Final

Source Water Assessment

for the

Highland Hills Mobile Home Park Water System

Cecil County, Maryland

Prepared for:

Maryland Department of the Environment
Water Management Administration
Water Supply Program
1800 Washington Boulevard, Suite 625
Baltimore, Maryland 21230-1719

Prepared by:

EA Engineering, Science, Technology, Inc.
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Sparks, Maryland 21152
(410) 771-4950

May 2003

Project No. 61726.01

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5/30/03

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May 2003

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

AST	Aboveground Storage Tank
BMP	Best Management Practice
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CHS	Controlled Hazardous Substances
COMAR	Code of Maryland Regulations
CREP	Conservation Reserve Program
DWEL	Drinking Water Equivalent Level
ft	Foot/Feet
gal	Gallon(s)
gpd	Gallon(s) Per Day
gpm	Gallon(s) Per Minute
GPS	Global Positioning System
GWUDI	Ground Water Under Direct Influence
IOC	Inorganic Compound
L	Liter(s)
LUST	Leaking Underground Storage Tank
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
mg	Milligram(s)
MGS	Maryland Geological Survey
MHP	Mobile Home Park
mrem	Millirem(s)
OU	Operable Unit
PWSID	Public Water System Identification
SDWA	Safe Drinking Water Act
SDWR	Secondary Drinking Water Regulations
SOC	Synthetic Organic Compound
SWAP	Source Water Assessment Plan
SWPA	Source Water Protection Area

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

µg	Microgram(s)
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WHPA	Wellhead Protection Area

EXECUTIVE SUMMARY

EA Engineering, Science, and Technology was tasked to perform a Source Water Assessment for the Highland Hills Mobile Home Park (MHP) water system in Cecil County, Maryland. This water system is identified as Public Water System Identification (PWSID) 0070220 by the Maryland Department of the Environment (MDE). EA has performed this study under Purchase Order No. U00P3200205, as authorized by the MDE.

The required components of this report as described in Maryland's Source Water Assessment Plan (SWAP) are:

- Delineation of the area that contributes water to the source
- Identification of potential sources of contamination
- Determination of the susceptibility of the water supply to contamination
- Recommendations for protecting the drinking water supply

The source of the Highland Hills MHP's water supply is the Port Deposit Gneiss, which is an unconfined crystalline rock aquifer. The Source Water Protection Area (SWPA) for the one supply well at Highland Hills MHP was delineated using the watershed delineation method for fractured bedrock wells. The area of the SWPA is based on land topography, a nearby stream, and a calculation of the total ground-water contributing area during a drought. The SWPA is approximately 121 acres.

Potential point and non-point sources of contamination within the assessment area were identified based on site visits, a review of MDE's databases, and a review of sewer service area and land use maps. Heating oil tanks and septic systems were observed on site. A former Superfund site and an underground storage tank site were also observed near the SWPA. Croplands and residential areas account for a significant portion of the SWPA and can be considered non-point source of contaminants. Well information and water quality data were also reviewed.

The susceptibility analysis for the Highland Hills MHP water supply is based on a review of the water quality data, potential sources of contamination, aquifer characteristics, and well integrity. It was determined that the Highland Hills MHP water supply has a low susceptibility to volatile organic compounds, synthetic organic compounds, inorganic compounds, radiological compounds, and microbiological contaminants.

Recommendations to protect the ground-water supply include creating a SWPA protection team, resident awareness, and communication with county officials about future planning and land use.

1. INTRODUCTION

EA Engineering, Science, and Technology was tasked to perform a Source Water Assessment for the Highland Hills Mobile Home Park (MHP) water system in Cecil County, Maryland. EA has performed this study under Purchase Order No. U00P3200205, as authorized by the Maryland Department of the Environment (MDE).

The Highland Hills MHP water system serves the community of Highland Hills MHP and is interconnected with the Misty Meadows I MHP Water system in Cecil County. The water treatment plant and the supply wells for the system are within the development. The Highland Hills MHP water system is operated in conjunction with the Misty Meadows I MHP system and serves a population of 415 with 85 connections. The water is supplied by one well (Figure 1).

1.1 GROUND-WATER SUPPLY SYSTEM INFORMATION

A review of the well data and sanitary surveys of the system indicates that the well was drilled in 1966 and therefore it is unknown whether the well was drilled in accordance with the State's current well construction standards, which were implemented in 1973. The well has a yield of 17,600 gallons per day (gpd). The well has a pumping rate of 26 gallons per minute (gpm). The production well was completed approximately 3 ft above grade. The well was observed secure and in good repair. One additional well is listed in the MDE Public Water Supply Inspection Report for the water system dated July 2002 as being not in use. It is unknown if this well has been properly abandoned. The well was not observed during the site visit but is identified as CE731763. Three wells that formerly served the Running Brook MHP were recently connected to the Highland Hills distribution system. However, these wells are not currently being used due to high levels of iron. Table 1 below contains a summary of the well construction data.

TABLE 1. WELL INFORMATION

Source ID	Source Name	Permit No.	Total Depth (ft)	Casing Depth (ft)	Aquifer
01	Highland Hills Well 1	CE670179	80	23	Port Deposit Gneiss

According to the MDE Public Water Supply Inspection Report for the water system dated July 2002, the operator of the water system is David A. Jones. EA personnel discussed water quality issues at the time of the site visit with Mr. Jones.

Currently, the raw ground water is treated with sodium carbonate (soda ash) for corrosion control and sodium hypochlorite (bleach) for disinfection. The finished water is stored in eight approximately 100-gallon bladder tanks prior to distribution.

1.2 HYDROGEOLOGY

Cecil County has two distinct physiographic provinces, the Piedmont and the Atlantic Coastal Plain, divided by the Fall Line. In the northern third of the county, Precambrian to early Paleozoic crystalline igneous and metamorphic rock of the Piedmont province is exposed at the surface. In the southern two-thirds of the county, the crystalline rocks are overlain by Coastal Plain deposits consisting largely of unconsolidated pebbly sand, sand, sandy clay, and clay. The deposits form a wedge-shaped mass of materials that range in thickness from inches along the Fall Line to as much as 1,600 ft in the southeastern corner of the County (Overbeck et al. 1958).

The ground water used by the Highland Hills MHP is from production wells drilled into the Port Deposit Gneiss formation. The Port Deposit Gneiss Formation is described as a "moderately to strongly deformed intrusive complex composed of gneissic biotite quartz diorite, hornblende-biotite quartz diorite, and biotite granodiorite, with all rocks foliated and some strongly sheared" [Maryland Geological Survey (MGS, 1968)].

The source of the ground water in Cecil County is from precipitation in the form of rainfall or snow melt. The water table in the aquifer generally mimics the surface topography. The availability of ground water in the crystalline rock of the area depends on the nature and distribution of secondary openings resulting from fracturing and weathering. The yield of a well in crystalline rock depends primarily on the amount of fracture openings penetrated by the well. The well yield range of 43 wells in the Port Deposit Gneiss ranges from 2 to 100 gallons per minute (gpm) with 35 percent of the wells having well yields greater than 10 gpm. The range of specific capacity, which relates well yield to drawdown, of 43 wells in the Port Deposit Gneiss range from less than 0.1 to 4.0 gallons per minute per foot of drawdown (Otton et al. 1988).

2. DELINEATION OF THE AREA CONTRIBUTING WATER TO SOURCE

For ground-water systems, a Wellhead Protection Area (WHPA) is considered to be the Source Water Protection Area (SWPA) for the system. Consistent with the recommended delineation in the Maryland SWAP (MDE 1999), the watershed drainage area that contributes ground water to the supply wells methodology was used.

This original delineation shape was then modified by accounting for surface water bodies, topography, significant land features, and by using a conservative calculation of total ground-water recharge during a drought. For conservative purposes, a drought condition recharge value of 400 gpd per acre (or approximately 5.4 inches per year) was used to estimate the total ground-water contribution area required to supply the well.

For the Highland Hills MHP, the current Water Appropriation Permit issued by the MDE Water Rights Division for is 17,600 gpd. To determine the total ground-water contribution area during a drought, the following equation was used:

Recharge Area (acre) = Average Use (gpd)/Drought Condition Recharge (gpd/acre)

From the equation above, the total ground-water contributing area during a drought is approximately 44 acres. The delineated SWPA is approximately 121 acres (Figure 2), and is therefore adequate to meet the average daily ground-water usage during a drought.

3. INVENTORY OF POTENTIAL CONTAMINANTS WITHIN THE DELINEATED AREA

A field survey was performed on 4 November 2002 to confirm potential sources of contamination around the ground-water wells identified in MDE databases. These databases include the Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS), which includes National Priority List (Superfund) sites, Maryland Registered Underground Storage Tank (UST) sites, Maryland Leaking Underground Storage Tank (LUST) sites, landfills, pesticide dealers, ground-water discharge permits, colonial tanks, and Controlled Hazardous Substances (CHS) generator sites.

During the field survey, other sources of potential contamination not in the MDE databases were noted and the location was surveyed using a Global Positioning System (GPS) receiver for mapping purposes (Figure 2).

3.1 POINT SOURCES

Two heating oil and one diesel aboveground storage oil tanks (ASTs) were observed proximal to the wells. Additionally, several 275-gallon aboveground residential heating oil tanks (AST) were observed throughout the development. Failure of an AST may impact the ground water with petroleum hydrocarbons.

Septic system drain fields were observed onsite. Septic system discharge could contain contaminants if there is insufficient treatment of biological contaminants such as coliforms and inorganic compounds such as nitrogen. Septic system discharge could also contain contaminants that the systems were not designed to treat, such as solvents and fuels.

The former Superfund site Bainbridge Naval Training Center is adjacent to the SWPA to the south/southwest of the mobile home park. However, the cleanup at the site is complete (USEPA 2003). The majority of the cleanup effort at this site was for asbestos removal. Two Operable Units (OUs) were identified as sources of contaminants to ground water including the Old Base Landfill and the Fire Training Area. A Record of Decision, where the selected remedial action is detailed, for the sites includes capping the former landfill to prevent further rain water infiltration and long term ground-water monitoring for manganese, iron, and chlorobenzene.

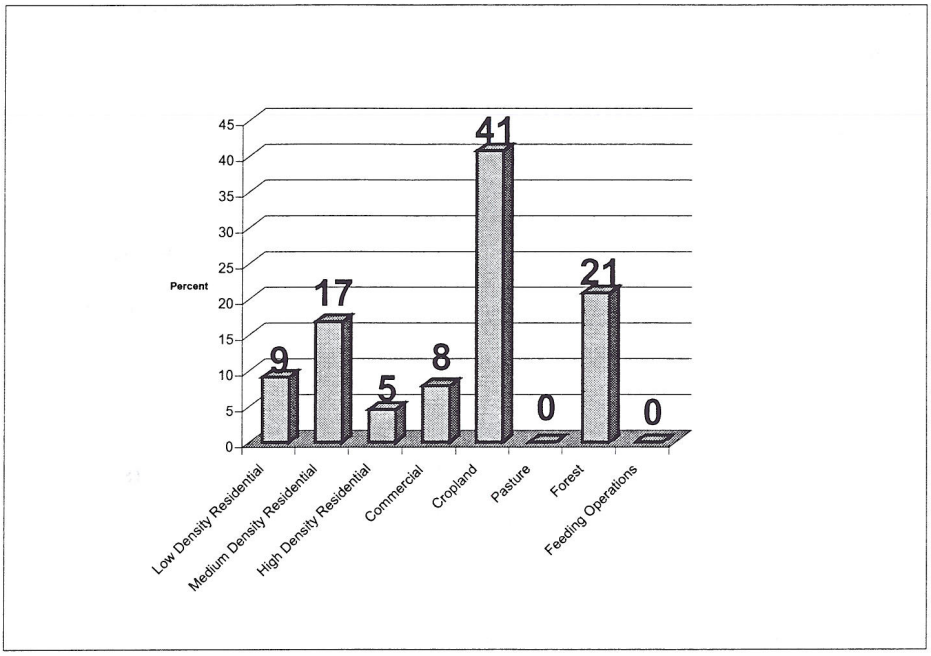
In addition to the above-stated point sources of contamination, one gasoline station (Craigtown Market) exists along Route 275 that is just outside the SWPA to the east.

3.2 NON-POINT SOURCES

In addition to the above point-sources, non-point source agricultural lands were observed north of the SWPA.

Using the Maryland Office of Planning's 2000 Land Use/Land Cover map for Cecil County, potential non-point sources within the SWPA area were also evaluated by land use designation (Figure 3). A summary of the percent and acreage of each type of land use is presented in the graphs below:

PERCENTAGE OF EACH LAND USE TYPE



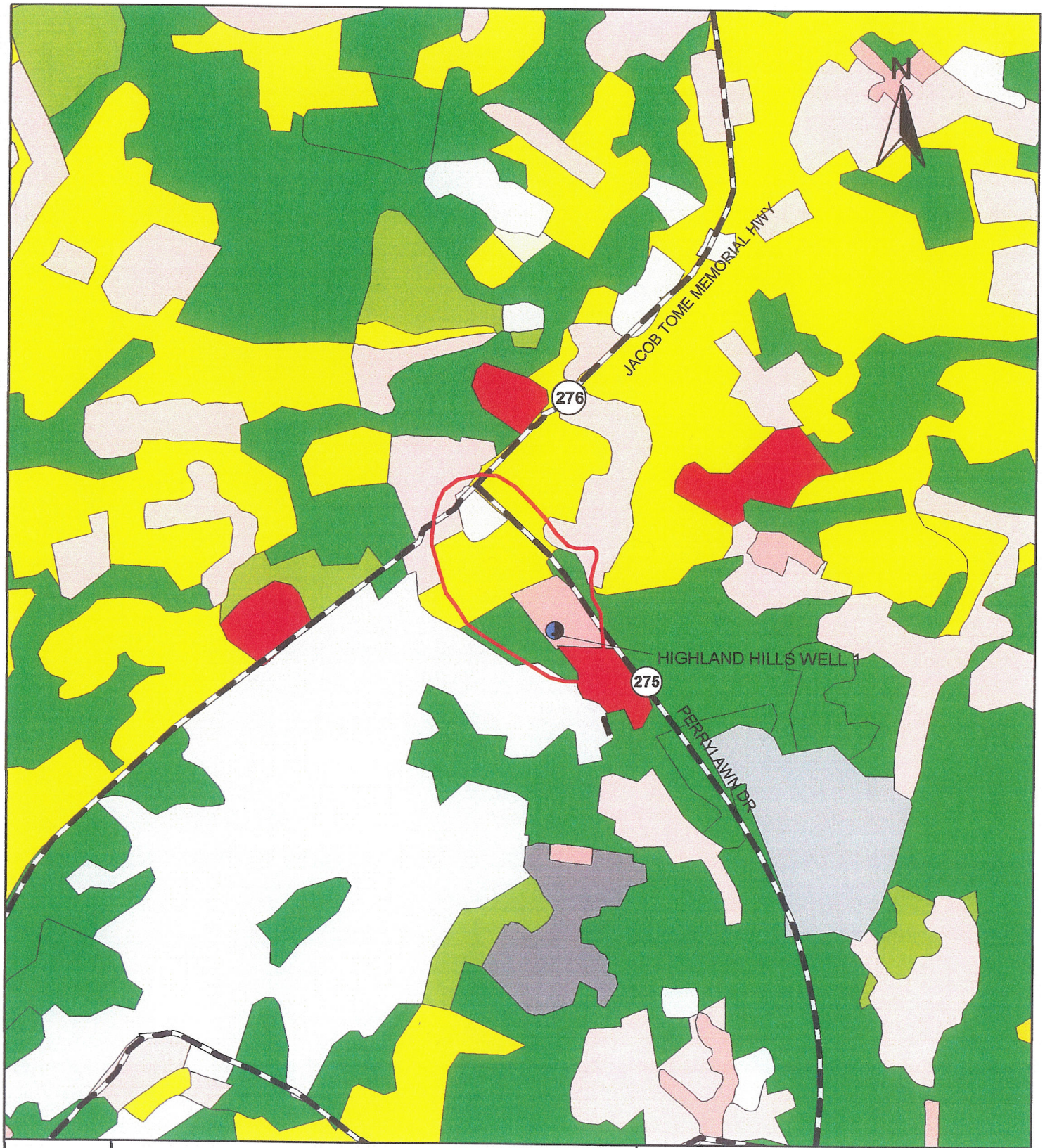


Figure 3. Highland Hills MHP Land Use Map of the Source Water Protection Area

Source Water Assessment Program
2003

Scale: 1000 0 1000 2000 Feet

Source: Maryland Office of Planning, 2000.

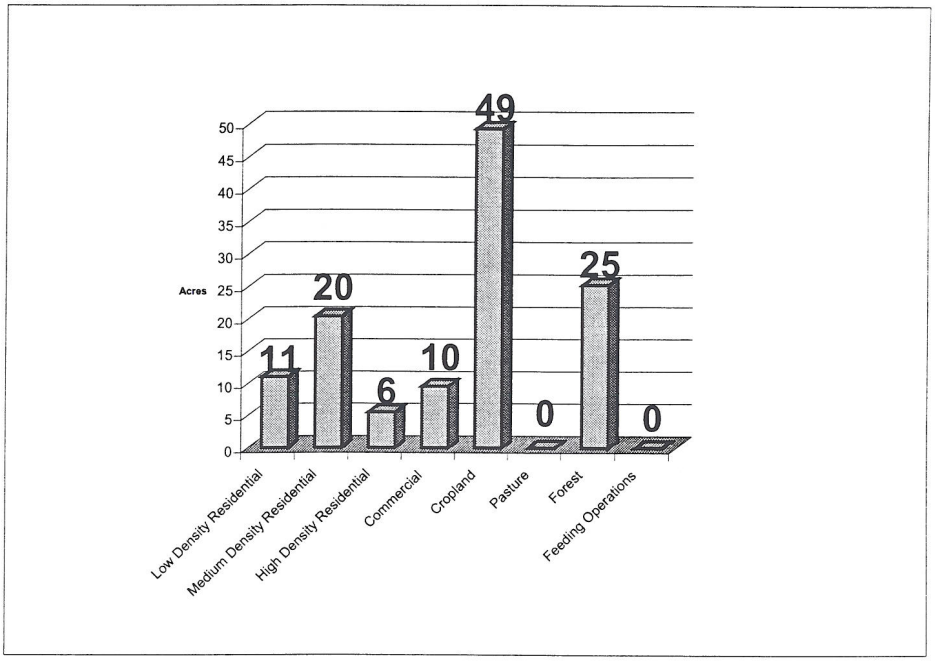
Legend:

- MHP Well
- SWPA Boundary
- Major Roads

Land Use

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Extractive
- Open Urban Land
- Cropland
- Pasture
- Orchards
- Forest
- Barren Land

ACREAGE OF EACH LAND USE TYPE



From an interpretation of the graphs above, cropland (49 acres) and residential areas (37 acres) accounts for over one-half of the SWPA (121 acres). The use of fertilizers and pesticides in croplands and residential areas are common. Therefore, there is potential for the migration of potential contaminants into the ground water.

Using the 1993 Maryland Office of Planning's Cecil County sewerage coverage, potential non-point sources from other septic system users in the SWPA were assessed (Figure 4). By overlaying the SWPA on the sewerage coverage layer in ArcView GIS, it was determined that approximately 68 percent of the SWPA does not have public sewer service and 32 percent is either on public sewer service or is under construction.

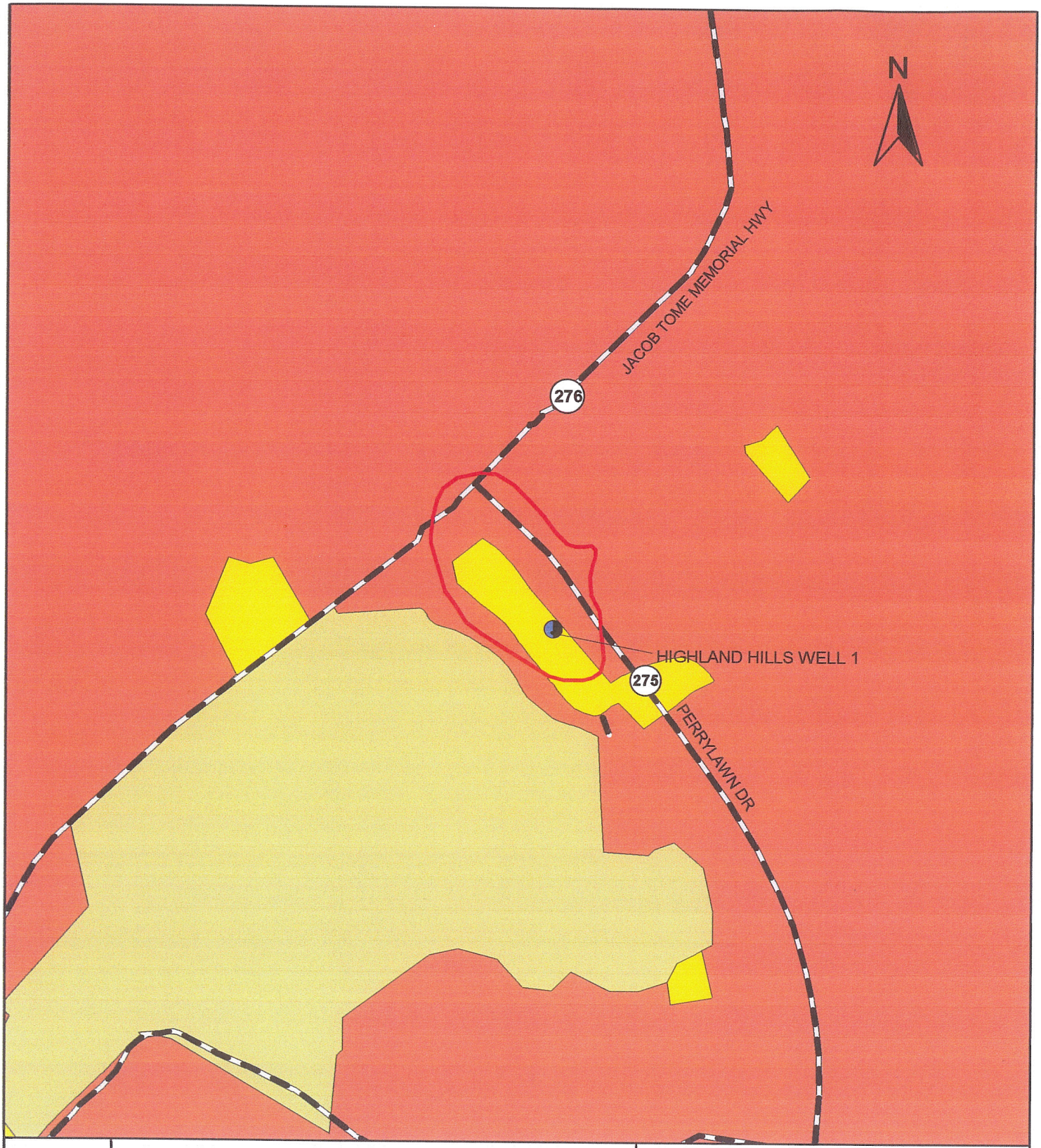


Figure 4. Highland Hills MHP Sewer Service Map of the Source Water Protection Area

Source Water Assessment Program
2003

Legend:

- MHP Well
- SWPA Boundary
- Major Roads

Sewer

- No planned service area
- Existing service area
- Area programmed for service within 5 years

Source: Maryland Office of Planning, 1993.

Scale: 1000 0 1000 2000 Feet

4. REVIEW OF WATER QUALITY DATA

Water quality data was obtained from the MDE Water Supply Program database of Safe Drinking Water Act (SDWA) contaminants. The results reported are for finished (treated) ground water (unless noted).

A review of the water quality data from 1992 to 2002 has been performed for Highland Hills MHP's finished water samples. All detected compounds from ground-water samples collected are shown in Appendix A.

Ground-water analytical results were compared to 50 percent of the United States Environmental Protection Agency (USEPA) Maximum Contaminant Levels (MCLs) or the USEPA Secondary Drinking Water Regulations (SDWR). If no MCL or SWDR is available, the Drinking Water Equivalent Level (DWEL) was substituted as recommended by the USEPA Office of Water.

4.1 GENERAL WATER QUALITY PARAMETERS

One ground-water sample collected on 22 October 1996 was reported with a pH of 6.4 units. This is below the SDWR range of 6.5 to 8.5 units. SDWR parameters are non-enforceable federal guidelines regarding cosmetic effects, such as tooth or skin discoloration, or aesthetic effects, such as taste, odor, or color.

4.2 VOLATILE ORGANIC COMPOUNDS

No volatile organic compounds (VOCs) were reported in the ground-water samples above 50 percent of the USEPA MCL.

The disinfection byproduct bromodichloromethane was reported in the water sample collected in January 1997 at a concentration of 0.7 µg/L. Bromodichloromethane is one of four trihalomethanes regulated under the SWDA. Trihalomethanes are formed as a reaction of chlorine to organic matter during water disinfection. Effective 1 January 2004, the MCL for total trihalomethanes will be 80 µg/L.

4.3 SYNTHETIC ORGANIC COMPOUNDS

No synthetic organic compounds (SOCs) were reported in the ground-water samples above 50 percent of the USEPA MCL.

4.4 INORGANIC COMPOUNDS

Nitrate was detected in ground-water samples collected in February 1993, January 1995, October 1996, January 1997, December 1998, March 1999, February 2000, February 2001, and April 2002. Nitrate levels ranged between 1 and 2.4 mg/L.

Low levels of nitrite were also reported in the October 1996 ground-water sample at 0.002 mg/L. Nitrate and nitrite are USEPA primary drinking water standard parameters with a USEPA MCL of 10 and 1 mg/L, respectively. Elevated levels may occur due to the influx of agricultural animal waste, agricultural chemicals or fertilizers, and/or septic system effluent into the drinking water.

Also, low levels of sulfate were reported in ground-water samples collected in October 1996 at 5.9 mg/L but below the SDWR standard of 250 mg/L.

No inorganic compounds (IOCs) were reported in the ground-water samples above 50 percent of the USEPA MCL.

4.5 MICROBIOLOGICAL CONTAMINANTS

No total or fecal coliform has been detected in ground-water samples of the water system's finished collected from January 1997 to August 2002.

To assess the potential of Ground Water Under the Direct Influence (GWUDI) of surface water, ground-water sampling records (during dry and storm conditions) in MDE databases were assessed and information from Public Water Supply Inspection Reports were reviewed.

Surface water that directly recharges the aquifer through major fractures in rock does not pass through the soil overburden that both filters and contains beneficial microorganisms that break down potential contaminants. If significant variances in the ground-water results from dry and storm conditions are observed, it is possible that the ground water is under the direct influence of surface water.

From an assessment of GWUDI sampling results from a 20 May 2002 sampling event, the ground-water supply for Highland Hills MHP is not under the direct influence of surface water.

4.6 RADIONUCLIDES

No radionuclides were reported in the ground-water samples above 50 percent of the USEPA MCL.

Gross alpha was detected at 1 picocurie per liter (pCi/L) in an April 2001 ground-water sample. The reported concentration is below 50 percent of the MCL of 15 pCi/L.

The presence of gross alpha particles is generally attributed to the decay of naturally occurring minerals like uranium in the metamorphic rock aquifer (Bolton 1996).

No radon-222 data is available for review.

5. SUSCEPTIBILITY ANALYSIS

To evaluate the susceptibility of the ground-water source to contamination, the following criteria were used:

1. available water quality data
2. presence of potential contaminant sources in the SWPA
3. aquifer characteristics
4. well integrity
5. the likelihood of change to the natural conditions

The aquifer that supplies Highland Hills Home Park's drinking water is an unconfined aquifer.

For the Susceptibility Analysis in this report, rankings of "high," "moderate," and "low" susceptibility to contamination were utilized after a review of current information. However, other SWAP reports for the State of Maryland also utilized rankings of "is," "may be," and "is not" susceptible to contamination. For consistency between the ranking systems, the following details their equivalence. The ranking of "highly susceptible" is equivalent to "is susceptible," "moderately susceptible" is equivalent to "may be susceptible," and "low susceptibility" is equivalent to "is not susceptible."

5.1 VOLATILE ORGANIC COMPOUNDS

No VOCs have been reported in the water samples analyzed with the exception of the disinfection byproduct dibromochloromethane.

While small heating oil and diesel storage tanks were observed within the SWPA, the oils consist of the heavier molecular weight compounds and little VOCs. Only chlorobenzene is a concern from the Bainbridge Naval Training Center. However, the contamination site is not within the SWPA or within one-half mile of the supply well.

Based on the water quality data reviewed and the lack of point sources of VOC contamination, the water supply at Highland Hills has a low susceptibility to VOCs.

5.2 SYNTHETIC ORGANIC COMPOUNDS

Pesticides and herbicides are often used on croplands and residential lawns, which account for 72 percent of the SWPA. Heating oil and diesel oil contain some SOCs such as benzo(a)pyrene. However, no SOCs were reported in the water samples collected and analyzed. From the well information, there is approximately 23 ft of soil between the surface and the bedrock aquifer. Most SOCs will sorb to soil particles before dissolving into ground water.

Based on the water quality review, the relative thickness of the overburden, and lack of significant point sources of SOC, the water supply at Highland Hills Home Park has a low susceptibility to SOCs.

5.3 INORGANIC COMPOUNDS

No IOCs concentrations were reported above 50 percent of the MCL in any of the water samples analyzed.

Approximately 68 percent of the SWPA does not use public sanitary sewer systems and residential and commercial areas use private on-site septic systems, which can cause nitrate pollution in ground water. Septic systems were observed within the MHP. However, no concentrations of nitrate have been reported above 3 mg/L (the MCL is 10 mg/L) and no upward trend in the reported nitrate concentrations in the water samples have been observed over time.

Based on the water quality data reviewed and the lack of observed point sources of IOCs, the water supply at Highland Hills has a low susceptibility to IOCs.

5.4 RADIONUCLIDES

One water sample was reported to contain gross alpha particles below the MCL. This is most likely due to presence of uranium bearing minerals in the bedrock in the Piedmont region of Maryland (Bolton 1996). No radon-222 data was available for review.

Based on the natural occurrence of radionuclides in the ground water in the Piedmont region of Maryland and a review of the current water quality data, the water supply at Highland Hills MHP has a low susceptibility to radionuclides.

5.5 MICROBIOLOGICAL CONTAMINANTS

No coliform bacterium has been detected in the ground-water samples, which have been collected and reported since 1997. From an assessment of GWUDI ground-water results by MDE, the ground-water supply for Highland Hills MHP is not under the direct influence of surface water. The supply well was constructed prior to 1973, the year that current well construction standards were required. The well was secure and appeared to be in good repair.

Based on the water quality review and the condition of the well, the water supply at Highland Hills MHP has a low susceptibility to microbiological contaminants.

6. RECOMMENDATIONS FOR PROTECTING THE WATER SUPPLY

With the information contained in this report, Highland Hills MHP has a basis for better understanding of the risks to its drinking water supply. Being aware of the SWPA, knowing potential contaminant sources, evaluating current and future development, working with agricultural producers and soil conservation agencies, and effective outreach and education are examples of management practices that will help protect the water supply.

Recommendations for the protection of the ground-water supply are intended for the mobile home park owner and its residents. Specific management recommendations for consideration are listed below.

6.1 PROTECTION TEAM

The management of the mobile home park should be aware of the SWPA boundary and evaluate the possible effects to the quality of the ground water prior to building or making any changes.

6.2 PUBLIC AWARENESS AND OUTREACH

The management of the mobile home park should consider discussing with property owners and businesses located within the SWPA of the activities that may have impacts to the ground water and its quality.

The management of the mobile home park should also consider sending pamphlets, flyers, or bill stuffers to its residents to educate them about the SWPA. An example pamphlet, "Gardening in a Wellhead Protection Area," is available from MDE. The residents should also be encouraged to notify the mobile home park management of any significant spills from gasoline or any other potentially hazardous substances.

Placing signs at the SWPA boundaries is an effective way to make the public aware of protecting their source of water supply, and to help in the event of spill notification and response.

The Executive Summary of this report should also be listed in the Consumer Confidence Report for the water system, and should also indicate that the report is available to the general public by contacting the MHP owner, the local library, or MDE.

6.3 PLANNING/NEW DEVELOPMENT

The mobile home park should also inform the Cecil County Health and Planning Departments of any concerns to future development or zoning changes of properties that are within the SWPA.

6.4 MONITORING

The management of the mobile home park should continue to monitor the ground water for all SWDA contaminants as required by MDE.

Annual raw water sampling for microbiological contaminants is a good way to check the integrity of the well.

A ground-water sample should be submitted for laboratory analysis of radon-222.

6.5 CONTINGENCY PLAN

As required by the Code of Maryland Regulations (COMAR) 26.04.01.22, all water system owners are required to prepare and submit for approval a plan to provide safe drinking water under emergency conditions.

6.6 CHANGES IN USES

The management of the mobile home park should inform the Water Supply Program at MDE of any changes to pumping rates and when a change in the number of wells used is anticipated. Any changes to the pumping rate and/or the number of supply wells will affect the size and shape of the SWPA.

6.7 CONTAMINANT SOURCE INVENTORY UPDATES/INSPECTIONS

The management of the mobile home park should conduct its own survey of the SWPA to ensure that there are no additional potential sources of contamination.

A regular inspection and maintenance program of the supply well should be considered to prevent a failure in the well's integrity, which may provide a pathway for contaminants to the aquifer.

Unused wells that are no longer connected to the distribution system should be abandoned and sealed as per COMAR 26.04.04.11. One unused well was reported in the Public Water Supply Inspection Report and it is unknown if the well has been abandoned properly. Unused wells can provide a pathway for contaminants to the aquifer.

Depressions around the wellheads should be filled and graded to prevent surface water ponding that may occur during rain events. This will help to prevent surface water infiltration into the well.

6.8 COOPERATIVE EFFORTS WITH OTHER AGENCIES

The management of the mobile home park may request the assistance of the University of Maryland Agricultural Extension Service, Soil Conservation Service to work with the nearby farmers to adopt Best Management Practices (BMPs) for cropland located within the SWPA.

The nearby farmers can also participate in the New Conservation Reserve Program (CREP) applicable to the cropland located within the SWPA. Government funding is available to qualified farmers equal to the cost and financial benefit of farming the area. The Natural Resources Conservation Service is responsible for determining the relative environmental benefits of each acre offered for participation.

7. REFERENCES

The following sources of information were consulted as a part of this investigation:

1. Bolton, David W. 1996. *Network Description and Initial Water-Quality Data From a Statewide Ground-Water Quality Network in Maryland.* Maryland Geological Survey Report of Investigations No. 60.

2. Otton, E. G, R. E Willey, R. A McGregor, G. Achmad, S. N. Hiortdahl, J.M. Gerhart. 1988. *Water Resources and Estimated Effects of Ground-Water Development, Cecil County, Maryland.* United States Department of the Interior, Geologic Survey. Bulletin 34.

3. Overbeck, R.M., T.H. Slaughter, and A.E Hulme, 1958. *Water Resources of Cecil, Kent, and Queen Annes Counties.* Maryland Department of Geology, Mines and Water Resources Bulletin No. 21.

4. Maryland Department of the Environment, Water Supply Program. 1999. *Maryland's Source Water Assessment Plan*, 36. pp.

5. Maryland Geological Survey (MGS). 1968. *Cecil County Geologic Map adapted from Maryland Geological Survey's Geologic Map of Maryland.*

6. United States Environmental Protection Agency (USEPA). 2001. *A Small Systems Guide to the Total Coliform Rule.* Office of Water. EPA 816-R-01-017A. June.

7. United States Environmental Protection Agency (USEPA). 1999. *Proposed Radon in Drinking Water Rule.* Office of Water. EPA 815-F-99-006. October.

8. United States Environmental Protection Agency (USEPA). 2003. Hazardous Site Cleanup Division Website. Accessed 14 March 2003. http://www.epa.gov/reg3hwmd/super/MD/naval-bainbridge/pad.htm.

SOURCES OF DATA

Water Appropriation and Use Database
Public Water Supply Inspection Reports
Monitoring Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Maryland Office of Planning 2000 Harford County Land Use Map
Maryland Office of Planning 1993 Harford County Land Use Map
USGS Topographic 7.5 minute Quadrangle Map – 1992 Rising Sun, Maryland Quad
USGS Topographic 7.5 minute Quadrangle Map – 1992 Havre de Grace, Maryland Quad

Appendix A

Detected Compounds in Ground-Water Samples

SUMMARY OF DETECTED COMPOUNDS IN HIGHLAND HILLS MHP WATER SAMPLES				
Plant ID	**Sample Date**	**Contaminant Name**	**Result**	**Unit**
Volatile Organic Compounds				
01	28-Jan-97	DIBROMOCHLOROMETHANE	0.7	ug/L
Inorganic Compounds				
01	09-Feb-93	NITRATE	1	mg/L
01	11-Jan-95	NITRATE	1.04	mg/L
01	22-Oct-96	NITRATE	1	mg/L
01	13-Jan-97	NITRATE	1.44	mg/L
01	16-Dec-98	NITRATE	2.4	mg/L
01	17-Mar-99	NITRATE	1.1	mg/L
01	22-Feb-00	NITRATE	1.3	mg/L
01	05-Feb-01	NITRATE	1.59	mg/L
01	03-Apr-02	NITRATE	1.3	mg/L
01	22-Oct-96	NITRITE	0.002	mg/L
01	22-Oct-96	SODIUM	15	mg/L
01	22-Feb-00	SODIUM	49.2	mg/L
01	22-Oct-96	SULFATE	5.9	mg/L
General Water Quality Parameters				
01	22-Oct-96	pH	6.4	s.u.
Radionuclides				
01	23-Apr-01	GROSS ALPHA	1	pCi/L

s.u. – standard units.