oil #2	Lehigh	PA	18103
72	Lexus of Lehigh Valley		0.00000	0.00000	PA DEP	PA DEP	BIA-LG & CK	4-4-02	none	Lehigh	PA	18049
73	Mobil Oil Gas Station 15 DMP		40.55786	-75.48747	PA DEP	PA DEP-BIA	BIA-LG	3-15-02	none	Lehigh	PA	18103
74	Rileigh Gander & Showalter Inc.		40.53960	-75.48981	PA DEP	PA DEP	BIA-BR	4-23-02	none	Lehigh	PA	18049
75	Roberts Professional Cleaners		40.54713	-75.48932	PA DEP	PA DEP	BIA-LG	3-15-02	none	Lehigh	PA	18049
76	Spirax Sarco Inc.		40.56667	-75.48866	PA DEP	PA DEP	BIA-LG & CK	4-4-02	none	Lehigh	PA	18103
77	Upper Milford Township Landfill		40.51158	-75.49829	PA DEP	PA DEP	BIA-LG & CK, Boro-DD	3-12-02		Lehigh	PA	18049
78	Vinart Dealerships		40.55124	-75.49081	PA DEP	PA DEP	BIA-LG & CK	4-4-02		Lehigh	PA	18049
79	Vinart Dealerships		40.55219	-75.49069	PA DEP	PA DEP	BIA-LG & CK	4-4-02		Lehigh	PA	18049
80	Scott Chevrolet Dealship		40.55429	-75.48990	Boro	Boro-BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
81	Scott Chrysler Dealership		40.55510	-75.48947	Boro	Boro-BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
82	Scott Used Car Dealership		40.55009	-75.49138	Boro	Boro-BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
83	Jeep Dealership		40.54827	-75.48909	Boro	Boro-BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
85	Vinart Used Car Dealership		40.54399	-75.48737	Boro	Boro-BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
89	Sell's Truck Repair		40.52264	-75.51851	Boro	Boro-BIA	BIA-BR	4-2-02		Lehigh	PA	18049
97	Hendrick's Gas Station (Citgo)		40.53705	-75.48881	Boro	Boro-BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
98	Road Salt Storage		40.53984	-75.48496	Boro	Boro-BIA	BIA - LG & JH	3-21-02		Lehigh	PA	18049
99	Pesticide Storage		40.54038	-75.48591	Boro	Boro-Bia				Lehigh	PA	18049
102	Andy's Repair (Pine Ridge)		40.54653	-75.48840	Boro	Boro-BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
103	Lexus Detailing and Car Wash		40.54355	-75.48639	Boro	Boro-BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
105	Emmaus Composting Facility		40.54238	-75.48221	Boro	Boro-BIA	Boro			Lehigh	PA	18049
122	Feher Color Lab (Photo Lab)		40.54952	-75.49127	Boro	Boro-BIA	BIA-LG	3-15-02		Lehigh	PA	18049
123	White Rose (Susquehanna) Dry Cleaners		40.54992	-75.49138	Boro	Boro-BIA	BIA-LG	3-15-02		Lehigh	PA	18049
124	Lamm's Machine Shop		40.55607	-75.48609	Boro	Boro-BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
125	KJ Automotive Shop		40.55474	-75.47894	Boro	Boro-BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
134	VinArt Used Cars		40.54375	-75.48750	BIA	BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
143	Blue Plum Dry Cleaners		40.52958	-75.50511	BIA	BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
158	Texaco/East Penn Tire		40.51908	-75.52151	BIA	BIA	BIA-BR	4-23-02		Lehigh	PA	18049

SITE ID	NAME	Comment2	LAT	LONG	SOURCE	MAPPED	FIELD CHECKED	FIELD CHECK DATE	CONTAMINANTS	COUNTY	STATE	ZIP
2	A&M Total Auto Body		40.48873	-75.52350	InfoMap	BIA	BIA-LG & CK	4-4-02	metals	Lehigh	PA	18042
26	Hasik Auto Body (Hydrex) (R&B?)		40.51029	-75.48599	InfoMap	BIA	BIA-LG & CK	4-4-02	Unleaded gasoline	Lehigh	PA	18049
31	Kehs Svc and Repair		40.49363	-75.52647	InfoMap	BIA	BIA-LG & CK	4-4-02	none	Lehigh	PA	18049
40	Rinker Enterprises Inc		40.50857	-75.49765	InfoMap	BIA	BIA-LG & CK	4-4-02		Lehigh	PA	18049
109	Bubbles Car Wash (Emmaus Car Wash)		40.52763	-75.50712	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
110	Rudy's Car WAsh		40.52866	-75.50758	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
112	Gerlette's Car Wash		40.52929	-75.50359	Boro	Boro-BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
121	R.U.S. Laundry Service		40.54561	-75.48547	Boro	Boro-BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
130	Mr. T Car Wash		40.55928	-75.48589	BIA	BIA	BIA-LG	3-15-02		Lehigh	PA	18049
140	Emmaus Laundry		40.53336	-75.49608	BIA	BIA	BIA-LG & JH	3-21-02		Lehigh	PA	18049
141	Boro Well #5 (abandoned)		40.53862	-75.50101	Boro	Boro-BIA	BIA-LG & CK, Boro-DD	3-12-02		Lehigh	PA	18049
144	Dick Blick Warehouse		40.52992	-75.49773	BIA	BIA	BIA-LG & BR	3-26-02		Lehigh	PA	18049
148	JAS Wholesale		40.52124	-75.52018	BIA	BIA	BIA-BR	4-2-02		Lehigh	PA	18049
150	Hospital Central Services		40.53114	-75.49790	BIA	BIA	BIA-BR	4-2-02		Lehigh	PA	18049
151	Republic International		40.53081	-75.49034	BIA	BIA	BIA-BR	4-2-02		Lehigh	PA	18049
156	Pioneer Glass and Mirror		40.53991	-75.48642	BIA	BIA	BIA-BR	4-23-02		Lehigh	PA	18049

Potential Contaminant Source Inventory

Watershed activities pose a wide range of pollution threats to the Emmaus public supply wells. Potential sources of contamination include industrial facilities, landfills, roads, and farms. A potential contaminant source inventory was completed to identify the activities that have a potential to impact the water supply system. This section describes the inventory, potential contaminants, and the land use ranking system as defined by the PA DEP Source Water Assessment and Protection Program (SWAP).

Potential Contaminant Source Inventory

BIA compiled a potential contaminant source inventory for each of the six supply wells. An area search was conducted on the Earl & Meiser Zones II and III for Wells 6 and 7. The wellhead protection zones for Wells 6 and 7 overlapped Well 3, so no additional search was made for Well 3.

Because there was no existing information on the wellhead protection zones for Wells 1, 2, and 4, an ASTM[1] radius search was used. The ASTM radius search incorporates various size radii searches to identify sites with government environmental listings. The ASTM radii searches are as follows:

- National Priority List sites, State Priority List sites, RCRA Corrective Actions sites - 1.0-mile search radius
- Federal CERCLIS sites, state Hazardous Sites Cleanup Act sites, Landfills, and Leaking Underground Storage Tank sites - 0.5-mile search radius
- RCRA hazardous waste generator sites, Registered Underground Storage Tanks - 0.25-mile search radius

Additional sites were identified through a potential contamination source inventory completed by Borough of Emmaus employees in March 2001. The land use descriptions on the Emmaus tax parcels were reviewed to determine potential contamination sources. A windshield survey was completed between March 12, 2002 and April 23, 2002 by representatives of BIA and Emmaus Borough to confirm the location of the identified sites and identify additional sites not listed on the previous sources. Identified potential contaminant sources were compiled and added to a Site Location Map (see Figure 9). Appendix D contains the complete search results. The types of potential contaminants, potential contaminant sources, and the SWAP ranking system are discussed below.

[1] American Society for Testing and Materials.

Types of Potential Contaminants

The potential contaminant source inventory includes sites that use, store, transport, or dispose of contaminants, including microbiological pathogens, nitrate/nitrite, VOCs and petroleum hydrocarbons (PHCs), heavy metals, metals, and synthetic organic compounds (SOCs). Appendix E includes a copy of the potential contaminant source impact table and the contaminant maximum contamination limit (MCL) table from the PA DEP SWAP manual. Each of these contaminants and their potential health effects are discussed below.

Microbiological Pathogens

Microbiological pathogens can be introduced to groundwater by animal feedlots, dairy farms, manure spreading or storage, and on-lot wastewater disposal (failing septic systems). These activities may contaminate groundwater with bacteria and viruses.

Nitrate/Nitrite

Nitrate and nitrite contamination can result from animal feedlots, dairy farms, manure spreading or storage, fertilizer storage or use, golf courses, and on-lot wastewater disposal. The maximum contaminant level (MCL) for nitrate and nitrite in public water supplies is 10 mg/L. The primary health concern for nitrate is methemoglobinemia, or "blue-baby" syndrome, which primarily affects infants under 6 months of age. The nitrates bind to hemoglobin and reduce the blood's ability to carry oxygen, resulting in a bluish hue on the skin.

Volatile Organic Compounds (VOCs) and Petroleum Hydrocarbons (PHCs)

Contamination from VOCs and PHCs could result from airports, auto repair shops, bus and truck terminals, construction areas, dry cleaners, furniture re-finishing, gas stations, junk yards, paint shops, photo processors, print and blueprint shops, railroad tracks and yards, chemical manufacturing, electronics manufacturing, electroplating, metal fabrication, metal plating, hazardous materials storage, plastics manufacturing, and storage tank facilities.

VOCs can be harmful to the central nervous system, the kidneys, or the liver. VOCs may also cause irritation when they contact the skin or may irritate mucous membranes if they are inhaled. Some VOCs are known or suspected carcinogens. The maximum contaminant level for VOCs and PHCs varies by compound (see Appendix E).

Heavy Metals

Contamination from heavy metals (including lead, cadmium, chromium, copper, cyanide, and mercury) can result from airports, auto repair shops, bus and truck terminals, construction areas, furniture re-finishing, gas stations, junk yards, paint shops, photo processors, print and blueprint shops, railroad tracks and yards,

chemical manufacturing, electronics manufacturing, electroplating, metal fabrication, metal foundries, metal plating, plastics manufacturing, mining activities, and power plants.

Heavy metals cause serious health effects, including reduced growth and development, cancer, organ damage, nervous system damage, and in extreme cases, death. Exposure to some metals, such as mercury and lead, may also cause development of autoimmunity, in which a person's immune system attacks its own cells. This can lead to joint diseases such as rheumatoid arthritis and diseases of the kidneys, circulatory system, and nervous system.

Synthetic Organic Compounds

Contamination from synthetic organic compounds (SOCs) could result from animal feedlots, dairy farms, fertilizer storage and use, pesticide storage and use, bus and truck terminals, funeral homes, golf courses, photo processors, printer and blue print shops, and railroad tracks and yards. The most common SOCs are pesticides.

The health effects associated with the presence of SOCs in drinking water vary depending on many factors including the type of contaminant present, the levels found, and the duration of the exposure. Generally, health effects associated with exposure to SOCs include the risk of cancer; anemia; damage to the eyes, liver, kidneys, and spleen; and problems with the cardiovascular, nervous, and reproductive systems (Wisconsin Department of Natural Resources).

Potential Contaminant Sources Listed by Land Use

Potential contaminant sites were divided into the following categories: residential, agricultural, golf courses, industrial, commercial, waste management, transportation routes, non-point sources, and potential future sites. Each of these categories will be discussed below. SWAP ranking was performed for each site identified. A general risk assessment is included below for each land use.

The potential contaminant sites can be classified as either point source or non-point source. Point sources have one physical location of a release or potential release. Point sources include underground storage tank sites, auto repair shops, and industrial manufacturing sites. Non-point sources include dispersed contamination from many sources such as soil erosion, on-lot septic systems, storm water discharges, agricultural activities, and pollution associated with resource extraction and silviculture. Nitrate is a common contaminant from non-point sources including the use of manure, fertilizer, and pesticides, which drain into streams and infiltrate into groundwater. Household hazardous and commercial/industrial wastes (*e.g.*, ammonia, chlorides, paint, paint thinners, waste oil, antifreeze, solvents, etc.), which are sometimes discharged into on-lot septic systems, are also sources of non-point pollution.

Residential

The main contaminants associated with residential land include fertilizers, pesticides, pathogens (from improperly treated wastewater), and illegally disposed waste (such as household chemicals or motor oil that are poured down a storm drain or into a septic system).

Wells 4, 6, and 7 are located within residential areas. These areas are primarily served by public sewers, reducing potential contamination from septic systems.

An area of housing in Overlook Springs is known to have failing septic systems. Further, it was reported that the residents in Overlook Springs used to dump TCE into their septic systems to clean them out. This area is located 0.33 mile east of Wells 1 and 2. The town of Vera Cruz, 1.33 miles south of Well 6, is also known to have failing septic systems. Currently Upper Milford Township is attempting to develop a sewage collection project that will eliminate the septic tanks.

Municipal Facilities

The Borough maintenance garages, salt storage, fire training area, and snow dump area are all within Zones I and II of Wells 1 and 2. The well pumping stations and maintenance garages were listed by the DEP as having leaking underground storage tank cases. However, the fuel tanks were replaced. New double lined tanks with leak detection have been installed.

Agricultural Land

Improperly applied chemicals such as pesticides, fungicides, and fertilizers can leach through the soil into the groundwater or runoff into streams and can present a contamination threat to drinking water supplies. When stored in containers, there is the potential for leaks from the storage area into the ground. There are agricultural areas within the southern half of the WHPA. The use type, and storage of pesticides is not known.

Golf Courses

As with agricultural properties, improperly applied turf treatments can leach through the soil into the groundwater or runoff into streams and can present a contamination threat to drinking water supplies. When stored in containers, there is also the potential for leaks from the storage area into the ground. The Indian Creek Golf Club is located with Zone II of Well 7.

Industrial

Industrial operations commonly use hazardous substances as part of manufacturing, warehousing, and/or distribution. These hazardous substances include petroleum products, cleaning supplies, machinery oils, metals and electronic products manufacturing solvents, and asphalt. These substances pose a potential

threat to the water supply and must be managed. Other possible sources of contamination associated with industrial land uses include: pipelines, storage tanks, operating and abandoned wells (*e.g.*, gas, oil, water supply, injection, monitoring, and exploration), septage lagoons, and manufacturing plants.

The potential contaminant inventory database search identified approximately 25 industrial sites. These sites included a former electroplating company, a printing company, a few machining companies, a chemical company, and a few other industries, discussed below.

The former Rodale Manufacturing facility (currently owned by Square D Company) is the most obvious documented source of contamination in the Borough. Background information on Rodale Manufacturing was obtained from Emmaus Borough files. Additional information was also obtained from EPA. Rodale Manufacturing began its operations in the 1930s. Rodale Manufacturing's electrical component business included electroplating, vapor degreasing, and metal shaping and molding. Until the mid-1970s, Rodale Manufacturing used TCE in their vapor degreasing processes. The degreaser solvents were disposed of in on-site wells. It was reported that this practice took place until 1967. In 1975, a subsidiary of Square D Company purchased the Rodale Manufacturing site and continued operations until 1986. Square D discovered the three injection wells in 1981. At that time, the wastes in the wells were removed and disposed of at an approved hazardous waste facility. The groundwater at the site was found to be contaminated with heavy metals, TCE, and VOCs. A pump and treat system was installed on the property in 1997 and is in full operation. This facility poses a high risk of impacting Well 6, the only remaining unimpacted Well within the system, approximately 1 mile southwest of this facility.

Several additional industrial facilities are located along Broad and Tenth Streets. These are: Cita Technology, Rodale Press (the former site of a Rodale manufacturing lagoon), Atlantis Aquaculture, CVIP, Oak Street (furniture refinishing), East Penn Machining, Electrochemical Engineering and Manufacturing, Impress Industries, and Air Products & Chemicals, Inc. The sites are all located within 0.25-mile northeast or southeast of Well 3.

The Buckeye pipeline is also located 0.77 mile south of Well 6. This pipeline extends in an east-west direction through the center of the watershed. It is considered to be a moderate risk for contamination to Well 6.

Commercial

Many commercial operations use toxic and hazardous materials in their processes. Examples of commercial operations include: auto repair shops, gas stations, road maintenance depots, de-icing operations, railroad tracks and yards, airports, construction areas, dry cleaners, laundromats, medical institutions, research laboratories, photography establishments, and printers.

The storage, use, and disposal of chemicals required by these operations can pose a potential threat to water since even small amounts of the hazardous materials can contaminate large amounts of surface or groundwater. Storing quantities of the materials can also create a serious problem if they are not contained and stored properly. Leaks and spills from storage tanks and pipes can contaminate water, rendering the water unfit for consumption.

More than 80 commercial establishments were identified during the potential contaminant source inventory. Eleven gas stations, auto repair shops, and/or car dealerships are located within 0.5 mile (Zone II) of Wells 1 and 2. Nine gas stations or auto repair shops exist with 0.5 mile (Zone II) of Well 3. Eighteen gas stations, auto repair shops, and/or car dealerships and three drycleaners/laundry services are located within 0.5 mile (Zone II) of Well 4. Eight gas stations or auto repair shops exist within 0.5 mile (Zone II) of Well 6. Also included in the inventory are a few schools that have heating oil storage tanks.

The area surrounding the wells is already developed and thus has a low potential for commercial growth. However, there is a greater potential for development in the southern portion of the watershed.

Waste Management

Disposal of wastes must be handled carefully to prevent contamination of water. Older landfills in particular can significantly threaten groundwater. Leachate is produced from precipitation or other moisture seeping through waste to the base of the landfill, taking with it soluble materials. In unlined landfills, substances in the leachate can percolate through the soil and contaminate aquifers below the landfill. Hazardous waste management is an even more difficult problem since the materials to be handled pose a greater threat. In lined landfills, reliance is placed on the liner not failing after a number of years. Thought must be given to future preventative measures and contingency plans in case of failure.

One current municipal landfill and ten former landfills/dumps were identified in the database search. The landfills near the Emmaus wells include:

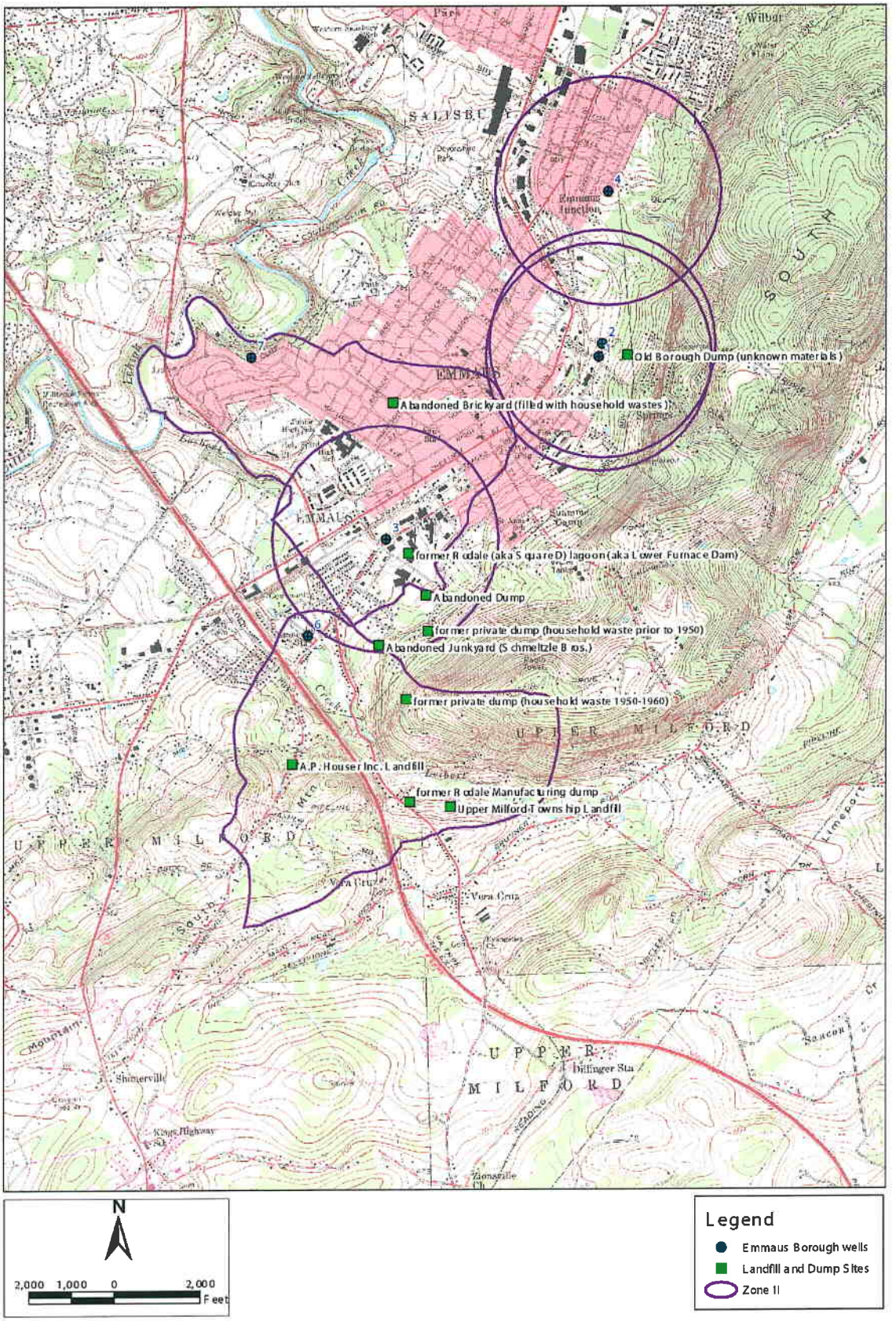
- A.P. Houser permitted landfill – 0.6 mile south of Well 6 (currently in use)
- former Upper Milford Township Landfill - approximately 1 mile south of Well 6 (not required to have a liner)
- former Emmaus Borough dump - approximately 600 feet east of Wells 1 and 2
- an abandoned brickyard - approximately 3,000 feet north of Well 3
- the former Rodale lagoon - approximately 650 feet southeast of Well 3

Transportation Routes

More than 1,000 highway spills are reported in Pennsylvania each year. Chemicals from accidental spills are often diluted with water, potentially washing the chemicals into the soil or nearby surface water and increasing the potential for contamination. Oil spills can create plumes that travel with groundwater flow for long distances. Additionally, de-icing compounds used on transportation routes can contaminate water.

Well 6 is located within 0.15 mile of the PA Turnpike, Northeast Extension (Route 476). This could present a high risk of potential contamination to the well. There are currently no existing wells between the Turnpike and Well 6 that could be used for a monitoring well in case a spill occurred on the Turnpike.

Two sets of railroad tracks extend in a northeast-southwest direction through Emmaus and Upper Milford Township (see Figure 9). The Reading Railroad is north of the Conrail Railroad, and the two lines meet in the northeast corner of the Borough. Contaminants associated with railroad tracks include metals, herbicides (used for weed control along the tracks), PCBs (from onboard transformers), and petroleum products. The railroad tracks are located approximately 250 feet east and west of Wells 1 and 2; approximately 415 feet northwest of Well 3; approximately 1,470 feet west of Well 4; approximately 1,375 feet northwest (Reading Railroad); approximately 1,850 feet to the southeast (Conrail Railroad) of Well 6; and approximately 1 mile southeast of Well 7.



USGS Topographic Map: Allentown East, Allentown West, East Greenville, Milford Square
Landfills and Dumps from Potential Contaminant Points from InfoMap database search, Borough of Emmaus and BIA field survey, 2001-2002
Layout created by Barry Isset & Associates, 2003

Figure 10: Landfills and Dumps

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DEP SWAP REPORT

SWAP Ranking System

More than 150 potential contaminant source sites were identified in the database search and the windshield survey. The PA DEP Source Water Assessment and Protection (SWAP) Program was used to determine the protection priority of each site for the water supply wells. The SWAP ranking system includes five factors: time of travel of a pollutant to the water supply, persistence of the potential pollutant, quantity of the potential pollutant, sensitivity of the water supply, and the potential for release of the potential pollutant. Each of these factors is briefly described below. The SWAP ranking flow chart and matrix tables are included in Appendix E.

Time of Travel (TOT)

The TOT is the amount of time it will take a pollutant to travel to the water supply. The SWAP system defines the TOT as short, medium, or long depending on whether the potential contaminant source is located in wellhead protection Zones I, II, or III, respectively.

Persistence

Persistence is based on the potential contaminant's ability to move in the environment. The DEP provided a draft list of common activities and the persistence of the potential contaminants from these activities. The persistence of a substance is rated as high, medium, or low.

Quantity

The quantity of a potential contaminant was ranked based on whether the property was used for retail, commercial, or manufacturing processes. The rankings used were low, medium, and high, respectively.

Sensitivity

Because the construction of some of the Emmaus water supply wells is not known and all but one of the wells are known to be contaminated, Emmaus, and PA DEP, were consulted regarding the appropriate sensitivity ranking for the Emmaus water supply wells. It was determined that a sensitivity of "high" would be used for the Emmaus water supply wells.

Potential for Release

The potential for release of a contaminant is based on whether the contaminant is regulated, unregulated, uses best management practices, or has no control practices. The SWAP ranking process results in a score of A through E, with A being the highest protection priority and E being the lowest protection priority. After SWAP rankings are completed for a potential contaminant source inventory list, measures should be

implemented to protect the water supply wells from potential contaminants from sites with high rankings (such as A and B).

Example SWAP Ranking: Rodale Manufacturing (Square D)

The SWAP ranking process begins with the Matrix A table found on page 20 of the SWAP manual (Appendix E). This table compares the persistence of a potential contaminant with the time of travel to the well. For Rodale, the persistence was high (as per PA DEP) and the time of travel was medium (located in Zone II of Well 3). These first two designations result in a Matrix A rank of "high". Next, the Matrix A result is compared to the quantity of the substances stored at the facility. Because this was an industrial facility, it had a quantity value of "high". Using the Matrix B table found on page 20 of the SWAP manual, the Matrix B result was "high". The Matrix B result is then compared to the well's sensitivity. It was determined that the Borough wells all had a "high" sensitivity. Using the Matrix C table on page 20 of the SWAP manual, the Matrix C result is "high". Finally, the Matrix C result is compared to the potential for release from the site. Because it has been documented that substances formerly used at the Rodale site were released to the soil and groundwater, the potential for release is "high" due to no control practices (page 21 of the SWAP Manual). Comparing the Matrix C result of "high" to the Potential for Release of "high" gives a Matrix D result of A – highest protection priority.

SWAP Ranking Results

A summary of the SWAP rankings for the potential contaminant source inventory points is included in Appendix F; the sites are organized by well and zone in Appendix G. The most obvious threats to the water supply wells are discussed below.

The former Rodale Manufacturing site has been documented as having groundwater contamination of TCE. Remediation is currently taking place. This facility poses a high risk of impacting the Borough's Water Supply wells. Wells 1, 2, 4 and 7 have air stripper units installed to remove the TCE and other VOC contamination from the well water. Well 3 is also contaminated with TCE and other VOCs but does not currently have an air stripper unit installed and is not used for the water supply. No contamination has been documented in Well 6 to date.

The Emmaus pumping station LUST cases and the Emmaus fire training facility are located within Zone I of Wells 1 and 2. These sites pose a high risk of further impacting the wells. The Borough maintenance garage LUST case, snow dump location, and the former Borough municipal dump are all located on Klines Road within Zone II of Wells 1 and 2. These sites also pose a high risk of impact to the wells.

Several commercial/industrial facilities are located along Broad Street, within Zones I and II of Well 3. These sites pose a high risk of impact to the well.

An area of residential housing in Overlook Springs is known to have failing septic systems. Additionally, it was reported that residents formerly dumped TCE into their septic systems to clean them out. This area is located up-gradient of Wells 1, 2, and 4. This area poses a high risk of impacting these wells.

Lehigh Street is a commercial corridor that extends through the Borough of Emmaus and Zone II of Wells 1, 2, 3, and 4. This commercial corridor has numerous RCRA generation sites, UST sites, LUST sites, etc. These sites, located along this corridor, pose a high risk for impacting these public water supply wells.

Eleven private dumps, landfills, and junkyards were identified within the Borough of Emmaus and Upper Milford Township. Five of these sites are located within Zone II of Well 6; four of these sites are located within Zone II of Well 3; two of these sites are located within Zone II of Well 7; and one site is located within Zone II and almost adjacent to Zone I of Well 1 and Well 2. One of these landfills (A.P. Houser) is monitored and one dump (former Rodale Manufacturing dump) has been closed. All of the remaining sites are unpermitted sites, without any known or published environmental studies. In addition, the contents of each of these dumps and landfills are not known. Therefore, these sites represent a high potential for impact to the public supply wells.

Well 6 is located within 0.15 mile of the PA Turnpike, Northeast Extension (Route 476). This could present a high risk of potential contamination to the well. There are no existing wells between the Turnpike and Well 6 that could be used for a monitoring well in case a spill occurs on the Turnpike.

Disclaimer

The information contained in this plan is limited to that available from public records and the water supplier. Other potential contamination sites or threats to the water supply may exist in the Source Water Protection area that are not identified in this Plan. Identification of a site as a potential contamination site should not be interpreted that this site has or will cause contamination of the water supply.

InfoMap
Technologies Incorporated

Environmental FirstSearch™ Report

TARGET PROPERTY:
EMMAUS PA 18049 Job Number: SOUTH18049

PREPARED FOR:

Barry Isett & Associates, Inc.

85 S. Route 100 & Kressler lane

Trexlertown, PA 18087-0147

12-14-01

Tel: (610) 430-7530 *Fax: (610) 430-7535*

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Environmental FirstSearch
Search Summary Report

Target Site:

EMMAUS PA 18049

FirstSearch Summary

Database	Sel	Updated	Radius	Site	1/8	1/4	1/2	1/2 >	ZIP	TOTALS
NPL	Y	11-13-01	1.00	0	0	0	1	0	0	1
CERCLIS	Y	11-13-01	0.50	0	0	0	0	-	0	0
RCRA TSD	Y	11-25-01	0.50	0	0	0	0	-	0	0
RCRA COR	Y	11-25-01	1.00	0	0	0	0	0	0	0
RCRA GEN	Y	11-25-01	0.25	0	0	2	-	-	2	4
ERNS	Y	01-06-00	0.25	0	0	0	-	-	1	1
State Sites	Y	08-22-01	1.00	0	0	0	0	0	0	0
SWL	Y	02-05-01	0.50	0	0	0	0	-	0	0
REG UST/AST	Y	06-01-01	0.25	0	0	4	-	-	2	6
Leaking UST	Y	05-01-01	0.50	0	2	4	1	-	1	8
State Wells	Y	06-01-98	1.00	0	2	1	11	26	0	40

Notice of Disclaimer

Due to the limitations, constraints, inaccuracies and incompleteness of government information and computer mapping data currently available to InfoMap Technologies, certain conventions have been utilized in preparing the locations of all federal, state and local agency sites residing in InfoMap Technologies' databases. All EPA NPL and state landfill sites are depicted by a rectangle approximating their location and size. The boundaries of the rectangles represent the eastern and western most longitudes; the northern and southern most latitudes. As such, the mapped areas may exceed the actual areas and do not represent the actual boundaries of these properties. All other sites are depicted by a point representing their approximate address location and make no attempt to represent the actual areas of the associated property. Actual boundaries and locations of individual properties can be found in the files residing at the agency responsible for such information.

Waiver of Liability

Although InfoMap Technologies uses its best efforts to research the actual location of each site, InfoMap Technologies does not and can not warrant the accuracy of these sites with regard to exact location and size. All authorized users of InfoMap Technologies' services proceeding are signifying an understanding of InfoMap Technologies' searching and mapping conventions, and agree to waive any and all liability claims associated with search and map results showing incomplete and or inaccurate site locations.

Environmental FirstSearch
Site Information Report

Request Date: 12-14-01
Requestor Name: Barry Isett
Standard: ASTM

Search Type: COORD
Job Number: SOUTH18049
FILTERED REPORT

Target Address:

EMMAUS PA 18049

Demographics

Sites: 60 **Non-Geocoded:** 6 **Population:** NA
Radon: 18.4 - 28.2 PCI/L

Site Location

	Degrees (Decimal)	Degrees (Min/Sec)		UTMs
Longitude:	-75.48344	-75:29:0	**Easting:**	459059.249
Latitude:	40.539689	40:32:23	**Northing:**	4487561.416
			Zone:	18

Comment

Comment:

Additional Requests/Services

Adjacent ZIP Codes: 1.00 Mile(s)

ZIP Code	City Name	ST	Dist/Dir	Sel
18034	CENTER VALLEY	PA	0.79 SE	N
18103	ALLENTOWN	PA	0.11 NE	Y

Services:

	Requested?	Date
Sanborns	N	
Aerial Photographs	N	
Topo Maps (hardcopy)	N	
City Directories	N	
Title Search	N	
Municipal Reports	N	
Online Topo Map	N	

Environmental FirstSearch
Selected Sites Summary Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

TOTAL: 60 **GEOCODED:** 54 **NON GEOCODED:** 6 **SELECTED:** 60

ID	DB Type	Site Name/ID/Status	Address	Dist/Dir	Map ID
24	PWS	EMMAUS BOROUGH 23945	EMMAUS BORO PA	0.02 SW	20
22	PWS	EMMAUS BOROUGH 23953	EMMAUS BORO PA	0.03 NW	18
11	LUST	EMMAUS BOROUGH MAIN PUMPING STA 2395876	202 KLEINS LN EMMAUS PA 18049	0.04 SW	10
10	LUST	EMMAUS BOROUGH MAIN PUMPING STA 0797-206/NO	101 KLEINS LN, EMMAUS, PA 1804 EMMAUS PA 18049	0.05 NW	9
4	UST	EMMAUS BORO MAINT GARAGE 39-32058	44 KLEINS LN EMMAUS PA 18049	0.14 NW	4
12	LUST	EMMAUS BOROUGH MAINTENANCE GARAGE 2395877	44 KLEINS LN EMMAUS PA 18049	0.14 NW	4
8	LUST	EMMAUD BOROUGH MUNICIAPL GARAGE 2395878	33 KLEINS LN EMMAUS PA 18049	0.15 NW	8
13	LUST	EMMAUS BOROUGH MAINTENANCE GARAGE 0797-2396/NO	44 KLEINS LN, EMMAUS, PA 18049 EMMAUS PA 18409	0.15 NW	8
14	LUST	RENNINGERS SVC STA 2395963/YES	12-14 E MAIN ST EMMAUS PA 18049	0.18 NW	6
6	UST	TOP STAR 11 39-41533	14 E MAIN ST EMMAUS PA 18049	0.18 NW	6
2	RCRAGN	MOTORWORKS PAD987345139/SGN	121 MAIN ST EMMAUS PA 18049	0.19 SW	2
3	RCRAGN	RODALE PRESS INC PAD982708513/SGN	154 E MINOR ST EMMAUS PA 18098	0.20 SW	3
5	UST	RODALE PRESS KEYSTONE BUILDING 39-52305	154 E MINOR ST EMMAUS PA 18098	0.20 SW	3
44	PWS	NEWHARD WILLIAM 183153	SALISBURY TWP. PA	0.22 NE	38
7	UST	WM ME YEAKEL & SONS INC 39-06050	RIDGE & WILLIAMS ST EMMAUS PA 18049	0.25 NW	7
20	PWS	EMMAUS AUTO PARTS 23979	EMMAUS BORO PA	0.27 NW	16
36	PWS	HILLEGASS JOHN 23920	EMMAUS BORO PA	0.33 SW	32
29	PWS	GOLLIE GEORGE 184273	UPPER MILFORD PA	0.34 SW	25
37	PWS	HOLTZMAN PETRO 180935	EMMAUS BORO PA	0.34 SW	33
38	PWS	HOLTZMAN PETRO CO 180936	EMMAUS BORO PA	0.34 SW	33

Environmental FirstSearch
Selected Sites Summary Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

TOTAL: 60 **GEOCODED:** 54 **NON GEOCODED:** 6 **SELECTED:** 60

ID	DB Type	Site Name/ID/Status	Address	Dist/Dir	Map ID
35	PWS	HILLEGASS JOHN 23919	EMMAUS BORO PA	0.35 SW	31
9	LUST	EMMAUS BORO MARKS HOUSE 0101-624/CLOSED	R 164 E MAIN ST EMMAUS BORO PA 18049	0.36 NW	5
39	PWS	HOLTZMAN PETRO CO 180937	EMMAUS BORO PA	0.36 SW	34
46	PWS	ROCKAWACK ROBER T 23924	SALISBURY TWP. PA	0.37 SE	40
1	NPL	RODALE MANUFACTURING CO., INC. PAD981033285/FINAL	6TH & MINOR STS EMMAUS BOROUGH PA	0.40 SW	1
27	PWS	EMMAUS SILK COMPANY 23932	EMMAUS BORO PA	0.42 SW	23
34	PWS	HAROLD ROBERT 180938	EMMAUS BORO PA	0.47 NE	30
21	PWS	EMMAUS BOROUGH 23910	SALISBURY TWP. PA	0.50 SE	17
40	PWS	LIZUN PAUL 184057	UPPER MILFORD PA	0.52 SE	35
30	PWS	H. KOSTENBADER BREWI 23912	EMMAUS BORO PA	0.58 SW	26
42	PWS	MILLER RICHARD 23915	SALISBURY TWP. PA	0.60 SE	37
17	PWS	BEIBLE ANDREW 24012	EMMAUS BORO PA	0.63 NW	13
26	PWS	EMMAUS FOUNDRY 23905	EMMAUS BORO PA	0.63 SW	22
49	PWS	SIEGFRIED JOANNE 183074	SALISBURY TWP. PA	0.64 SE	43
51	PWS	TAVANO RICHARD 183211	SALISBURY TWP. PA	0.66 SE	45
23	PWS	EMMAUS BOROUGH 25063	EMMAUS BORO PA	0.72 NE	19
48	PWS	ROLAND F 180939	EMMAUS BORO PA	0.72 SW	42
19	PWS	EISENHART MYLES 183076	SALISBURY TWP. PA	0.76 SE	15
54	PWS	ZEHNDER GREG 184603	UPPER SAUCON T PA	0.78 SE	48
47	PWS	RODALE MFG CO 23901	EMMAUS BORO PA	0.82 SW	41

Environmental FirstSearch
Selected Sites Summary Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

TOTAL: 60 **GEOCODED:** 54 **NON GEOCODED:** 6 **SELECTED:** 60

ID	DB Type	Site Name/ID/Status	Address	Dist/Dir	Map ID
41	PWS	METZGER MIKE 184499	UPPER SAUCON T PA	0.85 SE	36
50	PWS	SQUARE D CO 180929	EMMAUS BORO PA	0.85 SW	44
28	PWS	FORTUNATO L M 184270	UPPER MILFORD PA	0.88 SE	24
43	PWS	MOSIG W R JR 184271	UPPER MILFORD PA	0.88 SE	24
31	PWS	HAGAR D 184402	UPPER MILFORD PA	0.89 SE	27
32	PWS	HAGAR D 184403	UPPER MILFORD PA	0.90 SE	28
25	PWS	EMMAUS BOROUGH 23936	EMMAUS BORO PA	0.90 SW	21
16	PWS	BEDICS W 184882	UPPER SAUCON T PA	0.92 SE	12
15	PWS	AIR PRODUCTS CO 180894	ALLENTOWN PA	0.94 NE	11
18	PWS	BUXTON TOM 183942	UPPER MILFORD PA	0.94 SE	14
33	PWS	HAGER DONALD 183931	UPPER MILFORD PA	0.94 SE	29
45	PWS	RAINIER JOSPEH 184272	UPPER MILFORD PA	0.98 SW	39
52	PWS	TITAN HOMES 183922	UPPER MILFORD PA	0.99 SE	46
53	PWS	ZARTLER JEFF 184576	UPPER SAUCON T PA	1.00 SE	47

Environmental FirstSearch
Selected Sites Summary Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

TOTAL: 60 **GEOCODED:** 54 **NON GEOCODED:** 6 **SELECTED:** 60

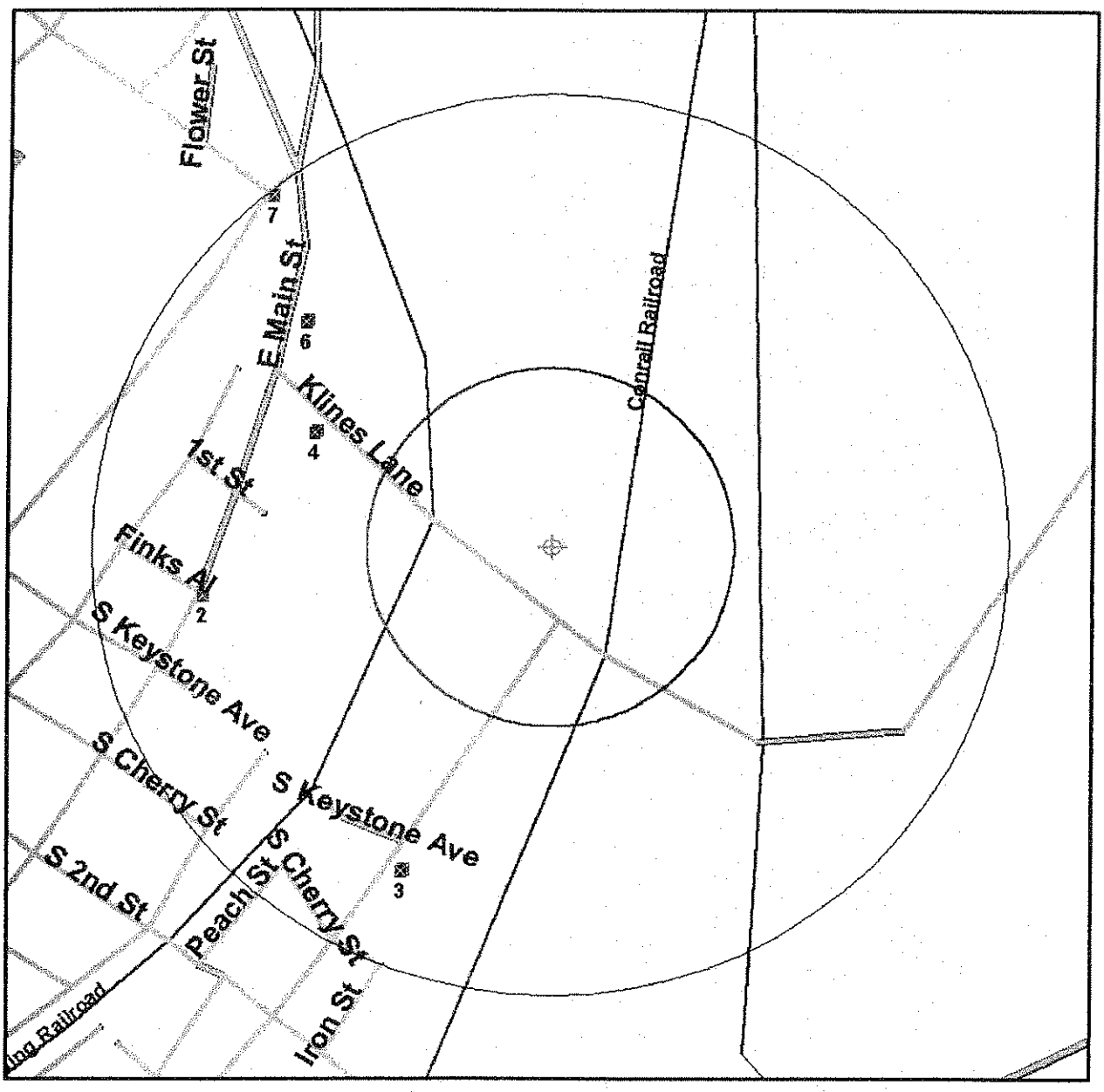
ID	DB Type	Site Name/ID/Status	Address	Dist/Dir	Map ID
59	UST	ALLENTOWN CITY WATERSHED 39-37453	2052 PARK DR ALLENTOWN PA 18103	NON GC	
58	UST	ATLANTIS AQUACULTURE 39-37417	840 BROAD ST EMMAUS PA 18049	NON GC	
55	RCRAGN	CVIP INC PAR000036152/VGN	801 BROAD ST EMMAUS PA 18049	NON GC	
60	LUST	DAVID HANSSEN PROPERTY 2395869	RR 2, BOX 211 EMMAUS PA 18049	NON GC	
56	RCRAGN	ELECTRO CHEMICAL PAR000027433/SGN	750 BROAD ST EMMAUS PA 18049	NON GC	
57	ERNS	UNKNOWN 342663/UNKNOWN (EPA REGIONS	EMMAUS AREA EMMAUS PA 18049	NON GC	

Environmental FirstSearch

.25 Mile Radius

ASTM Map: RCRAGEN, ERNS, UST

, EMMAUS PA 18049



Source: 1999 U.S. Census TIGER Files

Target Site (Latitude: 40.539689 Longitude: -75.48344) .....

Identified Site, Multiple Sites, Receptor .....

NPL, Solid Waste Landfill (SWL) or Hazardous Waste .....

ilroads .....

Black Rings Represent 1/4 Mile Radii; Red Ring Represents 500 ft. Radius

Environmental FirstSearch

.5 Mile Radius

ASTM Map: CERCLIS, RCRATSD, LUST, SWL

, EMMAUS PA 18049

Source: 1999 U.S. Census TIGER Files

Target Site (Latitude: 40.539689 Longitude: -75.48344) .....

Identified Site, Multiple Sites, Receptor .....

NPL, Solid Waste Landfill (SWL) or Hazardous Waste .....

ailroads .....

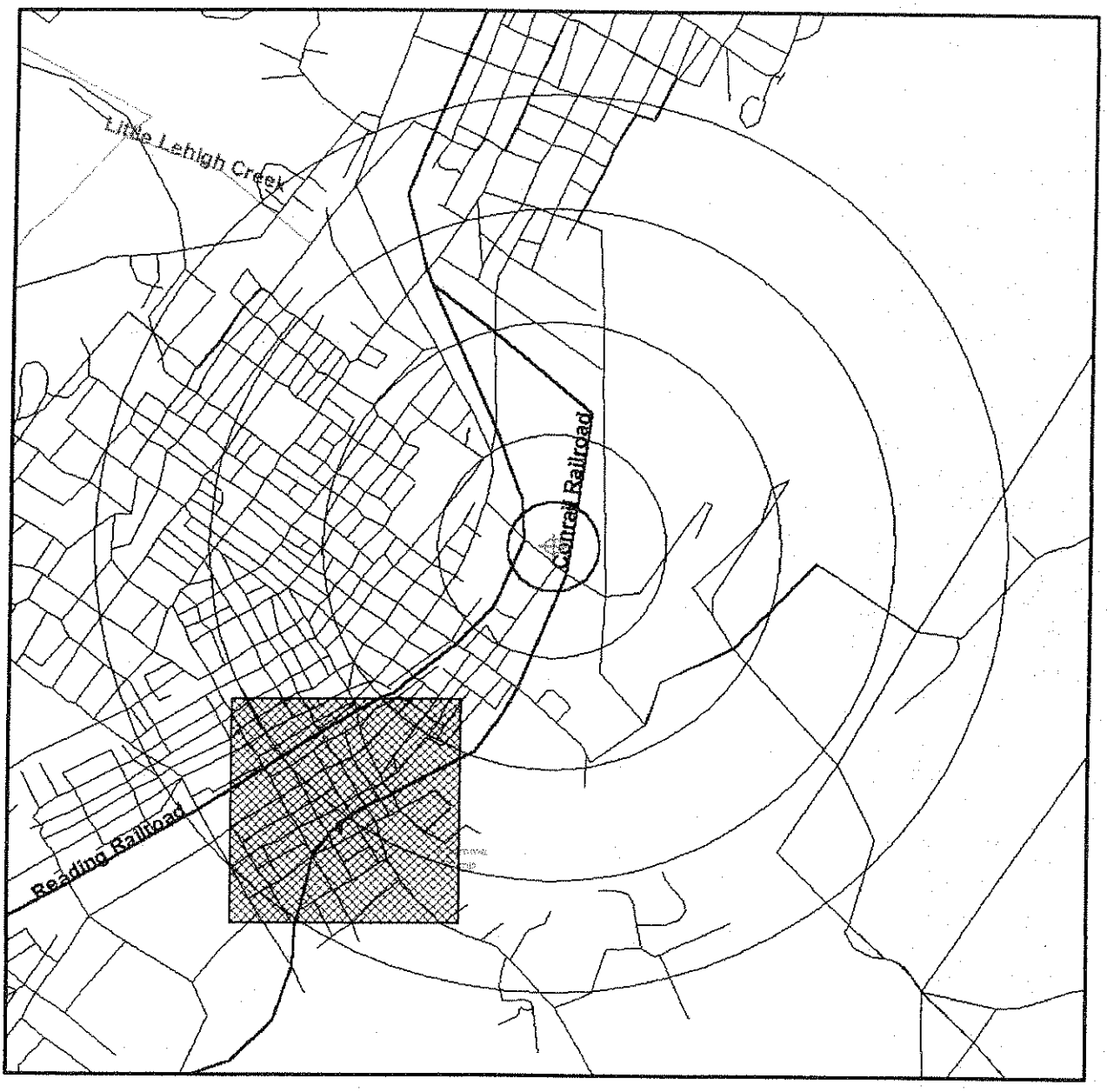
Black Rings Represent 1/4 Mile Radii; Red Ring Represents 500 ft. Radius

Environmental FirstSearch

1 Mile Radius

ASTM Map: NPL, RCRACOR, STATE Sites

, EMMAUS PA 18049



Source: 1999 U.S. Census TIGER Files

Target Site (Latitude: 40.539689 Longitude: -75.48344) .....

Identified Site, Multiple Sites, Receptor .....

NPL, Solid Waste Landfill (SWL) or Hazardous Waste .....

Railroads .....

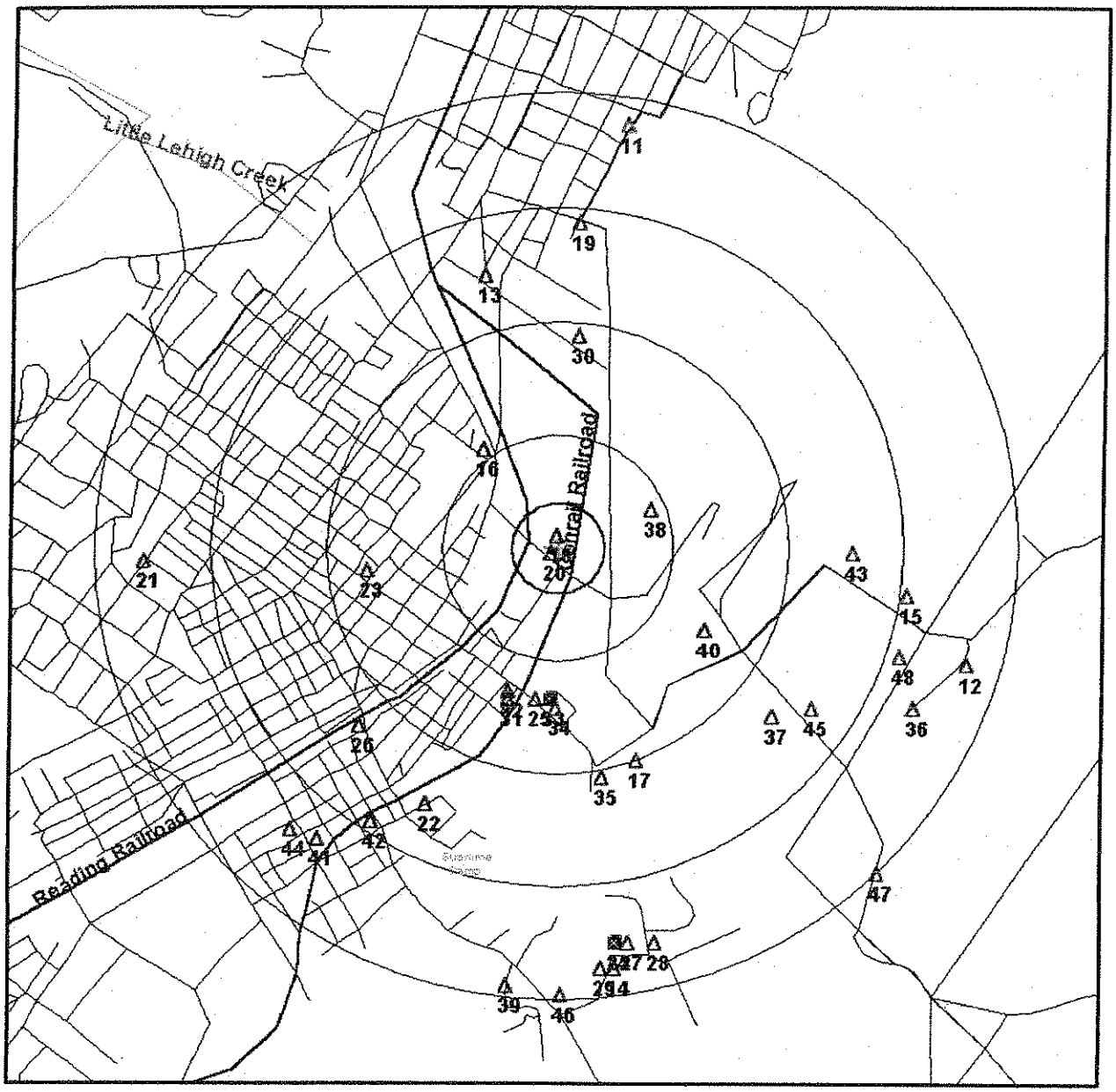
Black Rings Represent 1/4 Mile Radii; Red Ring Represents 500 ft. Radius

Environmental FirstSearch

1 Mile Radius

State Wells Sites

, EMMAUS PA 18049



Source: 1999 U.S. Census TIGER Files

Target Site (Latitude: 40.539689 Longitude: -75.48344) .....

Identified Site, Multiple Sites, Receptor .....

NPL, Solid Waste Landfill (SWL) or Hazardous Waste .....

ilroads .....

Public Water Supply, DEP Zone II Boundaries .....

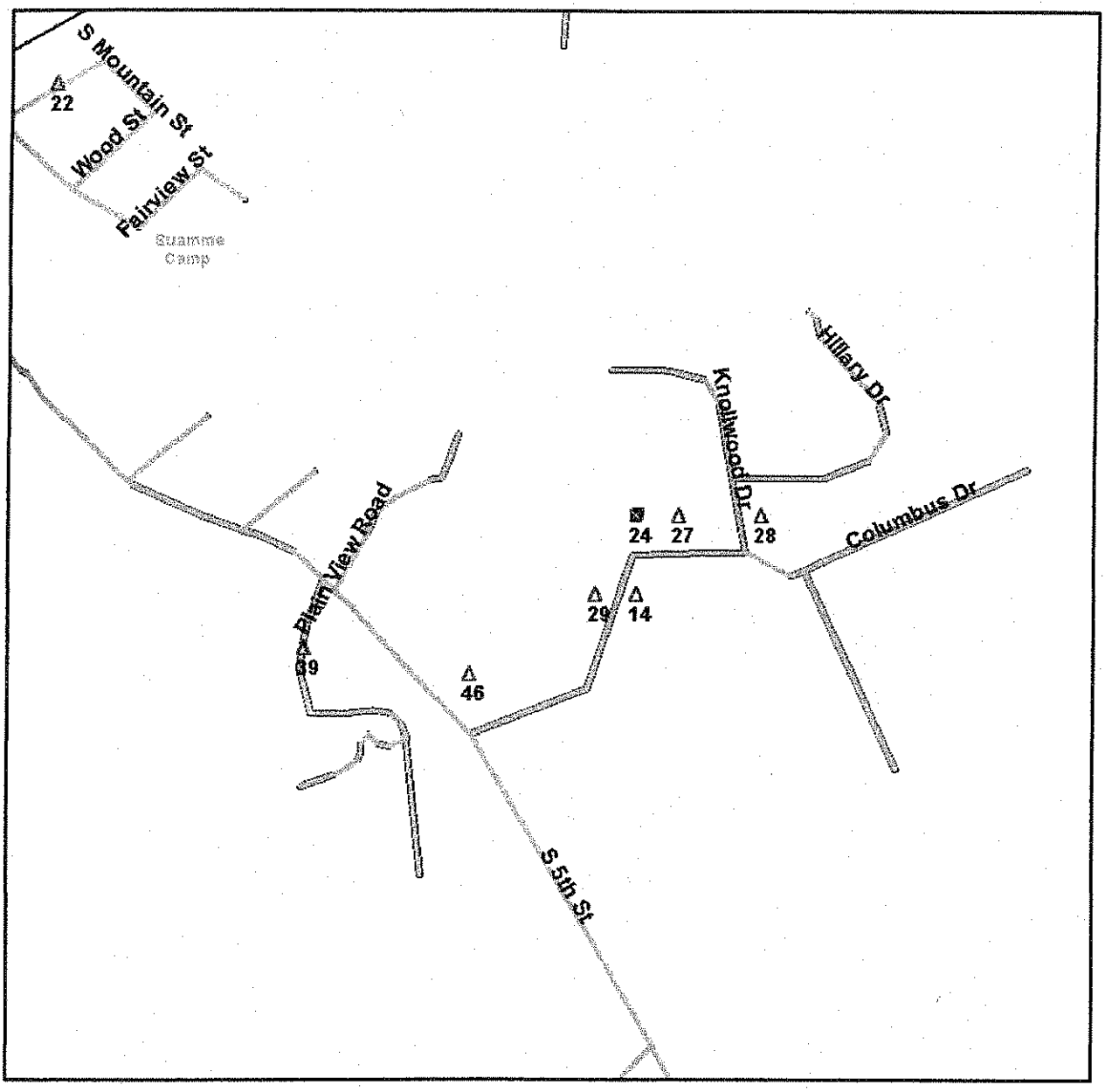
Black Rings Represent 1/4 Mile Radii; Red Ring Represents 500 ft. Radius

Environmental FirstSearch

Map Width: 0.646 Mile(s)

State Wells Sites

, EMMAUS PA 18049



Source: 1999 U.S. Census TIGER Files

Target Site (Latitude: 40.539689 Longitude: -75.48344) .....

Identified Site, Multiple Sites, Receptor .....

NPL, Solid Waste Landfill (SWL) or Hazardous Waste .....

Railroads .....

Public Water Supply, DEP Zone II Boundaries .....

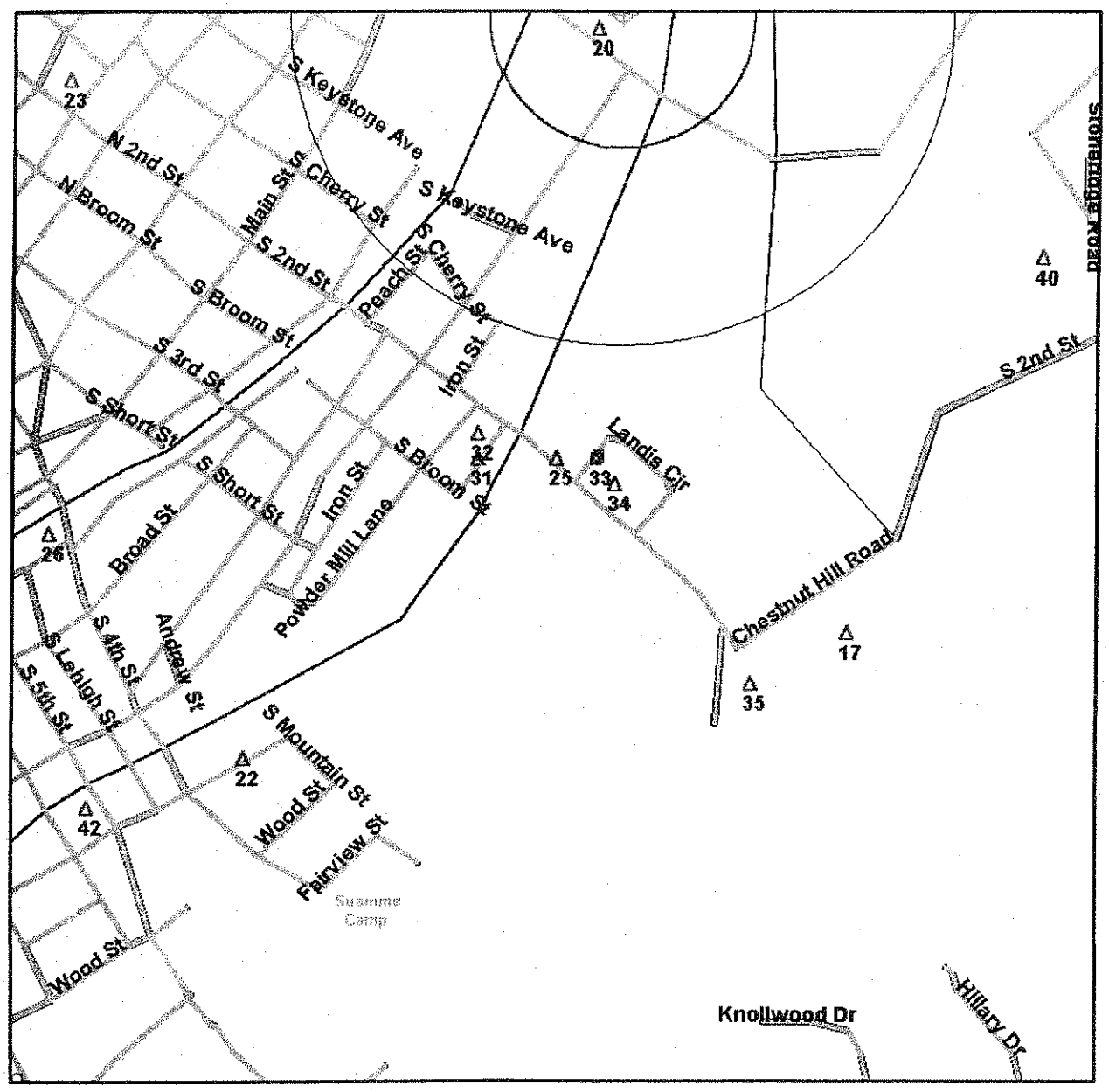
Black Rings Represent 1/4 Mile Radii; Red Ring Represents 500 ft. Radius

Environmental FirstSearch

Map Width: 0.690 Mile(s)

State Wells Sites

, EMMAUS PA 18049



Source: 1999 U.S. Census TIGER Files

Target Site (Latitude: 40.539689 Longitude: -75.48344) .....

Identified Site, Multiple Sites, Receptor .....

NPL, Solid Waste Landfill (SWL) or Hazardous Waste .....

ilroads .....

Public Water Supply, DEP Zone II Boundaries .....

Black Rings Represent 1/4 Mile Radii; Red Ring Represents 500 ft. Radius

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 24 **DIST/DIR:** 0.02 SW **MAP ID:** 20

NAME: EMMAUS BOROUGH
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23945
ID2: LE 84
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1923
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	311
DISCHARGE:	450
STATIC LEVEL:	0
TOP OF CASING:	0
BOTTOM OF CASING:	
DIAMETER:	10
WATER USE:	PUBLIC SUPPLY
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 22 **DIST/DIR:** 0.03 NW **MAP ID:** 18

NAME: EMMAUS BOROUGH
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23953
ID2: LE 85
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: USGS - GWSI
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: LEITHSVILLE FORMATION
DRILLER: UNKNOWN
DATE DRILLED: 1/1/1923
USE OF SITE: WITHDRAWAL
WELL DEPTH: 375
DISCHARGE: 800
STATIC LEVEL:
TOP OF CASING: 0
BOTTOM OF CASING:
DIAMETER: 10
WATER USE: PUBLIC SUPPLY
REMARK:

SOURCE OF RECORD: USGS - GWSI
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: LEITHSVILLE FORMATION
DRILLER: UNKNOWN
DATE DRILLED: 1/1/1923
USE OF SITE: WITHDRAWAL
WELL DEPTH: 375
DISCHARGE:
STATIC LEVEL: 56
TOP OF CASING: 0
BOTTOM OF CASING:
DIAMETER: 10
WATER USE: PUBLIC SUPPLY
REMARK:

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

LEAKING UNDERGROUND STORAGE TANKS

SEARCH ID: 11 **DIST/DIR:** 0.04 SW **MAP ID:** 10

NAME: EMMAUS BOROUGH MAIN PUMPING STA
ADDRESS: 202 KLEINS LN
EMMAUS PA 18049
CONTACT:

REV:
ID1: 2395876
ID2:
STATUS:
PHONE:

SUBSTANCE RELEASED: HEATING OIL (NO. 2)
CLEANUP COMPLETION DATE:
CLASS: U

LEAKING UNDERGROUND STORAGE TANKS

SEARCH ID: 10 **DIST/DIR:** 0.05 NW **MAP ID:** 9

NAME: EMMAUS BOROUGH MAIN PUMPING STA
ADDRESS: 101 KLEINS LN, EMMAUS, PA 1804
EMMAUS PA 18049
CONTACT:

REV:
ID1: 0797-206
ID2:
STATUS: NO
PHONE:

SUBSTANCE RELEASED: HEATING OIL (NO. 2)
CLEANUP COMPLETION DATE:
CLASS: U

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

REGISTERED UNDERGROUND STORAGE TANKS

SEARCH ID: 4 **DIST/DIR:** 0.14 NW **MAP ID:** 4

NAME: EMMAUS BORO MAINT GARAGE
ADDRESS: 44 KLEINS LN
EMMAUS PA 18049
CONTACT:

REV: 06-01-01
ID1: 39-32058
ID2: 21666
STATUS:
PHONE:

TANK DETAILS

TANK ID: 36086
TANK NO.: 003
CAPACITY: 2000
INSTALLATION DATE: 19880401
TANK TYPE: UST
PRODUCT: DIESEL
STATUS: CURRENTLY IN USE

TANK ID: 36087
TANK NO.: 004
CAPACITY: 2000
INSTALLATION DATE: 19880401
TANK TYPE: UST
PRODUCT: GASOLINE
STATUS: CURRENTLY IN USE

TANK ID: 36088
TANK NO.: 005
CAPACITY: 2000
INSTALLATION DATE: 19880401
TANK TYPE: UST
PRODUCT: GASOLINE
STATUS: CURRENTLY IN USE

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

LEAKING UNDERGROUND STORAGE TANKS

SEARCH ID: 12 **DIST/DIR:** 0.14 NW **MAP ID:** 4

NAME: EMMAUS BOROUGH MAINTENANCE GARAGE
ADDRESS: 44 KLEINS LN
EMMAUS PA 18049
CONTACT:

REV:
ID1: 2395877
ID2:
STATUS:
PHONE:

SUBSTANCE RELEASED: MEDIUM DIESEL FUEL (NO. 2-D)
CLEANUP COMPLETION DATE:
CLASS: U

LEAKING UNDERGROUND STORAGE TANKS

SEARCH ID: 8 **DIST/DIR:** 0.15 NW **MAP ID:** 8

NAME: EMMAUD BOROUGH MUNICIAPL GARAGE
ADDRESS: 33 KLEINS LN
EMMAUS PA 18049
CONTACT:

REV:
ID1: 2395878
ID2:
STATUS:
PHONE:

SUBSTANCE RELEASED: HEATING OIL (NO. 2)
CLEANUP COMPLETION DATE:
CLASS: U

LEAKING UNDERGROUND STORAGE TANKS

SEARCH ID: 13 **DIST/DIR:** 0.15 NW **MAP ID:** 8

NAME: EMMAUS BOROUGH MAINTENANCE GARAGE
ADDRESS: 44 KLEINS LN, EMMAUS, PA 18049
EMMAUS PA 18409
CONTACT:

REV:
ID1: 0797-2396
ID2:
STATUS: NO
PHONE:

SUBSTANCE RELEASED: BTEX
CLEANUP COMPLETION DATE:
CLASS: F

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

LEAKING UNDERGROUND STORAGE TANKS

SEARCH ID: 14 **DIST/DIR:** 0.18 NW **MAP ID:** 6

NAME: RENNINGERS SVC STA
ADDRESS: 12-14 E MAIN ST
EMMAUS PA 18049
CONTACT:

REV:
ID1: 2395963
ID2:
STATUS: YES
PHONE:

SUBSTANCE RELEASED: UNLEADED GASOLINE
CLEANUP COMPLETION DATE: CLEANUP COMPLETION DATE 10-19-94
CLASS: U

REGISTERED UNDERGROUND STORAGE TANKS

SEARCH ID: 6 **DIST/DIR:** 0.18 NW **MAP ID:** 6

NAME: TOP STAR 11
ADDRESS: 14 E MAIN ST
EMMAUS PA 18049
CONTACT:

REV: 06-01-01
ID1: 39-41533
ID2: 11384
STATUS:
PHONE:

TANK DETAILS

TANK ID: 120520
TANK NO.: 008
CAPACITY: 12000
INSTALLATION DATE: 19910501
TANK TYPE: UST
PRODUCT: GASOLINE
STATUS: CURRENTLY IN USE

TANK ID: 120521
TANK NO.: 009
CAPACITY: 12000
INSTALLATION DATE: 19910501
TANK TYPE: UST
PRODUCT: GASOLINE
STATUS: CURRENTLY IN USE

TANK ID: 120522
TANK NO.: 010
CAPACITY: 8000
INSTALLATION DATE: 19910501
TANK TYPE: UST
PRODUCT: GASOLINE
STATUS: CURRENTLY IN USE

TANK ID: 120523
TANK NO.: 011
CAPACITY: 4000
INSTALLATION DATE: 19910501
TANK TYPE: UST
PRODUCT: DIESEL
STATUS: CURRENTLY IN USE

TANK ID: 155610
TANK NO.: 012
CAPACITY: 4000
INSTALLATION DATE: 19910501
TANK TYPE: UST
PRODUCT: KEROSENE
STATUS: CURRENTLY IN USE

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

RCRA GENERATOR SITE

SEARCH ID: 2 **DIST/DIR:** 0.19 SW **MAP ID:** 2

NAME: MOTORWORKS
ADDRESS: 121 MAIN ST
EMMAUS PA 18049
CONTACT: SUZANNE FEGLEY

REV: 11/25/01
ID1: PAD987345139
ID2:
STATUS: SGN
PHONE: 2158207020

SITE INFORMATION

CONTACT INFORMATION: SUZANNE FEGLEY
SM
121 MAIN ST
EMMAUS PA 18049

PHONE: 2158207020

UNIVERSE NAME:

SGN: GENERATES 100 - 1000 KG/MONTH OF HAZARDOUS WASTE

SIC INFORMATION:

ENFORCEMENT INFORMATION:

VIOLATION INFORMATION:

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

RCRA GENERATOR SITE

SEARCH ID: 3 **DIST/DIR:** 0.20 SW **MAP ID:** 3

NAME: RODALE PRESS INC
ADDRESS: 154 E MINOR ST
EMMAUS PA 18098
CONTACT: EUGENE HILLEGASS

REV: 11/25/01
ID1: PAD982708513
ID2:
STATUS: SGN
PHONE: 2159675171

SITE INFORMATION

CONTACT INFORMATION: EUGENE HILLEGASS
MC
154 E MINOR ST
EMMAUS PA 18098

PHONE: 2159675171

UNIVERSE NAME:

SGN: GENERATES 100 - 1000 KG/MONTH OF HAZARDOUS WASTE

SIC INFORMATION:

ENFORCEMENT INFORMATION:

VIOLATION INFORMATION:

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

REGISTERED UNDERGROUND STORAGE TANKS

SEARCH ID: 5 **DIST/DIR:** 0.20 SW **MAP ID:** 3

NAME: RODALE PRESS KEYSTONE BUILDING
ADDRESS: 154 E MINOR ST
EMMAUS PA 18098
CONTACT:

REV: 06-30-99
ID1: 39-52305
ID2: 33841
STATUS:
PHONE:

TANK DETAILS

TANK ID: 001
CAPACITY: 6000
INSTALLATION DATE: 19760401

TANK TYPE: UST
PRODUCT: HEATING OIL

STATE WELLS SITE

SEARCH ID: 44 **DIST/DIR:** 0.22 NE **MAP ID:** 38

NAME: NEWHARD WILLIAM
ADDRESS:
SALISBURY TWP. PA
CONTACT:

REV: 08/010/99
ID1: 183153
ID2: X 0211
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: GRANITE & GRANITE GNEISS
DRILLER: ODENHEIMER CO
DATE DRILLED: 1/1/1973
USE OF SITE: WITHDRAWAL
WELL DEPTH: 77
DISCHARGE: 5
STATIC LEVEL:
TOP OF CASING: 0
BOTTOM OF CASING: 29
DIAMETER: 6
WATER USE: DOMESTIC
REMARK:

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

REGISTERED UNDERGROUND STORAGE TANKS

SEARCH ID: 7 **DIST/DIR:** 0.25 NW **MAP ID:** 7

NAME: WM ME YEAKEL & SONS INC
ADDRESS: RIDGE & WILLIAMS ST
EMMAUS PA 18049
CONTACT:

REV: 06-01-01
ID1: 39-06050
ID2: 2380
STATUS:
PHONE:

TANK DETAILS

TANK ID: 35003
TANK NO.: 001
CAPACITY: 971
INSTALLATION DATE: 19891201

TANK TYPE: UST
PRODUCT: GASOLINE
STATUS: CURRENTLY IN USE

STATE WELLS SITE

SEARCH ID: 20 **DIST/DIR:** 0.27 NW **MAP ID:** 16

NAME: EMMAUS AUTO PARTS
ADDRESS:
EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23979
ID2: LE 83
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: USGS - GWSI
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: LEITHSVILLE FORMATION
DRILLER: UNKNOWN
DATE DRILLED: 1/1/1928
USE OF SITE: UNUSED
WELL DEPTH: 125
DISCHARGE: 400
STATIC LEVEL: 13
TOP OF CASING: 0
BOTTOM OF CASING: 110
DIAMETER: 6
WATER USE: UNUSED
REMARK:

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 36 **DIST/DIR:** 0.33 SW **MAP ID:** 32

NAME: HILLEGASS JOHN
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23920
ID2: LE 90
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1972
USE OF SITE:	UNUSED
WELL DEPTH:	260
DISCHARGE:	125
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	
DIAMETER:	8
WATER USE:	UNUSED
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 29 **DIST/DIR:** 0.34 SW **MAP ID:** 25

NAME: GOLLIE GEORGE
ADDRESS: UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184273
ID2: X 0263
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	GRANITE & GRANITE GNEISS
DRILLER:	C S GARBER & SONS INC
DATE DRILLED:	1/1/1974
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	80
DISCHARGE:	30
STATIC LEVEL:	28
TOP OF CASING:	0
BOTTOM OF CASING:	43
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 37 **DIST/DIR:** 0.34 SW **MAP ID:** 33

NAME: HOLTZMAN PETRO
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 180935
ID2: 2044N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME:
FORMATION NAME: LEITHSVILLE FORMATION
DRILLER: BORGER, LEON
DATE DRILLED: 1/1/1989
USE OF SITE: MINE
WELL DEPTH: 30
DISCHARGE: 1
STATIC LEVEL: 12
TOP OF CASING: 0
BOTTOM OF CASING: 30
DIAMETER: 2
WATER USE:
REMARK: DRAWDOWN=DRY

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 38 **DIST/DIR:** 0.34 SW **MAP ID:** 33

NAME: HOLTZMAN PETRO CO
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 180936
ID2: 2045N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	BORGER, LEON
DATE DRILLED:	1/1/1989
USE OF SITE:	MINE
WELL DEPTH:	38
DISCHARGE:	1
STATIC LEVEL:	30
TOP OF CASING:	0
BOTTOM OF CASING:	38
DIAMETER:	2
WATER USE:	
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 35 **DIST/DIR:** 0.35 SW **MAP ID:** 31

NAME: HILLEGASS JOHN
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23919
ID2: LE 91
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	EPLER FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1910
USE OF SITE:	UNUSED
WELL DEPTH:	325
DISCHARGE:	150
STATIC LEVEL:	88
TOP OF CASING:	0
BOTTOM OF CASING:	
DIAMETER:	10
WATER USE:	UNUSED
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

LEAKING UNDERGROUND STORAGE TANKS

SEARCH ID: 9 **DIST/DIR:** 0.36 NW **MAP ID:** 5

NAME: EMMAUS BORO MARKS HOUSE
ADDRESS: R 164 E MAIN ST
EMMAUS BORO PA
CONTACT:

REV: 12-01-00
ID1: 0101-624
ID2:
STATUS: CLOSED
PHONE:

SUBSTANCE RELEASED: AVIATION GASOLINE
CLEANUP COMPLETION DATE: 8/4/00
CLASS: N

STATE WELLS SITE

SEARCH ID: 39 **DIST/DIR:** 0.36 SW **MAP ID:** 34

NAME: HOLTZMAN PETRO CO
ADDRESS:
EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 180937
ID2: 2046N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: LEITHSVILLE FORMATION
DRILLER: BORGER, LEON
DATE DRILLED: 1/1/1989
USE OF SITE: MINE
WELL DEPTH: 25
DISCHARGE: 1
STATIC LEVEL: 18
TOP OF CASING: 0
BOTTOM OF CASING: 25
DIAMETER: 2
WATER USE:
REMARK:

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 46 **DIST/DIR:** 0.37 SE **MAP ID:** 40

NAME: ROCKAWACK ROBER T
ADDRESS: SALISBURY TWP. PA
CONTACT:

REV: 08/010/99
ID1: 23924
ID2: LE 204
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	BYRAM GNEISS
DRILLER:	UNKNOWN
DATE DRILLED:	
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	72
DISCHARGE:	
STATIC LEVEL:	28
TOP OF CASING:	0
BOTTOM OF CASING:	
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

NPL SITE

SEARCH ID: 1 **DIST/DIR:** 0.40 SW **MAP ID:** 1

NAME: RODALE MANUFACTURING CO., INC.
ADDRESS: 6TH & MINOR STS
EMMAUS BOROUGH PA 18049
CONTACT: HARRY STEINMETZ

REV: 11/13/01
ID1: PAD981033285
ID2: 0301744
STATUS: FINAL
PHONE: 2158143161

SITE INFORMATION

EVENT TYPE
SITE DISCOVERY BY:
SITE PROPOSED BY:
FINAL LIST BY:

DISCOVERY DATE:
PROPOSED DATE: 07-29-91
FINAL LIST DATE: 10-14-92

ACTIVITIES: MFG OF WIRING DEVICES & ELECTRICAL CONNECTORS

CONTAMINANTS: HEAVY METALS, TCE, OIL, SODIUM PHOSPHATE, CYANIDE WASTES
SOURCE OF CONTAMINATION: DISPOSAL OF ELECTROPLATING WASTE AND RINSE WATER INTO 3 ON- SITE WELLS

CONTAMINATED: GROUNDWATER, SOIL
THREATENED:

SITE DESCRIPTION

Conditions at Proposal (July 29, 1991): Rodale Manufacturing Co., Inc., formerly produced electrical wiring devices at a 4,000-square foot, U-shaped building at Sixth and Minor Streets in the Borough of Emmaus, Lehigh County, Pennsylvania. The plant is surrounded by industrial and residential areas. Rodale operated the plant from the 1950s to 1975, when Square D Co. assumed control, manufacturing wiring devices as well as electrical connectors. Operations ceased in February 1986.

According to Pennsylvania Department of Environmental Resources (PA DER) files, electroplating waste and rinse waters were disposed of from at least 1961 until 1967, in on-site wells, including the following three. Well No. 1 is 452 feet deep and cased to 444 feet. Electroplating wastes and solvents were disposed in the well until approximately 1967, according to a 1988 study by a Square D contractor. A brick cistern measuring 8 by 8 by 12 feet apparently served as a funnel to the well. Well No. 2, 251 feet deep and cased to 50 feet, was used for disposal of trichloroethene (TCE), other wastes, and possibly cyanide wastes. Well No. 3, 426 feet deep and cased to 400 feet, was used for disposal of TCE, oil, possibly cyanide wastes, and sodium phosphate cleaner.

In 1981, a Square D contractor removed wastes from three wells and transported the materials to hazardous waste facilities regulated under Subtitle C of the Resource Conservation and Recovery Act.

Copper, zinc, chromium, nickel, lead, and silver, which are typically found in electroplating wastes, and TCE were detected in on-site wells and nearby monitoring wells in 1981 and 1989 by Square D contractors and in 1989 by EPA. There is a general TCE problem in Emmaus Borough. Since 1981, seven wells of the Emmaus Municipal Water Works have shown varying levels of TCE. Borough Well No. 5 was taken out of service in 1981 and was abandoned in December 1988 because of TCE contamination. In October 1990, the Borough of Emmaus installed air strippers on three wells. The borough continues to monitor its wells for TCE. An estimated 21,000 people obtain drinking water from public and private wells and springs within 4 miles of the site; a borough well is within 0.5 mile of the site. Evidence suggests that Rodale is contributing to TCE contamination in both public and private wells.

Status (October 1992): EPA is investigating the possibility that Square D will conduct a Remedial Investigation/Feasibility Study to determine the type and extent of contamination at the site and identify alternatives for remedial action.

(The description of the site (release) is based on information available at the time the site was scored. The description may change as additional information is gathered on the sources and extent of contamination. See FR 5600, February 11, 1991 or subsequent FR notices.)

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 27 **DIST/DIR:** 0.42 SW **MAP ID:** 23

NAME: EMMAUS SILK COMPANY
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23932
ID2: LE 1280
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1915
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	125
DISCHARGE:	50
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	
DIAMETER:	6
WATER USE:	
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 34 **DIST/DIR:** 0.47 NE **MAP ID:** 30

NAME: HAROLD ROBERT
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 180938
ID2: X 0767
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	CAMBRIAN SYSTEM
DRILLER:	REITH BROS INC
DATE DRILLED:	
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	110
DISCHARGE:	15
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	105
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 21 **DIST/DIR:** 0.50 SE **MAP ID:** 17

NAME: EMMAUS BOROUGH
ADDRESS: SALISBURY TWP. PA
CONTACT:

REV: 08/010/99
ID1: 23910
ID2: LE 92
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	BYRAM GNEISS
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1908
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	700
DISCHARGE:	8
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	124
DIAMETER:	6
WATER USE:	PUBLIC SUPPLY
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 40 **DIST/DIR:** 0.52 SE **MAP ID:** 35

NAME: LIZUN PAUL
ADDRESS:
UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184057
ID2: 3424N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	HARDYSTON FORMATION-QUARTZITE
DRILLER:	REITH BROS INC
DATE DRILLED:	11/1/1991
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	100
DISCHARGE:	7
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	42
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 30 **DIST/DIR:** 0.58 SW **MAP ID:** 26

NAME: H. KOSTENBADER BREWI
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23912
ID2: LE 1279
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1910
USE OF SITE:	UNUSED
WELL DEPTH:	270
DISCHARGE:	
STATIC LEVEL:	
TOP OF CASING:	
BOTTOM OF CASING:	
DIAMETER:	
WATER USE:	UNUSED
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 42 **DIST/DIR:** 0.60 SE **MAP ID:** 37

NAME: MILLER RICHARD
ADDRESS: SALISBURY TWP. PA
CONTACT:

REV: 08/010/99
ID1: 23915
ID2: LE 512
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	POCHUCK GNEISS
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1938
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	181
DISCHARGE:	7
STATIC LEVEL:	23
TOP OF CASING:	0
BOTTOM OF CASING:	
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 17 **DIST/DIR:** 0.63 NW **MAP ID:** 13

NAME: BEIBLE ANDREW
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 24012
ID2: LE 797
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1965
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	175
DISCHARGE:	140
STATIC LEVEL:	82
TOP OF CASING:	0
BOTTOM OF CASING:	97
DIAMETER:	6
WATER USE:	IRRIGATION
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 26 **DIST/DIR:** 0.63 SW **MAP ID:** 22

NAME: EMMAUS FOUNDRY
ADDRESS:
EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23905
ID2: LE 669
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1957
USE OF SITE:	DRAIN
WELL DEPTH:	216
DISCHARGE:	
STATIC LEVEL:	
TOP OF CASING:	
BOTTOM OF CASING:	
DIAMETER:	
WATER USE:	UNUSED
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 49 **DIST/DIR:** 0.64 SE **MAP ID:** 43

NAME: SIEGFRIED JOANNE
ADDRESS: SALISBURY TWP. PA
CONTACT:

REV: 08/010/99
ID1: 183074
ID2: 3047N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	GRAPHITIC GNEISS
DRILLER:	
DATE DRILLED:	4/1/1992
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	360
DISCHARGE:	20
STATIC LEVEL:	70
TOP OF CASING:	0
BOTTOM OF CASING:	45
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 51 **DIST/DIR:** 0.66 SE **MAP ID:** 45

NAME: TAVANO RICHARD
ADDRESS: SALISBURY TWP. PA
CONTACT:

REV: 08/010/99
ID1: 183211
ID2: X 0766
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	GRANITE & GRANITE GNEISS
DRILLER:	ODENHEIMER CO
DATE DRILLED:	
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	227
DISCHARGE:	5
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	58
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 23 **DIST/DIR:** 0.72 NE **MAP ID:** 19

NAME: EMMAUS BOROUGH
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 25063
ID2: LE 87
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1951
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	187
DISCHARGE:	350
STATIC LEVEL:	55
TOP OF CASING:	0
BOTTOM OF CASING:	124
DIAMETER:	10
WATER USE:	PUBLIC SUPPLY
REMARK:	

WATER QUALITY INFORMATION

DATE: 1/4/1955 **REMARK:** 11 NONCARBONATE HARDNESS WATER WHOLE TOTAL, FIELD, (MG/L AS CA CO3)

DATE: 1/4/1955 **REMARK:** 94 ALKALINITY, WATER, WHOLE, TOTAL, FIXED ENDPOINT TITRATION, FIELD, MG/L AS CACO3

DATE: 1/4/1955 **REMARK:** 187 DEPTH TO BOTTOM OF SAMPLE INTERVAL (FEET BELOW LSD)

DATE: 1/4/1955 **REMARK:** 124 DEPTH TO TOP OF SAMPLE INTERVAL (FEET BELOW LSD)

DATE: 1/4/1955 **REMARK:** 187 DEPTH OF WELL, TOTAL (FEET)

DATE: 1/4/1955 **REMARK:** 465 ELEVATION OF LAND SURFACE DATUM (LSD) (FEET NGVD)

DATE: 1/4/1955 **REMARK:** 6.7 NITROGEN, NITRATE, DISSOLVED (MG/L AS NO3)

DATE: 1/4/1955 **REMARK:** 130 IRON DISSOLVED (UG/L AS FE)

DATE: 1/4/1955 **REMARK:** 7.7 SULFATE DISSOLVED (MG/L AS SO4)

DATE: 1/4/1955 **REMARK:** 3 CHLORIDE DISSOLVED (MG/L AS CL)

DATE: 1/4/1955 **REMARK:** 3.2 SODIUM PLUS POTASSIUM DISSOLVED (MG/L AS NA)

DATE: 1/4/1955 **REMARK:** 104 HARDNESS TOTAL (MG/L AS CA03)

DATE: 1/4/1955 **REMARK:** 1.514 NITROGEN NITRATE DISSOLVED (MG/L AS N)

DATE: 1/4/1955 **REMARK:** 1.2 CARBON DIOXIDE DISSOLVED (MG/L AS CO2)

- Continued on next page -

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 23 **DIST/DIR:** 0.72 NE **MAP ID:** 19

NAME: EMMAUS BOROUGH
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 25063
ID2: LE 87
STATUS:
PHONE:

DATE: 1/4/1955 **REMARK:** 55 DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET)

DATE: 1/4/1955 **REMARK:** 10.55 WATER TEMPERATURE, DEGREES CELSIUS

DATE: 1/4/1955 **REMARK:** 243 SPECIFIC CONDUCTANCE, US/CM @ 25 DEGREES CENTIGRADE

DATE: 1/4/1955 **REMARK:** 8.2 PH, WATER, WHOLE, FIELD, STANDARD UNITS

DATE: 1/4/1955 **REMARK:** 0 CARBONATE, WATER, WHOLE, FIXED ENDPOINT TITRATION, FIELD, MG/L AS CO3

DATE: 1/4/1955 **REMARK:** 114 BICARBONATE, WATER, WHOLE, FIXED ENDPOINT TITRATION, FIELD, MG/L AS HCO3

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 48 **DIST/DIR:** 0.72 SW **MAP ID:** 42

NAME: ROLAND F
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 180939
ID2: X 0768
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	CAMBRIAN SYSTEM
DRILLER:	MAYER S WELL DRILLING
DATE DRILLED:	
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	130
DISCHARGE:	20
STATIC LEVEL:	65
TOP OF CASING:	0
BOTTOM OF CASING:	125
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 19 **DIST/DIR:** 0.76 SE **MAP ID:** 15

NAME: EISENHART MYLES
ADDRESS: SALISBURY TWP. PA
CONTACT:

REV: 08/010/99
ID1: 183076
ID2: 3049N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	MAFIC GNEISS, HORNBLENDE-BEARING, PRECAMBRIAN
DRILLER:	
DATE DRILLED:	12/1/1987
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	235
DISCHARGE:	10
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	102
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 54 **DIST/DIR:** 0.78 SE **MAP ID:** 48

NAME: ZEHNDER GREG
ADDRESS: UPPER SAUCON TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184603
ID2: 3593N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	MAFIC GNEISS, HORNBLENDE-BEARING, PRECAMBRIAN
DRILLER:	
DATE DRILLED:	8/1/1991
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	700
DISCHARGE:	3
STATIC LEVEL:	70
TOP OF CASING:	0
BOTTOM OF CASING:	80
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 47 **DIST/DIR:** 0.82 SW **MAP ID:** 41

NAME: RODALE MFG CO
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23901
ID2: LE 218
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	LEITHSVILLE FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	
USE OF SITE:	UNUSED
WELL DEPTH:	330
DISCHARGE:	55
STATIC LEVEL:	70
TOP OF CASING:	0
BOTTOM OF CASING:	
DIAMETER:	6
WATER USE:	UNUSED
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 41 **DIST/DIR:** 0.85 SE **MAP ID:** 36

NAME: METZGER MIKE
ADDRESS: UPPER SAUCON TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184499
ID2: 3488N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: MAFIC GNEISS, HORNBLENDE-BEARING, PRECAMBRIAN
DRILLER:
DATE DRILLED: 4/1/1989
USE OF SITE: WITHDRAWAL
WELL DEPTH: 700
DISCHARGE: 3
STATIC LEVEL: 40
TOP OF CASING: 0
BOTTOM OF CASING: 85
DIAMETER: 6
WATER USE: DOMESTIC
REMARK: WBZ=LOW YIELD

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: MAFIC GNEISS, HORNBLENDE-BEARING, PRECAMBRIAN
DRILLER:
DATE DRILLED: 4/1/1989
USE OF SITE: WITHDRAWAL
WELL DEPTH: 700
DISCHARGE: 3
STATIC LEVEL: 40
TOP OF CASING: 0
BOTTOM OF CASING: 85
DIAMETER: 6
WATER USE: DOMESTIC
REMARK: WBZ=LOW YIELD

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 50 **DIST/DIR:** 0.85 SW **MAP ID:** 44

NAME: SQUARE D CO
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 180929
ID2: 1556N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: LEITHSVILLE FORMATION
DRILLER: GILL ENTERPRISES INC
DATE DRILLED: 6/1/1981
USE OF SITE: MINE
WELL DEPTH: 342
DISCHARGE: 150
STATIC LEVEL: 120
TOP OF CASING: 0
BOTTOM OF CASING: 104.5
DIAMETER: 8
WATER USE:
REMARK: WBZs=240-100GPM;340-150/200GPM

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: LEITHSVILLE FORMATION
DRILLER: GILL ENTERPRISES INC
DATE DRILLED: 6/1/1981
USE OF SITE: MINE
WELL DEPTH: 342
DISCHARGE: 150
STATIC LEVEL: 120
TOP OF CASING: 0
BOTTOM OF CASING: 192.5
DIAMETER: 6
WATER USE:
REMARK: WBZs=240-100GPM;340-150/200GPM

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 28 **DIST/DIR:** 0.88 SE **MAP ID:** 24

NAME: FORTUNATO L M
ADDRESS: UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184270
ID2: X 0260
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	CAMBRIAN SYSTEM
DRILLER:	MAYER S WELL DRILLING
DATE DRILLED:	1/1/1972
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	175
DISCHARGE:	40
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	47
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 43 **DIST/DIR:** 0.88 SE **MAP ID:** 24

NAME: MOSIG W R JR
ADDRESS:
UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184271
ID2: X 0261
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	CAMBRIAN SYSTEM
DRILLER:	MAYER S WELL DRILLING
DATE DRILLED:	1/1/1974
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	160
DISCHARGE:	15
STATIC LEVEL:	40
TOP OF CASING:	0
BOTTOM OF CASING:	95
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 31 **DIST/DIR:** 0.89 SE **MAP ID:** 27

NAME: HAGAR D
ADDRESS: UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184402
ID2: X 1546
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	GRANITE & GRANITE GNEISS
DRILLER:	ODENHEIMER CO
DATE DRILLED:	
USE OF SITE:	RECHARGE
WELL DEPTH:	525
DISCHARGE:	50
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	48
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 32 **DIST/DIR:** 0.90 SE **MAP ID:** 28

NAME: HAGAR D
ADDRESS:
UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184403
ID2: X 1547
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	GRANITE & GRANITE GNEISS
DRILLER:	ODENHEIMER CO
DATE DRILLED:	
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	750
DISCHARGE:	37
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	60
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 25 **DIST/DIR:** 0.90 SW **MAP ID:** 21

NAME: EMMAUS BOROUGH
ADDRESS: EMMAUS BORO PA
CONTACT:

REV: 08/010/99
ID1: 23936
ID2: LE 479
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	USGS - GWSI
QUAD NAME:	ALLENTOWN WEST
FORMATION NAME:	ALLENTOWN FORMATION
DRILLER:	UNKNOWN
DATE DRILLED:	1/1/1954
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	462
DISCHARGE:	600
STATIC LEVEL:	125
TOP OF CASING:	0
BOTTOM OF CASING:	72
DIAMETER:	10
WATER USE:	PUBLIC SUPPLY
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 16 **DIST/DIR:** 0.92 SE **MAP ID:** 12

NAME: BEDICS W
ADDRESS:
UPPER SAUCON TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184882
ID2: X 0454
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	HORNBLENDE GNEISS
DRILLER:	MAYER S WELL DRILLING
DATE DRILLED:	
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	180
DISCHARGE:	10
STATIC LEVEL:	30
TOP OF CASING:	0
BOTTOM OF CASING:	95
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 15 **DIST/DIR:** 0.94 NE **MAP ID:** 11

NAME: AIR PRODUCTS CO
ADDRESS: ALLENTOWN PA
CONTACT:

REV: 08/010/99
ID1: 180894
ID2: 2030N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: LEITHSVILLE FORMATION
DRILLER: CVM INDUSTRIES
DATE DRILLED: 1/6/1992
USE OF SITE:
WELL DEPTH: 97
DISCHARGE: 85
STATIC LEVEL: 52
TOP OF CASING: 0
BOTTOM OF CASING: 97
DIAMETER: 6
WATER USE:
REMARK: TYPE OF ROCK=LS/SHALE;WATUSE=DISPOSAL;WELL-USE=RECOVERY

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 18 **DIST/DIR:** 0.94 SE **MAP ID:** 14

NAME: BUXTON TOM
ADDRESS: UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 183942
ID2: 3309N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	MAFIC GNEISS, HORNBLENDE-BEARING, PRECAMBRIAN
DRILLER:	REITH BROS INC
DATE DRILLED:	9/1/1988
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	400
DISCHARGE:	3
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	63
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 33 **DIST/DIR:** 0.94 SE **MAP ID:** 29

NAME: HAGER DONALD
ADDRESS: UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 183931
ID2: 3298N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: MAFIC GNEISS, HORNBLENDE-BEARING, PRECAMBRIAN
DRILLER:
DATE DRILLED: 3/1/1991
USE OF SITE: WITHDRAWAL
WELL DEPTH: 675
DISCHARGE: 60
STATIC LEVEL: 50
TOP OF CASING: 0
BOTTOM OF CASING: 145
DIAMETER: 6
WATER USE: DOMESTIC
REMARK: WBZ=4)650

SOURCE OF RECORD: PAGS WWI PAPER
QUAD NAME: ALLENTOWN EAST
FORMATION NAME: MAFIC GNEISS, HORNBLENDE-BEARING, PRECAMBRIAN
DRILLER:
DATE DRILLED: 3/1/1991
USE OF SITE: WITHDRAWAL
WELL DEPTH: 675
DISCHARGE: 60
STATIC LEVEL: 50
TOP OF CASING: 0
BOTTOM OF CASING: 145
DIAMETER: 6
WATER USE: DOMESTIC
REMARK: WBZ=4)650

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 45 **DIST/DIR:** 0.98 SW **MAP ID:** 39

NAME: RAINIER JOSPEH
ADDRESS: UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184272
ID2: X 0262
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	HARDYSTON FORMATION-QUARTZITE
DRILLER:	C S GARBER & SONS INC
DATE DRILLED:	1/1/1973
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	80
DISCHARGE:	8
STATIC LEVEL:	28
TOP OF CASING:	0
BOTTOM OF CASING:	31
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

STATE WELLS SITE

SEARCH ID: 52 **DIST/DIR:** 0.99 SE **MAP ID:** 46

NAME: TITAN HOMES
ADDRESS: UPPER MILFORD TWP. PA
CONTACT:

REV: 08/010/99
ID1: 183922
ID2: 3289N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	MAFIC GNEISS, HORNBLENDE-BEARING, PRECAMBRIAN
DRILLER:	REITH BROS INC
DATE DRILLED:	7/1/1988
USE OF SITE:	OBSERVATION
WELL DEPTH:	800
DISCHARGE:	1
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	25
DIAMETER:	6
WATER USE:	INDUSTRIAL
REMARK:	

WATER QUALITY INFORMATION

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

STATE WELLS SITE

SEARCH ID: 53 **DIST/DIR:** 1.00 SE **MAP ID:** 47

NAME: ZARTLER JEFF
ADDRESS:
UPPER SAUCON TWP. PA
CONTACT:

REV: 08/010/99
ID1: 184576
ID2: 3566N
STATUS:
PHONE:

WELL INFORMATION

SOURCE OF RECORD:	PAGS WWI PAPER
QUAD NAME:	ALLENTOWN EAST
FORMATION NAME:	
DRILLER:	
DATE DRILLED:	11/1/1987
USE OF SITE:	WITHDRAWAL
WELL DEPTH:	250
DISCHARGE:	10
STATIC LEVEL:	
TOP OF CASING:	0
BOTTOM OF CASING:	61
DIAMETER:	6
WATER USE:	DOMESTIC
REMARK:	

WATER QUALITY INFORMATION

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

REGISTERED UNDERGROUND STORAGE TANKS

SEARCH ID: 59 **DIST/DIR:** NON GC **MAP ID:**

NAME: ALLENTOWN CITY WATERSHED
ADDRESS: 2052 PARK DR
ALLENTOWN PA 18103
CONTACT:

REV: 06-01-01
ID1: 39-37453
ID2: 17591
STATUS:
PHONE:

TANK DETAILS

TANK ID: 145079
TANK NO.: 001
CAPACITY: 550
INSTALLATION DATE: 19980109

TANK TYPE: AST
PRODUCT: Hazardous mixed with petroleum
STATUS: CURRENTLY IN USE

REGISTERED UNDERGROUND STORAGE TANKS

SEARCH ID: 58 **DIST/DIR:** NON GC **MAP ID:**

NAME: ATLANTIS AQUACULTURE
ADDRESS: 840 BROAD ST
EMMAUS PA 18049
CONTACT:

REV: 06-01-01
ID1: 39-37417
ID2: 36584
STATUS:
PHONE:

TANK DETAILS

TANK ID: 144792
TANK NO.: 001
CAPACITY: 1050
INSTALLATION DATE: 19980130

TANK TYPE: AST
PRODUCT: HAZARDOUS SUBSTANCE
STATUS: CURRENTLY IN USE

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

RCRA GENERATOR SITE

SEARCH ID: 55 **DIST/DIR:** NON GC **MAP ID:**

NAME: CVIP INC
ADDRESS: 801 BROAD ST
EMMAUS PA 18049
CONTACT: DAVID SMITH

REV: 11/25/01
ID1: PAR000036152
ID2:
STATUS: VGN
PHONE: 6109671525

SITE INFORMATION

CONTACT INFORMATION: DAVID SMITH
CONTROLLER
801 BROAD ST
EMMAUS PA 18049

PHONE: 6109671525

UNIVERSE NAME:

VGN: GENERATES LESS THAN 100 KG/MONTH OF HAZARDOUS WASTE

SIC INFORMATION:

ENFORCEMENT INFORMATION:

VIOLATION INFORMATION:

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

LEAKING UNDERGROUND STORAGE TANKS

SEARCH ID: 60 **DIST/DIR:** NON GC **MAP ID:**

NAME: DAVID HANSSEN PROPERTY
ADDRESS: RR 2, BOX 211
EMMAUS PA 18049
CONTACT:

REV:
ID1: 2395869
ID2:
STATUS:
PHONE:

SUBSTANCE RELEASED: HEATING OIL (NO. 2)
CLEANUP COMPLETION DATE:
CLASS: A

RCRA GENERATOR SITE

SEARCH ID: 56 **DIST/DIR:** NON GC **MAP ID:**

NAME: ELECTRO CHEMICAL
ADDRESS: 750 BROAD ST
EMMAUS PA 18049
CONTACT: TROY GEIST

REV: 11/25/01
ID1: PAR000027433
ID2:
STATUS: SGN
PHONE: 6109659001

SITE INFORMATION

CONTACT INFORMATION: TROY GEIST
PROD MGR
750 BROAD ST
EMMAUS PA 18049

PHONE: 6109659001

UNIVERSE NAME:

SGN: GENERATES 100 - 1000 KG/MONTH OF HAZARDOUS WASTE

SIC INFORMATION:

5084 - WHOLESALE TRADE - INDUSTRIAL MACHINERY AND EQUIPME

ENFORCEMENT INFORMATION:

VIOLATION INFORMATION:

Environmental FirstSearch
Site Detail Report

TARGET SITE: EMMAUS PA 18049 **JOB:** SOUTH18049

EMERGENCY RESPONSE NOTIFICATION SITE

SEARCH ID: 57 **DIST/DIR:** NON GC **MAP ID:**

NAME: UNKNOWN
ADDRESS: EMMAUS AREA
EMMAUS PA 18049
CONTACT:

REV: 9/27/93
ID1: 342663
ID2:
STATUS: UNKNOWN (EPA REGIONS)
PHONE:

SPILL INFORMATION
DATE OF SPILL: 9/27/93 **TIME OF SPILL:** 2100

PRODUCT RELEASED (1): GASOLINE: AUTOMOTIVE (4.23G PB/G
QUANTITY (1): 0
UNITS (1): UNK

PRODUCT RELEASED (2):
QUANTITY (2):
UNITS (2):

PRODUCT RELEASED (3):
QUANTITY (3):
UNITS (3):

MEDIUM/MEDIA AFFECTED

AIR:	NO	**GROUNDWATER:**	NO
LAND:	YES	**FIXED FACILITY:**	NO
WATER:	NO	**OTHER:**	NO

WATERBODY AFFECTED BY RELEASE: NONE

CAUSE OF RELEASE

DUMPING:	NO	**EQUIPMENT FAILURE:**	NO
NATURAL PHENOMENON:	NO	**OPERATOR ERROR:**	NO
OTHER CAUSE:	NO	**TRANSP. ACCIDENT:**	NO
UNKNOWN:	YES		

ACTIONS TAKEN: INVESTIGATING THE POSSIBLE SOURCE/CLEANING UP MATERIAL RELEASED AN UPPER LIMIT OF A FEW BARRELS IS BELIEVED RELEASED
RELEASE DETECTION:
MISC. NOTES:

DISCHARGER INFORMATION
DISCHARGER ID: 342663 **DUN & BRADSTREET #:**
TYPE OF DISCHARGER: UNKNOWN
NAME OF DISCHARGER: UNKNOWN
ADDRESS: UNKNOWN
UNKNOWN

Environmental FirstSearch
Federal Databases and Sources

1. **NPL:** ***National Priority List.*** The EPA's list of confirmed or proposed Superfund sites.

   Updated quarterly.

2. **CERCLIS:** ***Comprehensive Environmental Response Compensation and Liability Information System.*** The EPA's database of current and potential Superfund sites currently or previously under investigation.

   Updated quarterly.

3. **RCRIS:** ***Resource Conservation and Recovery Information System.*** The EPA's database of registered hazardous waste generators and treatment, storage and disposal facilities. Included are RAATS (RCRA Administrative Action Tracking System) and CMEL (Compliance Monitoring & Enforcement List).

   Updated quarterly.

4. **ERNS:** ***Emergency Response Notification System.*** The EPA's database of EPA emergency response actions.

   Updated quarterly.

5. **NPDES:** ***National Pollution Discharge Elimination System.*** The EPA's database of all permitted facilities receiving and discharging effluents to and from the environment.

   Updated semi-annually.

6. **FINDS:** ***The Facility Index System.*** The EPA's Index of identification numbers associated with a property or facility which the EPA has investigated or has been made aware of in conjunction with various regulatory programs. Each record indicates the EPA office that may have files on the site or facility.

   Updated quarterly.

Environmental FirstSearch
Pennsylvania Databases and Sources

1. **STATE:** The Pennsylvania Priorities List (SPL) is a priority list of sites which have released or could potentially release hazardous substances into the environment. Under the Hazardous Sites Cleanup Act (HSCA) and CERCLA, the Pennsylvania Department of Environmental Protection is authorized to investigate, assess, and cleanup sites in the Commonwealth regardless of whether or not these sites qualify for cleanup under the Federal Superfund Act.

2. **LUST:** The Pennsylvania List of Confirmed Releases report identifies facilities in the Commonwealth with known releases from above ground or underground storage tanks. In this report, the Pennsylvania Department of Environmental Protection, Bureau of Land Recycling and Waste Management provides pertinent site details such as name and address of the facility, type of substance released, and remediation status.

3. **UST:** The Pennsylvania Department of Environmental Protection, Bureau of Water Quality Management, provides a listing of registered underground storage tanks, known as the Regulated Storage Tank Listing.

4. **SWL:** Solid waste facilities within the Commonwealth are regulated by the Pennsylvania Department of Environmental Protection, Bureau of Waste Management. The lists provided by the DEP and searched in this report include Solid Waste Transfer Stations, Inactive Solid Waste Facilities, and the Solid Waste Inventory Database.

Environmental FirstSearch
Street Name Report for Streets within .25 Mile(s) of Target Property

TARGET SITE: EMMAUS PA 18049

JOB: SOUTH18049

Street Name	Dist/Dir	Street Name	Dist/Dir
1st St	0.15 NW		
E Main St	0.18 NW		
EAST Main St	0.18 NW		
Green St	0.20 NW		
Hickory Ln	0.22 SE		
Iron St	0.25 SW		
Keystone Ave	0.22 SW		
Klines Ln	0.03 SW		
Main St	0.17 NW		
Minor St	0.04 SE		
Peach St	0.23 SW		
Railroad St	0.19 SW		
Ridge St	0.24 NW		
S Cherry St	0.23 SW		
S Keystone Ave	0.18 SW		
SOUTH Cherry St	0.23 SW		
SOUTH Keystone Ave	0.18 SW		
State Ave	0.25 NW		
White Oak Ln	0.16 SE		
Williams St	0.25 NW		
Willow St	0.19 SW		

Susceptibility Analysis of Drinking Water Sources to Contamination

The susceptibility of a drinking water source serving a PWS is the potential for that source to draw water contaminated by inventoried sources of contamination at concentrations that would pose a concern. This susceptibility is determined at the point in the waterbody immediately preceding collection for the PWS. A drinking water source, as a whole, is considered highly sensitive to contamination if at this point an MCL has been exceeded for a regulated contaminant, 50 percent of an MCL has been reached for nutrients or heavy metals, or detections have been made of VOCs or SOCs above the detection limit. This does not complete the analysis of the individual potential sources of contamination for drinking water source susceptibility. The intent of the statute, as determined by EPA, is for the susceptibility analysis to "narrow down" the potential contaminant sources of concern to assist the effectiveness of local voluntary SWP programs.

The susceptibility analysis is a qualitative measure of relative priority for concern of the different potential and existing sources of contamination based on the following:

1. Drinking water source sensitivity
2. Potential impacts posed by sources of contamination to the PWS source

   (This is a qualitative assessment of the impact on a PWS source if an uncontrolled contaminant release were to occur from a specific activity.)
3. Potential for release of contaminants of concern

The process is described on Flowchart 1.

The susceptibility analysis uses a series of matrices to determine high, medium and low values for the various factors in the process (matrix A – D). The parameters used in these matrices include time of travel (TOT), persistence and quantity. Although some of these parameters will be set for base assessments, the parameters for quantity and the "potential for release" table will be discussed at the public meetings and set for the site specific assessments conducted by DEP staff or DEP contractors to reflect local public concern. The changes in the threshold values for the parameters must be consistent with setting high, medium and low values for the resulting factors and must apply to the entire group of potential contaminant sources (i.e. Volatile organic chemicals).

The time of travel (TOT) to the drinking water intake from a source of a potential contaminant is measured in terms of short, medium, or long. For groundwater sources, WHP areas I, II, and III are synonymous with short, medium, or long TOT, respectively. For surface water intakes, the definitions of the segmented delineations are based on TOT (zone delineations: A = 5 hours, B = 25 hours, and C represents the remainder of the watershed). Accordingly, the TOT for Zones A, B and C are short, medium and long, respectively.

The persistence of a potential contaminant will be measured as high, medium or low. This will be based on the contaminant ability to move in the environment and is determined on the adsorption and/or half-life (or rate of removal). If the contaminant has been known to contaminate water supply sources with concentrations greater than the MCL or in significant concentrations it will have a high to medium persistence. For ground water sources, the soils and geologic materials ability to remove the contaminant will be factored in as well. This will be based on the clay content and the hydraulic conductivity of the material.

Quantity will be measured as high, medium and low. Low quantities are those that are clearly on a domestic scale and can be categorized as non-reportable or non-regulated releases, volumes or events. Medium quantities are those that can be categorized as reportable releases, regulated minimum volumes, or events, or equivalent, up to 10X such a quantity, or those quantities that are associated with commercial- or industrial-sized operations and distribution. High quantities are those that are clearly associated with commercial- or industrial-sized operations and distribution, with a minimum 10X a reportable release, regulated minimum volume, event, or the equivalent.

The sensitivity of a drinking water source is most critical in a groundwater source where the aquifer and overlying geologic materials above are expected to provide some treatment of infiltrating water. Surface water sources are highly susceptible because of short travel times of contaminants and limited processes for mitigation of contaminants other than dilution, settling, oxidation and volatilization. By definition, there is a higher susceptibility of contamination by potential sources within Zone I (Zone A) then Zone II (Zone B).

Determining the potential for impact of a contaminant source on a drinking water source is related to the properties of the contaminant of concern, the amount that could be released, the distance or travel time of the contaminant and contaminant concentration reduction that can be expected. Some of these factors are represented in a practical way in the rank of significance of the identified contaminant types ranked in the previous section. If the potential or existing potential sources of contamination are considered to be of a high density, their potential impact should be analyzed cummulatively.

One of the more important considerations in the susceptibility analysis is the potential for release of the contaminant of concern. This would include containment measures for stored potential contaminants. Of primary concern is the level of treatment, monitoring and quality assurance of any treatment process before release of a contaminant. This is the purpose of most permitting programs related to water quality and can be a measure of drinking water source susceptibility. If the activity or a contaminant potentially released from that facility or activity is not regulated, susceptibility can be related to the use of best management practices established voluntarily or as accepted practice. The definition of Best Management Practices here is broader then for agriculture and is the combination of practices accepted in the industry or supported by the department to protect surface and groundwater from contamination. This will include pollution prevention measures. Another tool for determining the potential for release of a contaminant is the establishment and implementation of emergency management plans to protect against release.

Susceptibility Analysis of Groundwater Sources to Contamination

The first step is to assess the potential for contamination of the drinking water source if all the contaminant were released from the potential contaminant source without consideration of any source protection (See Flowchart 1). Factors controlling the potential for contamination from a release are the fate and transport of the contaminant, the amount of contaminant of concern that might be released and the time of travel (or distance) to the drinking water source. The relative value for this potential are determined from Matrix A and Matrix B.

Groundwater sources of drinking water have the benefit of a level of protection from contamination relative to their integrity and the vulnerability of their source aquifer. This defines the sensitivity of the groundwater sources to contamination. Factors related to the integrity of the well are the construction standards, depth of the well, pumping rate, and the rate of infiltration and movement of the groundwater. If the aquifer is confined, the drinking water source should be well protected from man-induced contamination. DEP has used a relative ranking of aquifer vulnerability by the DRASTIC method by Aller *et al.* (1987). DRASTIC stands for: **D**epth to ground water, aquifer **R**echarge, **A**quifer media, **S**oil permeability, **T**opography, **I**mpact of the vadose zone, and hydraulic **C**onductivity. The higher the DRASTIC score the more vulnerable the groundwater. Site-specific factors that increase aquifer sensitivity such as sinkholes can be included in the site-specific assessments.

The potential for impact can be assessed by considering the intrinsic sensitivity of the drinking water source Flowchart 2 and the potential for contamination or the value from Matrix B.

The potential for release is determined from the potential for release table and is based upon the following factors:

1 Containment
2 Regulatory control of the potential source of contamination
3 Compliance
4 Best Management Practices &/or Emergency Response Plan

If there is no control on the potential for release of the contaminant, the potential for release would be high.

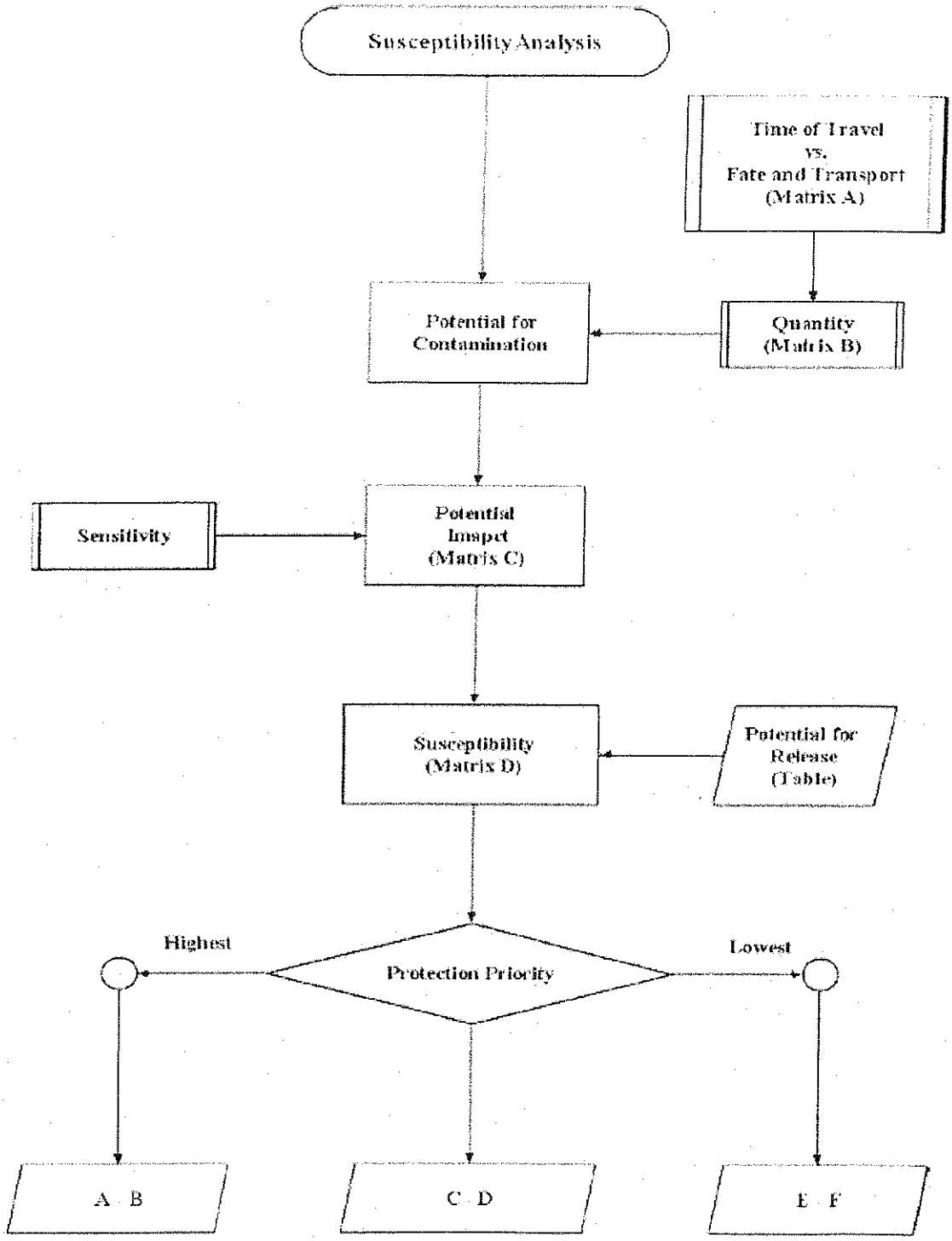
By relating the potential for impact described above to the potential for release, the susceptibility rating is determined from Matrix D. A potential source of contamination with a high potential for impact and a high potential for release would have an high susceptibility rating or priority.

Susceptibility Analysis of Surface Water Sources to Contamination

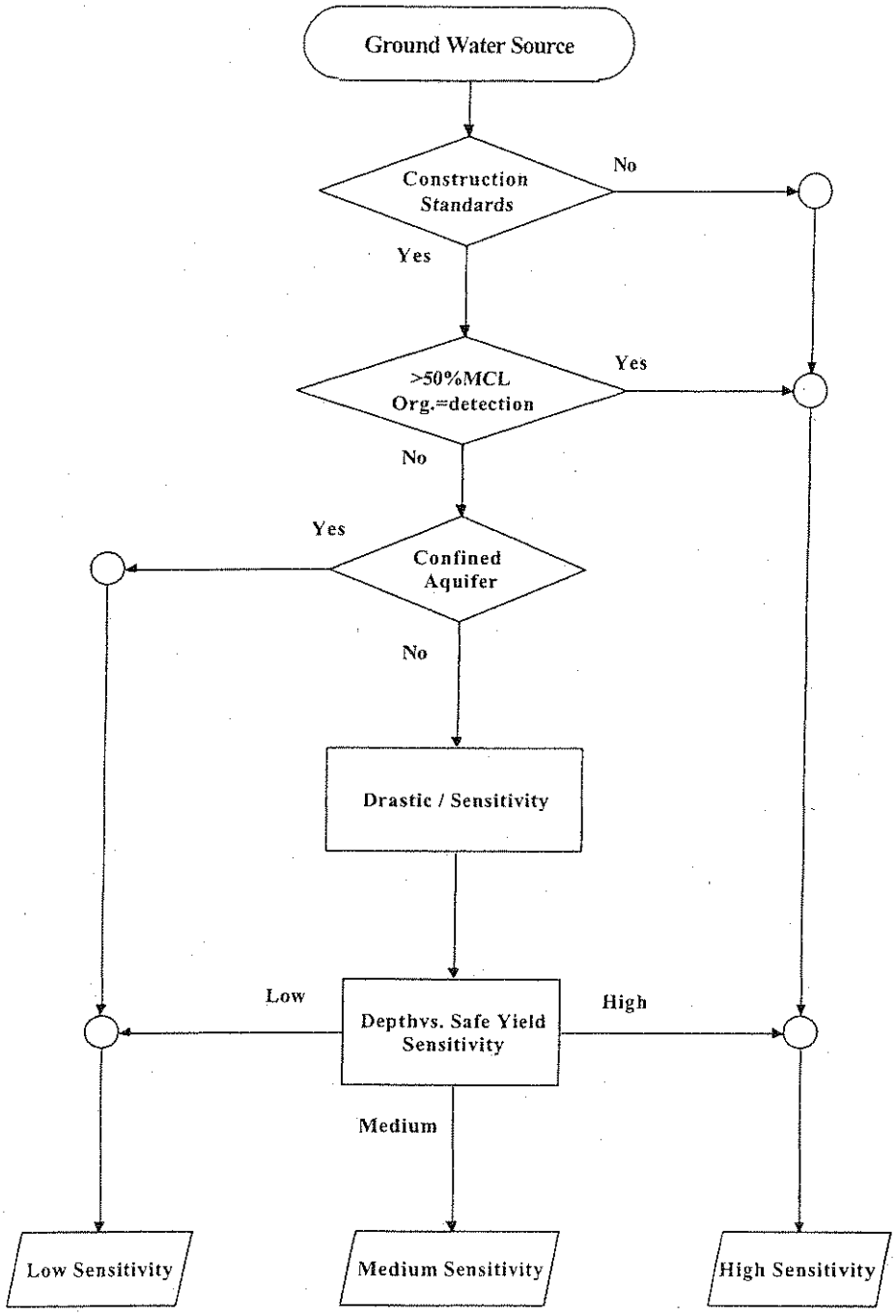
The susceptibility analysis for a surface water source of drinking water would not be substantially different from an analysis of a groundwater source except for the limited protection and resulting high sensitivity of surface water sources to contamination. Large reservoirs with at least a one month detention time at high flows could offer a medium sensitivity to upstream or distant potential sources of contamination.

Flow Chart 1

Susceptibility Analysis



Flow Chart 2
Susceptibility Analysis



Potential for Contamination

Matrix A (Step 1)

Time of Travel (TOT) vs. Fate & Transport (persistence)

\ Persistence TOT \	High	Medium	Low
Short	High	High	Medium
Medium	High	Medium	Low
Long	Medium	Low	Low

Matrix B (Step 2)

Matrix A vs. Quantity

\ Quantity Matrix A Result\	High	Medium	Low
High	High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low

Potential Impact

Matrix C

Potential for Contamination vs. Sensitivity

\ Sensitivity Potential for Contamination \ (from Matrix B)	High	Medium	Low
High	High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low

Potential for Release
Table

Potential for Release Control Practice \	Low	Medium	Medium-High	High
Regulated Containment &/or ERP	X			
Unregulated Containment / no ERP		X		
Regulated Discharge in Compliance			X	
" " Not in Compliance				X
NPS w/ Best Management Practices		X		
BMPs Not Operating			X	
No Control Practices				X

(ERP = Emergency Response Plan, NPS = Non-Point Source, BMP = Best Management Practice)

Susceptibility Rating
Matrix D

Potential for Release vs. Potential Impact

\ *Potential Impact* (from Maxtrix C) Pot. For Release \ (from Table)	High	Medium	Low
High	A	B	C
Medium High	B	C	D
Medium	C	D	E
Low	D	E	F

APPENDIX D
Contaminants for Source Water Assessments

Volatile Organic Chemicals (VOCs):

Benzene	0.005 mg/L	Styrene	0.1 mg/L
Carbon Tetrachloride	0.005 mg/L	Tetrachloroethylene	0.005 mg/L
o-Dichlorobenzene	0.6 mg/L	Toluene	1 mg/L
para-Dichlorobenzene	0.075 mg/L	1,2,4-Trichlorobenzene	0.07 mg/L
1,2-Dichloroethane	0.005 mg/L	1,1,1-Trichloroethane	0.2 mg/L
1,1-Dichloroethylene	0.007 mg/L	1,1,2-Trichloroethane	0.005 mg/L
cis-1,2-Dichloroethylene	0.07 mg/L	Trichloroethylene	0.005 mg/L
trans-1,2-Dichloroethylene	0.1 mg/L	Vinyl Chloride	0.002 mg/L
Dichloromethane	0.005 mg/L	Xylenes (Total)	10 mg/L
1,2-Dichloropropane	0.005 mg/L		
Ethylbenzene	0.7 mg/L		
Monochlorobenzene	0.1 mg/L		

Synthetic Organic Chemicals (SOCs):

Alachlor	0.002 mg/L	Glyphosate	0.7 mg/L
Acrylamide	treatment	Heptachlor	0.0004 mg/L
Atrazine	0.003 mg/L	Heptachlor Epoxide	0.0002 mg/L
Benzo(a)pyrene	0.0002 mg/L	Hexachlorobenzene	0.001 mg/L
Carbofuran	0.04 mg/L	Hexachlorocyclopentadiene	0.05 mg/L
Chlordane	0.002 mg/L	Lindane	0.0002 mg/L
2,4-D	0.07 mg/L	Methoxychlor	0.04 mg/L
Dalapon	0.2 mg/L	Oxamyl (Vydate)	0.2 mg/L
Dibromochloropropane (DBCP)	0.0002 mg/L	PCBs	0.0005 mg/L
Di(2-Ethylhexyl) Adipate	0.4 mg/L	Pentachlorophenol	0.001 mg/L
Di(2-Ethylhexyl) Phthalate	0.006 mg/L	Picloram	0.5 mg/L
Dinoseb	0.007 mg/L	Simazine	0.004 mg/L
Diquat	0.02 mg/L	2,3,7,8-TCDD (Dioxin)	0.00000003 mg/L
Endothall	0.1 mg/L	Toxaphene	0.003 mg/L
Endrin	0.002 mg/L	2,4,5-TP (Silvex)	0.05 mg/L
Ethylene Dibromide (EDB)	0.00005 mg/L		

Total Trihalomethanes (TTHMs):

Total Trihalomethanes (chloroform, chlorodibromomethane, bromoform & bromodichloromethane)	0.1 mg/L

PRIMARY CONTAMINANTS

Inorganic Chemicals (IOCs):

Antimony	0.006 mg/L	Fluoride	2 mg/L
Arsenic	0.05 mg/L	Lead	treatment
Asbestos	7 million fibers/L	Mercury	0.002 mg/L
Barium	2 mg/L	Nitrate (as Nitrogen)	10 mg/L
Beryllium	0.004 mg/L	Nitrite (as Nitrogen)	1 mg/L
Cadmium	0.005 mg/L	Nitrate + Nitrite (as Nitrogen)	10 mg/L
Chromium	0.1 mg/L	Selenium	0.05 mg/L
Copper	treatment	Thallium	0.002 mg/L
Cyanide (free CN)	0.2 mg/L		

Radionuclides:

Gross Alpha *	15 pCi/L	Beta Particle & Photon Activity **	4 mrem/yr
Combined Radium (226 + 228)	5 pCi/L		

* Gross Alpha MCL excludes Radon and Uranium particle activity.
** Beta Particle & Photon Activity MCL is for man-made radionuclides.

Microbiological Contaminants:

Presence or absence of total coliforms based on	
Number or percentage of total coliform positive samples/month	Or Fecal coliform or E. coli positive routine or check samples.

Turbidity:

Turbidity	1 NTU
(applicable only to unfiltered surface water sources)	

SECONDARY CONTAMINANTS

Aluminum	0.2 mg/L	Odor	3 T.O.N.
Chloride	250 mg/L	pH (reasonable goal) ***	6.5 - 8.5
Color	15 color units	Silver	0.1 mg/L
Corrosivity	non-corrosive	Sulfate	250 mg/L
Foaming Agents	0.5 mg/L	Total Dissolved Solids	500 mg/L
Iron	0.3 mg/L	Zinc	5 mg/L
Manganese	0.05 mg/L		

*** The pH MCL represents a "reasonable goal for drinking water quality.";
mg/L = milligrams per liter = parts per million;
um = micrometers;
T.O.N. = threshold odor number
pCi/L = picocuries per liter (particle activity);
mrem/yr = millirems/yr (annual dose equivalent).

NTU = nepholene turbidity units

APPENDIX E
Potential Contaminant Source Impact Table

The following table is a guide to the potential contaminants associated with particular activities. The activities are grouped by land use categories. These categories include agriculture, commercial, industrial, residential and miscellaneous. In most instances, the potential contaminants are for groundwater and surface water, although for some activities, the threat to one medium (ground water or surface water) might be more of a concern. Also, the potential contaminants for an activity may not be limited to those listed. Often the potential contaminant depends on the specific chemicals and processes being used in the activity.

ABBREVIATIONS FOR POTENTIAL CONTAMINANTS

MP	Microbiological Pathogens: Total/Fecal Coliform, Viruses, Protozoa
NN	Nitrate / Nitrite
VOC	Volatile Organic Compounds
HM	Heavy Metals
M	Metals
SOC	Synthetic Organic Compounds
T	Turbidity
D	Disinfection by product precursors
TO	Taste & Odor precursors
R	Radionuclides (anthropogenic)
PH	Petroleum Hydrocarbons

AGRICULTURAL	**Potential Contaminant**
Animal feedlots	MP, NN, SOC, M
Dairy farms	MP, SOC, NN,
Fertilizer storage or use	SOC, NN
Manure-spreading or storage	MP, NN
Pesticide storage or use	SOC
Silviculture	T, SOC
Slaughterhouses	MP, NN

COMMERCIAL	Potential Contaminant
Airports	VOC, M, HM, PH
Auto repair shops	VOC, HM, PH, M
Bus and Truck terminals	VOC, HM, SOC, PH
Construction areas	VOC, HM, M
Car washes	T, M
Dry cleaners	VOC
Funeral homes	VOC, SOC, MP
Furniture Refinishing	HM, VOC,
Gas/service stations	VOC, PH, M
Golf courses	SOC, NN, T, HM, M
Junk yards	VOC, HM, M, PH
Laundromats	T
Lumber yards	VOC, HM
Medical facilities	VOC, HM, M, SOC, R
On-lot Wastewater Disposal	MP, NN
Paint shops	VOC, HM
Photo processors	VOC, SOC, HM
Printer and Blueprint shops	VOC, SOC, HM,
Railroad tracks and Yards	VOC, SOC, HM, PH
Repair shops(engine, appliances, etc.)	VOC, HM, PH
Research laboratories	VOC, SOC, HM, M
Rust proofers	HM, VOC
Sand and gravel mining/ washing	T, M, VOC, HM

INDUSTRIAL	Potential Contaminant
Asphalt, Coal tar, and Concrete plants	VOC, PH
Chemical manufacture	VOC, SOC, HM, M
Deep Coal Mining	HM, M, T,
Deep Non-coal Mining	M, HM, T
Electronics manufacture	VOC, SOC, HM, M
Electroplaters	VOC, SOC, HM, M
Food processors	HM, VOC, M,
Foundries or Metal fabricators	HM, VOC, PH
Fuel oil distributors	PH, VOC
Hazardous materials storage, treatment and recycling	VOC, SOC
Industrial lagoons and pits	VOC, HM, M
Industrial parks	VOC, SOC, HM, M, PH, O
Jewelry or Metalplating	VOC, HM, M, SOC,
Machine/metalworking shops	VOC, HM, M, SOC
Metal & Drum reconditioning	VOC, HM, M, SOC
Oil and gas wells/production	M, PH, VOC
Oil Refineries	VOC, PH, HM, M
Plastics Manufacturing	PH, VOC, SOC, HM
Power plants	HM, M
RCRA facilities	VOC, SOC
Storage facilities (petroleum and chemical)	VOC, SOC, PH
Surface Coal Mining	T, M, HM
Surface Non-coal Mining	T, M, HM
Tanneries	HM, M, VOC
Wood preserving facilities	SOC, HM
Quarries	T, M, VOC, HM

RESIDENTIAL	Potential Contaminant
Fuel oil storage	VOC, PH
Household hazardous materials	VOC, SOC
Lawn care	SOC, NN, M
On-lot waste disposal	MP, NN
Swimming Pools	VOC

MISCELLANEOUS	Potential Contaminant
Aboveground storage tanks	VOC, PH
Air Pollution/local sources	N, VOC, M
Aquatic animal production	MP, NN
Combined sewer outfalls	VOC, SOC, MP, NN, HM, TO
Composting facilities	TO
Dredge disposal	T, VOC, SOC, M, HM
Drinking water treatment plants	M, T
Fire training facilities	VOC, PH, M, HM
Boating yards and marinas	PH, VOC, SOC
Landfills and Dumps	VOC, HM, SOC, NN, MP, M
Land application of sewage sludge	MP, NN, M, HM
Large quantity hazardous waste generators	VOC, SOC, HM
Military facilities (past and present)	VOC, SOC, HM, R, PH
NPDES locations	MP, NN, HM
Pipelines - petroleum	VOC, PH
Pipelines - sewer	MP, NN, T
Recycling or Reduction facilities	VOC
River barges / shipping	VOC, SOC, PH
Road and Maintenance depots	VOC, SOC, M
Road Salt Storage	M
Small quantity hazardous waste generators	VOC, SOC, HM
Snow dumps	M, T
Stormwater facilities	T, VOC, SOC, NN, M
Transportation corridors	SOC, M, T
Underground petroleum storage tank	VOC
Utility substation	SOC, VOC, HM
Waste incinerators	HM, VOC, SOC
Wastewater treatment plants	D, MP, NN, VOC, SOC, M
Road deicing	M
Abandoned wells	SOC, VOC
Wells/Borehole drilling	SOC, VOC, M, T

Monitoring Well Sampling

Groundwater sampling from private on-lot wells was part of this project. The purpose of the well sampling was to determine general baseline quality of the groundwater that is a source for the public water supply wells. Five of the six Borough wells (Wells 1, 2, 3, 4, and 7) currently have elevated levels of TCE or PCE in the groundwater and treatment systems for these pollutants. No contamination has been identified in Well 6. Thus, monitoring well sites were concentrated solely in the source water area for Well 6.

Monitoring Well Selection

The private wells within the source water area for Well 6 were selected based on well availability, geology, hydrogeology, topography, and the contaminant source inventory. Each of these criteria is discussed below.

Well Availability

The physical well availability was the most limiting factor in the selection of monitoring well sites. The Emmaus Borough was consulted during the selection of the monitoring wells. It was recommended to use the Well Survey Evaluation Summary Report for the Rodale Manufacturing Site, prepared by Geo-Environmental Consultants, Inc (1994). This study area included a 3-mile monitoring well survey, water level collection and groundwater contouring, and water sampling. Two wells from this study (LE312 and UM59) and two additional wells (MW1 and MW2) were chosen.

Geology

Two digital Geologic Maps were consulted for this project. These maps were obtained from the Lehigh Valley Planning Commission, Digital Geographical Data (Release 20 March 2001) and the Geologic Map of Pennsylvania (Arthur A. Socolow, 1980), which was digitized by the PA Topographic and Geologic Survey in 2001.

The Geologic Map from the Lehigh Valley Planning Commission showed Well 6 as being underlain by the Leithsville Formation (carbonate rock). The digital Geologic Map of Pennsylvania showed Well 6 as being underlain by gneiss. Because of the difference in the two maps, the well driller's logs were consulted to determine the geologic formation in which Well 6 was installed. The well drillers log from the construction of Well 6 indicates this well is located in the gneiss.

The potential monitoring wells located in Zone II and Zone III of Well 6 are mapped in the Allentown, Leithsville, Hardyston, and gneiss formations. No well logs or construction details are available for these potential monitoring well locations.

Hydrogeology

Zone I & Zone II

Meiser & Earl completed a Detailed WHPA Delineation for Well 6. Zone II was defined by Meiser & Earl as the area through which water is diverted to the well as determined from a calculated cone of depression. Zone III was defined as the zone of contribution (ZOC) that includes "the natural surface and inferred groundwater drainage area contributing water to this well." Therefore, the boundary of the ZOC is based on the topographic divide.

These two zones are critical in the location of monitoring wells. Monitoring well locations were therefore confined to the interior boundaries of these two zones. The location of monitoring wells within Zone II was critical since groundwater from this zone may contribute to the well during pumping.

Groundwater Flow Direction

The groundwater flow direction in the vicinity of Well 6 was also taken into consideration during the selection of monitoring well locations. Meiser & Earl determined the water table gradient of approximately 0.0007 toward the northwest. Geo-Environmental Consultants, Inc. found the groundwater flow direction in the vicinity of Well 6 to be north-northwest.

Based upon these groundwater flow vectors, BIA determined the greatest potential for impact to Well 6 was from sources located to the south-southeast.

Groundwater Flow Velocity

Meiser & Earl calculated the groundwater flow velocity near Well 6 to be 28 ft./day or 200 ft./week. Monitoring wells were spaced 2,000 to 6,500 feet up-gradient of Well 6. These distances will provide a reasonable amount of time for action if a spill occurs or if contaminants are detected to the south (upgradient) of Well 6.

Final Well Selection

Four monitoring wells were chosen to provide baseline water quality data of the groundwater in Zone II and Zone III of Well 6 (see Figure 11). Three wells, named MW-1, MW-2, and UM59, were selected in Zone II. These wells are privately owned and used for domestic consumption.

MW-1 and UM59 are located along the water gap (and preferential fracture trace orientation) in South Mountain. It is expected that radial flow from the western and eastern ridges of South Mountain will flow toward this water gap and into Leibert Creek. MW-2 is located approximately 2,000 feet west of Leibert

Creek, toward the base of the ridge. Thus, these three wells will provide general water quality data from a very large source area located within Zone II.

An abandoned junkyard is located southeast of Well 6. MW-1 is the closest available monitoring well near the abandoned junkyard; no monitoring wells exist between it and Well 6. MW-2 is located down-gradient of the A.P. Houser landfill site. UM59 is located down-gradient of the former township landfill. These wells are expected to act as sentinel wells for potential contaminants migrating from these sites toward Well 6. UM59 showed a trace level of Toluene (0.1 ug/l) during the 8/3/93 sampling conducted by Geo-Environmental Consultants, Inc. for the Rodale Manufacturing Site.

LE312 is located in Zone III and is located at the greatest distance (6,500 feet) from Well 6. This well will provide a monitoring location for potential contaminants migrating from Zone III towards the cone of depression of Well 6 (Zone II). This well is also down-gradient of the Hydrex Auto Repair Shop and failing septic systems near Vera Cruz.

Potential contamination of Well 6 from Route 476 and the industrial area near Well 3 is of concern. Unfortunately, no wells are located between Well 6 and Route 476 or between Well 6 and Well 3 to act as sentinels.

Water Quality Analysis

Influence of Geology

As stated in the geology section, no well logs or construction details are available for the monitoring wells. However, knowing the type of formation(s) in which the monitoring wells are located is a key factor in making conclusions regarding groundwater flow and contaminant transport. Geochemical analysis of the water for secondary parameters can be correlated with the type of geologic formation from which this water originates. The results of the analysis will be compared with "Median Concentrations in Groundwater from the Carbonate and Non-Carbonate Rock Aquifers" discussed in the Water Resources Report of Lehigh County, Report 31.

Contaminant Source Inventory

Seven potential contaminant sources were identified within Zone II and Zone III of Well 6:

- an abandoned junkyard, located at 1267 Tilghman Street, potential source of petroleum products and metals

- the former Upper Milford Twp. Landfill, located on Quarry Road, potential source of petroleum products and metals
- the A.P. Houser Landfill, located south of Mill Road, potential source of petroleum products and metals
- Rinker Enterprises, located at 5093 Vera Cruz Rd., potential source of petroleum products
- Hasik Auto Body Shop, located at 3295 Main Road in Vera Cruz, potential source of petroleum products and metals
- Hydrex Auto Repair Shop, located at the corner of Main Road and Vera Cruz Road, potential source of petroleum products and metals
- Village of Vera Cruz, which has known failing septic systems, potential source of microbacterial contaminants

These potential contaminant sites should be monitored carefully because Well 6 is currently uncontaminated.

New Source Requirements

The PA DEP new source sampling requirements were used as a guide in determining the parameters to be analyzed in the monitoring well samples. The new source requirements include VOCs, IOCs (inorganic compounds, including metals), SOCs, microbiological contaminants, radionuclides, and 14 secondary parameters.

Final Parameter Selection

The sampling parameters were chosen based upon geochemistry, contaminant source inventory, the new source sampling requirements, and the allotted budget. The sampling parameters included:

- Primary contaminants – parameters that pose a potential health risk when the levels are above the drinking water standard.
- VOCs – There is known VOC contamination in the other five Borough water supply wells.
- IOCs – There is the potential for metals contamination from some of the identified contaminant source inventory sites.
- Microbiological contaminants – There is the potential for bacterial contamination of the well water from failing septic systems.
- Secondary contaminants – are non-enforceable federal guidelines regarding substances in drinking water that may cause discoloration, corrosion, off tastes, or odors.

SOC's were not analyzed because there is little to no source area (farming) in Zone II and Zone III. Radionuclides were not analyzed because their source is naturally occurring in the bedrock and soils. Potential contamination from radionuclides cannot be controlled via wellhead protection.

Groundwater Quality/Analytical Sampling

Water Samples were collected and analyzed as part of this project to provide a cursory review of the baseline water quality up-gradient of Well No. 6. Four wells, MW-1, MW-2, UM59, and LE312, were selected by BIA for sampling. The well water samples were collected on February 11, 2003, by an Emmaus Borough employee. There has been known VOC contamination in other Borough water supply wells. Therefore, the samples collected were analyzed for the parameters listed under Regulated VOC's, Metals, Wet Chemicals, Free Cyanide, and Coliform. Analytical services were provided by Blue Marsh Laboratories, Inc. in Douglasville, Pennsylvania (PA DEP #06-409).

Analytical results were compared to the PA DEP's, Division of Drinking Water Management, Maximum Contaminant Levels (MCLs), dated January of 2002, and The Environmental Protection Agency, Current Drinking Water Residual Standards, List of Contaminants & Their MCLs, dated July of 2002 (Updated May 27, 2003).

Historic Well Sampling

Previous well samples were also collected from wells UM 59 and LE 312. These samples were collected in August of 1993. The samples collected in 1993 were analyzed for some of the same parameters as the February 2003 sampling event. Therefore, the previous groundwater samples have also been compared to the current state defined MCLs.

- Antimony was detected at 0.0097 mg/L in well UM 59. This detection level was above the current state defined MCL. However, the most recent sample collected and analyzed from the same well (UM 59) has revealed that the antimony levels were no longer detected at the laboratories practical quantitative limit.

- The groundwater sample collected from LE 312 in August of 1993 yielded pH levels of 5.88, which is beyond the current "reasonable goal for drinking water quality."

Published Groundwater Quality Information

Although no well logs or construction details are available for the selected monitoring well locations, knowing the type of formations in which the monitoring wells are completed is essential in formulating conclusions regarding groundwater contamination. GeoChemical analysis of the water for secondary parameters can be correlated with the type of geological formation from which the water originates.

Therefore, the analytical results have been compared with the "Medium Concentrations in Groundwater from Carbonate and Non-Carbonate Rock Aquifers" discussed in the Water Resources Report of Lehigh County, Report 31.

This is a cursory qualitative comparison to the general "types of water" and should not be considered as a hydro chemical facies match.

Well MW-2

The geologic mapping compiled by the PA Geologic Survey, 2001, has indicated that well MW-2 is located in the Felsic to Mafic Gneiss Formation. The Water Resources Report states that water from the majority of the wells located in the Reading Prong, containing geologic formations such as granite gneiss and felsic to mafic gneiss, will meet the US Public Health Service drinking water standards. Bacterial pollution is generally not a problem in this geologic formation, and the groundwater is generally quite low in dissolved solids. However, high iron concentrations are identified as a problem in the groundwater yielded from these aquifers.

Well MW-1

The geologic mapping compiled by the PA Geologic Survey, 2001, has indicated that well MW-1 is located in the Leithsville geologic formation. The Water Resources Report denotes that groundwater yielded from aquifers in the Leithsville formation (carbonate-rock) has relatively high levels of hardness and relatively high concentrations of Total Dissolved Solids (TDS). The Water Resources Report states that "approximately 15 to 20 percent of the water supplies obtained from carbonate rocks exceeds the US Public Health Service (1962) recommended limits for iron and manganese." Bacterial pollution is generally not a problem in this geologic formation.

Wells LE312 and UM59

The geologic mapping compiled by the PA Geologic Survey, 2001, has indicated that wells LE312 and UM59 are located along the border of the Allentown Formation and the Hardyston Formation. The report states that water from the Allentown and the Hardyston Formations will meet the US Public Health Service drinking water standards. Bacterial pollution is generally not a problem in these geologic formations. The groundwater may range from very low to relatively high concentrations of TDS. Iron and manganese concentrations may be identified as a problem in the groundwater yielded from these aquifers.

Analytical Sampling

The samples collected were analyzed for parameters listed under Secondary Contaminants and Primary Contaminants, which includes VOCs, Inorganic Chemicals, and Microbiological Contaminants.

Parameters Detected Above the MCL

- MW-1 – Thallium was detected as 0.015 mg/L, which is over the statewide MCL of 0.002 mg/L.
- MW-2 – Antimony and thallium were detected in the groundwater sample at 0.01 mg/L and 0.056 mg/L, respectively. These detection levels were greater than the statewide maximum contaminant levels of 0.006 mg/L and 0.002 mg/L, respectively.
- UM59 – No parameters were detected at levels greater than that statewide maximum contaminant levels.
- LE312 – No parameters were detected at levels greater than the statewide maximum contaminant levels, excluding the pH level.
- The pH levels in three of the wells, MW 1 (6.48), MW 2 (5.52), and LE 312 (6.16), were outside the "reasonable goal for drinking water quality" of 6.5-8.5, set by the PA DEP.

Parameters Detected at Levels Near the MCL

- Lead was detected in three of the groundwater well samples. The detection levels are as follows: MW-1 (0.007 mg/L), MW-2 (0.014 mg/L), and UM 59 (0.012 mg/L). These levels were below the action level set by the EPA, which is 0.015 mg/L.
- Iron was detected in two of the groundwater well samples: MW-1 (0.039 mg/L) and MW-2 (0.21 mg/L). The state defined MCL for iron is 0.3 mg/L.

The remainder of the parameters were either non-detectable at the laboratories practical quantitative limit or were detected at levels significantly below the statewide and national MCLs. A summary of the detected parameters can be found in the attached table labeled "Groundwater Sampling Analysis Results." The complete Laboratory Certificates of Analysis and the Chain of Custody and a copy of the EPA's List of Contaminants & Their MCLs can also be found with this report.

Conclusions

The quality of the well water sampled in wells MW-2, LE312, and UM59 generally follows the water quality described in the Water Resources Report of Lehigh County (Wood et. al.). However, the quality of water sampled in well MW-1 did not correlate with the Water Resources Report. The report also notes that bacterial pollution is not a serious problem in the geologic formations. All of the wells, excluding UM59, were positive for total coliforms but they were negative for E. Coli (fecal coliforms). In conclusion, analysis of the well water samples collected concurs with the Wood *et al.*, Water Resources Report, regarding bacterial pollution.

Based on the well sampling that has been completed to date, three RCRA metals, arsenic, barium, and lead, have been found in the groundwater. Barium has been detected in every well sample. Lead has been detected in every sample, excluding LE312, and arsenic has been detected in the MW-1 well sample. The levels at which the RCRA metal contaminants were detected are below the stated defined MCL. However, lead has been detected at levels extremely close to the MCL in two of the wells.

Iron was detected in two of the groundwater well samples at levels below the state defined MCL. However, antimony and thallium have been detected at levels above the state defined MCL. The Water Resources Report indicated that high iron concentrations may be expected in the groundwater form the underlying geologic formations; however, it does not indicate typical concentrations or primary contaminants, such as antimony and thallium; although, all of the metals previously discussed (arsenic, barium, lead, iron, antimony, and thallium) are naturally occurring in the bedrock and soils on-site. Corrosion of household plumbing systems is another common source of lead contamination in drinking water.

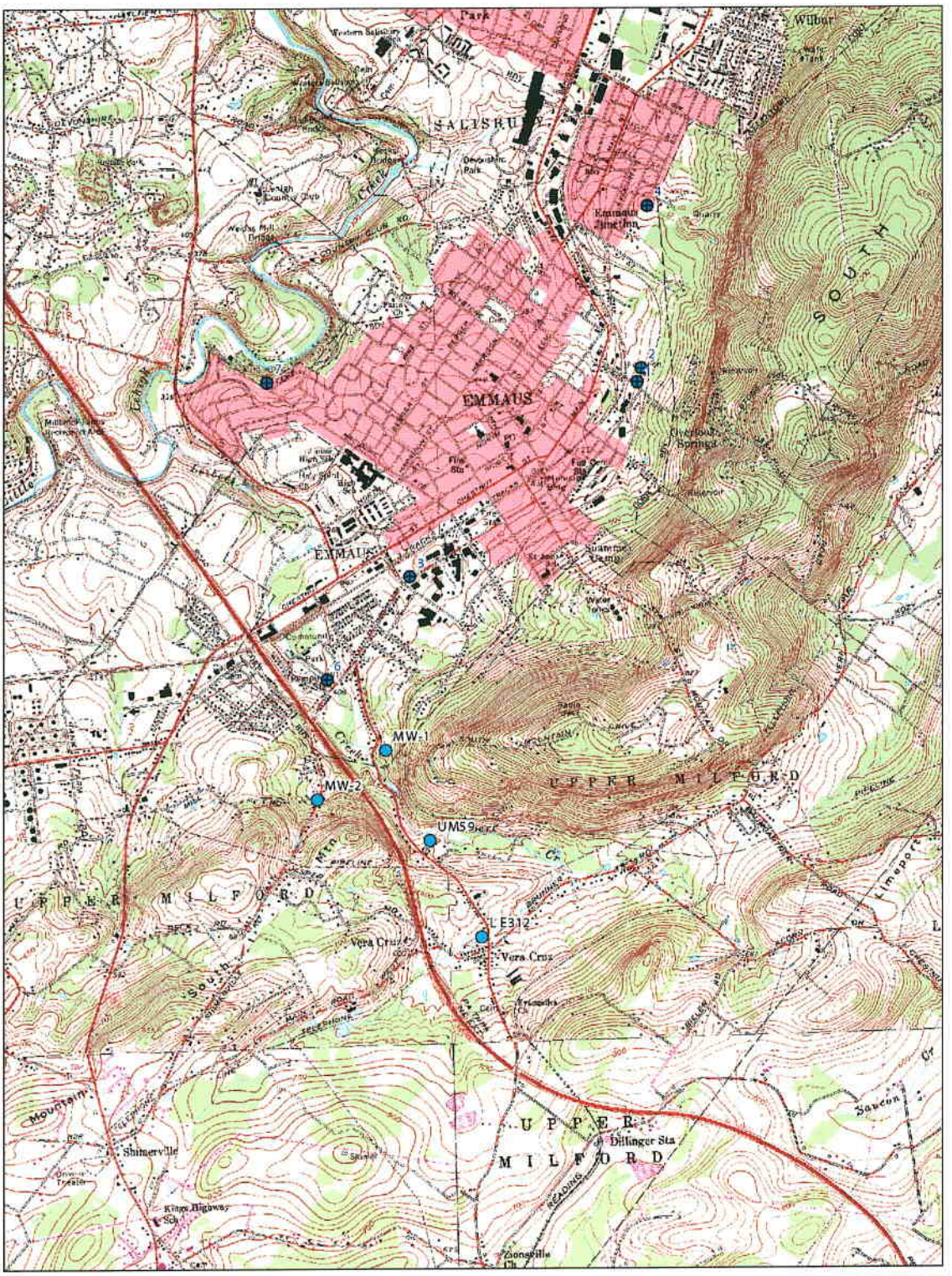
Based upon the comparisons of the analytical results and the compiled contaminant data, it has been determined that the groundwater quality is generally good, with some slightly elevated metals and low pH concentrations.

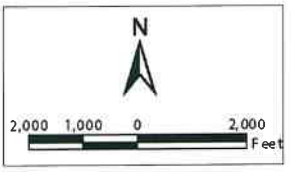
Recommendations

Based on the compiled data, BIA recommends additional groundwater sampling on all of the monitoring wells for the analysis of Inorganic Chemicals (Metals) and Secondary Parameters, excluding Well LE312.

- MW-1 and MW-2 should be re-sampled and analyzed for the list of total primary metals, copper, and lead. Two metals (antimony and thallium) were detected above the state MCL in February 2003.
- UM-59 should be re-sampled and analyzed for lead and copper. Lead was detected near the state MCL in February 2003.
- To build a database of water quality data from UM-59 and LE-312, periodically collect samples from both these wells for the list of total primary metals, copper, and lead. Consider sampling for the full list of VOCs; although, no VOCs were detected above the state MCL in the 1993 Rodale sampling or the February 2003 sampling, VOCs are the primary contaminant found in the public supply wells and throughout the Borough.
- Monitoring the Rodale Manufacturing/Square-D Superfund Site. All reports generated by the Rodale Manufacturing/Square-D Superfund site should be reviewed by a qualified individual on behalf of the Borough of Emmaus. The Superfund site, along with other unknown sources, is known to have contaminated groundwater within the Borough and

impacted six of seven public supply wells. Monitoring of these reports will reveal trends of migration of the contaminants, with particular attention to potential migration towards Well 6, which is currently uncontaminated.





Legend

- Emmaus Wells
- Private Monitoring Wells

USGS Topographic Map: Allentown East, Allentown West, East Greenville and Milford Square Quadrangles

Layout created by Barry Isset & Associates, 2003

Figure 11: Private Monitoring Well Locations

BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors
855 Route 100 & Kressler Lane
Trexlertown, PA 18087-0147
610-398-0904

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Fax: (609) 924-9692

NJ DEP Cert #11198

- CERTIFICATE OF ANALYSIS -

LAB #: 31363-1

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW 1 - 1490 Pennsylvania Ave.

Received: 2/12/03

Sample Type: Water
Sample ID: 21 Reg. VOCs.
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Vol-524.2-aq							
1,1,1-Trichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,1,2-Trichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,1-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2,4-Trichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichloropropane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
[illegible]chlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Benzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Carbon tetrachloride	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Chlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
cis-1,2-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Dichloromethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Ethyl benzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Styrene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Tetrachloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Toluene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
trans-1,2-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Trichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Vinyl chloride	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Xylenes	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59

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- CERTIFICATE OF ANALYSIS -

LAB #: 31363-2

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW 1 - 1490 Pennsylvania Ave.

Received: 2/12/03

Sample Type: Water
Sample ID: Metals
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Met-200.7-aq							
Aluminum	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Antimony	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Arsenic	0.01		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Barium	0.029		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Beryllium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Cadmium	< 0.001		mg/L	0.001	200.7	KJP-DV	2/14/03 12:30
Chromium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
[illegible]er	0.031		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Iron	0.039		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Lead	0.007		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Manganese	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Nickel	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Selenium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Silver	< 0.001		mg/L	0.001	200.7	KJP-DV	2/14/03 12:30
Thallium	0.015		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Zinc	0.055		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Met-245.1-aq							
Mercury	< 0.0002		mg/L	0.0002	245.1	KJP-DV	2/18/03 14:30
WC-130.2-aq							
Hardness (Total as CaCO3)	24.		mg/L	2	130.2	DJC-DV	2/13/03 9:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31363-3

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW 1 - 1490 Pennsylvania Ave.

Received: 2/12/03

Sample Type: Water
Sample ID: Wet Chem
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
WC-110.1-aq							
Color	8.		Pt-Co	4	110.1	MA-DV	2/12/03 13:15
WC-150.1-aq							
pH	6.48		s.u.	0.01	150.1	MA-DV	2/12/03 8:30
WC-160.1-aq							
Total Dissolved Solids (TDS)	60.		mg/L	10	160.1	MA-DV	2/12/03 9:00
WC-310.1-aq							
Alkalinity	28.		mg/L	2	310.1	SMS-DV	2/20/03 9:00
WC-325.1-aq							
Chloride	0.8		mg/L	0.1	325.1	JG-DV	2/13/03 9:45
WC-340.1-aq							
Fluoride	0.4		mg/L	0.1	352.1	JG-DV	2/13/03 9:45
WC-352.1-aq							
Nitrate as N	2.		mg/L	0.5	354.1	JG-DV	2/13/03 9:45
WC-354.1-aq							
Nitrite as N	0.27		mg/L	0.01	375.1	JG-DV	2/13/03 9:45
WC-375.1-aq							
Sulfate	1.5		mg/L	0.2	300.0	JG-DV	2/13/03 9:45
WC-425.1-aq							
Surfactants (MBAS)	< 0.02		mg/L	0.02	425.1	KSF-DV	2/13/03 8:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31363-4

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW 1 - 1490 Pennsylvania Ave.

Received: 2/12/03

Sample Type: Water
Sample ID: Free CN
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
WC-335.1-aq							
Cyanide	< 0.009		mg/L	0.009	335.1	KSF-DV	2/20/03 10:30

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LAB #: 31363-5

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW 1 - 1490 Pennsylvania Ave.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq							
E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
Total Coliform	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31363-6

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW 1 - 1490 Pennsylvania Ave.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq							
E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
Total Coliform	Presence		CFU		SM9221D	TAL-DV	2/12/03 15:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31363-7

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW 1 - 1490 Pennsylvania Ave.

Received: 12/30/99

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: December 30, 1999
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract	Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq								
	E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
	Total Coliform	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30

Reviewed and Approved by;

Debbie Wanner
Laboratory Manager

< - indicates the result was non-detect or a result below the laboratories reporting detection limit
D - indicates the sample was diluted
J - indicates an estimated value between the method detection limit and the practicle quantitation limit for the analyte
E - indicates an estimated value outside of the calibration range of the analysis
B - indicates that the analyte was found in the method blank associated with the sample
T - indicates that the sample was analyzed out of hold
I - indicates that there was matrix interference
Q - indicates that the sample was analyzed without all quality control being in compliance
H - exceeds permit limit

DV - in the 'Init' column indicates that the sample was analyzed at our Douglassville, PA facility
PR - in the 'Init' column indicates that the sample was analyzed at our Princeton, NJ facility
SB - in the 'Init' column indicates that the sample was analyzed at a sub-contracted laboratory

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- CERTIFICATE OF ANALYSIS -

LAB #: 31362-1

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW-2 4191 Shimerville Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: 21 Reg. VOCs.
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Vol-524.2-aq							
1,1,1-Trichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,1,2-Trichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,1-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2,4-Trichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichloropropane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,3-Dichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Benzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Carbon tetrachloride	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Chlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
cis-1,2-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Dichloromethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Ethyl benzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Styrene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Tetrachloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Toluene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
trans-1,2-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Trichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Vinyl chloride	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Xylenes	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59

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- CERTIFICATE OF ANALYSIS -

LAB #: 31362-2

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW-2 4191 Shimerville Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Metals
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Met-200.7-aq							
Aluminum	0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Antimony	0.01		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Arsenic	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Barium	0.154		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Beryllium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Cadmium	< 0.001		mg/L	0.001	200.7	KJP-DV	2/14/03 12:30
Chromium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Copper	0.159		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Iron	0.21		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Lead	0.014		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Manganese	0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Nickel	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Selenium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Silver	< 0.001		mg/L	0.001	200.7	KJP-DV	2/14/03 12:30
Thallium	0.056		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Zinc	0.024		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Met-245.1-aq							
Mercury	< 0.0002		mg/L	0.0002	245.1	KJP-DV	2/18/03 14:30
WC-130.2-aq							
Hardness (Total as CaCO3)	112.		mg/L	2	130.2	DJC-DV	2/13/03 9:30

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Princeton Location:
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- CERTIFICATE OF ANALYSIS -

LAB #: 31362-3

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW-2 4191 Shimerville Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Wet Chem
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
WC-110.1-aq							
Color	4.		Pt-Co	4	110.1	MA-DV	2/12/03 13:15
WC-150.1-aq							
pH	5.52		s.u.	0.01	150.1	MA-DV	2/12/03 8:30
WC-160.1-aq							
Total Dissolved Solids (TDS)	222.		mg/L	10	160.1	MA-DV	2/12/03 9:00
WC-310.1-aq							
Alkalinity	24.		mg/L	2	310.1	SMS-DV	2/20/03 9:00
WC-325.1-aq							
Chloride	76.		mg/L	2	352.1	JG-DV	2/13/03 9:45
WC-340.1-aq							
Fluoride	0.6		mg/L	0.1	300.0	JG-DV	2/13/03 9:45
WC-352.1-aq							
Nitrate as N	3.8		mg/L	0.5	354.1	JG-DV	2/13/03 9:45
WC-354.1-aq							
Nitrite as N	< 0.01		mg/L	0.01	375.1	JG-DV	2/13/03 9:45
WC-375.1-aq							
Sulfate	38.7		mg/L	0.2	340.1	JG-DV	2/13/03 9:45
WC-425.1-aq							
Surfactants (MBAS)	< 0.02		mg/L	0.02	425.1	KSF-DV	2/13/03 8:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31362-4

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW-2 4191 Shimerville Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Free CN
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
WC-335.1-aq							
Cyanide	< 0.009		mg/L	0.009	335.1	KSF-DV	2/20/03 10:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31362-5

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW-2 4191 Shimerville Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq							
E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
Total Coliform	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31362-6

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: MW-2 4191 Shimerville Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq							
E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
Total Coliform	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31362-7

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn: Jeff Clapper

Project: MW-2 4191 Shimerville Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Dick Krauss
Collected: February 11, 2003
Source:
Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq							
E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
Total Coliform	Presence		CFU		SM9221D	TAL-DV	2/12/03 15:30

Reviewed and Approved by;

Debbie Wanner
Laboratory Manager

< - indicates the result was non-detect or a result below the laboratories reporting detection limit
D - indicates the sample was diluted
J - indicates an estimated value between the method detection limit and the practicle quantitation limit for the analyte
E - indicates an estimated value outside of the calibration range of the analysis
B - indicates that the analyte was found in the method blank associated with the sample
T - indicates that the sample was analyzed out of hold
I - indicates that there was matrix interference
Q - indicates that the sample was analyzed without all quality control being in compliance
H - exceeds permit limit

DV - in the 'Init' column indicates that the sample was analyzed at our Douglassville, PA facility
PR - in the 'Init' column indicates that the sample was analyzed at our Princeton, NJ facility
SB - in the 'Init' column indicates that the sample was analyzed at a sub-contracted laboratory

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- CERTIFICATE OF ANALYSIS -

LAB #: 31364-1

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: UM 59 4819 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: 21 Reg. VOCs.
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: March 05, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Vol-524.2-aq							
1,1,1-Trichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,1,2-Trichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,1-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2,4-Trichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichloropropane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,3-Dichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Benzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Carbon tetrachloride	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Chlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
cis-1,2-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Dichloromethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Ethyl benzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Styrene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Tetrachloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Toluene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
trans-1,2-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Trichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Vinyl chloride	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Xylenes	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59

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- CERTIFICATE OF ANALYSIS -

LAB #: 31364-2

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: UM 59 4819 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Metals
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: March 05, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Met-200.7-aq							
Aluminum	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Antimony	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Arsenic	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Barium	0.044		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Beryllium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Cadmium	< 0.001		mg/L	0.001	200.7	KJP-DV	2/14/03 12:30
Chromium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Copper	0.017		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Iron	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Lead	0.012		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Manganese	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Nickel	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Selenium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Silver	< 0.001		mg/L	0.001	200.7	KJP-DV	2/14/03 12:30
Thallium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Zinc	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Met-245.1-aq							
Mercury	< 0.0002		mg/L	0.0002	245.1	KJP-DV	2/18/03 14:30
WC-130.2-aq							
Hardness (Total as CaCO3)	198.		mg/L	2	130.2	DJC-DV	2/13/03 9:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31364-3

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: UM 59 4819 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Wet Chem
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: March 05, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
WC-110.1-aq							
Color	< 4.		Pt-Co	4	110.1	MA-DV	2/12/03 13:15
WC-150.1-aq							
pH	7.51		s.u.	0.01	150.1	MA-DV	2/12/03 8:30
WC-160.1-aq							
Total Dissolved Solids (TDS)	248.		mg/L	10	160.1	MA-DV	2/12/03 9:00
-310.1-aq							
Alkalinity	152.		mg/L	2	310.1	SMS-DV	2/20/03 9:00
WC-325.1-aq							
Chloride	12.1		mg/L	2.0	352.1	JG-DV	2/13/03 9:45
WC-340.1-aq							
Fluoride	0.4		mg/L	0.1	354.1	JG-DV	2/13/03 9:45
WC-352.1-aq							
Nitrate as N	3.8		mg/L	0.5	340.1	JG-DV	2/13/03 9:45
WC-354.1-aq							
Nitrite as N	< 0.01		mg/L	0.01	325.1	JG-DV	2/13/03 9:45
WC-375.1-aq							
Sulfate	28.3		mg/L	0.2	300.0	JG-DV	2/13/03 9:45
WC-425.1-aq							
Surfactants (MBAS)	< 0.02		mg/L	0.02	425.1	KSF-DV	2/13/03 8:30

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LAB #: 31364-4

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: UM 59 4819 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Free CN
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: March 05, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Free Cyanide							
Free Cyanide	< 0.01		mg/L	0.01	SM4500 CNI	KSF-DV	2/20/03 10:30

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LAB #: 31364-5

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: UM 59 4819 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: March 05, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq							
E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
Total Coliform	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30

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LAB #: 31364-6

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: UM 59 4819 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: March 05, 2003

Abstract	Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq								
	E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
	Total Coliform	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31364-7

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: UM 59 4819 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: March 05, 2003

Abstract	Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq								
	E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
	Total Coliform	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30

Reviewed and Approved by;

Debbie Wanner
Laboratory Manager

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D - indicates the sample was diluted
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E - indicates an estimated value outside of the calibration range of the analysis
B - indicates that the analyte was found in the method blank associated with the sample
T - indicates that the sample was analyzed out of hold
I - indicates that there was matrix interference
Q - indicates that the sample was analyzed without all quality control being in compliance
H - exceeds permit limit

DV - in the 'Init' column indicates that the sample was analyzed at our Douglassville, PA facility
PR - in the 'Init' column indicates that the sample was analyzed at our Princeton, NJ facility
SB - in the 'Init' column indicates that the sample was analyzed at a sub-contracted laboratory

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NJ DEP Cert #11198

- CERTIFICATE OF ANALYSIS -

LAB #: 31365-1

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: LE 312 5202 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: 21 Reg. VOCs.
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Vol-524.2-aq							
1,1,1-Trichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,1,2-Trichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,1-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2,4-Trichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
1,2-Dichloroethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
[illegible] Dichloropropane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
[illegible] Dichlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Benzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Carbon tetrachloride	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Chlorobenzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
cis-1,2-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Dichloromethane	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Ethyl benzene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Styrene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Tetrachloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Toluene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
trans-1,2-Dichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Trichloroethene	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Vinyl chloride	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59
Xylenes	< 0.5		ug/L	0.5	524.2	DRA-DV	2/15/03 1:59

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Douglassville Location:
1605 Benjamin Franklin Highway
Douglassville, PA 19518
Phone: (610) 327-8196
Fax: (610) 327-6864

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NY LAB ID NO.: 11828
PA DEP Cert #06-409

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LABORATORIES • INC

Professional testing for the critical decision

Princeton Location:
267 Wall Street
Princeton, NJ 08540
Phone: (609) 924-5151
Fax: (609) 924-9692

NJ DEP Cert #11198

- CERTIFICATE OF ANALYSIS -

LAB #: 31365-2

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: LE 312 5202 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Metals
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Met-200.7-aq							
Aluminum	0.009		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Antimony	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Arsenic	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Barium	0.086		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Beryllium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Cadmium	< 0.001		mg/L	0.001	200.7	KJP-DV	2/14/03 12:30
Chromium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Copper	0.266		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Iron	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Lead	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Manganese	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Nickel	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Selenium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Silver	< 0.001		mg/L	0.001	200.7	KJP-DV	2/14/03 12:30
Thallium	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Zinc	< 0.005		mg/L	0.005	200.7	KJP-DV	2/14/03 12:30
Met-245.1-aq							
Mercury	< 0.0002		mg/L	0.0002	245.1	KJP-DV	2/18/03 14:30
WC-130.2-aq							
Hardness (Total as CaCO3)	20.		mg/L	2	130.2	DJC-DV	2/13/03 9:30

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NY LAB ID NO.: 11828
PA DEP Cert #06-409

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Phone: (609) 924-5151
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NJ DEP Cert #11198

- CERTIFICATE OF ANALYSIS -

LAB #: 31365-3

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: LE 312 5202 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Wet Chem
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
WC-110.1-aq							
Color	< 4.		Pt-Co	4	110.1	MA-DV	2/12/03 13:15
WC-150.1-aq							
pH	6.16		s.u.	0.01	150.1	MA-DV	2/12/03 8:30
WC-160.1-aq							
Total Dissolved Solids (TDS)	86.		mg/L	10	160.1	MA-DV	2/12/03 9:00
WC-310.1-aq							
Alkalinity	24.		mg/L	2	310.1	SMS-DV	2/20/03 9:00
WC-325.1-aq							
Chloride	1.8		mg/L	0.1	340.1	JG-DV	2/13/03 9:45
WC-340.1-aq							
Fluoride	< 0.1		mg/L	0.1	352.1	JG-DV	2/13/03 9:45
WC-352.1-aq							
Nitrate as N	1.2		mg/L	0.5	354.1	JG-DV	2/13/03 9:45
WC-354.1-aq							
Nitrite as N	0.26		mg/L	0.01	325.1	JG-DV	2/13/03 9:45
WC-375.1-aq							
Sulfate	1.8		mg/L	0.1	300.0	JG-DV	2/13/03 9:45
WC-425.1-aq							
Surfactants (MBAS)	< 0.02		mg/L	0.02	425.1	KSF-DV	2/13/03 8:30

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- CERTIFICATE OF ANALYSIS -

LAB #: 31365-4

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: LE 312 5202 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Free CN
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
WC-335.1-aq							
Cyanide	< 0.009		mg/L	0.009	335.1	KSF-DV	2/20/03 10:30

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1605 Benjamin Franklin Highway
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- CERTIFICATE OF ANALYSIS -

LAB #: 31365-5

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: LE 312 5202 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract	Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq								
	E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
	Total Coliform	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30

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Fax: (609) 924-9692

NJ DEP Cert #11198

- CERTIFICATE OF ANALYSIS -

LAB #: 31365-6

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: LE 312 5202 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract	Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq								
	E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
	Total Coliform	Presence		CFU		SM9221D	TAL-DV	2/12/03 15:30

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Douglassville Location:
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Douglassville, PA 19518
Phone: (610) 327-8196
Fax: (610) 327-6864

NJ DEP Cert #PA925
NY LAB ID NO.: 11828
PA DEP Cert #06-409

Blue Marsh
LABORATORIES • INC
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Princeton Location:
267 Wall Street
Princeton, NJ 08540
Phone: (609) 924-5151
Fax: (609) 924-9692

NJ DEP Cert #11198

- CERTIFICATE OF ANALYSIS -

LAB #: 31365-7

Client: Emmaus Borough
28 South 4th Street
Emmaus, PA 18049

Attn:

Project: LE 312 5202 Vera Cruz Rd.

Received: 2/12/03

Sample Type: Water
Sample ID: Coliform
Collected By: Emmaus Boro
Collected: February 11, 2003
Source:

Print Date: July 07, 2004
Report Date: February 26, 2003

Abstract	Test	Result	Qls	Units	MDL/PQL	Method	Init	Analysis Date
Mic-SM9221D-aq								
	E. coli	Absence		CFU		SM9221D	TAL-DV	2/12/03 15:30
	Total Coliform	Presence		CFU		SM9221D	TAL-DV	2/12/03 15:30

Reviewed and Approved by;

Debbie Wanner
Laboratory Manager

< - indicates the result was non-detect or a result below the laboratories reporting detection limit
D - indicates the sample was diluted
J - indicates an estimated value between the method detection limit and the practicle quantitation limit for the analyte
E - indicates an estimated value outside of the calibration range of the analysis
B - indicates that the analyte was found in the method blank associated with the sample
T - indicates that the sample was analyzed out of hold
I - indicates that there was matrix interference
Q - indicates that the sample was analyzed without all quality control being in compliance
H - exceeds permit limit

DV - in the 'Init' column indicates that the sample was analyzed at our Douglassville, PA facility
PR - in the 'Init' column indicates that the sample was analyzed at our Princeton, NJ facility
SB - in the 'Init' column indicates that the sample was analyzed at a sub-contracted laboratory

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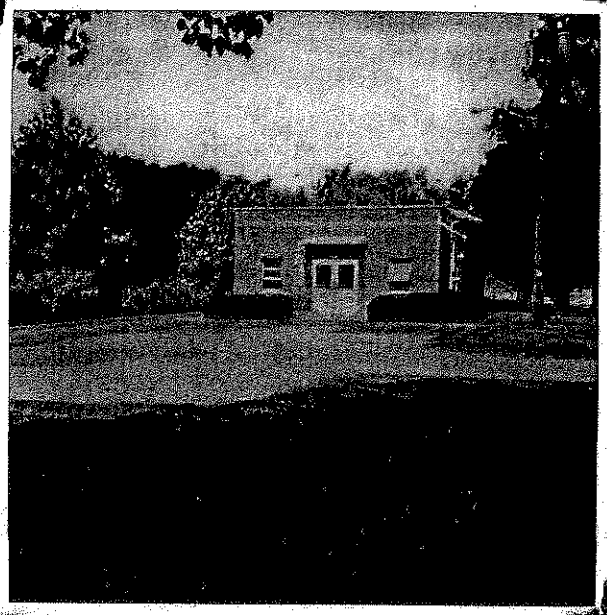
BOROUGH OF EMMAUS
WATER DEPARTMENT
28 SOUTH FOURTH STREET
EMMAUS, PA 18049-3802

PLAN FOR
EMMAUS WELL NO. 6
SURFACE WATER IDENTIFICATION PROTOCOL



Prepared by: Daniel A. DeLong
Public Works Coordinator
Waterworks Operator Certificate No. W681
August 1, 1997

BOROUGH OF EMMAUS
WELL NO. 6

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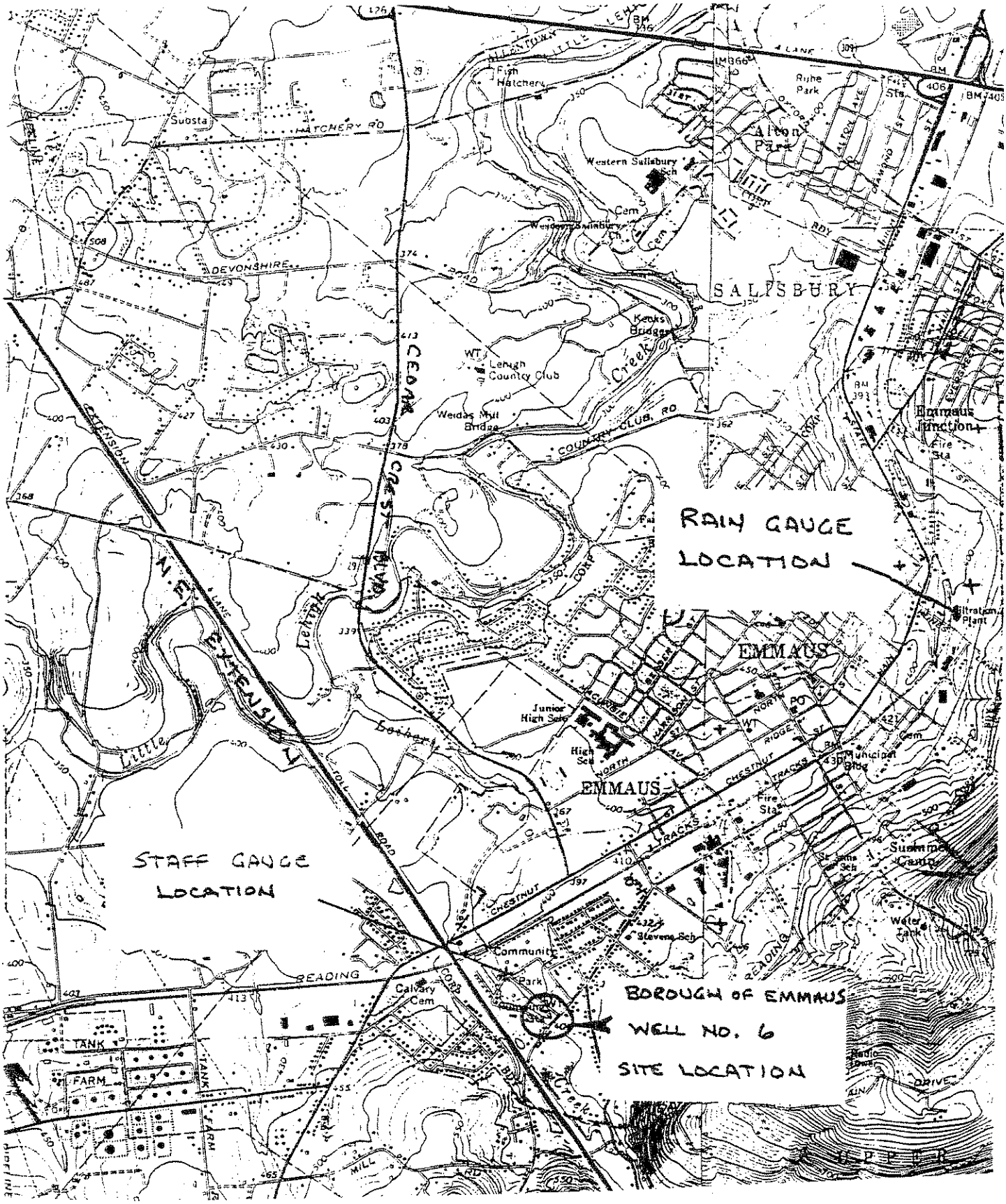
BOROUGH OF EMMAUS
WELL NO. 6
SUMMARY

In accordance with the requirements of the Pennsylvania Safe Drinking Water Act (35 P.S.§721.1 et. Seq.) and regulation at 25 PA. Code Chapter 109, the Borough of Emmaus submits this plan for special surface water identification protocol monitoring. The plan was prepared by the Borough's Public Works Coordinator Daniel A. DeLong, who is a certified water works operator and registered professional land surveyor.

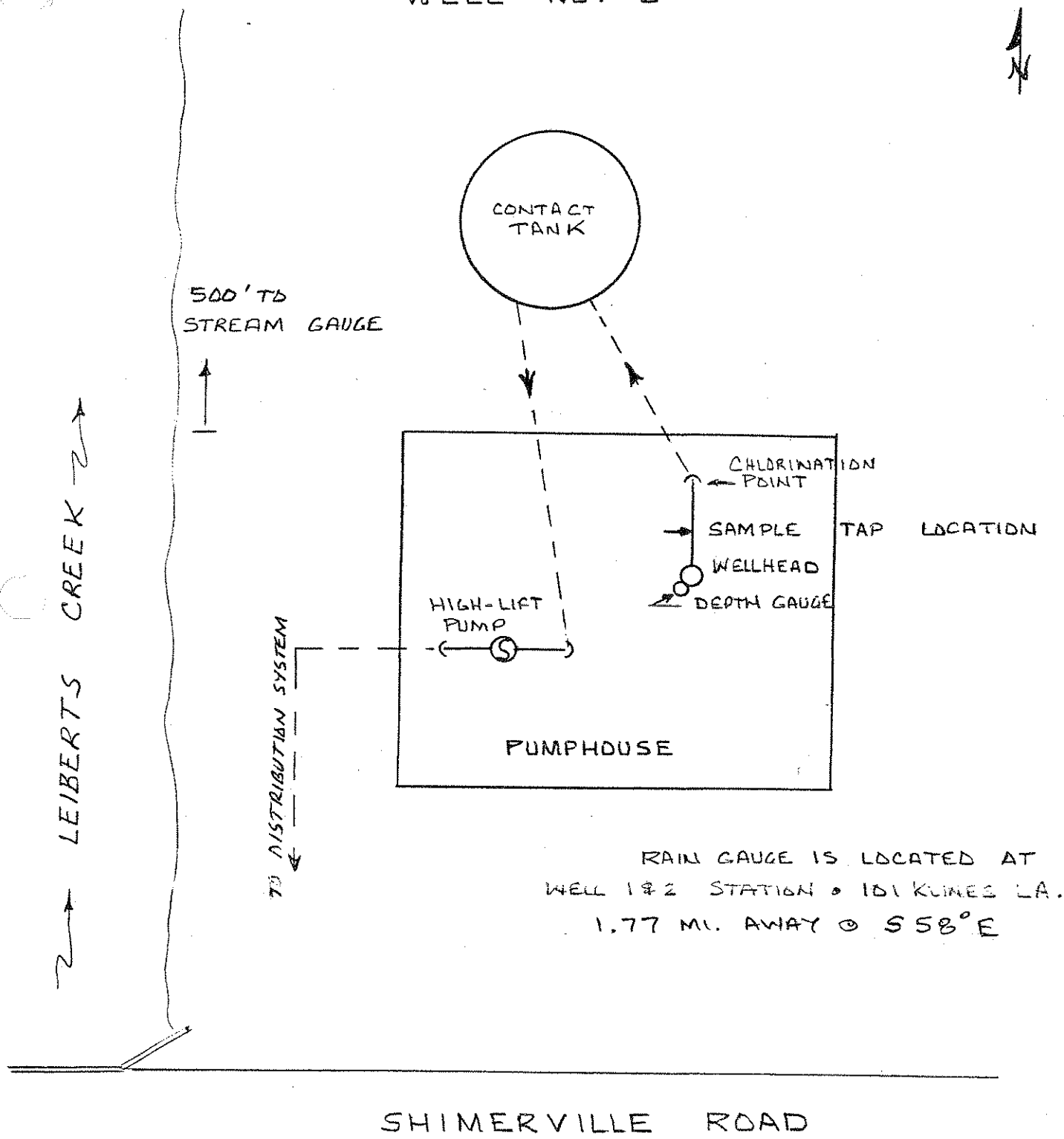
BOROUGH OF EMMAUS
WELL NO. 6



BOROUGH OF EMMAUS
WELL NO. 6
AERIAL PHOTO

SCALE 1" = 50'±

SCHEMATIC OF SYSTEM
BOROUGH OF EMMAUS
WELL NO. 6



NOT TO SCALE

BOROUGH OF EMMAUS
WELL NO. 6
CONSTRUCTION COMPONENTS

Public Water Supply Identification Number: PW3390032

Source Location (Lat/Long): N 40° - 31' - 20" W 75° - 30' - 33"

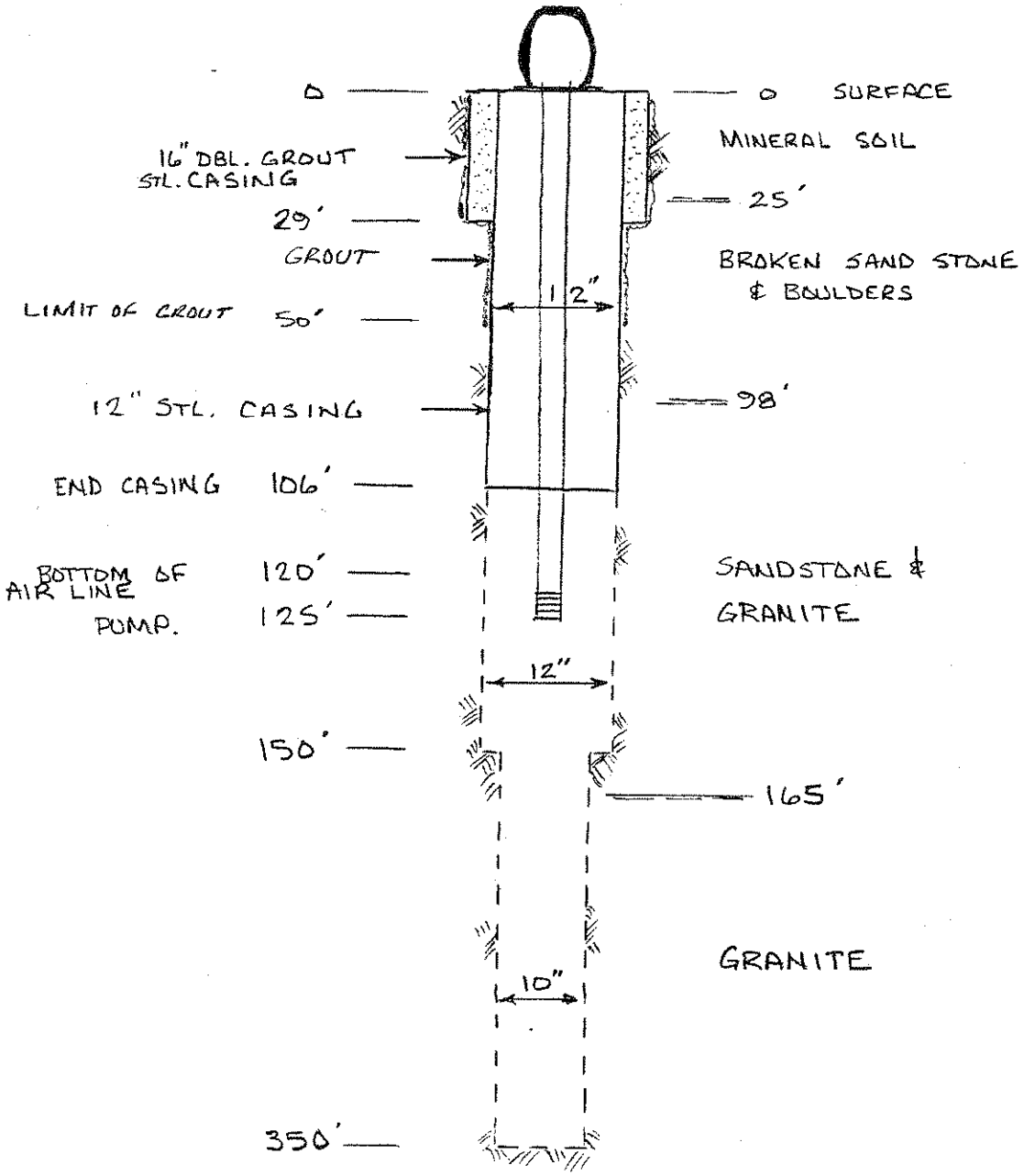
Well:

Distance to nearest surface water:	52'
Static or pumping water level depth:	65' (average)
Casing depth:	106'
Well screen interval:	none
Depth of grouting:	to 29' double, to 50' single
Discharge (GPM) + time pumped daily:	460 GPM Minimum 8 hr. daily
Name of aquifer:	Hardyston Formation of Cambrian Age

The Emmaus Well No. 6 located at Shimerville Road and Leibert's Creek was constructed in 1961 in the same location as a test well drilled in 1960. The construction consists of the following:

29' of 16" steel casing driven to rock and grouted;
106' of steel casing grouted to a depth of 50';
46' of 12" diameter clear drilled open hole in rock to a depth of 150';
200' of 10" diameter clear drilled hole to a depth of 350'

Cross section on page 8.



BOROUGH OF EMMAUS
WELL NO. 6

AS-BUILT
CONSTRUCTION DETAILS

NOT TO SCALE

BOROUGH OF EMMAUS
WELL NO. 6
SWIP INSTRUMENTATION

	INSTRUMENT	RANGE (UNITS)	CALIBRATION PERIOD
pH	Hach EC 10 Portable pH/MV/temp	pH -2.00 to 19.99 MV -1600.0 to+1600.0	Daily
Temperature	Hach EC 10 Portable pH/MV/temp	temp. -5.0 to 105.0°C	
Conductivity	Hach C0150 conductivity meter	0 - 199.9 MS	Daily
Turbidity	Hach 2100P Portable Turbid Meter	0-1000 NTU	Daily

Method of coliform analysis: Membrane filtration

By: ABE Laboratory
7596-B Beth-Bath Pike
Bath, PA 18014
DEP No. 48-108

Method and instrumentation for measuring water level in well: Direct Read Air Gauge

Daniel A. DeLong
Name

Phone: (610) 965-9288

Signature

Address: Borough of Emmaus
28 South Fourth Street
Emmaus, PA 18049

BOROUGH OF EMMAUS
WELL NO. 6
SWIP MONITORING PLAN

The Borough of Emmaus Water Department submits the following SWIP Monitoring Plan:

Public Works Coordinator, Mr. Daniel A. DeLong, Water Works Cert. No. W681, will be responsible for the collection and reporting of all data.

Emmaus Borough Well No. 6 is located 52 feet away from Leibert's Creek, a tributary to the Little Lehigh Creek, and 150' north of Shimerville Road within the Borough of Emmaus. The well was constructed in 1961 and is 350 feet deep, double cased and grouted to 29 feet depth, and single cased and grouted to a depth of 50 feet with casing extending to a depth of 106 feet.

A stream staff gauge will be installed on the concrete bridge abutment 500 feet north of the well location. This gauge will be a standard baked enamel strip graduated in 100th of a foot and permanently attached to the abutment.

The rainfall gauge will be a standard free standing gauge which is presently located at the Borough's offices at 101 Klines Lane, located 1.77 mi. from this site. The current location is unlikely to be vandalized as would a gauge located near the well site.

The water sample tap is a ¼" tap located approximately 2 feet from the wellhead and prior to the disinfection point.

The Borough has selected water analysis equipment manufactured and serviced by the Hach Company, P.O. Box 608, Loveland, Colorado, 80539-0608. This selection was based on past experience and reliability of products supplied by the Hach Company. Copies of specifications for the proposed equipment are listed in the appendix. All calibration, standardization, solutions and analysis will be in strict accordance with the manufacturer's published operating manuals.

The well water depth gauge is a direct reading air line gauge located at the wellhead.

The well station is automatically controlled and the well is normally pumping for a minimum of 8 hours at a constant rate of 460 gallons per minute. During the monitoring period, the well will be scheduled to be pumping from 2:00 a.m. to at least 10:00 a.m. or longer, if usage demand so requires.

Sampling

The water system personnel will take a daily grab sample between the hours of 6:30 a.m. and 8:00 a.m. from the approved sampling point and measure turbidity, pH, specific conductance (total dissolved solids) and temperature. To collect the sample for field measurements of pH, specific conductance, and temperature, a 500 ml sample bottle will be used. The sample

bottle will be dedicated to a single source and be identified by source on the bottle. The bottle, and instruments to be put into the sample, will be rinsed with the water to be sampled three times before the same is collected for measurement. Analysis for all parameters will be in strict accordance with manufacturer's directions. Methods 906A and 906B of Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 16th edition for the collection and handling of weekly coliform samples will be followed.

Daily measurements will be made of the water level in the well. The water level from a well will be pumping water level, all future readings will be the same type. Weekly total coliform and, if positive, fecal coliform samples will be taken in accordance with Standard Methods from the approved sample point.

Coliform analysis will be performed by B. Gradley Niper of A.B.E. Laboratory, 7596B Beth-Bath Pike, Bath, PA, 18014, PA DEP No. 48-108.

Monthly reports will be completed by Daniel A. DeLong and submitted to the Regional DEP Officer at 2 Public Square, Wilkes-Barre, PA, 18711-0790.

APPENDIX

2100P Portable Turbidimeter

Combines the performance of a laboratory instrument with the convenience of portability

The 2100P Portable Turbidimeter combines microprocessor-controlled operation and Hach's patented Ratio™ optics to bring greater accuracy, sensitivity and reliability to field testing.

- **Ratio Optics.** The two-detector optical system compensates for color in the sample, light fluctuation and stray light, allowing analysts to achieve laboratory-grade performance on a wide range of samples, under a wide range of conditions.
- **Portable testing.** The lightweight turbidimeter comes field ready with four AA alkaline batteries (optional battery eliminator available), all necessary apparatus, and a rugged carrying case.
- **Greater sensitivity.** With a measurement range of 0-1000 NTU and resolution to 0.01 NTU, the 2100P is ideal for regulatory monitoring,* process control or field studies.
- **Choice of ranges.** Choose one of three manual range modes (0-9.99, 10-99.9 and 100-1000 NTU) or automatic range mode for measuring samples that vary widely in turbidity.
- **Illustrated instructions.** Each instrument is supplied with a complete instruction manual to guide you step by step through calibration, testing and maintenance procedures.
- **Signal averaging.** The 2100P also features a selectable signal averaging mode, which compensates for fluctuations in readings caused by large particles drifting through the light path.
- **Two-year warranty.** Hach warrants the 2100P Portable Turbidimeter against defective materials or workmanship for two years from the date of purchase.

Complete portable laboratory available

For comprehensive field testing capabilities, complement the 2100P Turbidimeter with Hach's CEL/700 Portable Laboratory. Ideal for regulatory monitoring and environmental testing, the portable laboratory features the instrumentation, apparatus and reagents for performing 27 common water quality tests. For more information request literature number 1301.

*The 2100P Portable Turbidimeter meets or exceeds design and performance criteria as specified in the United States Environmental Protection Agency method 180.1.

SPECIFICATIONS

Ranges: 0-1000 NTU in automatic range mode; 0-9.99, 10-99.9 and 100-1000 NTU in manual range selection
Accuracy: ± 2% of reading or ± 1 least significant digit; ± 3% of reading at 500-1000 NTU
Repeatability: ± 1% of reading or ± 0.01 NTU, whichever is greater
Resolution: 0.01 NTU on lowest range
Stray Light: ≤0.02 NTU
Sample Required: 15 mL
Power Requirement: Four AA alkaline batteries or optional 120 or 230 Vac battery eliminator.
Construction: High-impact ABS plastic shell
Dimensions: 22.2 × 9.5 × 8.9 cm (8.75 × 3.75 × 3.5'
Shipping Weight: 3.6 kg (8 lb)
Warranty: Two years

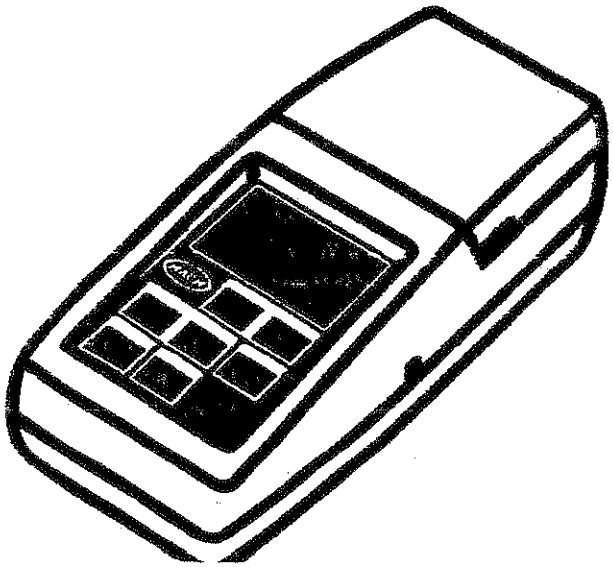
How to Order

Each 2100P Portable Turbidimeter is supplied with three sample cells, 118 mL of 4000 NTU Formazin Primary Standard, three Gelex® Secondary Standards, four AA alkaline batteries, 15 mL of silicone oil, instrument/procedure manual with quick reference card, and carrying case.

Cat. No. 46500-00 2100P Portable Turbidimeter

Optional Accessories

Cat. No. 46079-00 Battery Eliminator, 120V
Cat. No. 46080-00 Battery Eliminator, 230V



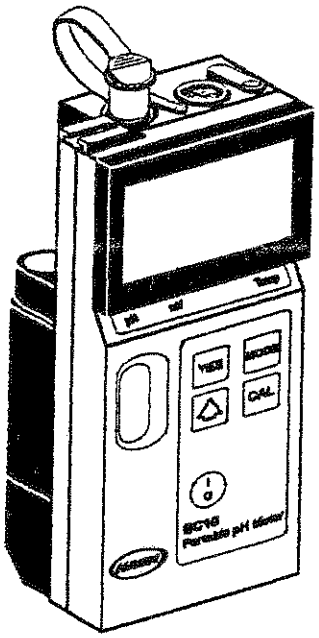
Hach Model EC10 Portable pH/mV/Temperature Meter

Fast, accurate, easy-to-use

The EC10 Portable pH Meter is a complete portable system that provides accurate, convenient measurement of pH, mV, and temperature.

Instrument Features

- **Easy Calibration.** The EC10 automatically recognizes 4.0, 7.0, and 10.0 buffers for fast, easy calibration. Allows one- or two-point pH calibrations and slope editing for quick adjustments.
- **Reliable Readings.** The Ready Indicator lets you know when a stable reading is reached.
- **Integral Electrode Holder.** The EC10 has an electrode holder with a removable bottom chamber in which electrode storage solution can be added to keep the electrode in peak condition.
- **Simultaneous Temperature Display.** Easy-to-read results, at a glance.
- **Complete System.** The EC10 Portable pH Meter comes with a choice of combination pH electrodes with temperature, buffers, beakers and other accessories in a durable carrying case.
- **Self-Diagnostics.** At power-up, meter automatically performs a complete system check.



SPECIFICATIONS

Range:

pH	-2.00 to 19.99
mV	-1600 to 1600
Temp	-5 to 105 °C (23 to 221 °F)

Relative Accuracy:

pH	± 0.02
mV	± 0.2 or ± 0.05% of ΔE, whichever is greater
Temp	± 1.0 °C

Resolution

pH	0.01
mV	0.1
Temp	0.1 °C

Temperature Compensation: Automatic or manual
Ambient Temperature: 5 to 45 °C (41 to 113 °F)
Inputs: BNC (Electrode), DIN (Temp Probe), PIN (Reference)
Power Requirements: 9 V alkaline battery (included) or 9 Vdc line power adapter for 115 or 220 Vac
Display: Custom LCD
Meter Dimensions: 20 x 8 x 5 cm (8 x 3.3 x 2")
Warranty: 18 months meter

How to Order

The EC10 Portable pH/mV/Temperature Meter is supplied with calibration buffers (4.0 and 7.0), beakers, 9 V alkaline battery and manuals in a durable carrying case. It is available with either a Hach One® Combination pH Electrode with free-flowing junction or a standard gel-filled combination pH electrode.

50050-10 EC10 Portable pH/mV/Temperature Meter with Hach One Combination pH Electrode with temperature

✳ **50050-00** EC10 Portable pH/mV/Temperature Meter with gel-filled combination pH electrode with temperature

Accessories

50070-00 Battery Eliminator, 115 Vac, North American plug
50070-01 Battery Eliminator, 230 Vac, Continental European plug
26573-64 pH Electrode Storage Solution, Powder Pillows, pk/20

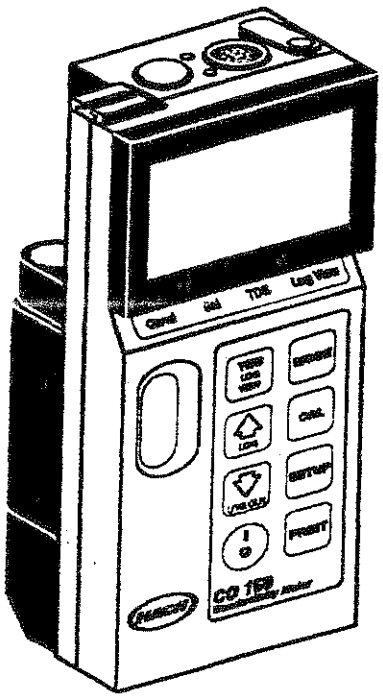
Hach Model CO150 Conductivity Meter

Versatile, accurate, full-featured

The CO150 Conductivity Meter is a very capable instrument for field or lab measurement of conductivity, salinity and TDS. It comes with a model 50161 Conductivity Probe with a cell constant of 1.0 and a 1 meter cable.

Instrument Features

- **Complete System.** The CO150 Conductivity Meter comes with a probe, sample containers, manual and accessories in a durable carrying case.
- **Conductivity, Total Dissolved Solids (TDS), Salinity and Temperature Measurements.** The CO150 measures each of these parameters (see specifications).
- **Easy Calibration.** The CO150 calibrates using a known conductivity standard or by adjusting the cell constant value.
- **Auto-Ranging and Temperature Compensation.** The CO150 automatically uses the range that is most accurate for the sample measurement and allows automatic or manual temperature compensation. The reference temperature is also selectable at 20 or 25 °C.
- **Computer/Printer Output.** An RS232 output receptacle provides a computer connection for recording readings, or mates directly with the optional, integral printer attachment.
- **Internal Datalog.** Up to 50 readings can be stored for display or for downloading to computer or printer.
- **Integral Electrode Holder.** The CO150 has an electrode holder for convenient storage of the conductivity probe.
- **Self-Diagnostics.** At power-up, the meter automatically performs a complete system check. It also has low battery warning indicators and auto-shutoff.



Specifications

(all with Model 50161 Conductivity Probe)

Conductivity Range: 0 - 199.9 µS, 200 - 1999 µS, 2000 - 19,990 µS, 20,000 - 199,900 µS
Conductivity Resolution: 0.1 µS
Conductivity Accuracy: ± 0.5% of full scale of reading within each range, max.
Salinity Range: 0.0 to 80 ppt
Salinity Resolution: 0.1 ppt
Salinity Accuracy: ± 0.1%
TDS Range: 0 - 19,900 mg/L
TDS Resolution: 3 S.D.
TDS Accuracy: ± 1% RSD
Temperature Range: -9.9 - 110.0 °C
Temperature Resolution: 0.1 °C
Temperature Accuracy: ± 1.0 °C
Temperature Compensation: Automatic or Manual
Compensation Coefficient: 2.1% per °C
Ambient Temperature: 5 to 45 °C (41 to 113 °F)
Inputs: 8-pin DIN, RS232, power
Output: RS232
Power Requirements: 9V alkaline battery (included), optional battery eliminator for 115 or 220 VAC
Display: Custom LCD
Meter Dimensions: 20 x 8 x 5 cm (8 x 3.3 x 2")
Model 50161 Conductivity Probe:

Cell Constant (K)	1.0
Cable Length	1 m (39.4")
Diameter	12 (0.48")
Connector	8-pin DIN

Warranty: 18 Months Meter; 12 Months Probe
Options: Unique printer attachment mounts directly on the side of the meter. Optional probes: cell constant 0.1, 1 m cable; cell constant 1.0, 3 m cable.

How To Order

The CO150 Conductivity Meter is supplied complete with a Model 50161 Conductivity Probe, sample containers, 9V battery, and manual in a durable, roomy carrying case .

50150-00	CO150 Conductivity Meter
50070-00	Battery Eliminator, 115 Vac
50070-01	Battery Eliminator, 220 Vac
50060-00	Model 50 Printer
50160-00	Conductivity Probe, K = 0.1, 1 m cable
50162-00	Conductivity Probe, K = 1.0, 3 m cable

BOROUGH OF EMMAUS
WELL NO. 6
MONTHLY SURFACE-WATER IDENTIFICATION MONITORING REPORT

PWSID: 3390032 County: Lehigh
Permittee: Borough of Emmaus
Source Code: 106 Source Name: Well No. 6

_____, 19___ _____, 19___ to _____, 19___
For the month of Monitoring Began Will End

This report is to be completed for each source in question and returned every month to the appropriate Pennsylvania Department of Environmental Resources' regional office. Daily and weekly, raw water monitoring results are to be recorded on this report for the surface-water identification monitoring. Daily results are to be recorded by the person conducting the measurements and the report must be signed by the person submitting the form. Sampling and analysis must be conducted in accordance with the permittee's approved monitoring plan. Bacteriological samples must be analyzed by a DER-certified laboratory.

_____
Print Name of Person Completing Form

_____
Signature

Weekly Raw Water Coliform Sampling Results (Actual Densities)

DATE	TOTAL COLIFORM*	[1]FECAL COLIFORM*	INITIALS**

[1]If total positive * #/100 ml ** Initials of person logging results

Abbreviations for Daily Monitoring

[1]pH<0.1 Unit
[2]COND = Conductivity, µS/cm @ 25° C
[3]TURB = Turbidity, NTU
[4]TEMP = Temperature in degrees <0.1, (specify C)
[5]WLEV = Water Level in well while running
[6]PREC = Precipitation for previous 24 hr. period
[7]STGA = Stream Gauge Elevation
[8]STQU = Stream Water Quality (clear, muddy, etc.)
[9]INT= Initials of person making field measurements

Comments: include any anomalous events; i.e. stream muddy from construction upstream, etc.

BOROUGH OF EMMAUS
WELL NO. 6

DAILY MONITORING

MONTH OF _____, 19___

DATE	pH[1]	COND[2]	TURB[3]	TEMP[4]	WLEV[5]	PREC[6]	STGA[7]	STQU[8]	INT[9]	COMMENTS
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
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26										
27										
28										
29										
30										
31										

WHP Area Management and Commitment

The management options presented here are recommended for consideration by the Emmaus Water Department and Borough of Emmaus as appropriate actions for protecting the Source Water Protection Areas that supply potable water to the Borough of Emmaus municipal supply wells. These recommendations are both broad and specific in scope in order to allow future updates and amendments to recommended actions based on input from the community. The current recommendations do not include implementation of wide ranging regulatory controls. Until a rigorous delineation of the recharge areas and well capture zones can be completed it is premature to institute regulatory controls. Without strong scientific support, such regulatory controls are susceptible to legal challenge. Therefore, the recommendations presented here are primarily directed toward public education and recognized best management practices (BMPs).

PUBLIC EDUCATION

Public education is widely recognized as a key element in ultimately correcting and/or eliminating activities, which may adversely affect water quality. The public education options listed below are intended to educate existing business and homeowners, school children and the general public on the issues of source water protection. Additionally, public education will provide an overall awareness of the need to protect all of our water resource. The educational options recommended include:

Conducting Annual Watershed Awareness programs

- Publish information in the local newspaper relating to water quality and water conservation
- Distribute documentation on source water and water resources protection
- Conduct educational workshops of source water and water resources protection
- Install roadside signage identifying to Wellhead Protection Zones
- Distribute information on septic system maintenance, and household hazardous waste disposal
- Implement a storm drain stenciling program
- Develop additional educational options

LAND USES

Industrial and Commercial

Assess potential water quality impacts from various commercial and industrial and other businesses located within the watershed. Steering Committee members will conduct site visits to individual facilities to review on going operations. During site visits the use of general BMPs directed toward pollution prevention, will be encouraged with facility operators, including:

- Posting of spill hotline numbers
- Proper identification, handling and storage of hazardous materials

See Review Comment No. 11 in Report Foreword

- Spill response training
- Compliance with regulatory programs and policies
- Use of Preparedness, Prevention and Contingency Plans
- Use of non-toxics chemical alternatives
- Development of public awareness programs

Agricultural Land and Golf Courses

Groundwater can be impacted by agriculture and golf courses by infiltration of fertilizers, pesticides, nitrates, and other contaminants.

- Fertilizers
- Pesticides
- Fungicides
- Animal Waste

Urban and Residential Land Uses

Urban areas are characterized by dense development and extensive impervious areas. While the threat from any single residential use is small the combined impact from many residential properties can be considerable, especially if densely compacted in to a localized area. Therefore, residential property owners need to be aware of BMPs that can make a difference when it comes to ground water protection. Many of these options have low or no associated costs and could easily be implemented by homeowners without significant municipal support. The Steering Committee will develop information materials that can be distributed that provide information on BMP's that can be used, including:

- Septic system maintenance
- Storm water runoff controls
- Erosion and sediment controls
- Proper fertilizer/pesticide use
- Property improvement practices, e.g. minimize creation of new impervious surfaces
- Infiltration enhancements
- Minimize groundcover disturbance
- Encourage water conservation
- Use of native plantings

Recreational Land Uses

Water quality impacts can be associated with recreational use of water supplies and water supply watersheds from vandalism, microbial contamination, gasoline and other contamination. Access to water supply areas should be carefully controlled. The Steering Committee will review and recommend appropriate actions for further protecting sensitive water receptors and groundwater recharge areas that are within and/or immediately adjacent to recreational use areas.

New Development

Although Emmaus is largely developed, the Zone II and Zone III areas of several of the municipal supply wells extend into nearby municipalities with undeveloped land that falls within groundwater recharge and watershed areas. To adequately protect existing drinking water supplies, new development should be directed away from sensitive areas, and proper BMPs encouraged to minimize impacts from future development activities. The Steering Committee will work with regional planning and local municipal officials to identify sensitive tracks of land and develop appropriate land use planning policies, including:

- Encourage environmental impact assessments of proposed developments
- Improved erosion control measures during construction
- Encourage construction techniques that minimize ground disturbance during development
- Encourage cluster zoning
- Encourage environmental easements
- Encourage land preservation

Roadways and Highways

Contamination from roadways includes suspended solids, heavy metals, nutrients, pathogens, and road salt. Accidental spills and or miscellaneous discharges, e.g., oil leaks, radiator leaks, pose another threat to both surface water and groundwater supplies. The Steering Committee will work with the appropriate agency and local officials too:

- Post Water Supply Protection area signs where roads enter wellhead protection and watershed areas
- Identify alternative hazardous materials transport routes
- Establish coordinated spill response procedures
- Encourage improved municipal road maintenance operations
- Encourage the use of updated BMPs during road improvement projects

Landfills

Leachate from landfills threatens groundwater supplies. Although new landfills are designed with impervious liners to protect water quality, they may still leak. Older less regulated landfills pose the greatest threat to groundwater because they are generally unlined and uncapped. The Steering Committee will work with state and local officials too:

- Identify suspected landfills and encourage proper characterization of impacts
- Encourage monitoring of groundwater around known or suspected landfill areas for early detection of contamination
- Encourage recycling to reduce the waste sent to landfills

JOINT ENVIRONMENTAL ADVISORY COMMITTEE

The Borough of Emmaus has expressed an interest in forming a joint committee with Upper Milford Township to address environmental issues. The committee should be comprised of municipal officials, residents, business owners and environmentally knowledgeable citizens. As part of that groups mandate they should have the responsibility of:

- Performing the actions outlined above
- Continue to develop policies and activities that will protect Well 6 from contamination
- Encourage the passage of residential and potable well construction standards
- Continue to review and amend the management options and recommendations setforth here
- Identify and address other environmental issues and concerns as they arise

3800-FM-WSFR0300 8/2005

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

EMERGENCY RESPONSE PLAN
FOR

Public Water System Name: Borough of Emmaus

Public Water System I.D. No.:

3	3	9	0	0	3	2

Address: 28 South Fourth Street
Emmaus
PA 18049

Telephone No.: 610-965-9288

Municipality: Emmaus

County: Lehigh

System Type: (Please Check) ☒ Community ☐ Nontransient Noncommunity

Population Served: 12,000

Plan Prepared by: Jeffry D. Clapper

Plan Reviewers:

Name	Title	Date
Bruce E. Fosselman	Borough Manager	1/11/06
Richard D. Krauss	Operator	1/11/06
Leslie DeLong	Operator	1/11/06

Date Completed: 2/26/04 **Date Updated:** 1/11/06

Section 1 - Organization Table

The following persons will be in charge of the water system during any type of emergency:

Order	Name	Position	Contact Numbers (include area code)			Radio Frequency (MHz)		
1	Jeffry D. Clapper	Public Works Director	Office:	Home:	Fax:	159.135		
			610-965-9288	610-799-3055	610-965-0705			
			Cellular:	Pager:	E-mail:			
			610-597-7083					
2	Richard Krauss	Operator	Office:	Home:	Fax:	159.135		
			610-965-0707	610-965-5609	610-965-8638			
			Cellular:	Pager:	E-mail:			
				610-778-6138				
3	Leslie DeLong	Operator	Office:	Home:	Fax:	159.135		
			610-965-0707	610-965-3847	610-965-8638			
			Cellular:	Pager:	E-mail:			
				610-778-6138				
4	Leon Whitesell III	Operator	Office:	Home:	Fax:	159.135		
			610-965-0707	610-965-2097	610-965-8638			
			Cellular:	Pager:	E-mail:			
				610-778-6138				

Section 2 - Emergency Reference Table

- Part A displays who to contact during certain emergencies.
- Part B contains the phone numbers for each of the contacts in Part A.

Part A: Emergency Reference Table

Emergency Situation	Contacts (see suggested contacts at bottom of page)														
	DEP*	System Supervisor	Local EMA	Power Co.	Equip. Manuf.	Chem. Supplier	Fire Dept.	Media	Mayor	Police	Engineer	Excavator	Operator		
Distribution System Line Break	X	X									X		X		
Power Outages	X	X		X									X		
Drought Conditions	X	X	X				X	X	X				X		
Disinfection System Failure	X	X				X		X	X		X		X		
Contamination of Supply	X	X	X				X	X	X	X	X		X		
Source Pump Failure	X	X		X	X						X		X		
Prolonged Water Outage	X	X	X				X	X	X	X	X		X		

*Any circumstances that may adversely affect the quality or quantity of the drinking water must be reported to DEP immediately. Within **4 HOURS** of DEP's determination that an imminent hazard is present, the public water supplier needs to provide public notification.

Additional suggested contacts: Public official, public works, police, PA One, 911, well driller and customers.

Part B: Emergency Reference Table Contacts and Phone Numbers

General Contact Information					
Contact	**Contact Individual**	**Phone #1**	**Phone #2**	**Pager Number**	
System Supervisor	Jeffry D. Clapper	610-965-9288	610-799-3055	610-597-7083	cell # / not pager
Local EMA	James Schneck	610-967-4206			
Power Company	Gerald Labar	610-774-6242			
Equipment Manufacturer	Dave Gettle	717-866-2161			
Chemical Supplier	Univar	800-283-0326			
Fire Department	Chief James Reiss	610-965-0713	610-437-5252		
East Penn Press	Mary Gaal	610-740-0944			
The Morning Call	Randy Kraft	610-820-6557			
CAT Country 96.1 FM		610-266-7600			
B104 FM		610-720-1041			
WLEV 100.7 FM		610-266-7600			
Mayor	Winfield Iobst	610-965-9255	610-967-2865		
Police Department	Chief David Faust	610-965-0711	610-437-5252		
Engineer	Brad Youst, P.E.	610-691-5644			

System Equipment Contact Information					
Item	**Manufacturer**	**Contact Individual**	**Phone Number #1**	**Phone Number #2**	**Pager Number**
Chemical Feed Equipment	Pulsatron	USA Blue Book	800-548-1234		
Electrical Equipment	Diefenderfer Orlando Electrical Contractors	Gary Wisser	610-434-9595		
Well Pump and Equipment	Kohl Brothers	Kohl Brothers	717-866-2161		
Water and Service Line Pipe	National Waterworks	Rick Murphy	610-481-9979		
Chemical Feed Equipment	B.I.F./Pyrz Water Supply Co.	Steve Pyrz	215-256-8430		
Chemical Feed Equipment	Ecometrics/Pyrz Water Supply Co.	Steve Pyrz	215-256-8430		

System Chemical Contact Information					
Chemical	**Supplier**	**Contact Individual**	**Phone Number #1**	**Phone Number #2**	**Pager Number**
Gas Chlorine	Univar	Univar	1-800-283-0326 (370)		
Potassium Permanganate	N/A				
Sodium Hypochlorite	Univar	Univar	1-800-283-0326 (370)		
System Monitoring testing chemicals	Hach	Hach	1-800-227-4224		

Section 3 – Communications

***Note**: This section establishes emergency lines of communication. All phone numbers are in Sections 1 and 2 of this plan.*

1. Lines of Communication

A. The types of communication available at this system during an emergency include:

- ☒ Landline Telephone
- ☒ Cellular Phone
- ☒ Radio System (Primary Frequency or Channel: **159.135** Alternate: _____)
- ☐ E-mail or chat
- ☒ Facsimile Machine
- ☒ Pager
- ☐ Other:

Radio Frequency 159.135

B. Specific Communication Instructions:

Radio Frequency 159.135

2. Emergency Communications Equipment

A. Landline Telephones:

Number of Telephones:	3
Location(s) of Telephones:	Borough Offices 28 S. 4th St. and Main Pump Station 101 Klines Lane

B. Cellular Phones:

Number of Cell Phones:	3
Location(s) of Cell Phones:	Public Works Director, Asst. Public Works Director, Water Department Operator
Location(s) of Batteries for Cell Phones:	N/A

C. CB Radios:

Number of Radios:	9
Location(s) of Radios:	4 Public Works vehicles, 5 personal portable radios
Location(s) of Batteries for Radios:	N/A

D. Facsimile Machines:

Number of Fax Machines:	2
Location(s) of Fax Machines:	Borough Offices 28 S. 4th St. and Main Pump Station 101 Klines Lane

E. Pagers:

Number of Pagers:	0
Location(s) of Pagers:	N/A

F. Other Communication Equipment Available:

N/A

Section 4 - Summary Description of the System

The following should provide enough information about the system for use during an emergency. For more detailed information, refer to the operation and maintenance manual.

1. Location of Pertinent Information

Item	Location A	Location B
Distribution System Map	Borough Hall	Main Pump Station
Other Pertinent Maps	Borough Hall	Main Pump Station
Daily Operation Logs	Main Pump Station	
Permits	Borough Hall	Main Pump Station
Technical Manuals	Main Pump Station	
O&M Plan	Main Pump Station	
Start-Up/Shut-Down Procedures	Main Pump Station	
Inventory list of Distribution Parts		
Inventory list of Spare Parts		

2. Source Information

A. Well Information

Not Applicable ☐

Well ID	Location
1. Well 1	101 Klines Lane
2. Well 2	101 Klines Lane
3. Well 3	10th & Broad Streets
4. Well 4	580 Glenwood Street
5. Well 6	Community Park
6. Well 7	3676 Orchid Place

B. Surface Water Source

Not Applicable ☐

Location of Primary Intake:

N/A

Location of Alternate Intake:

N/A

C. Source Pump Information

Source ID	Pump Type	Manufacturer	H.P.	Capacity (gpm)	Phase, Voltage
Well 1	Submersible Turbine	Peerless Pump	25	550	3-230/460
Well 2	Submersible Turbine	Peerless Pump	25	550	3-230/460
Well 3	Submersible Turbine	Peerless Pump	30	250	3-230/460
Well 4	Submersible Turbine	Peerless Pump	40	620	3-230/460
Well 6	Submersible Turbine	Peerless Pump	60	530	3-230/460
Well 7	Submersible Turbine	Peerless Pump	30	515	3-230/460

3. Treatment Information

Location of Chemical MSDS: _____

A. Disinfection

Chemical(s) Used: Chlorine gas/Sodium Hypochlorite

Type of Chemical Feed: Gas Ejector/Injector Pump

Location of Disinfection System: Wells 1, 2, 4, 6, 7

Location of Chem. Storage: Well 6

(Note: See the Emergency Reference Table in Section 2 for Chemical Supplier Information)

B. Other Treatment

Chemical(s) Used: Caustic Soda

Type of Chemical Feed: Chemical Feed Pump

Location of Chem. Feed System: Well 6

Location of Chem. Storage: Well 6

(Note: See the Emergency Reference Table in Section 2 for Chemical Supplier Information)

C. Other Pertinent Treatment Information

4. Description of Surrounding Area

Description of Potential Sources of Contamination in the Area (approximate 3 mile radius):

Gas Stations, Farms, Bulk Fuel Storage and Pipe Line, Railroads, Turnpike, Local Roadways

5. Finished Water Storage

Storage Facility 1:

Location: S. 2nd Street

Type: Concrete Capacity: .2 Million

Storage Facility 2:

Location: S. 5th Street

Type: Welded Steel Capacity: 2.2 Million

Storage Facility 3:

Location: _____

Type: _____ Capacity: _____

6. System Demand

Average Demand: 1.5 MGD Peak: _____ MGD

Capacity: 4.2 MGD

7. Other Pertinent System Information

Other information about the system that could be useful during an emergency:

VOC Removal Systems

VOC Removal Systems in place at Well 1, Well 2, Well 4, and Well 7.

The Systems were designed by:

DeLoach Industries, Inc.
818 Cattleman Road
Sarasota, FL 34232
Ph: 813-371-4995
Fx: 813-377-2649

The Systems are maintained by:

A.C. Shultes, Inc.
664 S. Evergreen Ave.
Woodbury Heights, NJ 08097
Ph: 856-845-5656
Fx: 856-845-1335

There are no spare parts on hand other then belts for the blowers, which are kept at the Main Pump Station, 101 Klines Lane Emmaus, PA.

Section 5 – Assessment of Available Equipment

Note: *Communication equipment is listed in Section 3.*

1. Emergency Water Supply Equipment (for more information, see the drought contingency plan)

A. Bulk Water Supply Truck

None Available ☐

Contact for truck: **Azure Blue Water Co. 310 Stoke Park Rd. Bethlehem, PA 610-317-9810**

Location(s) that truck(s) will be setup during an emergency:

Maintenance Garage, 44 Klines Lane Emmaus, PA
Store inside heated garage.

B. Other Emergency Water Supply Equipment

Item	Location and Contact
Emergency Generator	Wells 1 and 2
Generator Hook Up	Well 6

C. Parts Available for Emergency Interconnections

Item	Location and Contact

2. Power Supply Equipment

A. Power Sources

Primary Power Source:	PPL Utilities - Electric
Alternate Power Sources:	Generator Well 1 and 2
Location of Fuel:	S.E. Corner, Pump House Exterior

B. Generators

None Available ☐

Make/Model	Phase/ Voltage/ Amps	Contact Individual	Phone No.	Location of Storage	Location of Use
Onan	3	Operators		In Place, Main Pump Station	Main Pump Station

3. Vehicles and Construction Equipment

A. Pickup Trucks, Vans, and other Vehicles

None Available ☐

Make and Model	4x4? Yes	4x4? No	Owner	Phone Number	Location of Vehicle and Keys
Chevrolet 2500	☐	☒	Borough of Emmaus	610-965-9288	Main Pump Station
Chevrolet 2500	☒	☐	Borough of Emmaus	610-965-9288	Main Pump Station
Chevrolet Deluxe 30	☒	☐	Borough of Emmaus	610-965-9288	Maintenance Garage
Ford F350	☒	☐	Borough of Emmaus	610-965-9288	Maintenance Garage
	☐	☐			
	☐	☐			

B. Dump Trucks

None Available ☐

Make and Model	Capacity (tons)	Owner	Phone Number	Location of Vehicle and Keys
GMC Dump Truck	9	Borough of Emmaus	610-965-9266	Maintenance Garage
International Dump Truck	8	Borough of Emmaus	610-965-9266	Maintenance Garage

C. Construction Equipment

None Available ☐

Item (include make/model)	Owner	Phone Number	Location of Item
CAT Backhoe	Borough of Emmaus	610-965-9266	Maintenance Garage
Air Compressor	Borough of Emmaus	610-965-9266	Maintenance Garage

4. Inventory of Repair Equipment

Location of Inventory: 33 Klines Lane

If an inventory is not available, fill in the table below.

Item	Location
Repair Clamps	Storage Building - 33 Klines Lane
Curb Boxes and Stops	Storage Building - 33 Klines Lane
Corp Stops	Storage Building - 33 Klines Lane
3/4" Copper	Storage Building - 33 Klines Lane
1" Copper	Storage Building - 33 Klines Lane

Recommended: *Two (2) repair clamps for each size of your pipe.*

5. Spare Equipment for the Water Source

A. Spare Pump(s) **None Available** ☒

Pump Type	Manufacturer	H.P.	Capacity (gpm)	Phase, Voltage

B. Location of Inventory of Spare Parts for Pump(s) and Well(s) **None Available** ☒

If an inventory is not available, fill in the table under (C.) on the next page.

C. List of Spare Parts for Pump(s) and Well(s)

Part	Location

6. Spare Parts for the Distribution System

A. Location of Inventory of Spare Parts and Valves for Distribution

None Available ☐

8" Ductile Iron Pipe - Pipe Yard, Klines Lane
6" Ductile Iron Pipe - Pipe Yard, Klines Lane
8" Valves - Storage Building, 33 Klines Lane
6" Valves - Storage Building, 33 Klines Lane

7. Spare Parts for Treatment

A. Spare Chemical Feed Pump(s)

None Available ☐

Manufacturer	Model	Location of Spare
Pulsation (2)	LPD48-A	Well 6
LMI	U011-281	Pump Station - 101 Klines Lane

List Spare Parts for Feed Pump	Location

B. Reserve Chemicals

Location of reserve supply of chemicals

Well 6

8. Miscellaneous Equipment for the System

A. Additional Equipment Not Listed Above

None Available ☒

Equipment	Location

Section 6 – Emergency Measures

1. List of Anticipated Emergencies

1. Distribution System Line Break
2. Power Outage
3. Drought Conditions
4. Disinfection System Failure
5. Contamination of Supply
6. Source Pump Failure
7. Prolonged Water Outage
8. Tank Leaks
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.

2. Description of Emergency Measures

Emergency: Distribution System Line Break

Corrective Action:

1. Refer to Section 2 - Emergency Reference Tables A and B for emergency contact list.

2. Determine the boundaries of the area that will need to be valved off for isolating the repair location.

3. Notify customers in the affected area when service will be disrupted for repair.

4. Borough forces and equipment will be used to make the repair.

5. Complete repairs and disinfect the repaired line(s). Notify customers when service is back to normal.

6. If the disinfection is compromised, or if the system or a portion of the system is placed on a "boil water advisory", two consecutive days of Total Coliform Bacteria samples must be taken. Contact the labroatory. Negative sample results must be received prior to taking the system off of the "boil water advisory".

Emergency: Power Outage

Corrective Action:

1. Refer to Section 2 - Emergency Reference Tables A and B for emergency contact list. Obtain an approximate time that the power will be restored.

2. Determine the impact of the power outage on system and arrange for temporary power genterators, as needed. Verify water storage tank levels.

3. Notify the customers, as needed.

4. If the system or a portion of the system is placed on a "boil water advisory", two consecutive days of Total Coliform Bacteria samples must be taken. Contact the labroatory. Negative sample results must be received prior to taking the system off of the "boil water advisory".

Emergency: Drought Conditions

Corrective Action:

Location of Drought Contingency Plan:

Summary of Drought Contingency Plan:

1. Refer to Section 2 - Emergency Reference Tables A and B for emergency contact list.

2. Base upon Drought Warning Level initiate appropriate directions regarding water usage.

3. Inform water customers as to water consumption.

4. Provide public service announcements to local media.

5. Monitor well levels.

6. Perform a complete leak survey to minimize unaccounted water loss.

Emergency: Disinfection System Failure

Corrective Action:

1. Refer to SEction 2 - Emergency Reference Tables A and B for emergency contact list.

2. Shut down source, immediately. Adjust the remaining wells production rates to offset a shut down of affected well(s).

3. Estimate the time period that the disinfection system has been shut down. If warranted, manually disinfect the system by using chlorine tablets.

4. Refer to Disinfection System's Operation and Maintenance Manual for emergency repair procedures. Contact manufacturer, as needed.

5. If the system or a portion of the system is placed on a "boil water advisory", two consecutive days of Total Coliform Bacteria samples must be taken. Contact the labroatory. Negative sample results must be received prior to taking the system off of the "boil water advisory".

Emergency: Contamination of Supply

Corrective Action:

1. Refer to Section 2 - Emergency Reference Tables A and B for emergency contact list.

2. Sut down system, or portion of system, to contain contamination and prevent mixing with distribution system water.

3. Determine the nature of the contamination and contact law enforcement if any illegal acts are suspected.

4. Sample contaminated supply, per PA DEP requirements.

5. Inform customers of system shut down or partial system shut down.

6. If the system or a portion of the system is placed on a "boil water advisory", two consecutive days of Total Coliform Bacteria samples must be taken. Contact the labroatory. Negative sample results must be received prior to taking the system off of the "boil water advisory".

Emergency: Source Pump Failure

Corrective Action:

1. Refer to Section 2 - Emergency Reference Tables A and B for emergency contact list.

2. Shut down power to pump and turn off chemical feed disinfection system for the affected source.

3. Adjust the remaining well(s) production rates to offset a shut down of the affected well(s). Arrange for an alternate source, as needed.

4. Refer to Pump Operation and Maintenance Manual for troubleshooting procedures and contact manufacturer, as needed.

Emergency: Prolonged Water Outage

Corrective Action:

1. Refer to Section 2 - Emergency Reference Tables A and B for emergency contact list.

2. Monitor static water level(s) of affected well(s). If the well(s) continue(s) to deplete and reach a pumping level of the 5 feet above the pump, remove the well from service.

3. Adjust the remaining well(s) production rates to offset the shut down of the affected well(s) and arrange for an alternate source, as needed.

Emergency: Tank Leaks

Corrective Action:

1. Refer to Section 2 - Emergency Reference Tables A and B for emergency contact list.

2. Remove damaged tank from service.

3. Inform customers as needed.

4. Repair storage tank.

5. Fill and disinfect storage tank.

6. Place storage tank back in service.

Emergency:

Corrective Action:

Contingency Planning

The purpose of contingency planning is to identify response actions to potential impacts to the wells (*e.g.*, spills or unintended releases), to outline contingencies commensurate with each of the potential threats identified, and to provide provisions for alternate water supplies.

Potential Impacts

Several types of impacts may affect Emmaus' wells, including:

- **Highway Spills** – More than 1,000 highway spills are reported in Pennsylvania each year. Chemicals from accidental spills are often diluted with water, potentially washing the chemicals into the nearby surface water and increasing the potential for contamination. Oil spills can create plumes that travel with groundwater for long distances. Additionally, deicing compounds used on transportation routes can contaminate water. Any of the public supply wells could be impacted by a nearby road spill. Route 476 is of particular concern for Well 6. The highway is only 0.15 miles away from the well, and there are no wells between Route 476 and Well 6 that could be used as a monitoring well in the case of a spill.
- **Spill or release into Leibert Creek up-gradient of Well 6** – WHP Zones I, II, and III encompass a very large land area. Several potential contaminant sources are located within Zones I and II of Well 6. Leibert Creek flows through the entire length of Zone I and Zone II for Well 6, and receives surface runoff from a large land area within Zones II and III. A spill or release into the creek could impact Well 6.
- **Vandalism** - Vandalism can be either mechanical (*e.g.*, damage to well lock, well pump) or chemical (*e.g.*, polluting of wellhead with hazardous substances), and can have a serious impact on a public water supply.
- **Drought** - Drought affects groundwater levels (*i.e.*, water availability) as well as the groundwater quality. A short-term drought may only have minor effects on water availability, and voluntary water use restrictions may be imposed by the water supplier. A short-term drought may also have a minor effect on water quality. A long-term drought may require more severe water use restrictions, with a greater potential impact on water quality.

Emergency Response Plan

An emergency response plan identifies appropriate responses to the different types of emergencies that may arise within the water system and is not necessarily limited to emergencies related to wellheads. This plan

has detailed, chronological procedures to be followed by Borough and emergency personnel during an emergency. A copy of the Emmaus Emergency Response Plan is included in Appendix I[2]. The Emmaus Public Works Director will review and update the plan annually to include emergencies related to wellhead protection. The plan includes the potential for impacts from spills and other unintended releases.

Contingencies

Several water supply contingencies were developed as part of this plan. These contingencies are summarized below in order of preference.

Existing Supply

1. The maximum yield from the supply wells is 3.277 million gallons per day (mgd) as calculated from the well information supplied by the Borough of Emmaus (see Appendix J). This is a conservative estimate calculated by summing the lower of either the maximum pump rate or the maximum permitted withdrawal for each well.

   The average water demand is 1.508 mgd. This value was also calculated from the well information supplied by the Borough of Emmaus (see Appendix J) by summing the average pumping rate for each well. Thus, the water supply is roughly estimated to be twice the average system demand.

2. Well 7 is being pumped at a low rate because of its elevation and the costs related to pumping water from this well into the system. As a contingency, the pump rate could be increased. There would be not additional effort required to apply this option, only an increase in electric costs.

3. Well 3 is contaminated and is currently off-line. It is only exercised for short periods to ensure that the pump remains functional. A treatment system has been designed for this well but has not yet been constructed. Contingency planning would include the construction of the treatment system to facilitate bringing this well on-line. This well could add 349,000 gallons per day to the total system capacity.

Interconnections

There are two existing water system interconnections with the City of Allentown.

[2] For security reasons, this appendix is only provided to DEP.

4. **Allentown Interconnections** – Two mechanical interconnections between Allentown and Emmaus water systems exist. They have never been used and are assumed to be non-functional. The interconnections need to be rebuilt to be functional. The interconnections would need to account for pressure differences between the two systems. A formal agreement, signed by both municipal governments and approved by DEP, would be required. This agreement would provide for either system to supplement the other in a time of need.

5. **Lehigh County Authority (LCA) Interconnection** – Currently no interconnection exists. It is anticipated that in the future an interconnection will be built connecting LCA and Emmaus.

The Emmaus Water Department will continue to evaluate emergency interconnections with Allentown and the Lehigh County Authority.

New Sources

There are currently no plans to develop new water supply sources (wells) but this option has not been ruled out. If future demand exceeds the current supply or if the contingencies previously described are not effective in addressing impacts to the existing wells, new sources will be considered.

See Review Comment No. 14 in Report Foreword

Growing Greener Grant Application

submitted to the

PA Department of Environmental Protection

for

Wellhead Protection Plan for Emmaus Borough Public water System

in the

Leibert Creek Watershed, Lehigh County

submitted March 9, 2001 by

BOROUGH OF EMMAUS

28 South Fourth Street, Emmaus, PA 18049-3899
TEL: 610.965.9292 FAX: 610.965.0705

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Appendices

Greener

2001

This form is to be used to apply to the Department of Environmental Protection for a grant to support restoration and protection of watersheds and environmental stewardship in the Commonwealth. Projects will be supported by state funds through Pennsylvania Growing Greener and/or federal funds. ***See Instructions, and additional conditions on reverse.***

PROJECT AND APPLICANT INFORMATION

1. Project Title (please be concise): Wellhead Protection - Borough of Emmaus Public Water System

2. Major River Basin(s) Covering Project Location: ☐ Ohio/Great Lakes ☐ Susquehanna/Chesapeake Bay ☒ Delaware

   Watershed: Little Lehigh Creek Township: Upper Milford, Emmaus County: Lehigh

   (Include an 8½" x 11" copy of a USGS 1:24000 scale topographic map with project boundaries indicated.)

   Latitude 40 31' Longitude 75 30'

3. Applicant Organization: Borough of Emmaus

   Address: 28 South 4th Street, Emmaus, PA 18049

   Address for UPS deliveries (no P.O. Boxes): same

   Contact Person: Daniel Delong

   Phone: (610) 965-9288 Fax: (610) 965-0705 E-Mail:

   Type of organization:

   ☐ Watershed Group ☐ Conservation District ☐ Non-profit ☐ School ☒ Government

   ☒ Community Water System (PWSID #R3-339032)

   Applicant's Federal Employer Identification Number (FEIN) or Tax Number: 23-6002863

   Does the applicant have 501(c)(3) status? Yes ☐ No ☒

4. If your group is a watershed association that is not incorporated, you must find a *sponsor* to administer the grant on your behalf. If your group is a nonprofit group that is not a watershed association and does not have 501(c)(3) status, you must also find a *sponsor* to administer the grant on your behalf. The sponsor accepting responsibility for the grant must be a local government entity, county conservation district, educational institution, incorporated watershed association or incorporated non-profit 501(c)(3).

   Sponsor's Name (Organization): Borough of Emmaus (same as applicant organization)

   Sponsor's Contact Person: Daniel Delong

   Address: 28 South 4th Street, Emmaus, PA 18049 Phone: (610) 965-9288 Fax: (610) 965-0705

   Sponsor's Federal Employer Identification Number (FEIN) or Tax Number: 23-6002863

   Does the sponsor have 501(c)(3) status? Yes ☐ No ☒

5. Application Type: (check only one)

   Watershed Protection

   A. ☐ Organization of a watershed group;

   B. Watershed assessments and development of watershed restoration or protection plans:

      1. ☐ abandoned mine drainage only

      2. ☐ multiple nonpoint sources

   C. ☐ Implementation of watershed restoration or protection projects;

   D. ☐ Demonstration project;

   E. ☐ Education project/outreach;

   Source Water Protection

   F. ☒ Wellhead protection (ground-water source for public water system);

   G. ☐ Watershed protection (surface-water source for public water system)

   Does your project involve mine reclamation or remediation of abandoned mine drainage pollution? Yes ☐ No ☒

   Are facilities or infrastructure projects to be funded under this application? Yes ☐ No ☒

   If yes, is your project consistent with a county, municipal or multi-municipal comprehensive plan or zoning ordinance? Yes ☐ No ☐

6. **Did you discuss your application with a DEP regional or mining watershed coordinator?** Yes ☒ No ☐

   Discussed project w/ Patrick Bowling, hydrogeologist, DEP Central Office, week of February 26th.

7. Project Duration (months): 30

Department of Environmental Protection
Environmental Stewardship and Watershed Protection Grant Application

CHECKLIST FOR APPLICATION COMPLETENESS

(This must be completed and submitted with each Grant Project Proposal)

Applicant Sponsor: BOROUGH OF EMMAUS

Project Title: Wellhead Protection - Borough of Emmaus Public Water System

Use check if contained in your application. N/A means "Not Applicable"

GENERAL

✓ The project addresses nonpoint sources of pollution.
✓ The project participants/responsible parties are identified.
✓ All tasks required to implement project are identified and assigned.
✓ The project outputs are listed.
✓ "Match" is supported with documentation.
✓ The application includes the original and three copies (a total of four)

APPLICATION

The two-page application form includes:

- ✓ Project Title
- ✓ Project Location
- ✓ Applicant Organization Information
- ✓ Sponsor Organization Information
- ✓ Application Type
- ✓ Discussion with DEP regional or mining watershed coordinator
- ✓ Project Duration
- ✓ Project Description
- ✓ Funding Request Summary
- ✓ Applicant and/or Sponsor certification and signature

The proposal body and attachments include:

- ✓ Project Location Map
- ✓ Discussion of proposal's relationship to watershed plans
- ✓ Detailed Project Description including:
  - ✓ Executive Summary
  - ✓ Statement of Need and Justification of Funding
  - ✓ Goals and Objectives
  - ✓ Partnerships
  - ✓ Work Plan with Timeline
  - ✓ Measurable Environmental Results
  - ✓ Detailed Budget Worksheets
- ✓ County Conservation District Acknowledgement Letter
- ✓ Participating Partners' Letters of Commitment
- ✓ Letters of Support
- N/A Letter of Acknowledgement from the Western or Eastern Pa Coalition of Abandoned Mine Reclamation, if applicable

Executive Summary

The Emmaus Borough Water System is supplied by groundwater pumped from six (6) deep wells located in and around the municipal boundaries of the Borough. Of the six (6) wells only one (1) remains uncontaminated (Well No. 6) by regulatory standards. If Well No. 6 becomes contaminated, the Borough of Emmaus Public Works Department will take it offline and the other wells (treated due to contamination) would provide a comfortable level of service. Depending on the level of contamination, the Borough would start a design to treat Well No. 6. The next option for backup water supply is the two (2) interconnects with the City of Allentown that would only serve approximately 80% of the system. The purpose of this project is to develop a strategy to protect the only remaining uncontaminated well. The Borough of Emmaus, in cooperation with Upper Milford Township and Barry Isett & Associates, Inc., proposes to carry out a project over the course of 30 months, from notice to proceed, with an estimated approximate cost of $50,000 with an additional $27,000 of in-kind services by the sponsor organization, for a total of almost $77,000. The project will produce groundwater well water-quality monitoring, GIS database for contaminant source inventory, steering committee, public education, and a completed Wellhead Protection Plan.

CONTINUATION OF APPLICATION FORM

The following information is provided in response to item #8 of the Growing Greener grant application for this project.

8. Watershed Planning Coordination

Watershed plans that are related to the proposed Wellhead Protection-Source Water Protection Plan for the Borough of Emmaus' Public Water System (PWS) are:

- **Watershed Assessment: City of Allentown** by the Cadmus Group, Inc. **1998.** As part of the PA DEP's source water protection program, The Cadmus Group, Inc. studied the Little Lehigh Creek, in which they delineated the watershed, reviewed potential and actual pollutant sources, analyzed the susceptibility of the watershed to the sources, and prepared a management plan consisting of a series of recommendations.

- The goal of the **Wellhead Protection Area (WHPA) Delineation Report (1995)** by Meiser & Earl, Inc., for the Lehigh-Northampton Joint Planning Commission (JPC), is for the municipalities to adopt a Wellhead Protection (WHP) Ordinance. The Borough of Emmaus has requested and the Township of Upper Milford has agreed to adopt a wellhead protection/source water protection ordinance in order to safeguard the Borough's Well No. 6 and the water quality of Leibert Creek. The proposed wellhead protection project will continue to support, develop, and strengthen the intermunicipal cooperation.

- Chapter 9 of the **Wellhead Protection Demonstration Project (December 1992)** by the Lehigh-Northampton Joint Planning Commission and R.K.R. Hess Associates provides recommendations that this proposed Wellhead Protection project for the Borough of Emmaus Public Water System addresses and plans to carry out.

  - Recommendation – An inventory should be created for each of the following within wellhead protection areas (facilities with underground injection wells, waste disposal, sewage sludge land application sites permitted under DER regulations, sinkholes, and annual reports for DER permitted sewage disposal facilities.
  - A key element of a successful wellhead protection program is the accumulation of pertinent data within wellhead protection areas. State and federal agencies cannot effectively keep track of all potential contaminant activities within these areas. Therefore, a local entity needs to be responsible for the acquisition and management of such data. Data acquired through this process would be valuable for designing the water quality-monitoring program and for structuring the coordination activities such as providing DEP and/or EPA with the collected data.

2001. The proposed wellhead protection project will support the enactment of Act 167 Plan and the adoption of other water resource management conscious land use plans. The Little Lehigh Report recommends that Education, Public Participation and Continued Monitoring be prevalent in the watershed. The proposed Wellhead Protection project addresses those three (3) recommendations.

- The proposed Wellhead Protection project fits with **Pennsylvania's Nonpoint Source (NPS) Management Program 1999 Update** in many respects. In keeping with the NPS vision statement, this project aims to achieve appropriate water quality standards and protect beneficial uses of all surface water and groundwater. This project will meet the long-term goals with short-term objectives of the NPS Program in that portions of it will utilize the handbook for citizen volunteers on conducting water monitoring and watershed assessments for state and local use. In addition, a GIS will be used to show watershed features and to report and track environmental improvements, focused within the wellhead protection zones. This proposed project will include the first three (3) out of the six (6) steps to PA's Watershed Approach and will provide direction and assistance for taking the remaining three (3) steps. This project focuses on watershed improvement and nonpoint source abatement at the local level. In terms of GIS, this project will utilize ArcView and ArcInfo software which is compatible with all DEP programs and most outside agencies, and the project team will continue to stay abreast of PaMAGIC's statewide efforts to insure that the GIS data format can be utilized by all entities. The NPS Management Program seeks to include public education, awareness, and action activities. Examples listed in the program that are included in the Wellhead Protection proposed project are: citizen monitoring, providing NPS information on Best Management Practices (BMPs), municipalities in compliance with the Storm Water Management Act (Act 167), increasing the number of watershed associations, and conducting a number of information/education outreach activities to ensure understanding and use of NPS management materials.

Demonstrated Commitment

The "Detailed WHPA Delineation" report (Meiser & Earl, Inc., 1995) illustrates the Borough of Emmaus' Well No. 6 Wellhead Protection areas. The delineated area for Zone III is entirely in Upper Milford Township as is the majority of Zone II, while Well No. 6 and Zone I are within the Borough of Emmaus. On February 22, 2001 Upper Milford Township signed an agreement to sign a WHP Model Ordinance. A Growing Greener grant for WHP would take the model ordinance and the Meiser & Earl delineation efforts one step further. Meaning, the rigorous delineation of the wellhead protection areas would be capitalized by a contaminant source inventory, WHP area management and commitment, contingency planning, and looking into new sources of water supply (all steps required by the WHP Source Water Protection (SWP) program Growing Greener Grant).

Steps to address the need for source water protection wellhead protection for the Emmaus Borough Water System include formation of a broad-based steering committee, multi-municipal public participation efforts, contaminant source (existing and potential) inventory, Wellhead Protection area management and community commitment, contingency planning, and identification of new sources for future water supply needs. These steps will build upon the already completed rigorous delineation of the area to be protected by Meiser & Earl, Inc. (1995).

Intermunicipal Cooperation

Neither the Borough of Emmaus nor Upper Milford Township has historically pursued cooperative projects. Funding of this proposal would foster a cooperative effort which otherwise would most likely not get accomplished by either entity by themselves. The hopes are that this project will be the first in a series of cooperative efforts.

Environmental Initiatives and Planning

Positives for this Wellhead Protection Project:

1. Portions already studied by Cadmus Group (1998).
2. Wellhead protection area identified by Meiser & Earl, Inc. for LVPC Project, 1995.
3. Emmaus has a sanitary sewer system and a water system; Upper Milford has neither and is desirous of connecting to Emmaus' sewer system. Emmaus and Upper Milford are in the process of coordinating a cooperative project where Upper Milford would connect to the Emmaus sewer system and in turn agree to adopt wellhead or source water protection ordinances.
4. Emmaus, Upper Milford, Macungie, Lower Macungie, and Alburtis are pursuing a regional comprehensive plan agreement.
5. We are currently in a cooperative mode regarding communication and thinking of cooperating for a regional benefit.

Upper Milford Township has written a letter endorsing the proposal and is willing to assist the Borough of Emmaus and other partners in completing the work necessary in preparing, publishing, and implementing a wellhead protection plan for the Borough of Emmaus Public Water System. Upper Milford Township will donate meeting space for the project steering committee meetings as well as the public education and participation meetings. Upper Milford Township will have at least one municipal personnel on the steering committee.

The Lehigh County Conservation District, State Representative Jane Baker, Lehigh County Commissioner Grayson McNair, Lehigh County Executive Jane Ervin, the *Little Lehigh Trout Unlimited Chapter, the Lehigh Valley Planning Commission, City of Allentown Water Department*, and the *East Penn School District* support this project and have demonstrated this by writing letters of support that can be found in Appendix C. Letters of support from *State Senator James Gerlach* and the Emmaus Public Library will be mailed under separate cover following the submission of this application.

The list of project partners is expected to grow as the project develops.

Work Plan

This section describes the three (3) major components of this project's work plan as well as the elements associated with each. **A detailed timeline for scheduled project activities can be found in Appendix D.**

- INTRODUCTION AND OVERVIEW OF WELLHEAD PROTECTION AREA
  1. Demographic Setting
  2. Hydrogeologic Setting
  3. Size of Drainage Basin and Geologic Unit Names
  4. Water System Description and Source Characteristics
  5. Service Area Size and Extent Including Current and Projected Population
  6. Current Land Use in Study Area
  7. Major Environmental and Planning Initiatives Underway or Planned
  8. Unique Characteristics
  9. Related Watershed Management Efforts

- WORK PLAN AND SCHEDULE
  1. Steering Committee and Public Participation
  2. Delineation of the Wellhead Protection Area
  3. Inventory of Existing and Potential Contamination Sources
  4. WHP Area Management and Commitment
  5. Contingency Planning
  6. New Sources

- INFORMATION, EDUCATION, AND PUBLIC PARTICIPATION
  1. Periodic Press Coverage
  2. Presentations at Public Meetings
  3. "Water-Awareness" Event

INTRODUCTION AND OVERVIEW OF WELLHEAD PROTECTION AREA

Appendix A contains a site location map for this wellhead protection project showing the six (6) public water supply wells for the Emmaus Borough Public Water Supply System as well as municipal boundaries. Note that there are six (6) wells numbered 1, 2, 3, 4, 6, and 7, with No. 5 missing. The Borough, in 1988, abandoned Well 5, previously located at North 6th Street and Berger Street, because of chemical contamination.

1. Demographic Setting

Emmaus Borough, located in southwestern Lehigh County, has a population of approximately 14,000 people. Lehigh County presents a variety of cultural settings, including the City of Allentown, suburbs, and rural and agricultural areas. Development pressure is encroaching on the county from several major directions: from the Philadelphia area along Interstate-476, from the Allentown area along U.S. Route 22, and from Eastern PA and NJ along I-78. The participating municipalities lie to the south of U.S. Route 22, to the southwest of I-78, and the PA Turnpike (I-476), which runs through the middle in a North-south direction.

A regional approach would be desirable, as several of the original participants clearly understand that groundwater and potential contamination do not respect municipal boundaries. Municipal officials from the affected municipalities will be asked to serve on the steering committee. The early and direct involvement of these officials is believed to be the key to success in implementation. The possibility exists at this time that additional municipalities will come on board this wellhead protection effort.

Other organizations that will potentially be represented either directly on the steering committee or as interested parties include the Lehigh Valley Planning Commission, Lehigh County Conservation District, the agricultural community, East Penn School District, the Wildlands Conservancy, and consultants. A representative of the Pennsylvania Department of Environmental Protection (DEP) will also be invited to participate in committee meetings.

2. Hydrogeologic Setting

Well No. 6 is located along Leibert Creek, just north of Shimerville Road, within the southern end of the Borough of Emmaus, Lehigh County, Pennsylvania. The well is in the Great Valley Physiographic Section of the Ridge and Valley Province, approximately 500 feet from the Reading Prong Section of the New England Province, according to the JPC "Wellhead Protection Demonstration Project" report December 1992 (Meiser & Earl, 1995).

The well site is mapped as being located within the Carbonate Valley Landscape Unit and falling within the Leithsville Dolomite Subunit, according to Table 5-2 and Plate 6 in the JPC "Wellhead Protection Demonstration Project" report, December 1992, and the Pennsylvania Geologic Survey's "Water Resources of Lehigh County" report W-31, 1972. However, the driller's log shows that this well is drilled entirely in sandstones and granites, which comprise the Hardyston Quartzite Subunit and Igneous-Metamorphic Subunit of the Reading Prong Landscape Unit (Meiser & Earl, 1995).

Based on the driller's log, the well apparently is completed within the Hardyston Formation of Cambrian age and the underlying granites and gneisses of Pre-Cambrian age. The Hardyston Formation consists of white to dark gray quartzite interbedded with arkose, quartz pebble conglomerate, and silty shale or phyllite (Meiser & Earl, 1995).

3. Size of Drainage Basin and Geologic Unit Names

The size of the contributing area to the six (6) wells in the Emmaus Borough Public Water System is approximately seven (7) square miles, which includes the four (4) square miles within the Leibert Creek drainage basin in addition to the approximately three (3) square miles that fall within the municipal boundaries of the Borough.

4. Water System Description and Source Characteristics

The Emmaus Borough Water System [PWSID No. PA 3390032] services Emmaus Borough and portions of Salisbury, Upper Milford, and Lower Macungie Townships. The Emmaus Borough Water System is supplied by groundwater pumped from six (6) wells located in and around the municipal boundaries of the Borough. Wells 1 and 2 are located at Klines Lane and Minor Street. Well 4 is located at Glenwood Street and Mountain Boulevard. Well 6 is located at Shimerville Road and South 15th Street. Well 7 is located at Macungie Avenue and Orchid Place. (The Borough has a 6th well, Well 3, which is currently not in service due to chemical contamination. It is located at South 10th and Broad Street). The Borough, in 1988, abandoned another well, Well 5, previously located at North 6th Street and Berger Street, because of chemical contamination.
The first water system within the Borough of Emmaus was established in 1871. This system was a series of pipes connecting springs located on South Mountain. The spring water was distributed to customers via small diameter distribution piping. In 1927, two (2) wells were drilled at the site of the exiting "Main Pumping Station" location at Klines Lane and Minor Street. In subsequent years, the spring connections were abandoned, other wells were drilled and a series of water mains were installed to create the current system.

Today, the Borough's water sources rely solely on groundwater. The Borough pumps all of its water from six (6) deep wells located at various locations in and around the Borough. This groundwater is treated by two (2) methods: (1) the water from certain wells is treated by an aeration process to remove volatile organic chemical contaminants and (2) chlorine is added to the water supply at all individual well locations for the purpose of destroying and safeguarding against the growth of any pathogenic organisms that could be transmitted by water.

The Emmaus Borough Water Department is constantly striving to maintain high quality drinking water and an adequate supply that meets all regulatory requirements. Past projects have included the upgrading of five (5) of the Borough's six (6) wells, the most recent upgrade completed in June of 1999.

5. Service Area Size Including Current and Projected Population

The Emmaus Borough Water Department provides water service to approximately 4,600 customers in Emmaus Borough and surrounding areas, including portions of Salisbury

and sedimention, failing substandard septic systems in the Vera Cruz area of Upper Milford Township, and urban runoff. Based upon the segment of the Little Lehigh Creek that the Leibert Creek flows into, the Chapter 93 stream classification is High Quality-Cold Water Fishes (HQ-CWF). Total Maximum Daily Loads (TMDLs) have not been done for Leibert Creek.

The proposed Emmaus Borough Wellhead Protection project will meet the **Environmental Protection Agency's (EPA) Source Water Protection and Protection (SWAP)** program's goal of "supporting the development of local voluntary source water protection plans (i.e., wellhead protection) in the United States." This program is a voluntary program for water providers to participate but mandatory for the DEP to complete. Therefore, this proposed cooperative effort by the Borough of Emmaus and Upper Milford Township will assist the EPA in achieving it's goals. The Borough of Emmaus has recently taken part in the voluntary assessment of the Public Water System by DEP.

An assessment is not completed for the Borough of Emmaus Public Water System; therefore, this project will address priorities identified in the source water assessment that are included in the elements of delineation, contaminant inventories, and susceptibility analysis. For groundwater sources of PWS serving a population of 3,300 or more, as is the case with Emmaus, site-specific studies and individual delineations will be developed for each source. There are approximately 1,100 groundwater sources under this definition, according to the Source Water Assessment and Protection (SWAP) Program manual (March, 2000).

WORK PLAN AND SCHEDULE

The tasks listed below are necessary to develop and implement a local Source Water Protection Program that meets DEP minimum elements. A more detailed description of the tasks can be found in *Appendix E*.

The Timeline Chart in *Appendix D* coupled with the spreadsheet in *Appendix E*, provides a detailing of this project's *Major Steps and Milestones and Expected Completion Dates.*

1. Steering Committee and Public Participation

A Steering Committee will be assembled at the onset of the project consisting of a limited number of representatives from the Borough of Emmaus, Upper Milford Township, interested watershed-minded organizations, and a consultant. The *Steering Committee* will *meet quarterly and will work to guide and develop the project throughout the 30-month duration.*

Public participation for this project includes three (3) public meetings with one held at the initial stages of the project to educate and inform the public of WHP and SWP, the second at the mid-point of the project to provide a status report to interested persons, and the third will take place approximately two (2) months prior to project completion so that the public has a chance to offer input to the final Source Water Protection Plan.

- Pollutant types by pollutant source (toxics, sediments, nutrients, salts, pesticides, pathogens, etc.)
- Implication of each pollutant type for the water supply (i.e., pathogens cause disease and health consequences)

Methods to identify potential contaminants in the wellhead protection area:

a.) Review of Point Source Pollution Database

- Available data from the pollutant sources including: direct surface or groundwater discharges, NPDES permittees, hazardous waste sites and spills, petroleum and chemical bulk storage facilities, salt storage facilities, and landfill/dump sites will be collected from appropriate state and federal agencies.
- The data collected will be presented in maps and tables.
- These data will provide important baseline information on location and extent of activity in each contributing area.

The inventory will include searching regulatory databases at the federal and state level for information on facilities and sources subject to certain federal and state laws (including but not limited to RCRA, CERCLIS, and NPL). A reconnaissance level field survey will also be conducted of the entire area along with detailed surveys of selected areas. A variety of potential contamination sources will be identified ranging from cemeteries and private "junk yards" to major transportation facilities and industries using materials that could potentially contaminate groundwater.

The information collected throughout the course of the existing and potential contaminant sources inventory will be compiled in a GIS database as a feature with associated data attached.

A base map of the study area will first be developed in the GIS and will consist of study area boundaries, zones of contribution areas for PWS wells, municipal boundaries, major transportation lines (roads and railroads), streams, and public water supply well locations.

Additional GIS layers that will be collected/created are:

- Private groundwater sampling wells
- WHP delineated areas for six (6) wells
- Locations of existing contaminant sources
- Locations of potential contaminant sources

b.) Interview of Key Watershed Stakeholder/Informants and Mapping

- Key stakeholders/informants who live and work in the watershed from both public and private organizations will be interviewed and asked about potential sources of pollution in the watershed.
- Their responses will be summarized and included in the report.

5. *Contingency Planning*

Contingency planning will include a revised emergency response plan; Upper Milford Township in cooperation with the Borough of Emmaus will be responsible for this effort. Both municipalities currently recognize the need for contingency planning.

Contingency planning is currently being discussed between Emmaus and Upper Milford Township and will be incorporated into this project when applicable, or about mid-way to the end of the 30-month project duration.

6. *New Sources*

The protection of Well No. 6 would preclude the need to find a new source of water supply and although the Borough of Emmaus does not actively pursue new sources, this wellhead protection study process would provide necessary information to readily evaluate possible areas for a new source. This item of the work plan would address adequate planning for new wells including careful consideration of potential sites, existing land use, predicted Zone I area, and how to obtain access and rights to access areas if necessary and how the areas will be protected.

This item will be addressed as need or at some point prior to completion of the 30-month project schedule.

INFORMATION, EDUCATION, AND PUBLIC PARTICIPATION

It is understood and agreed upon by project partners that *on-going public education* and information program will be important to the success of the project. As a result, a variety of activities will be included in this program, such as:

1. *Periodic Press Coverage*

- In addition to the routine newspaper coverage, the local press will be asked to publish a featured article on the wellhead protection project.

2. *Presentations*

- A PowerPoint presentation developed as a stand-alone project via Water Resources Education Network (WREN) funding, will be made to the governing body of each participating municipality as well as other interested organizations. The content will include Source Water Protection and Wellhead Protection information specific to this project area (Borough of Emmaus Water Supply System). The presentation will consist of text, graphs, photos, and maps to illustrate and educate the topics at hand.

Postage will be purchased and disposed of by mailing up to 400 letters regarding informing landowners of potential contaminants, as well as educating the public and calling for participation in the Wellhead Protection project efforts.

DEP Growing Greener Budget Worksheet

This worksheet should be used to prepare Item #12 on the Application, Budget Summary.
Totals for each category should be entered on the application form.
Please include a copy of this worksheet with the application package.

1. SPONSOR SALARIES/BENEFITS

INDIVIDUAL	POSITION	HOURLY RATE	HOURS	BENEFITS	TOTAL COST
BOROUGH OF EMMAUS	PUBLIC WORKS DIRECTOR	30.00	825		24750.00
TOTAL SALARIES/BENEFITS					$ 24750.00

2. TRAVEL

Mileage: 580 miles @ $0.345 /mile = 200.10
Meals: _____ = _____
Lodging: _____ nights @ $_____ /night = _____

TOTAL TRAVEL = $200.10

See the DEP website at www.dep.state.pa.us/growgreen/travel.htm for maximum reimbursement rates.

B. OTHER CONTRACTUAL EXPENSES

ITEM	COST
Color Maps ($2/map)	$50.00
LAB FEES for WQ samples	$2800.00
ArcView GIS Software ($5/HR)	$500.00
Global Positioning Systems (GPS) Equipment ($40/hr.)	$320.00
Federal & State Computer Database Search	$500.00
TOTAL OTHER CONTRACTUAL EXPENSES	$4170.00

C. TOTAL CONTRACTUAL (= A+B)

ITEM	SALARY COST	OTHER COSTS	TOTAL COST
PUBLIC EDUCATION/MEETINGS	5300.00	$50.00	5350.00
Water Sample Analysis	1624.00	$2800.00	4424.00
Contaminant Inventory/GIS Database	16430.00	$1000.00	17430.00
SWP WHP Plan	16960.00		16960.00
Field Work	4770.00	$320.00	5090.00
TOTAL CONTRACTUAL	$45084.00	$4170.00	$49254.00

6. CONSTRUCTION

ITEM	COST
Materials	
TOTAL CONSTRUCTION	$0.00

7. OTHER

ITEM	COST
Volunteer(s) Time (100 HR.)	$1000.00
Meeting Space (11 meetings)	$1100.00
TOTAL OTHER	$2100.00

LIST OF APPENDICES

A - Maps

B - Photographs

C - Letters of Support

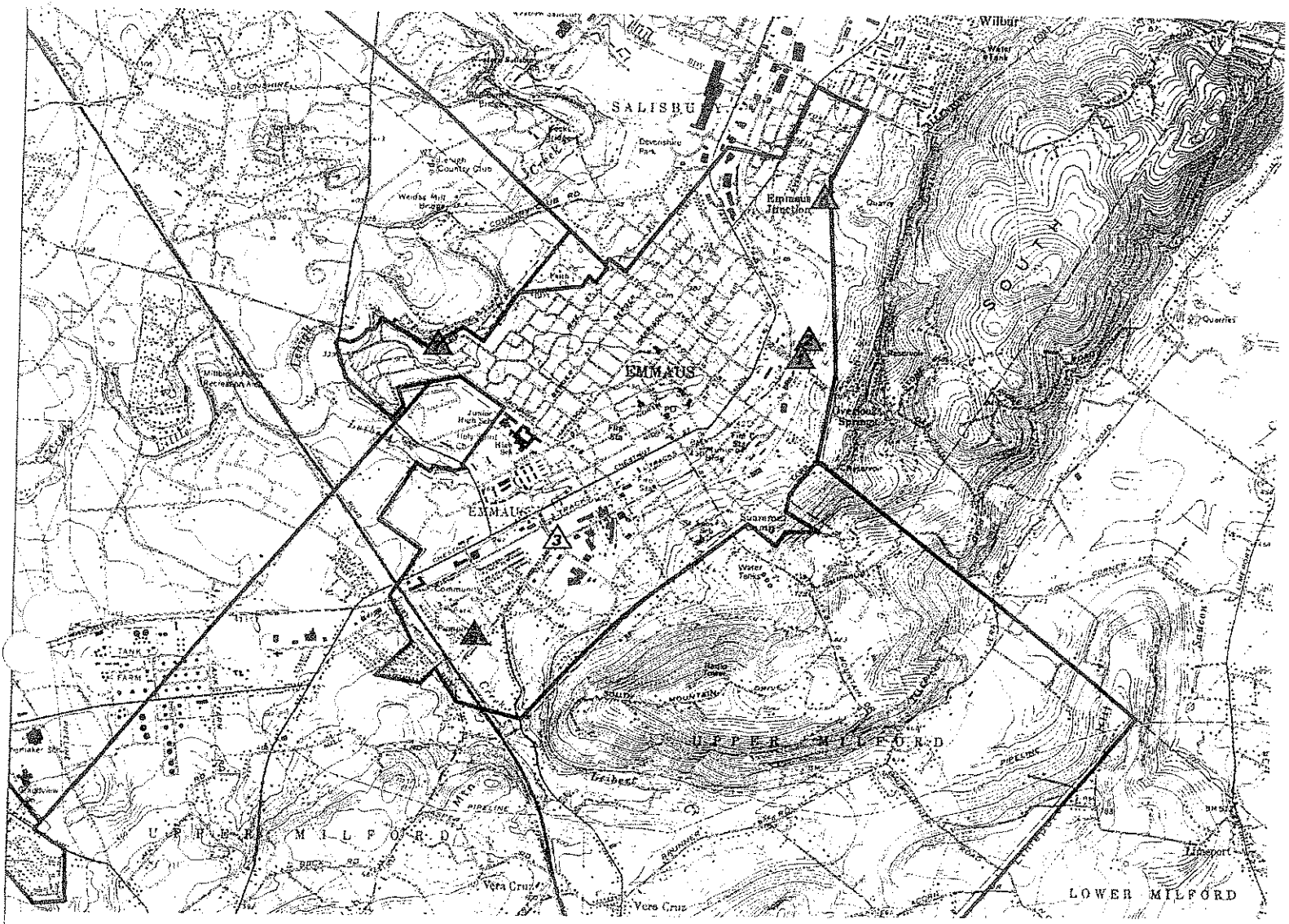
D - Timeline

E - Detailed Task List and Budget

F - Barry Isett & Associates, Inc. Qualifications

and Municipal Boundaries

Lehigh County



BOROUGH OF EMMAUS 18 59 PENNSYLVANIA

N W E S

PWS Wells

- Abandoned
- Contaminated
- Uncontaminated

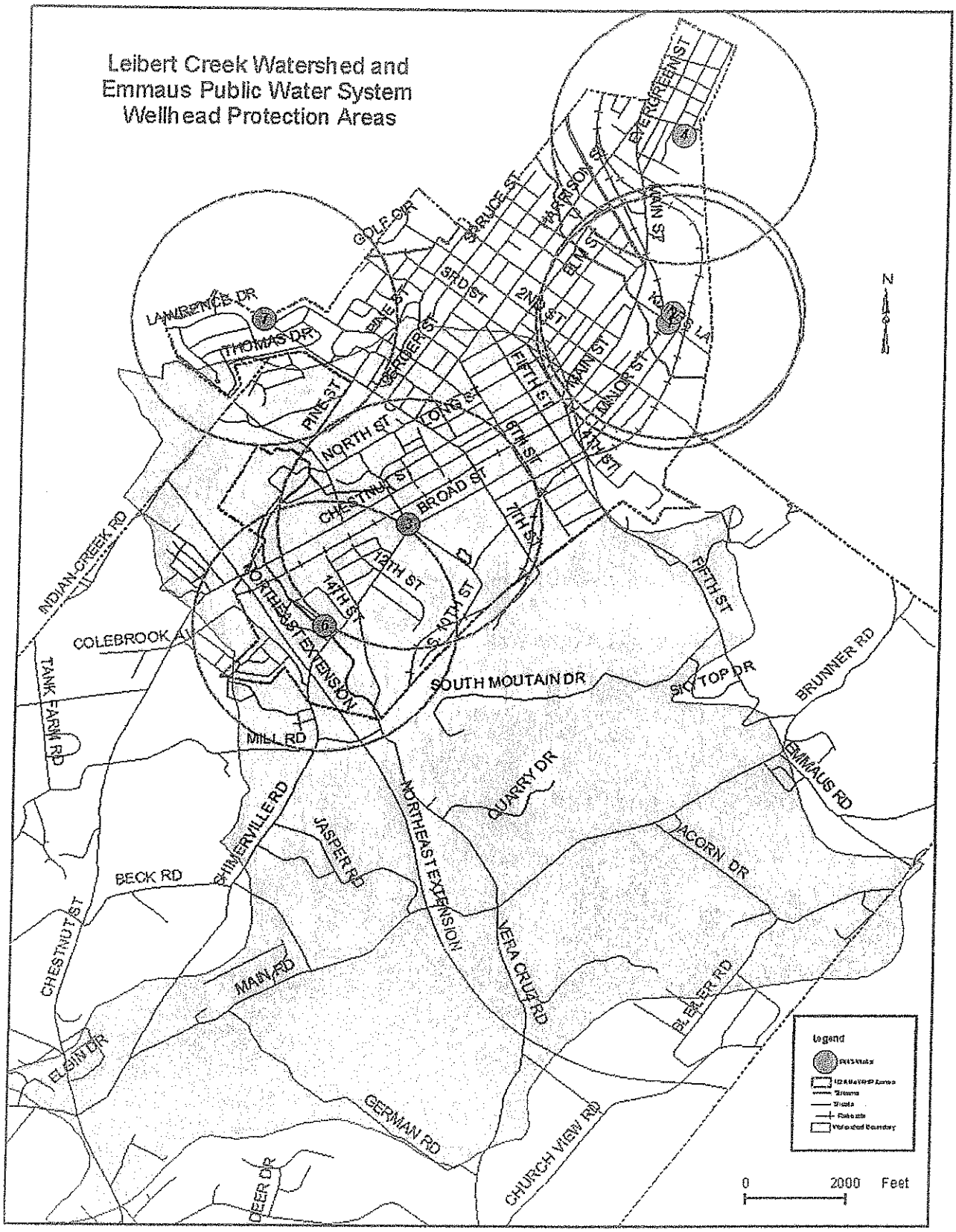
BARRY ISETT & ASSOCIATES
Consulting Engineers & Surveyors

Trexlertown 610.398.0904
Norristown 610.278.0166
Hazleton 570.455.2999
www.barryisett.com

USGS Topographic Map
Allentown West, Allentown East,
East Greenville & Hellertown Quadrangles
Emmaus Borough & Upper Milford Township
Lehigh County, Pennsylvania

0 1 Miles

1:42,000


Leibert Creek Watershed and
Emmaus Public Water System
Wellhead Protection Areas
EVERGREEN ST
GOLF DR
SPRUCE ST
HARRISON ST
ELM ST
3RD ST
2ND ST
LAWRENCE DR
THOMAS DR
PINE ST
GERDER ST
FIFTH ST
MAIN ST
MANOR ST
LONG ST
NORTH ST
6TH ST
4TH ST
CHESTNUT ST
BROAD ST
7TH ST
INDIAN CREEK RD
13TH ST
14TH ST
10TH ST
NORTHEAST EXTENSION
FIFTH ST
COLEBROOK AV
TANK FARM RD
SOUTH MOUTAIN DR
SKY TOP DR
BRUNNER RD
MILL RD
EMMAUS RD
QUARRY DR
SCHIMERVILLE RD
JASPER RD
NORTHEAST EXTENSION
ACORN DR
BECK RD
CHESTNUT ST
VERA CRUZ RD
MAIN RD
BLEILER RD
ELGIN DR
GERMAN RD
CHURCH VIEW RD
DEER DR
N
Legend
0
2000
Feet

APPENDIX B

PHOTOGRAPHS

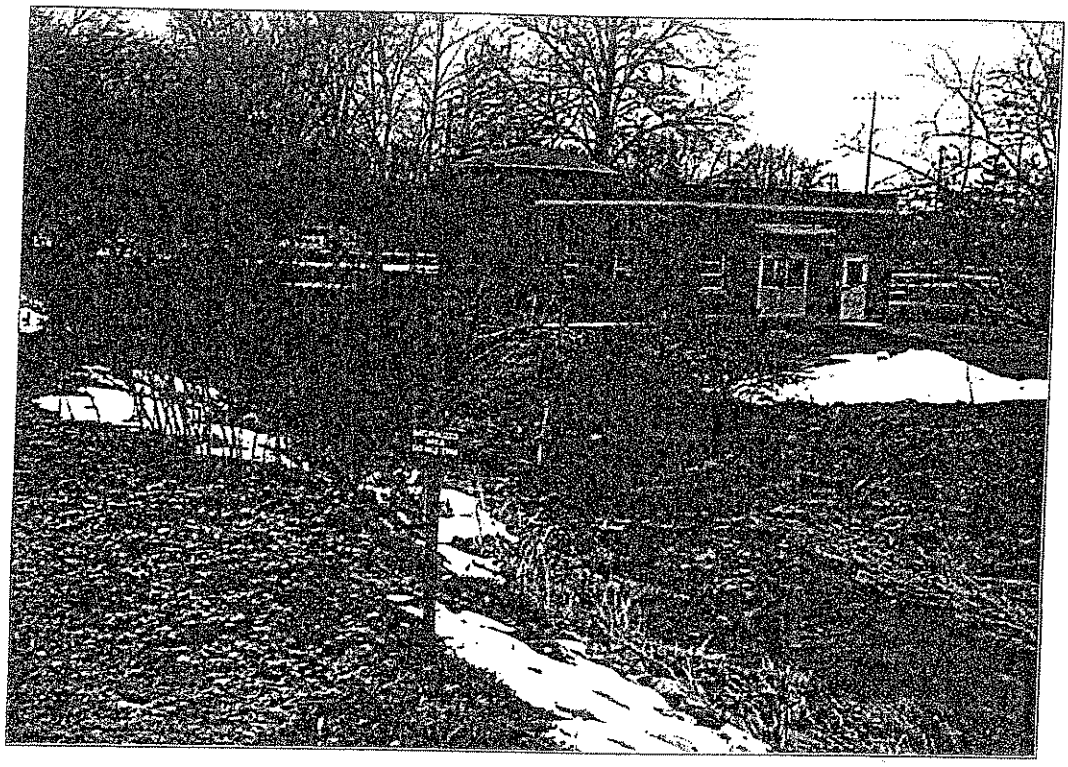


PHOTO 1: Leibert Creek (looking north/downstream) runs within 50 feet of Well No. 6. Emmaus Community Park can be seen beyond the brick well house. Sign in foreground says "Natural Land Area. Do Not Trespass."

BOROUGH OF EMMAUS

28 South Fourth Street, Emmaus, PA 18049-3899
TEL: 610.965.9292 FAX: 610.965.0705

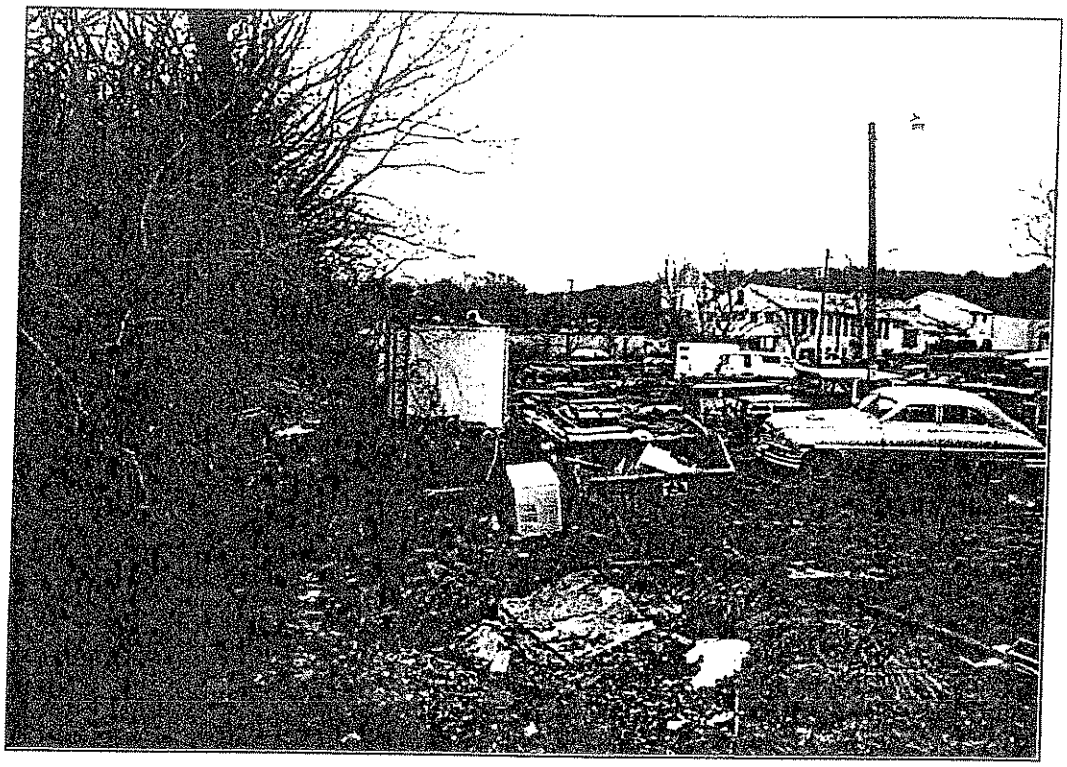


PHOTO 2: Tributary to Leibert Creek in Vera Cruz, Upper Milford Township, runs next to an auto parts lot.

BOROUGH OF EMMAUS

28 South Fourth Street, Emmaus, PA 18049-3899
TEL: 610.965.9292 FAX: 610.965.0705

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OVERVIEW OF THE SOURCE WATER PROTECTION PROGRAM

The 1986 amendments to the federal Safe Drinking Water Act (SDWA) required States to develop Source Water Protection (SWP) Programs to protect ground-water sources used by public water systems from contamination. Pennsylvania's SWP Program, which is administered by the **Pennsylvania Department of Environmental Protection (PA DEP),** obtained approval from the U.S. Environmental Protection Agency in March 1999. The responsibilities for SWP are shared among many stakeholders, but the primary responsibility is at the local government level. Because the majority of the recharge areas fall outside the political boundaries of the Borough, the responsibility to regulate land use will require cooperation between multiple local government entities. SWP is a cooperative, pro-active, positive approach to protecting ground-water supplies and should not be interpreted as an adverse action. The program involves the delineation of Source Water Protection areas for wells and springs, identification of potential sources of ground-water contaminants and the development of recommended management measures as a means to reduce the potential for contamination of the ground-water supplies.

Although development of a local SWP program is voluntary, PA DEP regulations do require some basic Source Water Protection measures for new public water supply wells, springs, or infiltration galleries. Each new ground-water source must establish an innermost protection zone (Zone I SWP area) with a fixed radius of 100-400 feet depending on certain site-specific characteristics. The water supplier must show that it has ownership, or substantial control by a deed restriction or other acceptable means, the Zone I SWP area. In addition to this delineation, communities are encouraged to establish Source Water Protection programs, which include the following:

1) The formation of a steering committee to establish and implement the Source Water Protection program. These tasks include conducting a potential contaminant source inventory, providing options for the management of the SWP area (also known as the source water protection area), seeking public input into the creation of the SWP plan, seeking approval of the SWP program and implementing the SWP program;
2) Development of a public education program;
3) Delineation of the contributing areas of the water sources;
4) Identification of potential contamination sources within the Source Water Protection area;
5) Development and implementation of Source Water Protection area management actions to protect the water sources;
6) Development of an Emergency Contingency Plan for alternative water supply sources in the event the ground water supply becomes contaminated and emergency response planning for incidents that may impact water quality;
7) Conduct new water source planning to insure the protection of new water source locations and to augment current supplies.

Source Water Protection is a voluntary program, but water systems across the state are encouraged to take the above steps in protecting all ground-water sources. In addition, PA DEP has issued a set of guidelines outlining the minimum elements necessary for a local SWP program to obtain DEP approval. These guidelines are provided in Appendix A of this plan. DEP approval of local SWP programs will allow proper tracking and coordination so that local SWP efforts will be supported and recognized.

PA DEP has developed forms for submittal of SWP plans for review and approval. These completed forms, along with 3 copies of the Plan can be submitted to the DEP Regional Office for review, recommendations and approval. Electronic copies of these forms can be obtained at www.dep.state.pa.us and typing "Source Water" in the "directLink" box or you can contact the Bureau of Water Supply Management at 717-772-4018.

DELINEATION OF RECHARGE AREA

The focal point of a local SWP program is the delineated Source Water Protection area (SWPA). The Safe Drinking Water Act defines a Source Water Protection area as the surface and subsurface area surrounding a water well or well field, through which contaminants are reasonably likely to move toward and reach such water well or well field. The PA DEP Safe Drinking Water Regulations define a three-tiered SWPA as follows:

Zone I: - The protective zone immediately surrounding a well, spring or infiltration gallery which shall be 100' to 400' radius depending on site-specific source and aquifer characteristics.

Note: As explained above, this area shall be controlled by the water supplier for new sources. Zone I may be determined by either using PA DEP's Zone I graphs or by a qualified consultant directly calculating the area using site-specific data. For wells permitted before the October 1995, an acceptable Zone I would be the isolation distance as permitted. Typically, this is a 100 ft. radius.

Zone II: - The zone encompassing the portion of the aquifer through which water is diverted to a well or flows to a spring or infiltration gallery. Zone II shall be a one-half mile radius unless a more detailed delineation is approved.

Zone III: - The zone beyond Zone II that contributes significant surface water and ground water to Zone I and Zone II.

OVERVIEW OF THE SOURCE WATER ASSESSMENT AND PROTECTION PROGRAM

To expand the benefits realized from SWP efforts, the 1996 Safe Drinking Water Act reauthorization requires (under Section 1453) States to develop a Source Water Assessment and Protection (SWAP) Program. The SWAP program assesses the drinking water sources serving public water systems for their susceptibility to pollution. This information will be used as a basis for building voluntary, community-based barriers to drinking water contamination.

Pennsylvania's assessment program will:

(1) Delineate the boundaries of the areas providing source waters for all public water systems; and

(2) Identify (to the extent practicable) the origins of regulated and certain unregulated contaminants in the delineated area to determine the susceptibility of public water systems to such contaminants.

These assessments are of the raw water quality, not the finished water compliance. DEP will conduct assessments for community water systems supplied primarily by ground water and serving a population of 3,300 or more. The ground-water sources of public water systems serving less than 3,300 will be initially assessed using readily available data from the program's geographic information system (GIS). Assessments for the larger community water systems supplied primarily by surface-water sources will be conducted through contracted services. DEP staff will conduct assessments for community water systems supplied by surface water in basins less than 100 square miles and 90% forested.

From PA DEP *Revised February2000*

MINIMUM ELEMENTS FOR LOCAL SWP PROGRAMS
(Ground-Water Sources)

This section describes the minimum elements necessary for a local source water protection program for ground-water sources (also known as a Source Water Protection (SWP) program) to receive DEP approval. Local SWP program plans will be reviewed and approved by regional Water Supply Management staff. If necessary, coordination with other programs could be accomplished in a manner similar to that for permit coordination. Essentially, the plan should not only detail the provisions of the local program including a schedule for implementation, but should also demonstrate the commitment needed to support the on-going efforts necessary for a successful local SWP program. Therefore, the plan should not only describe how sources will be protected but also document the resources necessary to implement the plan, thus linking implementation and management to finances.

Each plan should have a table of contents, an introduction that includes the goal or purpose of the plan along with a general description of the area (demographics, topography, local/regional hydro-geologic setting, source characteristics, etc.), concise narrative descriptions for each of the following sections plus any other relevant supporting information. Each plan must have a SWP area delineation map using an appropriate base map with a scale ranging from 1:400 to 1:24,000 that accurately and legibly depicts source locations, SWP area boundaries and potential contaminant sources (preferably a USGS 7.5' quad or GIS-generated map with adequate cultural features/landmarks). The map must also have a bar scale and north arrow.

A local SWP plan must contain the following minimum elements in order to be considered for DEP approval:

Steering Committee & Public Participation

This section of the plan will document the formation and meetings of the local SWP steering committee along with provisions for public involvement. The committee chairperson, the chairperson's telephone number, members, a description of roles and responsibilities of the committee and dates/locations of meetings must be listed. Ideally, meeting locations should vary if possible and a tour/inspection of the wellfield/well sites should be conducted. The narrative must also demonstrate that adequate opportunities for public participation were in place at the beginning of and throughout the project (copies of public notices such as flyers, newspaper notices, etc.). This section should also document all public education activities and describe how the final plan will be accessible to the public (on file at municipal government office or public water system office, libraries, etc.).

SWP Area Delineation

This narrative must completely describe the methodology used, justification for methodology, and who performed the delineation. For delineations in carbonate and fractured bedrock aquifers that utilize the ½ mile radius as the default SWPA, the justification must demonstrate that it is adequately protective. Rigorous delineation methods must be performed by or under the supervision of a Registered Professional Geologist. This section must also include a description of the local hydrogeologic setting and a formulation of a *conceptual* ground-water flow model. Relevant hydrogeologic data with sources/references, supporting calculations and any other information necessary for the reviewer to reproduce the steps involved in delineating the SWP area must be provided. The level of delineation will be commensurate with the type of management option to be utilized.

Contaminant Source Inventory

A description of the methods used to conduct an inventory of existing and potential sources of contamination must be provided in this narrative. Documentation of field verification of computerized database searches and actual inspection of the SWP area must be provided. Contaminant source locations must be plotted on the accompanying SWP area map(s) and keyed into a table listing the facility name, owner, type of contaminant and a relative prioritization of risk (low, moderate, high) from the source. (DEP can assist with assessing relative risk if requested). This section must also include documentation that these sources are targeted for or were provided specific education regarding potential risks to the water supply.

SWP Area Management and Commitment

This section will provide a description of current land use and describe the management method(s) appropriate for the delineated SWP area. What is the cost to do the activities and where will resources come from? Commitment may be demonstrated by:

In-kind services

b.) Dedicated funding (water rate)

c.) Tax/fee dedicated to SWP

d.) General revenue

e.) Other acceptable means

A table listing management options for each identified threat along with a schedule for implementation must also be provided.

Contingency Planning

This section will contain a Revised Emergency Response Plan that includes realization of potential threats through spills and any other unintended releases and describes coordination with water supplier, municipalities and local emergency management agency to address contingencies commensurate with risks for each identified threat. Provisions for alternate water supply must be described such as arrangements for bulk hauling or sources of interconnection.

New Sources

This section addresses adequate planning for new wells including careful consideration of potential sites, existing land use, predicted Zone I area, how to obtain access and rights to areas if necessary and how the areas will be protected.

Those water systems capable of satisfactorily addressing each of the above elements will be considered approved under §109.713 and would be issued an approval letter. Additionally, an annual report/update will be required that describes changes in SWP area boundaries, land use, potential threats and contingency planning. Specific requirements may also be contained in DEP's approval letter. For those systems that do not initially address the minimum elements adequately, a review letter will be issued pointing out what needs to be strengthened in order to receive approval.

APPENDIX B

PA DEP Regional Contact Information

DEP Regional Offices:

Southeast Region Lee Park, Suite 6010 555 N. Lane Conshohocken, PA 19428 610-832-6059 ***Counties*** *Bucks, Chester, Delaware, Montgomery and Philadelphia.*	**Southwest Region** 400 Waterfront Drive Pittsburgh, PA 15222 412-442-4217 ***Counties:*** *Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland.*	**Northcentral Region** 208 West 3rd Street, Suite 101 Williamsport, PA 17701 570-327-3675 ***Counties:*** *Bradford, Cameron, Centre, Clearfield, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union.*
Northeast Region 2 Public Square Wilkes-Barre, PA 18711 570-826-2511 ***Counties:*** *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne & Wyoming.*	**Southcentral Region** 909 Elmerton Avenue Harrisburg, PA 17110 717-705-4708 ***Counties:*** *Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York.*	**Northwest Region** 230 Chestnut Street Meadville, PA 16335-3481 814-332-6899 ***Counties:*** Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren.

Emmaus Wellhead Protection Plan Steering Committee
And
Leibert Creek Watershed Assessment Advisory Committee

1st Meeting, **January 29, 2002**
7:00 pm - Emmaus Borough Hall
28 S. 4th Street
Emmaus, Pennsylvania

AGENDA

7:00pm	Welcome & Introduction
7:10pm	Wildlands Conservancy & Little Lehigh Watershed Alliance, Chris Kocher
7:20pm	Little Lehigh Watershed Coalition, Mike Siegel
7:30pm	City of Allentown Bureau of Water Resources, Dan Koplish
7:40pm	Overview of Wellhead Protection Project, Joel Jordan
8:00pm	Overview of Leibert Creek Watershed Assessment, Jill Heller
8:10pm	Advisory Committee's Role in Each Project
8:20pm	Items to Start Thinking About ◆ Public Education/Information Meeting ◆ Web page to highlight what's going on with Growing Greener projects ◆ Storm Drain Stenciling ◆ WREN Grant Application (due April 3rd) ◆ Watershed Snapshot field data collection activity in April
8:30pm	Set Date, Time, and Place for Next Meeting

BOROUGH OF EMMAUS PENNSYLVANIA 1859

Pennsylvania is... Growing Greener

Growing Greener Program

WSCH REGIONAL/DISTRICT

COUNTY:

MEETING MINUTES

MUNIC:

PERMIT #:

FILE CODE:

Project: Emmaus Wellhead Protection **Project No:** 126501.1TC

Date: February 14, 2002

Location: Barry Isett & Associates, Inc. (BIA)

Attendees: Mr. Dan Delong (Borough of Emmaus); Mr. Andrew Augustine (PA DEP); Mr. Alex Ulmer (BIA); Ms. Jill Heller (BIA); Mr. Chris Kotch (BIA)

Purpose: The purpose of this meeting was for BIA, on behalf of and in conjunction with the Borough of Emmaus, to review both the progress and future tasks of this project with the PA DEP. These minutes follow the outline that was given to the attendees at the meeting and generally follows the Growing Greener Grant Application.

Steering Committee and Public Participation

1. Andrew recommended sending letters, at two (2) different levels, to local government and industry. The purpose of these letters is to invite them to participate in the project.

    a. Look at much larger operations, such as the ones that could have a catastrophic loss.

2. Jill suggested having the first public meeting at Community Park in Emmaus at the end of April.

    a. Andrew asked if we could get an advertisement in the newspaper.
    b. Jill will check to see if advertising was included in the budget.
    c. Some ideas for advertising event: East Penn Free Press, Morning Call, Rodale newsletter, municipal newsletters, web site.
    d. Alex suggested contacting GreenWorks to see if they would be able to cover the event.

3. Andrew said he would contact DEP's Susan Rickens to find out more about web site for WHP project progress reports, etc.

Wellhead Protection Area Delineation

1. Andrew said ½-mile radius would be fine for Wells 1, 2, 3, and 4.

2. The EPA standard is a ½-mile radius.

3. The DEP volumetric flow equation uses a 100-400 foot radius.

4. Andrew and Dan mentioned that Emmaus' wells pump at about 800 gpm.

5. Andrew asked that Alex run some numbers to develop a professional opinion on the ground water situation in Emmaus.

6. Square D Superfund well information should be reviewed for this project; Dan should already have this information or have access to it.

Inventory of Existing and Potential Contamination Sources - SWAP Ranking

Risk Assessment

Andrew Augustine gave a summarized presentation on using the SWAP ranking system. The following are key points from this presentation:

SWAP Assessment

1. Andrew said the fist flow chart to be used is Flow Chart 2, which determines the aquifer sensitivity.

    a. The first item to be reviewed is the well construction. If it does not have at least 40 ft. of casing into rock and is not grouted then it has a ranking of high sensitivity.
    b. If these minimal construction standards were met, the second item to check is chemical analysis of the water. It any VOC's were detected or non-VOC analysis were greater than 50% of the MCL, it has a ranking of high sensitivity.
    c. If these minimal chemical analyses were met, the next item to check is whether the aquifer is confined or unconfined. If confined, it has a low sensitivity. If unconfined, additional items must be reviewed, including drastic score/sensitivity, and depth verse safe yield.
    d. It was determined that all of Emmaus' wells are in high sensitivity aquifers.

2. The next step is to use Matrix A (Step 1) to determine TOT vs. Fate & Transport (persistence). The persistence rating can be taken from the Table from DEP showing activity vs. persistence.

3. The results from Matrix A should be used in Matrix B (step 2) to compare it to quantity.

    a. Quantity - i.e., if a facility has paint thinner stored on-site, do they manufacture it there or just store it? If they store it, is it in large quantities or just consumer amounts?

4. Results from Matrix B should be used in Matrix C to compare to sensitivity.

5. The next step is to use the Potential for Release Table to make a determination.

6. Once the potential for release is assessed, it can be used in Matrix d to determine a susceptibility rating (potential for release vs. potential impact)

The SWAP manual has supplemental information on the use of these tables for completing an assessment.

7. Andrew said the DEP does not regulate small quantity RCRA generators. If they do not have any violations listed on the database, or if there is no other evidence of them having a problem, they should be given a low potential rating.

8. Andrew said there are many features/sites where there are no release control practices. .These include abandoned roads, sinkholes, open boreholes, etc.

9. Andrew recommended getting the steering committee involved during ranking of sites. He said they might have additional information to add which may influence the rating.

10. Andrew said if you don't have any knowledge of potential contaminants for a site do not just use generic ones (i.e., Appendix E in the SWAP manual).

11. Andrew stated that the shape files containing NPDES sites primarily contain GPS data points that are entered in the field by DEP personnel. However, there should be some additional information in the files, although it would be limited. He suggested we look up additional data for these sites on eFacts.

12. Andrew stated eFacts is a DEP web site that contains information from certain facilities that are inspected by the DEP. It contains information on violations and dates that violations were corrected. Andrew, Dan, and Chris logged on this site after the meeting and went through some of the basics on using this site.

Interview of Key Watershed Stakeholder's/Informants

1. Chris asked Dan if he had any recommendations regarding interviews of key watershed stakeholders/informants. Andrew said these types of interviews are probably not necessary. Dan said most of the database sites have public information available on them. Dan said many interviews have already been conducted with regard to these types of sites (i.e., Square D) and the information is publicly available. Andrew said that the Borough of Emmaus probably has a copy of the files on Square D. Dan said he would rather have BIA spend their time on some other aspect of the project than on interviews. However, if we determine an interview(s) is necessary for a site, Dan said he could probably get us the contact if we get him the site name/location.

Windshield Surveys

1. Chris stated that BIA is ready to proceed with the windshield survey. Andrew reminded BIA to only use public roads, sidewalks, etc. He stated that we should not be entering private property. He also said that a pair of binoculars works well for these types of field surveys.

Static Water Level Readings

1. Andrew encouraged Dan to start locating some wells where the water table levels can be monitored.

2. The reason being, in a few years with the data collected a rigorous delineation could be done for the public water supply wells.

3. May need a way to entice homeowners to participate – Andrew suggested the Borough providing homeowner with free WQ sample if they will allow for an air line to be dropped down their well to measure water level.

4. Andrew suggested using airlines and Dan suggested having well driller's notify him when new well is installed, so they can drop an air line.

5. Rigorous delineation would be needed in the future for all wells in order to incorporate into zoning overlay.

6. DEP would want a minimum of quarterly sampling for two (2) years.

7. Andrew recommended a professional geologist review the data and make a judgment call as to how often additional sampling should take place.

8. Dan has detailed pump test information from wells. Andrew said BIA could review these test results and incorporate them into the report.

Final Report/Miscellaneous

1. Andrew said the final report would have to comply with Chapter 109 Standards. These require information on the hyrogeologic setting and aquifer properties. He said we would be required to provide this information even though many of the wells did not have a detailed hydrogeologic assessment performed on them. He said these requirements include aquifer properties and a water table map.

2. Dan stated that Upper Milford would like to adopt ordinances related to wellhead protection. Andrew stated that ordinances should be adopted township/borough wide and should not be based upon geologic divides, wellhead protection zone radii, etc.

3. Andrew asked Dan if he has a working knowledge of the emergency response team that would respond to a chemical spill, etc. Dan said the emergency response crew is located in the Borough of Emmaus and knows the locations of the public water supply wells. Dan also stated that the retired fire chief was previously the Emmaus water systems operator.

4. Andrew stated that the American Water Works is having training kits that can be used in the high schools. He said they cost approximately $500.00, but the Borough of Emmaus Water System is a member and could probably obtain them free of charge. Dan stated that the Emmaus High School has a strong environmental education program and that Jill has a working relationship with both environmental teachers.

Contingency Planning

1. Andrew asked Dan to explain their contingency plan. He asked Dan if they would have enough water if their highest yield well went off-line.

2. Dan stated there would still be ample water even if their most productive well went off-line. He said that there would still be an adequate supply of water if two (2) wells went off-line, provided the customers followed conservation measures.

3. Dan said Well #3 is currently not on-line because the rate at which it could be pumped is limited by the VOC removal system (250 gpm). He said a contingency plan for this well would be to install another type of VOC treatment that would treat a higher volume so the well could be pumped at a higher rate.

4. Dan stated that Well #7 is only to be used to pump minimal quantities of water. They are just "exercising" it.

5. Dan Delong has been discussing with Dan Koplish an interconnection between Allentown and Emmaus. Dan Delong said that Emmaus would also have to agree to supply some amount of water to Allentown in case of an emergency. However, any type of agreement must include limits on the amount of water Emmaus would be responsible for supplying to Allentown in the case of an emergency. Dan Delong said Allentown's total daily demand is 6 million gallons. Dan Koplish said at least the Mayor and Council should sign the agreements and be aware of its existence and its terms.

New Sources

1. Andrew Augustine noted that although Emmaus water supply is two (2) times greater than the demand, all the wells are within 1 mile of each other. He said "all their eggs are in one basket." Andrew said this is something that should be noted in the final report in the new source section.

2. Dan Delong stated that Emmaus owns approximately 36 acres near Quarry Drive, Main Road, and Vera Cruz Road. Dan said this might be a potential site for a new source. He said the underlying geology and potential yields would have to be researched.

3. Dan said Upper Milford has offered land for new sources.

Copies: All Attendees

Recorded By: Mr. Chris Kotch, Ms. Jill Heller

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MEMORANDUM OF MEETING

Project: Emmaus Wellhead Protection Program

Project No.: 126501.0TC

Date: May 22, 2003 **Time:** 8:10 p.m.

Location: Emmaus Borough Hall

Attendees: Mr. Andrew Augustine, PA DEP
Mr. Chris Kotch, P.G., Barry Isett & Associates, Inc. (BIA)
Mr. Alex Ulmer, P.G., BIA
Mr. Jeff Clapper, Emmaus Borough
Ms. Kathy Gorr, Emmaus Borough
Steering Committee Members—B. Ahlert, S. Baier, J. Baker, B. Evans, A. Forndran, R. Hayden, J. Jordan, J. Marin, and C. Neely

Purpose: To discuss the Steering Committee comments regarding the Wellhead Protection project. Specifically, to address those comments that would not simply be answered with the issuance of a draft report.

Minutes: The meeting generally followed the outline of the Steering Committee's comments presented in the April 29, 2003, Memorandum from the Wellhead Protection Subcommittee. BIA pointed out that the comments provided were made without a draft report having been issued or reviewed.

Steering Committee and Public Participation

The meeting began with a discussion of what the Steering Committee (SC) perceived as its roles and responsibilities. The following topics were presented:

- BIA is to provide ideas regarding the SC's roles and responsibilities.
- The SC is to review information presented
- The SC wishes to have an understanding of the major issues related to the Borough's water supply system
- BIA is to identify typical management issues and provide the SC with options
- The SC would like to assess and incorporate information from the Wellhead Protection Plan into revisions to the Comprehensive Plan.

The SC will provide BIA with a list of the Committee members, titles, and contact information for inclusion is the report.

Delineation of the Wellhead Protection Area

This discussion began with BIA stating that the Wellhead Protection Areas (WHPAs) for Wells 1, 2, 3, 4, and 7 would be calculated based upon a Calculated Fixed Radius Method and a Variable Shape Radius Method. Mr. Andrew Augustine, of the PA DEP, recommended the use of these EPA Methods to BIA prior to this meeting. The SC expressed several other concerns, which are presented here along with any associated discussion:

- The SC is interested in having a conceptual idea of the flow within each of the WHPAs. BIA stated that any conceptual flow model would need tobe based upon the available data and that the limited data may result in the flow model being similar for several wells. The SC felt that itwas important to have a thorough description of the existing ground water system.
- BIA confirmed that they would consider delineation methods other than just the fixed radius, including a variable radius method. The SC was satisfied with this approach, if accompanied by a description of the methodologies considered and the justification for the method selected.
- The SC has requested a historic review of water quality from the Borough's wells. The request also included a statistical analysis of the water quality data. BIA pointed out that there is considerable water quality data and that a statistical analysis of the data could become a rather involved effort. This was especially true in light of Mr. Dan Delong's previous comments that the water quality has remained fairly constant over time. BIA will include a discussion of the prior water quality testing and address significant trends within the report.
- BIA will include a brief description of the Superfund status of the Rodale site as well as a discussion of how this site could impact the rest of the Borough and its water supply.
- The SC also indicated a desire to see proposed impacts from future development within the Borough on the delineated WHPAs. There was some discussion as to how much area was available for further development within the Borough, after which increased population or industrial users would lead to increased pumping of the wells. BIA believes that this discussion would be more appropriate in the new source section rather than in the WHPA delineation section and will include such a discussion in that section of the report. Input from theSC or Borough regarding future population estimates and potential industrial growth would be appreciated.
- The Fire Training Grounds as well as several other Borough properties were identified as being potential threats to water quality. BIA asked that the SC provide any knowledge that they have as local residents on such facilities and operations. BIA suggested that these issues could be presented to the SC who could then forward these concerns to Borough Council to be addressed. This approach would provide the Council with time to begin addressing these issues prior to issuing a report identifying Borough sites as potential water threats.
- The SC wants the WHPAs to consider the effects of multiple pumping wells within the delineated WHPA. They asked that not only municipal wells be considered but that wells being pumped at the Superfund Site (Rodale) also be considered. BIA will include such considerations within the WHPA delineation, where practical, based upon available data.
- The SC expressed a concern that other WHP Plans exist in the vicinity of the Borough. If such plans exist, do the delineated WHPAs overlap, and if so, what are the consequences of such an overlap? BIA will ask the DEP and adjoining municipalities or authorities for information on WHP Plans that are in place around Emmaus. If any WHPAs are found to be close to the Emmaus border, they will be included in the discussion of WHPAs and may even impact the shape of the WHPA.

- The SC reiterated its request that BIA provide justification for the methodologies selected in determining the WHPA. BIA will include such justification within the text of the report.
- The SC asked that potential threats to Well #6 be identified in the report. Specific issues of concern were: the potential for impacts from the Turnpike, the potential for contaminants at Well #3 to migrate to Well #6, and the effect on a drought on Well #6. BIA will include a discussion of these topics within the text of the report.
- The SC requested that BIA identify the limitations of the models used in delineating the WHPAs. BIA will include this discussion in the report.
- The SC expressed some concern regarding the reliance on the Meiser & Earl Study. Mr. Andrew Augustine stated that a Professional Geologist from BIA would need to seal the report. BIA confirmed that prior to sealing a report that incorporated the work of others, the professional would need to be comfortable with that work.
- Upper Milford had indicated that they believed that all wells, private and public, should have similar protections. If management options are selected for the Zone II WHPA of a public well, the same options should be used for all private wells within the Township. Mr. Dan Delong has expressed this sentiment as, "It's all our water. If it's not your water it's the next guy's downstream."

Inventory of Existing and Potential Contaminant Sources

BIA stated that many of the issues and concerns noted in this section would be resolved once a draft report was issued. In particular, the inclusion of the full SWAP ranking charts and matrices would be included as an appendix and not part of the report text. The actual report text would include a brief summary of the SWAP process, referencing the full methodology in an appendix. Additionally, only a summary of the findings would be presented in the text, the full analysis would be contained within an appendix.

BIA stated that the SWAP procedure used followed the DEP's Northeast Regional Office's Protocols. These protocols addressed how to classify certain businesses that were not clearly identified within the state's methodologies. The Northeast Regional Protocols also required that any leaking storage tank be considered a high potential for release.

- The SC requested that the only basics be provided within the text and that the more technical aspects of the SWAP rankings be provided in an appendix(s).
- The SC also indicated that information related to some of the SWAP sites needs to be updated. BIA requested that the SC provide such information for inclusion in the update. The SC stated that they felt the update of such information was BIA's responsibility. Mr. Andrew Augustine and Mr. Joel Jordan, of the PA Rural Water Association, both stated that such information is typically provided by the SC of the project. BIA pointed out that the information provided was based upon what was commercially available and that information was field checked by BIA and Township personnel. If members of the SC have additional information, BIA would value that input. We are dependent upon the local residents for site-specific information.
- The Fire Training Grounds as well as several other Borough properties were identified as being potential threats to water quality. BIA requests that the SC provide a listing of Borough properties or associated facilities and indications of the potential threats that each site poses. If the activities at each site are not known, it is possible that the Borough staff could provide this information. BIA will provide the SC with a letter discussing these issues and identifying Best Management Practices (BMPs) or changes in activities that would reduce or eliminate threats to the ground water. BIA suggested that these issues could be presented to the SC who could then forward these concerns to Borough Council

to be addressed. This approach would provide the Council with time to begin addressing these issues prior to issuing a report identifying Borough sites as potential water threats.

- The SWAP rankings were performed following the DEP's Regional Office's Protocols; however, the SC has indicated that they may want to see the rankings altered. In particular, they did not agree that a Leaking Underground Storage Tank (LUST) should continue to have a high threat ranking if the release has been remediated. As per the SC's request, BIA will review the DEP's Closed LUST file to identify which site's ranking may be reduced. Additionally, BIA will identify remediated sites with a closed Act 2 status and sites that havefiled a Notice of Intent for remedial activities under Act 2. Once this information is presented to the SC, BIA will need to know what level of threat ranking the SC would like assigned for each of these statuses.
- The SC requested that BIA identify the existing classes of contaminants and related health effects, at least in general terms. BIA will include these descriptions in the report text.

WELLHEAD MANAGEMENT AND COMMITMENT

BIA has acknowledged that a description of the current land use within each of the WHPAs will be provided in the text of the report. The report will also discuss the consequences of such land use within WHPA.

- The SC has indicated that they will be responsible for maintaininga commitment to this project and the WHP Plan.
- BIA will provide the SC with a generalized list of management options and through an iterative process will work with BIA to select management methods appropriate for the WHPAs and the community.
- Mr. Andrew Augustine pointed out that the DEP's approval of the WHP Plan was good for only 1 year. Annual updates to the WHP Plan will be needed thereafter.

CONTINGENCY PLANNING

Several aspects of the contingency planning section of the report were discussed. These included the Emergency Response Plan, contingency options, and safety issues as related to the events of 9/11.

- The Emergency Response Plan is an existing Borough document. Mr. Jeff Clapper will review the existing plan and update the information as necessary. BIA will then review the plan and provide comments to the Public Works Director for revisions, if needed. It may be that the management options chosen will affect this plan, especially with respect to roadway or railway spills.
- The potential for interconnection between the Borough and the City of Allentown's water supply were discussed. Apparently the lines exist; however, there is no formal agreement regarding the interconnection. The potential for water to be trapped in dead-end line was also discussed. This is an issue that will need to be worked out between the City of Allentown and the Borough of Emmaus. BIA will work to facilitate a meeting(s) between both parties if the Borough is interested.
- The potential for maintaining the information related to contingency plans could be presented as a detachable appendix. This will allow this sensitive information to be removed from the publicly available documents, while still maintaining the full content of the report in documents held by the Borough or State. There appeared to be SC support for such an option.

NEW SOURCES

BIA has worked with the Borough to identify two(2) potential new source areas. We acknowledge that there may be issues with water quality at these sites; however, these are locations that we believed the Borough could easily gain access to. In considering other new source sites, BIA has requested some guidance as to the selection criteria for a new source. Examples of the guidance requested include: how far from existing water lines should new sources be considered, should a new source within an existing Zone II WHPA be considered, and should new sources be discounted if a potential threat exists in that vicinity.

- The SC has requested that BIA make recommendations regarding budgetary planning for new sources and provide an idea of when such sources will be needed. BIA responded that it would make sense to provide a budget line item, no matter how small, to be used for accessing, assessing and obtaining new sources.
- The potential for increased demand on the water system will need to be assessed on an ongoing basis. BIA will provide a comparison of the current average pumping rates to the permitting pumping levels. Such a comparison will provide an idea of the buffer between supply and demand within the existing wells. Depending upon the potential water demand increases possible from infilling development or new industrial users, this comparison may indicate that there is sufficient capacity within the system. However, it is still recommended that at least one (1) new source be considered.
- Mr. Andrew Augustine pointed out that another potential source of water would be to address water losses within the existing system. Mr. Jeff Clapper estimated that there are unaccounted for water losses of between 20 and 25% of the volume of water pumped. Eliminating losses could postpone the need for a new source.
- BIA indicated that a piping replacement program aimed at replacing 1% of the system piping a year would still result in piping being 100 years old at a scheduled replacement. Jeff indicated that currently piping is only replaced when damaged or if a section has a history of leaking.

The meeting ended with Ms. Rebecca Hayden suggesting that the next meeting to address the Liebert Creek Assessment and Restoration Plan comments be held during the day. Several SC members stated that they might be able to attend a daytime meeting, depending upon the day and the amount of notice. Rebecca also stated that she was confident that most of the comments could be addressed through discussion between BIA and the SC. She felt that Mr. Bill Manner would only need to be involved if both parties could not come to agreement through these discussions.

Action: BIA will provide SC with ideas regarding the SC's roles and responsibilities.
SC will provide BIA with names and contact information for members.
Borough will provide BIA with information on each wells construction and pumping rates.
SC will provide local insight on new SWAP sites or those needing revisions.
SC and Borough are to provide information on Borough facilities or practices that may pose a threat to the Leibert Creek.
BIA will provide the SC with a letter addressing threats posed by Borough facilities.
BIA will provide the SC with a preliminary list of management options.
Borough will provide BIA an updated copy of the Emergency Response Plan.
BIA will provide the SC an outline for the Wellhead Protection Plan report.
BIA will revise WHPA as discussed and present to SC.

Copies: Ms. Kathy Gorr, Ms. Rebecca Hayden, Mr. Jeff Clapper, Mr. Bill Ahlert, Mr. Dan DeLong and Mr. Chris Kotch – via hardcopy

SC members: Mr. Jim Baker, Ms. Joyce Marin, Mr. Craig Neely, Mr. Steve Baier, Mr. Brian Evans, Ms. Angelika Forndran, Ms. Debra Lermitte, Mr. Joel Jordan and Mr. Andrew Augustine (PA DEP) - via e-mail

Recorded By: Alexander Ulmer, Barry Isett & Associates, Inc.

May 30, 2003
Leibert Creek Watershed Assessment Meeting

In Attendance:

William Ahlert, Upper Milford Residence
Dan DeLong, Upper Milford Township
Rebecca Hayden, LCCD
Kathy Gorr, Emmaus Borough
Jeff Clapper, Emmaus Borough
Alex Ulmer, BIA
____?, BIA

Recommendations for Successful Completion of the Project

1) The training and capability of the staff that conducted the habitat assessment work was discussed along with the appropriateness of the protocol used.

- Program attended by Rebecca and BIA (Jill Heller) representatives was not a training course per say but a program to solicit assistance with a protocol under development.
- It was noted that the protocol had gaps and would require be further development.
- The protocol was not established and not necessarily an accepted procedure.
- Issues of nomenclature and definitions were discussed by Rebecca.
- LCCD had offered staff time to assist and it was agreed that additional assessment work would be performed in November 2002 (Dan agreed to this assertion)
- Questions noted by attendees:
  Why was protocol used if it was not adequate?
  Why wasn't it made clear that protocol was not adequate?
  Why didn't LCCD provide further input at the time?

One objective of study was to develop protocol that average person could use and provide limited assessment data. However, this was not stated in grant application and/or made a formal part of the project.

- Dan noted that it was his understanding that additional assessment would be needed to fill scientific requirements. Additional field work using different protocol and also visual inspection of properties that had not been visited due to access issues.
- Rebecca noted that protocol used by BIA was not providing sufficient data to complete necessary assessment.

BIA noted that assessment was originally geared for non-point source pollution and the development of recommendations for possible restoration projects. However, group noted that the results must be scientific enough to make technical recommendation.

It was agreed that LCCD and BIA to identify protocol for future assessment work and to work together to develop procedures for a group of volunteers to visually inspect properties within the watershed and provide usable information.

- Visual assessment would be done to point out problem areas
  - buffer
  - erosion

- Local volunteers look at land use and problem issues and identify issues that would be followed up with assessment in Fall 2003.

- Training session to be provided for volunteers – BIA to prepare draft protocol procedures for Steering Committee review and input.

- Steering Committee to work with volunteers to implement protocol.

- General recommendations for BMPs that could be used to address problem areas would be developed.

- Justification will be required to demonstrate impact to habitat quality.

Rebecca to contact DEP as to most useful information would be needed from agency prospective.

2) BIA contact LCCD/NRCS farm information.

3) Upper Milford ordinances are under review by PEC - Natural Land Trust and Dan will provide analysis to BIA upon completion to be incorporated in to report. BIA to review Emmaus ordinances and provide options and examples of ordinances to the steering committee for review. Jeff Clapper to review ordinances from borough prospective.

4) Water Quality Testing
   Comprehensive nature of testing was discussed and there were question about the reliability and representatives of additional data points and chemical parameters. It was agreed that two additional rounds of samples will be collected and tested. Both rounds will be tested for the same parameters that were completed in 2002 and one round will include heavy metals on three surface water and sediment samples. BIA to review Square D Superfund data base and select the appropriate metals for testing, at a minimum the samples will be tested for the RCRA metals. Sampling to be initiated ASAP.

5) Work to be completed jointly between BIA and Steering Committee.

6) GIS training is needed for borough officials. No one on staff is currently knowledgeable on GIS use. BIA will help with training Borough staff on the use of Arc View - viewing and printing of files.

7) Additional information on non-point sources will be provided in report. BIA will interview local residents (Dan DeLong)

8) Covered under item 6.

9) To be determined at a later date based on need.

10) Overview of pressures that are currently impacting, have historically impacted, and potentially will impact the watershed will be provided in the report.

- types of influences - current and anticipated
- ordinances and zoning impact
- regulatory impacts
- BIA to take a crack at language and steering committee to provide input

Editorial Comments

1. To include discussion of relationship this study has to other watershed studies and connection of this watershed with watersheds down stream.
2. Reference to Wellhead Protection Study and connection to Watershed will be provided.
3. Steering Committee to provide watershed terms to BIA
4. Typos to be corrected
    - Formal vs. informal writing style was discussed, it was agreed that BIA will use examples, bullets, figures and tables to augment text and make the report more reader friendly.

Specific Comments

1. BIA to address
2. BIA to address
3. BIA to reward
4. BIA to spell out Acronyms
5. Report to reflect the areas is controlled by Borough and historical problems, created by Borough, can be corrected.
6. BIA to address
7. To be addressed as a reference and provide proper list of references and citations in report.
8. To be provided
9. Several landfills are in the watershed and BIA will provide locations, age(relative), nature of fill (MSW vs industrial).
10. To be identified during volunteer survey.
11. Steering Committee to provide input on industries.

12. TCE in septic - what is potential impact to watershed will be discussed in report.
13. Relevance of PA water quality standards and what they mean to assessment.
14. To be provided
15. BIA to explain discrepancies
16. References to water quality standards to be included
17. BIA to review Square D Superfund investigation for information on organics and discuss findings in report - no new sampling to be done.
18. BIA to provide examples of D.O. problems and reasons for.
19. HYDAC unit – no one was sure of reference in comments.
20. To be addressed during additional monitoring events scheduled for 2003.
21. Rebecca to get further explanation from comment author on flood control and dam issue.
22. To be addressed
23. Assume comment referred septic system problem in Vera Cruz and will be addressed in report.
24. To be defined with examples
25. To be defined with examples
26. Clarification to be provided
27. To be discussed
28. BIA to provide list of data gaps
29. Clarification to be provided
30. Clarification to be provided
31. Will be looked at and provide clarification and connection
32. Will be looked at and provide clarification and connection
33. To be addressed after assessment and contact with Buck Eye
34. Will be addressed

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MEMORANDUM OF MEETING

Project: Leibert Creek Watershed Assessment

Project No.: 104401.4TC

Date: 5/30/03 **Time:** 11:00 a.m.

Location: Lehigh County Conservation District (LCCD)

Attendees: Mr. Nate Hoffman, Barry Isett & Associates, Inc. (BIA)
Mr. Alex Ulmer, P.G., BIA
Mr. Jeff Clapper, Borough of Emmaus (Borough)
Ms. Kathy Gore, Borough
Steering Committee (SC) Members—B. Ahlert, R. Hayden, and D. Delong

Purpose: To discuss the Steering Committee's comments regarding the Watershed Assessment project.

Minutes: The meeting followed the outline of the Steering Committee's comments presented in the April 29, 2003, Memo from the Watershed Assessment Subcommittee.

Watershed Assessment for this Project (Comment 1 Recommendations Section)

- The general validity of the protocol used was discussed. The question of what the objective of the assessment was, was then raised.
- BIA stated their understanding of the level of assessment was a basic understanding of stream impacts. BIA also believed that theWatershed Assessment protocol was to be able to be used by anyone, not just technical professionals.
- Then Rebecca stated that she had many concerns with the validity of the data for the protocol used. The data collected between the groups was not consistent and her opinion is that a more thorough investigation needs to be done. Rebecca stated that she felt the EPA Rapid Bio-Assessment should be utilized for this project as it will not only give us general watershed data but that it will also provide soil loss approximation for the various watershed sub-basins.
- Dan interjected that the original intent of the grant was to provide a visual assessment of the stream. The assessment chosen was to identify where buffers were adequate, where they could possibly be enhanced, and where they were non-existent. In addition, the assessment was to develop a list of where agricultural run-off areas were a problem, parking lot issues for run-off. Invasive species were also to be identified. Problem areas were to be identified and make mention of where Best Management Practices (BMPs) are currently in use and document where they could be added. Dan felt that this was a task that was well suited to volunteers and was something that would provide volunteers a sense of ownership in the project.

- Jeff concurred with Dan, but he also felt that the assessment needed to include backup information on a scientific level.
- Attendees came to a consensus that the Watershed Assessment should be carried on by both trained professionals as well as volunteers. It was agreed that BIA would develop guidelines for volunteers to follow such as standardized reporting sheets as well as mapping for each of the groups. It was suggested that SC members would lead the volunteer teams to assess various reaches of the Leibert Creek and its tributaries. Dan stated that the volunteers needed to be active and usefulmembers of the assessment team and was concerned that they may be marginalized if the SC lead assessment teams.
- The SC will take care of coordinating volunteers for the effort. BIA will have a package together for the next SC meeting to review and comment on. Rebecca was going to contact other watershed coordinators in PA and see if there was any already known publication for this process. She was to let BIA know within two(2) weeks after this meeting. BIA was to provide a volunteer training session on the stream assessment protocols to be used.
- Rebecca said that she would work with BIA on selecting the protocol to be used in the Scientific Assessment portion. This Scientific Assessment was to be carried out by Rebecca and LCCD staff sometime in the early fall. The fall date was selected so that the assessment group would have better access to the sites and to limit the visual impairment caused by dense vegetation.

Farming Information within the Watershed (Comment 2 Recommendations Section)

- Rebecca recommended that BIA contact NRCS and or the LCCD to get the information for this task. She recommended that Nate contact Lisa at NRCS or Claudette at the LCCD to get the needed info for the farming information.

Ordinance Review from Respective Municipalities (Comment 3 Recommendations Section)

- Dan stated that Upper Milford currently has an ordinance review in process and that he expected the review to be completed within the next two (2) weeks. Dan was going to provide a copy of the review to BIA to use in our evaluation.
- Emmaus ordinances would be reviewed by Nate, Scott Muller, and Jeff to discern the level of protection for the Leibert Creek and other associated information within the Zoning and Development Ordinances.
- BIA will make recommendations to the SC where additional wording could be implemented that would be upgraded to provide additional watershed protection.

Additional Water Quality Testing (Comment 4 Recommendations Section)

- Rebecca stated that she believed that the level of water testing for this grant was inappropriate and that further testing should be performed. Due to the fact that the Leibert Creek runs through urban and highly developed areas, she felt that metals should have been considered in the grant.
- Dan stated that even before the grant application was submitted, the extent of water testing was discussed with Bill Manner. The limited testing included in the grant was based upon this discussion and was intended only to serve as a baseline.
- Bill Ahlert commented that the level of assessment that Rebecca wanted to see wouldn't yield any really meaningful data. Bill said that toget any real meaningful data $100,000 in lab analysis would be needed and is well beyond the scope of this grant.

- The consensus was that BIA would collect one (1) additional round of water samples at each of the three (3) sites. These samples would be analyzed for each of the parameters that were tested for previously. BIA would also collect one (1) round of sediment samples for analysis of the eight (8) RCRA metals.
- Alex commented that BIA would not have a problem with offering the time to collect the samples but that the actual analysis would not be paid for out of this grant,because this additional sampling was not budgeted.
- Jeff commented that he would look at finding some money to pay for the sampling at the Borough of Emmaus. Rebecca mentioned that she understood that Benchmark Analytical had offered to LCCD that they would perform analysis at a fraction of the cost. She said that she would check into the costs for the Analysis. BIA will also check with Blue Marsh Laboratories to get pricing from them for comparison.
- Dan also mentioned that the Square D Report did perform some type of metals sampling previously and it should also be investigated and included within the report.

Prioritization of Restoration Projects (Comment 5 Recommendations Section)

- Rebecca commented that in order to facilitate the prioritization of the restoration projects, the Watershed Assessment would need to be completed. She again recommended that BIA not prioritize the projects.
- Alex interjected that BIA had no intention of being the sole group to prioritize the projects, but that BIA should have some level of involvement with the project prioritization.
- Once the assessment is completed, the SC will consider input on the prioritization of the restoration projects.

GIS Software Installation and Usage (Comment 6 Recommendations Section)

- Dan stated that the current status of the software was that it had been installed at the Borough and that Jill had shown him how to do a few things.
- Jeff stated that he would like a couple of half-day sessions on how to use GIS, just enough to get him to the point where he could retrieve the data.
- Alex said that he didn't see this as a major problem and that BIA and Jeff would work out a mutually agreeable schedule for the training.

Non-Point Source Pollution (Comment 7 Recommendations Section)

- It was agreed that further information would need to be gathered on this topic. It was agreed that the best way to address this issue was to interview Dan Delong a local angler.
- The group also agreed that a majority of this comment will be addressed under the Watershed Assessment (Comment 1).

Public Participation (Comment 8 Recommendations Section)

- The effort in this recommendation will be carried out in theWatershed Assessment (Comment 1).

Water Resource Protection and Conservation Brochure (Comment 9 Recommendation Section)

- The SC stated that the need for such a brochure would be addressed once weare near the completion of this project

Adequate Analysis on Land Use (Comment 10 Recommendations Section)

- Alex commented that this issue would probably be addressed within the ordinance review.
- Rebecca mentioned that she was uncertain as to what this statement really was asking for and that she may have to contact Angelika for explanation of the question
- Bill mentioned that what BIA reviewed on this topic would be more on a qualitative basis of land use trends.
- BIA was asked to provide a draft of this section to theSC and that this would then be reviewed and comments provided back to BIA

Reference to Other Watershed Work in the Larger Watershed (Overal Ed Comment 1)

- Alex mentioned that the works were mentioned and a summary provided within the draft of the assessment provided to the SC.
- Rebecca stated that additional information on the related watershed work should include everything that pertains directly to the Leibert Creek. Rebecca also stated that BIA should include any summary findings that were developed as a result of the respective reports.
- Rebecca said that reference should also be made to the Lehigh River Study being developed by Wildlands Conservancy, and that BIA should contact them to get preliminary information and then include that within this report as well.

Relationship to Ground Water Study Reference (Overall Ed Comment 2)

- Alex stated that he wasn't quite sure as to what level σ where the information could be best included within this Watershed Assessment.
- Bill stated that far too often projects are ongoing within the same area and either of the two (2) groups may not know that anyone else is or has done work in a similar or related field.
- BIA will include a small section within the assessment referencing the wellhead protection project intent and purpose of this study.

Glossary (Overall Editorial Comment 3)

- The SC will provide a list of terms and definitions to be includedwith the Glossary.

Proof Reading within the Report (Overall Editorial Comment 4)

- BIA will review the draft and assess the Watershed Assessment document to correct any of the problems commented on by the SC.
- Bill also added that items not clearly referenced should be done so that the reader can quickly turn to the reference items to review for further.

Listed below are the Comments and Actions which will be taken to address the Specific Comments

- **Action items have been provided in Bold Type**

Specific Comments

1. **Alex stated that the percent land use was in the process of being addressed and that it will be added to the assessment.**
2. **A reference to the Center of Watershed Protection's expected level of impact will be added and expounded upon in the draft.**
3. **Alex stated that the word "story" didn't denote it to be fiction, and that we would look at changing the language.**
4. **SWPA reference will be defined, added, and described.**
5. **Alex stated that the Community Park's potential for protection will be reworked to be clearer and that examples of how it could provide additional protection will be added.**
6. **The Wildlands Conservancy work will be moved to the additionalsection on "Current Projects."**
7. **Report references will be addressed as previously discussed.**
8. **Summary of prior reports was previously discussed and will be addressed within the Historic Section.**
9. Dan and Jeff both had some knowledge of the landfills discussed within the report as well as others within the watershed. **Dan and Jeff were both going to work at getting BIA the necessary information to be included within this section of the report.**
10. **This comment will be addressed within the Watershed Assessment to be performed in the fall.**
11. **BIA will interview Dan Delong to gather whatever information he had on anything that may be of importance to the watershed.**
12. **A discussion of what effects TCE could have as a result of these actions will be discussed in the assessment.**
13. **Chapter 93 will be reviewed, and the HQ-CWF information will be added to the report. A short discussion on why this is listed as a HQ-CWF.** Rebecca stated that it will interesting to see how the Creek holds this designation when the Creek continually exceeds the limits for water temperature during the summer months.
14. **The protocol selected for usage in this assessment will be summarized and a description of the protocol addressed.**

Memorandum of Meeting

Project: Emmaus Wellhead Protection & Leibert Creek Watershed Assessment

Date: June 17, 2003

Location: Emmaus Borough Hall

Attendees: Mr. Jeff Clapper – Borough of Emmaus
Ms. Kathy Gorr – Borough of Emmaus
Mr. Dan Delong – Upper Milford Township
Steering Committee Members – W. Ahlert, J. Baker, C. Neely, and B. Evans

Purpose: Discussion of recent meeting with Barry Isett & Associates, Inc. (BIA) in regards to both the Wellhead Protection Program and Leibert Creek Watershed Assessment Projects.

REVIEW OF LEIBERT CREEK WATERSHED ASSESSMENT MEETING

Representatives of the Leibert Creek Watershed Assessment Steering Committee, BIA, the Borough of Emmaus, and Upper Milford Township met on May 30, 2003 to discuss the status of the project, review draft documents prepared by BIA, and discuss forthcoming work to be completed by both BIA and the steering committee

The previously completed stream assessment did not follow a method approved by any federal or state regulatory authority. Therefore, additional stream assessment activities must be conducted to satisfy the grant requirements and PADEP regulations.

- BIA is to determine an appropriate protocol for the forthcoming stream assessment and perform the assessment during October-November 2003.
- Dan Delong offered to make the necessary access arrangements property owners along the stream.
- The steering committee is to perform a visual inspection/assessment of the stream with local volunteers during October-November 2003. BIA will provide the volunteers with a list of items to look for (i.e. erosion, mowing adjacent to stream bank, ect.).
- The goal of the assessment is to identify possible stream restoration projects.

An additional stream sampling event is to be conducted in conjunction with the October-November 2003 stream assessments.

- BIA and Rebecca Hayden are obtaining cost proposals from multiple laboratories.

- A suggestion was made to perform sediment sampling for RACR metals and Iron in conjunction with the surface water sampling.
- Steering Committee wants to conduct 1 additional sampling event at sample 3 locations.
- Provide Craig Neely with a cost estimate and he will request the funds from Borough Counsel

Report editorial issues:

- Rebecca Hayden provided numerous editorial comments
- BIA needs to reduce the amount of technical terminology to make the report understandable by layman.
- BIA to provide electronic copy of all data for future use by Borough.

Dan Delong and Jeff Clapper are working with the natural lands trust to review ordinances that may be applicable to this project.

DISCUSSION OF WELLHEAD PROTECTION ISSUES

- Steering committee to review draft report outline and provide BIA with comments. Compare with PA Rural Water Assoc. recommended outline. Steering committee to provide Bill Ahlert with comments by early next week.
- Next meeting the steering committee needs to plan an agenda to develop specific issues that need to be discussed with BIA and that the steering committee needs to provide BIA with guidance.
- City of Allentown Interconnection
    - Tested upon completion
    - Borough maintains higher water pressure than City
    - Unable to fill Borough's reservoirs from City's system
- Lehigh County Authority Interconnection
    - Discussions in progress to interconnect Borough with LCA
    - LCA lines do not currently join Borough's – LCA's closest line is west of Indian Creek Golf Course.
- BIA to include discussion of interconnections in contingency plan
- Tour of Borough's wells and reservoirs to be conducted.

Memorandum of Meeting

Project: Emmaus Wellhead Protection & Leibert Creek Watershed Assessment

Date: July 15, 2003

Location: Emmaus Borough Hall

Attendees: Mr. Jeff Clapper – Borough of Emmaus
Mr. Dan Delong – Upper Milford Township
Steering Committee Members – W. Ahlert, J. Baker, S. Baier, A. Forndran, J. Marin, and B. Evans

Purpose: Routine monthly meeting.

BIA provided additional materials to be reviewed by the steering committee. Committee members will review and discuss at next month's meeting.

The Borough and steering committee received a request from the Little Lehigh Alliance to support their efforts to change the classification of the Little Lehigh Creek.

- Probably will not pass on technical merits but has the potential to pass based on political pressure.
- If approved the Borough could be impacted especially with respect to storm water management.
- The steering committee must evaluate the merits and impacts prior to supporting the request.

A regional comprehensive plan is currently being prepared by others that may impact this project.

A recently completed survey concluded that most Upper Milford Township support the formation of an environmental action committee.

Fall stream assessment

- Assessment to be greater than stream and stream bank but not include entire basin. Possibly ¼ mile on each side on stream bank.
- Must be basic enough for general public/volunteers to be able to complete.
- Must obtain access from property owners prior to conducting assessment.
    - Letters were previously sent to approximately 90 property owners along stream. Only 3-4 responded that access was denied.
    - Should use tax maps to identify all affected properties within study area and contact those property owners by mail.

    - Direct BIA to compile information.
    - Prepare list of questions to ask property owners in access request.
- Jeff Clapper will work with BIA to prepare protocol and inspection sheets prior to next steering committee meeting.
- Compare photos to previous assessment to provide a then & now summary.
- Must be taken into account in formal assessment to be performed by BIA and Rebecca Hayden.

Proposed Steering Committee Goals/Actions

- Develop a citizens guide to watershed project. Possibly utilizing publicly available documents.
- Develop long term management/protection strategies.
- Provide information on Borough's website.
- Prepare press releases – Borough newsletter, East Penn Press, Morning Call, ect.
- Encourage public to attend meetings.
- Include pamphlets with stream assessment access requests.
- Focus on watershed instead on stream and stream bank.
- Possibly involve boy scouts or other citizen groups
- Emphasize that we're trying to protect both groundwater and stream.
- Have an information booth at Heritage Days and other public events
    - Dan Delong to man booth for Heritage Days
    - Attempt to get volunteers for fall assessment
    - Angelika Forndran will provide literature
    - Utilize maps and visual aids from previous meetings.

Report Review

- Review report in entirety, not piecemeal.
- Do not review entire reports during meetings. Review reports individually and discuss comments/concerns during meetings.

Future meetings and distribution of materials for review

- Steering committee should develop agenda prior to meetings
- BIA is to provide materials for distribution to steering committee members prior to each meeting. Steering committee members will review materials individually between meetings and discuss at meeting following delivery.
- Jeff Clapper will instruct BIA on new procedures.

Field tour of Borough's water system to be conducted Wednesday July 30, 2003. Meet at water works building located on Klines Lane.

Jeff Clapper will send a letter to Upper Milford Township requesting assistance paying for sediment testing.

Memorandum of Meeting

Project: Emmaus Wellhead Protection & Leibert Creek Watershed Assessment

Date: August 19, 2003

Location: Emmaus Borough Hall

Attendees: Mr. Jeff Clapper – Borough of Emmaus
Mr. Dan Delong – Upper Milford Township
Kathy Gore – Borough of Emmaus
Steering Committee Members – W. Ahlert, R. Hayden, J. Baker, and B. Evans
Public Observer – J. Seem

Purpose: Routine monthly meeting.

Stream Assessment Project

Volunteer assessment project

- Inspection sheet to be utilized during volunteer watershed assessment obtained from government publication.
    - Rebecca Hayden offered to edit form into more user friendly format.
- Completed forms to be included in final report as appendix.
- The steering committee is assuming full responsibility for the volunteer assessment.
    - Only assistance needed from BIA is map preparation and printing.
    - Jeff Clapper will notify BIA.
- Steering committee needs to break watershed down into 8 to 10 sub-watersheds to be evaluated by volunteer groups. Members of the Steering Committee will act as team leaders for each of the 8 to 10 groups of volunteers and provide instruction and guidance to the groups.
    - Bill Ahlert will solicit volunteers from the Steering Committee to act as team leaders.
    - Dan Delong offered to obtain digital elevation map to facilitate break down into sub-watersheds.
    - Dan Delong and Jim Baker will meet to work on sub-watershed breakdown.
    - Sub-watersheds will be based on a combination of physical divides, roadways/public access points, and property density.

    - Steering committee will have BIA overlay SWAP sites on sub-watershed maps for observation/evaluation by volunteer groups.

- Volunteer assessment will be conducted from public assess points (i.e. road crossings, parks, ect.) and access to individual private properties is not required.

- Rabid Bio-Assessment to be performed by Rebecca Hayden will require access to private properties along stream. Rebecca Hayden will obtain the necessary access prior to conducting the Rapid Bio-Assessment.

- Steering committee needs to begin recruiting volunteers to conduct volunteer assessment.

    - Rebecca Hayden will contact Steve Baier to determine availability of Emmaus High School students.

    - Possibly use Kidspeace students used in stream assessments of other watersheds.

Status of the Rapid Bio-assessment Work

- Assessment to be performed by Rebecca Hayden without assistance of BIA.

- PA Fish & Boat Commission representative to train Rebecca Hayden on proper technique/protocol.

- PA Fish & Boat Commission to provide personnel to assist with the completion of Rapid Bio-assessment of Leibert Creek.

Glossary of terms provided by BIA

- Steering committee at large ok with terms as presented.

- Rebecca Hayden to perform final review and submit comments to Bill Ahlert for submission to BIA.

Upper Milford Township ordinance review

- Natural Lands Trust was hired to review Upper Milford ordinances as part of Perkioming Creek watershed assessment project.

- Natural Lands Trust is still working on review of Upper Milford's ordinances.

- A professional from Connecticut who reviewed Upper Milford ordinances stated that they are not in compliance with Growing Greener requirements.

- Upper Milford Township is looking for direction from this project about how to upgrade their ordinances to be compliant with Growing Greener requirements.

- BIA should provide recommendation of types of ordinances that should be evaluated.

- Lehigh Valley Planning Commission has model ordinance that would be a good starting point for BIA's evaluation.

- The Borough investigated using well head protection ordinances when Meiser & Earl well head delineations were completed for wells 6 & 7.

    - Borough determined that ordinances were not legally defendable when the delineation crosses municipal boundaries and all impacted municipalities were not cooperating.

    - No action was taken at that time.

- Scope of the report/project is to provide sample ordinances that could be utilized in the future without recommending implementation of specific ordinances at this time.

Emergency Response Plan update

- Boroughs plan is currently being updated by Borough personnel.

- Jeff Clapper to Inform BIA that plan is currently being updated.

- BIA to work with Jeff and incorporate a general description of Plan and it's relationship to the watershed and groundwater resources as part of the report.

- Discuss process overview in report without providing details of or copy of plan (i.e. local fire dept ? haz-mat team ? specialty response team ? ect.)

Water and Sediment quality results

- Provide Appendices B & D of National Sediment Quality Survey to BIA.

- Request that BIA compare sediment sampling results to applicable standards presented in Appendix D and surface water results to Chapter 93 criteria.

    - Request that BIA discuss those results that indicate any impairments that might exist (e.g., temperature, cadmium, sediment loading) and provide a brief discussion of possible sources of impairment. Some of these impairments have resulted in Leibert Creek being listed on PADEP's 303d list.

    - Rebecca Hayden will work with BIA on impairment discussion.

There was some discussion of the amount of historical data that is available to assess the creek water quality. Apparently temperature measurements have been collected for some reaches over time that show that the creek does not meet the temperature requirements for a Cold Water Fishery, the current stream designation. It may be important in the future to obtain additional data to better develop statistical trends and evaluate the extent of the impacts.

    - Steve Baier may have some information available through assessments conducted with Emmaus High School students.

- Per Dan Delong, the quantity of silt (sediment load) within the Leibert Creek has decreased over the last 35 years.
    - Based on observations while fishing, no actual measurements of the sediment load have been made over time.

- The group did not see the need for any additional surface water or sediment sampling at this time. However, it maybe helpful to sample some of the storm water runoff areas associated with the Turnpike to evaluate what if any impact the storm water is having on the creek.

Little Lehigh Creek re-designation

- PADEP to provide presentation September 4, 2003 at Macungie Institute. An email was sent around by Rebecca Hayden on the time and place of the presentation. The Conservation District will be looking for a $5 contribution for those attending. Anyone that would like additional information should contact Rebecca.

Community education outreach activities

- This committee had a display at Heritage Days where approximately 50 people from the public visited the display expressed an interest in the program.

Wellhead Protection Project

Establishment of steering committee goals

- Bill Ahlert presented a concise goal/mission statement. Bill will distribute to the entire committee for comments.

- List of goals provided by BIA are responsibilities not goals and Bill Ahlert requested that the committee review and add, edit or delete responsibilities and get there comments back to Bill.

Management Option Matrix previously provided by BIA

- Steering committee members are to review individually and provide Bill Ahlert with written comments to be provided to BIA.

SWAP ranking previously provided by BIA

SWAP ranking was prepared using PADEP protocol with input from PADEP personnel. The Steering Committee discussed the appropriateness of some of the rankings (i.e., all USTs as high) and whether some consideration should be given to modifying those rankings on a grouping basis. It was agreed that BIA will be asked to move all UST sites that have been registered closed with PADEP and all Act 2 sites that have been closed under the Statewide Health Standard to medium. The Steering Committee in the future will need to periodically review the rankings and revise as appropriate.

- Jeff Clapper to instruct BIA to move all closed UST sites and closed Act 2 SWH sites from high to medium threat.

Interconnection agreements with City of Allentown and Lehigh County Authority

The Steering Committee discussed the interconnection in place between City of Allentown and Borough of Emmaus water systems.

  - Emmaus's system operates at higher pressure.
  - Interconnection has not been tested in recent years and may not function.
  - To properly exercise the interconnection, a system to send the water to waste needs to be installed to prevent increased turbidity and sediment from entering the water systems.
  - Bill Ahlert will contact Joe McMahon of the City of Allentown to discuss the City's willingness to enter into a written agreement of mutual support and the installation of a waste collection system to permit interconnection exercising.

- There is currently an agreement of understanding between the Borough and Lehigh County Authority to install an interconnection between the systems. The Steering Committee needs to obtain a copy of the agreement for the report.
  - Lines are approximately 1 mile apart in the area of Cedar Crest Boulevard and Indian Creek Road.
  - Borough to contact Lehigh County Authority to determine willingness to complete the interconnection.

Possible new source locations

The Steering Committee discussed the previous locations selected by BIA and agreed that those locations were not appropriate and BIA should identify alternative locations.

- Dan DeLong will work with BIA to identify alternative locations and to consider the following in their review:
  - Installation of an air stripper on Well No. 3

- Completing interconnect with Lehigh County Authority and purchasing water from Lehigh County Authority.
- Installation of new well(s)

Review of private potable well testing

The Steering Committee discussed the need for additional potable well testing as part of the current project and what wells were tested previously and which wells might be tested again depending on the amount of funds available. There is some money remaining in the budget for additional testing.

- Jeff Clapper to review records and determine amount of remaining funds.
- If funding permits, re-sample potable wells that previously had detectable concentrations of volatile organic compounds. Analyze for volatile organic compounds only.

Discussion of well tour

- The steering committee conducted a tour of the Borough's wells and water distribution system on July 30, 2003.

Review of BIA Progress Report #3

- BIA has requested a meeting with Jeff Clapper, Dan Delong, and Bill Ahlert.
  - Jeff Clapper will contact BIA and attempt to schedule the meeting for August 25, 2003 at 8:00 AM.
- Steering Committee Action Items
  - Comment on WHP report outline
    - The steering committee previously provided BIA with comments.
    - Jeff Clapper will resend comments to BIA.
  - SWAP Ranking Feedback
    - As discussed above, Jeff Clapper to instruct BIA to change closed UST and Act 2 sites medium threat.
  - Review of conceptual groundwater flow model
    - BIA needs to provide the necessary information for the steering committee to review.
  - Review of recalculated Zone II WHP areas
    - BIA needs to provide the necessary information for the steering committee to review
  - Determine goals of volunteer watershed assessment

    - As stated above, Jeff Clapper will inform BIA that the steering committee is taking responsibility for this activity.

- Provide list of terms to be added to watershed assessment report glossary.
    - As stated above, Rebecca Hayden will review and provide written comments to Bill Ahlert for submission to BIA.

- Provide sediment standards.
    - As stated above, Jeff Clapper will forward Appendices B & D of the Nation Sediment Quality Standard for use by BIA.

- Review BMP's currently used in watershed and address LCCD and NRCS concerns about presenting the information
    - LCCD previously provided BMP documentation to BIA.
    - BIA should not include the names of any property owners in the report.
    - Rebecca Hayden will contact BIA to clarify this issue.

- Discuss input for Lehigh River Conservation Plan
    - Debra Lermitte of the Wildlands Conservancy is involved in this project. and Rebecca Hayden will contact Debra Lermitte for her input.

- Review of Management Option Matrix
    - The steering committee will review and provide comments to Bill Ahlert who will compile and submit to BIA.

- Review of model ordinances
    - Direct BIA to review the LVPC ordinance as a starting point for suggested ordinances.

- Provide comments on the various chapters of the draft report.
    - The steering committee is firm on its position that BIA is to provide the draft report in its entirety for review by the committee.

- Discussion of potential new sources
    - As discussed above, BIA needs to provide the steering committee with a list of alternate new well locations with assistance from Dan Delong.
    - Also consider installing air stripper on Well No. 3 and completing interconnection with Lehigh County Authority.

- Discussion of final potable well sampling
    - As discussed above, determine remaining funds and sample wells with detectable concentrations of voc for voc analysis only.
- Discussion of volunteer watershed assessment and Rapid Bio-Assessment reporting requirements.
    - Will be address further after completion of the assessments.
    - Rebecca Hayden and the steering committee members will probably have to prepare these sections of the report.

- Municipal Action Items
    - BIA is seeking response to questions submitted to Dan Delong with respect to historical fishing on Leibert Creek.
        - Dan Delong recently responded to BIA on this issue.
    - Provide copy of Upper Milford Township ordinance review
        - Natural Lands Trust has not competed review.
        - Dan Delong will provide BIA with copy of LVPC ordinance review once completed.
    - Discussion of potential new sources
        - Dan Delong to contact BIA to assist in this process as discussed earlier in the meeting.
    - Input on revised or new ordinances
        - Possibly have BIA state that other ongoing projects are addressing ordinance review and preparation. Reference other projects.
        - Comments discussed earlier in the meeting will be explained to BIA at August 25, 2003 meeting.
    - Updating of Emmaus Emergency Response Plan
        - Comments discussed earlier in the meeting will be explained to BIA at August 25, 2003 meeting.
    - Determine potential actions to be taken at municipal properties.
        - The Borough will address these concerns internally without making specific recommendations in the report.

Memorandum of Meeting

Project: Emmaus Wellhead Protection & Leibert Creek Watershed Assessment
Date: September 16, 2003
Location: Emmaus Borough Hall
Attendees: Mr. Jeff Clapper – Borough of Emmaus
Ms. Kathy Gorr – Borough of Emmaus
Steering Committee Members – W. Ahlert, J. Baker,R. Hayden, S. Baier, D. Lermitte, J. Marin, C. Neely
Guest Observer – J. Seem

Purpose: Routine Monthly Meeting

Summary of BIA/Steering Committee Meeting
D. Delong and W. Alert met with BIA after the last monthly meeting. At that meeting, municipal and steering committee action items were reviewed. BIA was given a summary of the results of the August Steering Committee meeting. W. Ahlert is going to review the groundwater flow model and zone II wellhead delineations once BIA completes their initial efforts.

R. Hayden will contact BIA to ensure that the input from NRCS and LCCD is sufficient as it stands.

BIA was informed that the Steering Committee would take care of all stages of the volunteer effort, including data compilation. This information from this study will be appended to the final watershed assessment. J. Baker will calculate the number of road/stream crossings, so it can be decided how many groups will be needed to carry out the survey.

BIA was given the sediment contaminant criteria presented to the group by W. Ahlert at the last meeting.

Input to the Lehigh River Conservation Management Plan needs to be submitted to Wildlands Conservancy as quickly as possible, as their Plan is in its final draft stages. Items and projects listed in this Plan will be eligible for DCNR funding in the future, as the Conservancy's Plan is a DCNR project.

BIA was informed that the Steering Committee would like to see drafts of the project reports in their entirety, instead of reviewing individual chapters.

W. Ahlert recommended that the remaining funds from the study be used to pay for water samples for local residents whose wells have previously been found to contain VOC's. The committee agreed to this.

EPA Rapid Bioassement
R. Hayden reported that the EPA Rapid Bioassessment survey will be done in October.

Steering Committee Goals/Responsibilities
After creation of the goal statement at last month's meeting, the committee discussed the list of goals provided by BIA. There was considerable discussion of items #7, which concerns the ordinance review. W. Ahlert is going to review the grant deliverables to determine what is required to be in the assessment.

Management Recommendations Matrix
R. Hayden and J. Clapper reorganized and rewre the management options matrix into a narrative format. Committee members were asked to review the outline, and add other items as needed. Various committee members were asked to write the recommendations for various objectives and tasks, based on their areas of knowledge. R. Hayden will compile a complete draft management recommendations for distribution at the next meeting.

Interconnection with Allentown
W. Ahlert will contact Joe McMahon before the next meeting to discuss this item.

Land Use Management Review
D. Lermitte provided a review of the draft land use sections of the watershed assessment and wellhead protection project. She would like a digital copy of the draft report so she can work on it more easily. J. Clapper will request that from BIA.

Visual Assessment Form
Revised assessment forms were distributed for comment. Committee members were asked to return any comments to R. Hayden as soon as possible. There was discussion about whether the survey should be done on a single day, or over several days. Assessment points will be at stream/S. Baier stated that only those students who can drive from Emmaus High School would be able to participate. R. Hayden will contact Kidspeace to determine how many kids they had available. J. Clapper will write an article to be placed in the local paper soliciting adult volunteers from the community. Details of the surveying will be worked out over the next few weeks, dependent on the resources available. The date was set for October 25th, tentatively. Hunting season was discussed as a concern.

Emergency Response Plan
J. Clapper will contact BIA on this item.

Other items
J. Seem requested that the committee include Steven Peters, Lehigh University, on the contact list for the committee.

Meeting was adjourned at 8:57 pm

Leibert Creek Watershed Assessment Meeting
November 12, 2003

Alex Ulmer (AU), Bill Ahlert (BA), Rebecca Hayden (RH), Jeff Clapper (JC) DL, (Debra Lermitte) and DD (Dan Delong); present

Other initials used in these notes: JZ (Jeff Zehr); KZ (Kim Zieger); BE (Brian Evans)

Purpose of Meeting: To review status of project tasks, assign remaining tasks, and set timelines for completion

Farmland Preservation Objective JZ will make recommendations based on soils maps, relationship to existing farms, and proximity to important headwater areas. DL says the information is already on GIS. Forest and silviculture come under farmland preservation, but a farm can have up to 50% woodland. DEP is making conflicts with prime farmland a priority over new uses, according to AU. JZ will seek clarification from DD and DL where needed. The results need to be site specific, and need to identify high priority areas. The county has already identified high priority areas, and JZ says either the FPP needs to be consistent with that, or give reasons why not. Recommendations should state that points are given for being in the county's high priority areas in the FPP.

Steering Committee Meetings in the Evening JC and BA are concerned with the steering committee attendance dwindling, so they need to move on to new issues to keep interest.

Timeline for Project Completion We are looking for a draft report in February. Up to that point, BIA can submit pieces to the various people who need to be looking at it. A completion date for comments for each section will be determined so edits do not run on indefinitely.

Groundwater Model Review BA and BE – There will be no substantive comments. BA would like to see the calculations summarized and models that were used presented, and some depiction of what the results mean. BA is looking for the backup information. BA will get to AU with specific comments. BA would like to see the radii modified to reflect the modified shape, so the shapes have meaning. BIA needs to draft up text at this point, and submit it to BA for review. Timeline is predicated on when BA gets specific comments to BIA.

Land Use Information AU and DL are still working with rearranging the section. JZ and DD should probably take a look at that before completion. DJ and AU anticipate reorganization being done by early December.

Management Recommendations Reassign the wetlands recommendation to KZ. DL has already started on the others. By next meeting she will be done with those. The wellhead

protection objective can be punted to BIA. BIA will look at the objectives and red-flag any issues and get back to RH.

Volunteer Assessment Information BA says it is all done, and something needs to be written up. There are pictures, but a description is needed of what was done and why – BA will make sure that it gets written, although he might delegate it.

Ordinance Review AU looked at whether it would be worth Emmaus going through the same kind of process that UMT just went into. He found more restrictive stuff out west. East of the Mississippi, the ordinances refer to situations mostly when a drought emergency situations have been declared. There is another category for putting incentives for conservation measures, which worked very effectively in NYC. Built out Boroughs have not gone through an entire ordinance reviews. However, there are more targeted examples, such as Dayton, which worked to get all the hazardous materials from their wellhead protection zones, offering incentives to do that. AU will summarize all that in narrative and submit it when he has the chance. AU will identify any potential objectives and add them to the list.

EPA Rapid Bioassessment RH will submit that to BIA once the survey is complete, along with the protocol description.

Alternative Water Supply DD and AU need to reorganize the priorities. It looks as though interconnects are a better option than new sources. Joe McMahon is willing to help to look at that option as needed. Overall, the Borough has enough water even if the biggest well has to go offline. BIA and UMT will work out this item together by the end of next week.

Identification of Restoration Projects Volney dump is a remainder from a paper mill, and the DEP (DD). Removal of the Furnace Dam. (BIA). Camp Olympic (RH). Peter's property Main Road West and Shimersville Road. Vera Cruz parking lot on one side, guy with cars on other side (DD). RH will send an e-mail out to the rest of the steering committee asking about any other projects.

Additional Well Monitoring BIA will test the well of a private landowner whose well is contaminated to create useful information. The purpose of this is to get additional information for the well owner to help them out. JC will get together with BIA to decide how to do it.

Meeting Dates and Times and Places RH will send that information to BIA.

Feedback from Management Options for the Wellhead Protection Study JC said that the SC does not want to specifically mention anyone's names. The SC was otherwise ok with the recommendations. Reword the recommendation. BA and AU will get together and come up with the management options that are pertinent to the wellhead study.

Leibert Creek Watershed Assessment Meeting
December 9, 2003

Alex Ulmer (AU), Bill Ahlert (BA), Rebecca Hayden (RH), and Jeff Clapper (JC) present

Other initials used in these notes: DL (Debra Lermitte); DD (Dan Delong); JZ (Jeff Zehr); KZ (Kim Zieger); BE (Brian Evans)

Purpose of meeting: to review work already completed, and outline remaining tasks.

Comments from BA to AU on Wellhead Protections Zones BA had asked for tables or figures to allow the reader to picture how the different models would result in different wellhead protection zones. They discussed the comments and came up with agreement on how to deal with the various comments. Comment – the reader needs to understand that it is a qualitative and not quantitative assessment. AU is fine with explaining this. Comment – on using tables, which AU has taken care of. Needs bibliography and list of references. Comment on time of travel, which varies significantly. BA feels a table is needed. Explain why parameters result in such a wide variability. Section on mass balance needs to be included. The remainder of the comments are about including figures. Provide examples. Literature review is very good. JC wanted to be clear about what areas of town are included, so the Borough can make good use of the recommendation. There was some discussion of adjusting the fixed radius zones so they do not go over the ridge. It was determined that they do not go over into the next watershed, and should be left as is.

Land Use Section DL is tied up in the Lehigh River Conservation Management Plan and will not be able to get back to her tasks until after Christmas. AU took a look at a lot of it; Jackson, the summer intern from a few years ago for Emmaus, went through the material provided by the Planning Commission, which has changes since he did it. BIA needs the narrative from DL to describe the land uses provided by the Planning Commission. There are eight of them. They are broken down by % and amounts. BIA had written narrative on the types of pollution provided by each land use type. DL provided some more information on open space planning, zoning, comprehensive planning. AU is looking for some more of that narrative.

Farmland Preservation JZ will provide information after Christmas.

Evening Steering Committee Meetings BA wants to continue them, JC says the upcoming date is next week. JC suggested starting again in January. In the meantime, we will provide these notes to the steering committee for them to look at. BA and JC want to keep people involved. BA will forward notes to folks.

On the Ground Watershed Improvement Projects So far, DD has offered to write something on the felt dump. The Peter's property canyon has not yet been delegated to anyone to write up. BIA will write an item for the Furnace Dam. DL will look at invasive

plant removal. Community Park is already done. Public signs are under another heading. Camp Olympic was looked at by BA who will look for a description. BIA will provide the projects from the sites we looked at last year. JC talked about looking at the stream crossings, do they can be improved. BA says there are several other dams on Leibert Creek which could be removed. Dam by old mill by Vera Cruz. There is that one concrete mess behind the golf course. Dam removal recommendations need to include the need to analyze potential heavy metals releases from sediments that have accumulated behind the dams. There is another area behind Well 3 which has dead cars in it. Removal of the building in the Community Park and the associated flume is one option for that area. Buckeye Pipeline issue needs to be taken care of.

Other Management Recommendations JZ needs to get the farmland preservation one written. KZ wrote hers already. BIA has not yet finished with the wellhead protection study to red-flag and include in the watershed assessment. BE was supposed to write a description of what was done and why. RH will follow up on this.

Ordinance Review AU had not yet summarized the results of his inquiry. RH needs to forward the e mail from DD containing the ordinance review.

EPA Rapid Bioassessment Protocol Will get done eventually.

Alternative Water Supply LCA would like to buy the portion of the Borough's water supply which is outside of the Borough. This item is in flux at this point. BIA is waiting on information from DD. Options are getting well three online, or getting Allentown connections, or connections with LCA, or purchasing property and putting in a new well. BIA will take care of getting comments from DD.

Additional Well Monitoring BIA will get the information about which owner to retest by the end of this week. JC says two were done years ago as part of the Rodale process.

Next Meeting Date January 6 at the LCCD office at 1:00 pm.

PROGRESS REPORT #6

Project: Emmaus Wellhead Protection Program / Leibert Creek Watershed Assessment and Restoration Plan

Project No. 126501.0TC / 104401.0TC

Date: January 20, 2004

BIA has completed or substantially completed the following tasks since the last Progress Report:

Wellhead Protection Project

- Revisions to draft of the conceptual ground water flow model and zone II recalculations based upon comments received from SC Chairman, Mr. Bill Ahlert.

- The bulk of the background material for the introductory chapter of the Well Head Protection Plan has been assembled and drafted into text.

- A draft of the public relations / steering committee meeting chapter of the report has been substantially completed. It is anticipated that a summary of the agenda for the monthly steering committee meetings will be added by the steering committee.

- Recommendations for the second and final round of ground water sampling have been submitted to Mr. Jeff Clapper. BIA has been in contact with Mr. Clapper to discuss the recommendations and to answer any questions. It is anticipated Mr. Clapper, in conjunction with public works staff, will collect samples and send them for analysis to PSC Laboratories. BIA can assist with data analysis, if requested by Emmaus / steering committee.

- Based upon the discussions of the last daytime Steering Committee meeting, contingency planning will consider the following in the order presented: 1) the excess capacity within the existing Borough water system; 2) interconnections to other systems; 3) installation of an air stripper on Well #3 and 4) consider looking for new source wells. As the contingency plan will no longer identify specific new source locations, BIA has taken no further action regarding identification of new potential sources.

Leibert Creek Project

- BIA substantially revised the draft watershed assessment report to strengthen the organization, format, and writing.

- BIA incorporated the text provided by Rebecca Hayden for the restoration plan; however, significant gaps remain before this section can be completed.

- BIA received comments from Debra Lermitte on the land use section and completed the suggested revisions.

The tasks listed below will be worked on for the period of January 21, through February 27, 2003.

Wellhead Protection Project

- Continue on draft of final report; however, the draft report cannot be finished without input regarding the management options to be considered.
- BIA will complete a final draft of the Wellhead Protection report and submit it with all supporting documentation and electronic files to the SC by February 27, 2004.

Leibert Creek Project

- BIA will work with Rebecca Hayden to determine how to incorporate results from the June 2002 riparian assessment into the report.
- BIA will incorporate results from the 2003 volunteer stream walk; however, we have not received this information.
- BIA will complete the restoration plan after we receive the remaining text from the steering committee.
- BIA will complete a final draft report and submit it with all supporting documentation and electronic files to the SC by February 27, 2004.

Memorandum of Meeting

Project: Emmaus Wellhead Protection & Leibert Creek Watershed Assessment

Date: May 18, 2004

Location: Emmaus Borough Hall

Attendees: Mr. Jeff Clapper – Borough of Emmaus
Steering Committee Members – W. Ahlert, R. Hayden, A. Forndran, S Baier, and B. Evans
Public Observer – J. Seem, D. Miller

Purpose: Routine monthly meeting.

Wellhead Protection Project

Draft Wellhead Protection Plan Review

- BIA provided the Borough with a Draft Wellhead Protection Plan Report for review. Draft has been reviewed by some members of the Steering Committee and determined to be deficient.

- Draft report was submitted to PA Rural Water Association (PARWA) for third party review. PARWA compared the report to PADEP's minimum requirements and provided comments and a list deficiencies.

- J. Clapper, W. Ahlert, and R. Hayden have agreed to revise the report based on PARWA's comments. Steering Committee agreed to allow these members to revise the report without additional input/review by the steering committee at large.

- Upon completion of the revisions, a loose bound final draft WHPP report will be submitted to PADEP for preliminary review. Once PADEP approves the final draft report, the Final WPPP Report will be professionally printed, bound, signed/sealed, and formally submitted to PADEP for final review/approval.

- J. Clapper expressed concern that BIA may be unwilling to allow their licensed professional geologist (PG) to sign and seal the report after the steering committee has made changes to the document. The steering committee will not change any sections of the report that contain geologic interpretations required to be completed by a PG. The borough is withholding payment of several BIA invoices. The grant states that the final 20% of the funds are withheld until PADEP approves the report. Therefore, the borough will continue to withhold payment of the remaining invoices until PADEP approves the final report and it is in BIA's best interest to sign and seal the Final WHPP Report so they may receive payment on their remaining invoices.

SWAP Ranking and Management Options

- Steering committee needs to review and adjust SAWP rankings based on PADEP ranking protocol. BIA did not complete SWAP rankings appropriately.

- SWAP rankings need to be incorporated into Management Options with actions recommended for high priority sites. Actions may be simple such as outreach and education of property owners.

- W. Ahlert offered to review and edit SWAP rankings and management options.

Leibert Creek Assessment Project

Water Quality Testing

- R. Hayden and D DeLong collected two (2) rounds of water quality samples from multiple locations along the creek.

- The samples were analyzed for total coliform, e. coli, and nitrates. The following results summary was provided by R. Hayden:

    - Total Coliform – not provided

    - E. Coli – 30 – 200 µg/L

    - Nitrates – 1-2 (units ?)

Macro-invertebrate Sampling

- PADEP performed macro-invertebrate sampling of Leibert creek from Pa Turnpike to Camp Olympic.

- PADEP will prepare report of findings to be appended to Leibert Creek Watershed Assessment report.

- Preliminary data review indicates that lower portion of creek is impaired due to urban runoff.

Visual Stream Assessment

- R. Hayden is in process of walking entire length of Leibert Creek to perform a supplemental visual assessment.

- Several areas of concern have been identified.

    - Residences with failing septic systems impacting the creek.

    - Invasive vegetation (Japanese Knot Weed?) near Vera Cruz.

    - Lack of riparian buffer along some properties.

Future Goals and Projects for Steering Committee

- Both the WHPP and LCWA projects are rapidly coming to an end. The steering committee needs to evaluate the future goals of the group and

identify projects that can be undertaken to fulfill those goals and transform the group into an environmental advisory committee.

- The focus of the next steering committee will be discussion of future goals and projects.
    - Next meeting is scheduled for 7:00 PM Tuesday June 15, 2004.

Memo

To: Wellhead Protection Steering Committee

From: Wellhead Protection Subcommittee

Date: July 12, 2004

Re: Draft Wellhead Protection Plan

The Wellhead Protection subcommittee has reviewed the following documents:

- Growing Greener Grant Application submitted by the Borough of Emmaus on March 9, 2001.
- Emmaus Wellhead Protection Project Steering Committee Action Items dated March 13, 2003.
- Memo prepared by Chris T. Kotch of Barry Isett & Associates, Inc. (BIA) dated April 1, 2003.
- Pennsylvania Wellhead Protection Program Guidance

The subcommittee has focused its review on the scope of work described in the grant application against what has been completed by BIA and the minimum requirements for a Wellhead Protection Plan as described in the Pennsylvania Wellhead Protection Program guidance. The subcommittee's comments and recommendations are broken out Section by Section as described in the grant application submitted by the Borough in March 2001.

STEERING COMMITTEE AND PUBLIC PARTICIPATION

This section should document the formation and meetings of the local Wellhead Protection (WHP) steering committee and provide a description of the roles and responsibilities of the committee. As part of the public input process the steering committee and the general public should be offered a tour of the well sites and the area of interest in order that they may have appropriate prospective.

Although an ad hock committee has been formed there has been no formal selection of a chairperson or the development of written roles and responsibilities for the committee. The application states "*The Steering Committee will meet quarterly and will work to guide and develop the project throughout the 30-month duration.*" The subcommittee is not aware that there has been the formal selection of a Steering Committee. The memo prepared by Chris Kotch states "*There were also several Steering Committee Meetings, consisting of representatives from BIA (Alex Ulmer, Chris Kotch, Nate Hoffman, and Lori Girvan), the Borough of Emmaus (both Dan Delong and Jeff Clapper), Upper Millford Township (Dan Delong), and the PADEP (Andrew Augustine).* A majority of the Steering Committee consists of representatives from BIA and there is no involvement of "*interested watershed-minded organizations*". This is not what was envisioned by the state when they identified the need for establishing steering committees in the development of the wellhead protection plans. A committee consisting of community representatives and the public at large should be directly guiding the activities of the consultant responsible for the wellhead protection plan

development process and reviewing and commenting on each of the deliverables as they are completed, not the consultant hired to complete the project.

To Be Provided

The final report will need to document the following:

- Out reach efforts completed to date with details of how participants were identified and invited to attend and success of the efforts.
- The Steering Committee should be provided with a conceptual model of the area and potential impacts through a tour.
- How information has been disseminated and what efforts were made to solicit input and direction from the Steering Committee and public at large.
- Names and phone numbers of each Steering Committee member along with the identification of a Chairperson.
- The role and responsibility of the Steering Committee.
- Activities completed and to be completed by the Steering Committee.
- Future role of the Steering Committee.

DELINEATION OF THE WELLHEAD PROTECTION AREA

The application clearly states "*....The emphasis of this project is to protect the only uncontaminated well in the Borough of Emmaus Water System...*" The application also clearly indicates that the delineated areas for Wells No. 6 and 7 will be directly taken from the Meiser & Earl study and the remaining wells will be a fixed radius rather than a rigorous delineation.

The application does not provide technical justification for the selection of a fixed radius approach and/or if any effort will be made to verify the current applicability of the Meiser & Earl study or in the future under different pumping scenarios. The use of a fixed radius approach is problematic when used in a fracture and/or carbonate bedrock system and requires full justification in order to demonstrate that it is adequately protective. BIA provided some additional justification in their April 1, 2003 memo, however has not to date provided any technical analysis of the data and assumptions used in prior studies against what is currently known and/or what might occur in the future with respect to groundwater use, velocity, and flow direction. At a minimum a thorough literature review is necessary along with an appropriate evaluation of existing data and information. Additionally, some conceptual analysis and possible rudimentary modeling should be performed to verify the applicability of the previous studies that have been cited. This should include a detailed discussion of relevant hydrogeological data with sources/references, supporting calculations and any other information necessary so that people reviewing the plan in the future can reproduce the steps involved in delineating the WHP area. All of this information should be summarized and evaluated against the proposed wellhead protection areas and possible future impacts from known areas of contamination.

BIA argues in their April 1, 2003 memo that "*...the value of groundwater flow directions and contours constructed from well data, in which there is limited to no geologic log information or well construction*

information, is questionable." There is information available from prior studies that have been conducted in the region that provide reliable information on regional groundwater flow and geologic formations within the study area. Clearly a rigorous hydrogeologic study was never contemplated for this project and/or scoped in the original application, however a thorough review of all available data and studies was contemplated in order to verify the assumptions used under the current analysis and to perform an appropriate evaluation of potential future impacts to Well No. 6 from existing and unknown sources of contamination.

The DRAFT Wellhead Protection Plan presented by BIA does not currently satisfy the minimum requirements of the *Pennsylvania Wellhead Protection Program, Appendix A – Minimum Elements for Local WHP Programs.* According to the program guidance, "A local WHP plan must contain the following minimum elements in order to be considered for DEP approval" (WHP Area Delineation requirements are discussed below).

a. "The narrative must completely describe the methodology used, justification for methodology, and who performed the delineation."

    i. BIA appears to have satisfied the above requirement (based on the employed methodology), however additional technical justification for the methodology selected is warranted.

b. "For delineation in carbonate and fractured bedrock aquifers that utilize the ½ mile radius as the default WHPA, the justification must demonstrate that it is adequately protective."

    i. The grant application states "Wellhead protection area delineations for the remaining wells (1, 2, 3, 4) will be fixed radius rather than a rigorous delineation..." BIA attempts to justify the use of default ½ mile radius through calculations based on average annual groundwater recharge rates required to recharge or sustain the maximum permitted pump rate.

        1. Insufficient technical justification was provided for the pumping rates used and it appears that the rates used are below the maximum yields.

        2. It appears that they have not considered the combined pumping effect of multiple wells. This is especially important considering the close proximity of Wells No. 1 & 2.

        3. The approach used by BIA does not consider, even in a cursory way, regional groundwater flow, topography, fractures, lineaments, bedding plane orientation, and geologic formation contacts which have been described in previous studies.

c. "This section must also include a description of the local hydrogeologic setting and a formulation of a conceptual groundwater flow model."

    i. To date BIA has not developed a conceptual groundwater flow model for the area.

d. "Relevant hydrogeologic data with sources/references, supporting calculations and any other information necessary for the reviewer to reproduce the steps involved in delineating the WHP area must be provided."

i. To date BIA has not provided sufficient supporting documentation to allow an accurate reproduction of the steps involved in delineating the proposed WHP area.

e. "The level of delineation will be commensurate with the type of management option to be utilized."

i. The type of management option to be utilized is ultimately the decision of the Borough of Emmaus and Upper Milford Township. It does not appear that there has been any discussion and/or alternatives of management options presented to either the Borough the Township or The Wellhead Protection Steering Committee for consideration. It is inappropriate for the consultant to specify the management option(s) and subsequent level of delineation without the direct input of the stakeholders.

According to the Growing Greener Grant Application prepared submitted by the Borugh of Emmaus, "...the emphasis of this project is to protect the only uncontaminated well in the Borough of Emmaus' Water System, while educating the citizens of the communities on the importance of watershed and wellhead protection."

To Be Provided

- Thorough description of existing data and studies covering the area of interest. (list all references)
- A detailed description of the methods and procedures used to obtain and evaluate data collected during the project, including historical data and data from other studies.
- Thorough analysis of existing data sets and results of any model runs used to verify applicability and future trends. Discuss limitations of data and future data needs.
- Thorough description of the limitations associated with each of the two wellhead protection area delineation approaches and technical justification for the selection of one approach over the other.
- Discuss in detail the possible impacts to Well No. 6 and the wellhead protection area from different conditions including but not limited to:
    - Increased sustained pumping by the Borough at Well No. 6
    - Decreased pumping at other wells throughout the Borough water system
    - Significant long-term drought conditions
    - Installation of a public supply wells west and north of the Borough
- Provide a detailed description of the Borough Water System including:
    - Wells information (e.g., year of construction, depth, diameter, yield, current pumping rate, yearly output)
- Discuss current zoning and land use within the proposed protection area and possible impacts from each zoning and land use.

- Discuss possible impacts from planned or proposed development activities.

- Discuss other well head protection areas that might exist in the area and have an influence on future development.

- The Environmental Protection Agency (EPA) and United Stated Geologic Survey (USGS) have prepared several publications on basic methods to calculate WHPAs in carbonate and fractured aquifers which require basic and currently available published data. BIA should consider the techniques described in these publications in justifying the wellhead delineation approach selected.

- Conceptual groundwater flow model should be prepared for each WHPA.

- The draft plan should present clear and concise measures that the Borough should undertake to protect the uncontaminated well and continue to evaluate the potential for future impacts. This should include consideration of the presence of contamination identified in Well No. 3 and a strategy for the continued monitoring and evaluation of the movement of those contaminates toward Well No. 6.

- Relevant hydrogeologic data with sources/references, supporting calculations and any other information necessary for the reviewer to reproduce the steps involved in delineating the WHPA must be provided.

- All WHPAs need to be based on conservative withdrawal data (maximum reported well yield) and the combined effects of pumping multiple wells must be considered.

INVENTORY OF EXISTING AND POTENTIAL CONTAMINATION SOURCES

This section should include a detailed discussion of the different types of sources that represent a potential threat the water supply including a rating system that rates the risk each source presents to the system. This section should include documentation that the sources are either targeted for or are provided specific education regarding the potential risk.

For the most part this appears to have been accomplished.

To Be Provided

- Description of each electronic data base reviewed and the nature of the information provided within each data base, including limitations of information regarding nature and status of any conditions identified.

- Description of rating process used to identify potential risk

- Provide a detailed description of verification process, which sites visited and information gather during the visit (provide photos if taken).

WHP AREA MANAGEMENT AND COMMITTMENT

The Pennsylvania Wellhead Protection guidance identifies the following minimum elements must to provide:

- Discuss possible impacts from planned or proposed development activities.

- Discuss other well head protection areas that might exist in the area and have an influence on future development.

- The Environmental Protection Agency (EPA) and United Stated Geologic Survey (USGS) have prepared several publications on basic methods to calculate WHPAs in carbonate and fractured aquifers which require basic and currently available published data. BIA should consider the techniques described in these publications in justifying the wellhead delineation approach selected.

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- Description of rating process used to identify potential risk

- Provide a detailed description of verification process, which sites visited and information gather during the visit (provide photos if taken).

WHP AREA MANAGEMENT AND COMMITTMENT

The Pennsylvania Wellhead Protection guidance identifies the following minimum elements must to provide:

1. Description of current land use;
2. Management methods appropriate fro the delineated WHP area;
3. Description of cost to complete items 1 and 2;
4. Description of where the resources will come from; and
5. A table listing management options for each identified threat along with a schedule for implementation.

The Growing Greener Application submitted by the Borough of Emmaus indicates that the work plan will include:

1. Description of the current land use;
2. The level or type of management methods to apply to various area will be determined;
3. Costs associated with each management method; and
4. Identifying possible sources of funding.

The *Steering Committee Actions Items* document prepared by BIA identifies Public Education through the dissemination of information on various topics including best available technology relating to septic, UST's, disposal of hazardous waste, wellhead protection for private on-lot wells and the passage of zoning ordinance. BIA suggests that the Steering Committee and investigate many various educational and zoning management tools and look as possible funding sources. These are all required elements that BIA should complete providing the Steering Committee with a detailed description of the various alternatives and options available to the Borough to manage the WHP areas and develop the necessary commitments to implement the Wellhead Protection Plan including estimated costs to impellent each option. The options should be accompanied by recommendations for the option to be selected.

To Be Provided

- All the elements identified in the Pennsylvania Wellhead Protection Program guidance needs to be developed and provided in the wellhead protection plan including:
    - A written description of the land use through out each wellhead protection area and possible impacts associated with each land use;
    - A description of the various methods available to manage each wellhead protection area that should, in addition to education and zoning, consider:
        - New groundwater source location
        - Groundwater quality monitoring
        - Sanitary surveys
        - Land acquisition

- Training programs

- A matrix table presenting the various costs associated with the various methods alone and in combination;
- A description of various sources of funding that might provide the necessary funding to fund the items matrix table of methods;
- A description of the type of commitments that will be needed depending on the method ultimately selected to manage each WHP area; and
- A table listing recommended by BAI to address each identified threat along with a schedule for implementation. Text should be provided describing the technical rational for the recommended options.

CONTINGENCY PLANNING

NEW SOURCES

The *Pennsylvania Wellhead Protection Program, Appendix A – Minimum Elements for Local WHP Programs* state that "A local WHP plan must contain the following minimum elements in order to be considered for DEP approval...This section addresses adequate planning for new wells including careful consideration of potential sites, existing land use, predicted Zone I area, how to obtain access and rights to areas if necessary and how the area will be protected."

According to the Steering Committee Action Items presented by BIA, only one potential new well location was provided. The proposed location is below the Overlook Springs Area which, according to BIA, is a suspected source of groundwater contamination. In addition, this location is likely to be impacted by area wide volatile organic compound contamination known to exist. Therefore, this is not a suitable new source location.

According to the Growing Greener Grant Application submitted by the Borough of Emmaus, "The protection of Well No. 6 would preclude the need to find a new source of water supply and although the Borough of Emmaus does not actively pursue new sources, this wellhead protection study process would provide necessary information to readily evaluate possible areas for a new source. This item of the work plan would address adequate planning for new wells including careful consideration of potential sites, existing land use, predicted Zone I area, and how to obtain access and rights to access areas if necessary and how the areas will be protected."

Clearly, the issue of adequate planning for new wells including careful consideration of potential sites, existing land use, predicted Zone I area, and how to obtain access and rights to access areas and how these areas would be protected has not been addressed to date and requires further work.

To Be Provided

- BIA must conduct further work to identify multiple suitable new well locations. This should include a minimum of three sites for consideration by the Steering Committee, Borough of Emmaus, and Upper Milford Township.

- For each of the proposed new sites, BIA must evaluate existing land use, predicted Zone I WHPA area, how to obtain access and rights to areas if necessary and how the area will be protected.

July 20, 2004

STEERING COMMITTEE MEETING MINUTES

The meeting began at 7:00 p.m.
The meeting adjourned at 9:15 p.m.

Those in attendance were: Judy Muehl of PA Rural Water, Jeff Clapper, Rebecca Hayden, Joe Seem, Dan DeLong, Joyce Marin, Jim Baker and Angelika Forndran.

DRAFT WELLHEAD PROTECTION PLAN

The committee discussed the items missing from the draft. Additional items to include in the final report: Meiser & Earl's report, newspaper articles on events, minutes from meetings, well logs, SWAP report from DEP.

The current organization of the draft was discussed. The method of organizing the final report into the DEP template was discussed. Jeff Clapper will send selected sheets from final report to Alex Ulmer to sign and seal.

Jeff Clapper discussed the number of copies. It appears that only 10 are necessary, Lehigh County, Upper Milford Township, three for DEP, Emmaus Borough.

MANAGEMENT OPTIONS

Judy Muehl discussed the necessity for public education as the major Management option. The committee included more information relating to public education in the report.

Judy was asked if the management options need to be specific to the potential contaminant sources. Judy stated that the main management option should be public education.

Judy Muehl suggested a series of articles in the local paper about water and protection as part of education.

Talk to the East Penn Press about a list of story ideas and home owned wells.

The committee also agreed that establishing a formal joint environmental action committee should be a management option.

Judy also stated that a brochure is necessary. Judy Muehl has a template for general groundwater education.

Dan suggested working with the state and Upper Milford Township to develop well construction standards.

Bill Ahlert feels it should be broader to look over legislative issues.

July 20, 2004

STEERING COMMITTEE MEETING MINUTES

Judy Muehl said that the Well drillers association would like well construction standards.

The committee discussed the following topics as possible management options:

1. Annual Watershed Awareness Day
2. Newspaper Articles
3. Roadside Signage
4. Quarterly Newsletter
5. Groundwater Brochure to mail out
6. Educational Shops
7. Publicize household hazardous waste
8. Encourage recycling as a whole
9. Implement a homeowner lawncare/gardening education program
10. Encourage toxins reduction
11. Develop & implement a septic system maintenance education program
12. Work with Upper Milford Township to develop well construction standards
13. Inspect industrial/commercial floor drains and wash sinks for proper connections.
14. Address conversional planning and design standards
15. Work with Upper Milford Township to protect Well 6, and to further identify any options possible.
16. Help to create a joint Environmental Advisory Committee
17. Monitor existing contamination through EPA Rodale Site

Bill Ahlert feels good about the Leibert Creek Watershed – DEP/PennDOT approved the signs, but there are none on the turnpike. Public Supply area 5-miles. Discussion of signs on roads for Leibert Creek Watershed throughout.

Jeff Clapper and Judy Muehl will go over the report soon for final printing after discussed items are included.