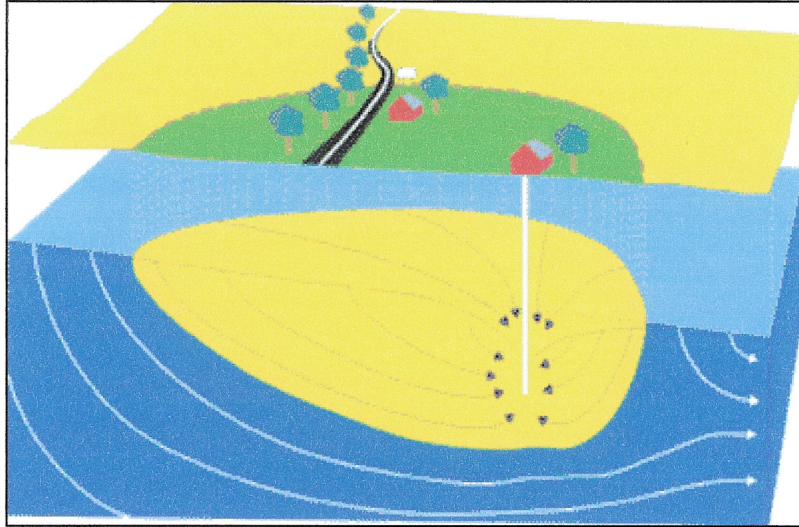


SOURCE WATER ASSESSMENT
FOR MAYBELLE MANOR MOBILE HOME PARK
CECIL COUNTY, MD



Prepared By
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EXECUTIVE SUMMARY

The Maryland Department of Environment's Water Supply Program (WSP) has performed a Source Water Assessment for the Maybelle Manor Mobile Home Park (MHP) water system in Cecil County, Maryland. This water system is identified as Public Water System Identification (PWSID) 0070248 by the Maryland Department of the Environment (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 Maybelle Manor MHP's water supply is the Baltimore Gabbro Complex, which is an unconfined crystalline rock aquifer. The Source Water Protection Area (SWPA) for the two ground-water supply wells was delineated using the watershed delineation method for fractured bedrock wells. The area of the SWPA is based on land topography, and a calculation of the total ground-water contributing area during a drought. The SWPA is approximately 29 acres in area.

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 land use maps. One above ground heating oil tank (AST) was observed near the site. Because residential areas account for a significant portion of the SWPA, overuse of nitrogen-based fertilizers in residential areas can be considered a non-point source of contamination. Well information and water quality data for the system were also reviewed.

The susceptibility analysis for the Maybelle Manor 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 Maybelle Manor MHP water supply is susceptible to arsenic, may be susceptible to volatile organic compounds, but not susceptible to nitrate, radionuclides, microbiological contaminants and other inorganic and synthetic organic compounds.

1.0 INTRODUCTION

The Water Supply Program has conducted a Source Water Assessment for the Maybelle Manor Mobile Home Park (MHP) water system in Cecil County, Maryland.

The Maybelle Manor MHP water system serves the Maybelle Manor MHP community of Cecil County. The water treatment plant and the supply wells for the system are located within the park. The Maybelle Manor MHP water system is owned by Marvin & Grace Comer and operated by Maryland Environmental Service. It serves a current population of 50 people with 28 connections. The park is continuing to grow and is adding new homes on a monthly basis and is expected to max out to 48 connections when the park is fully occupied. The water is supplied by two wells (Figure 1).

GROUND-WATER SUPPLY SYSTEM INFORMATION

A review of the well data and sanitary surveys of the system indicates that both wells were drilled in 1993 and are in compliance with the State's current well construction standards, which were implemented in 1973. The wells have a total average yield of 37,000 gallons per day (based on on-site pump test results). Table 1 contains a summary of the well construction data.

TABLE 1. WELL INFORMATION - PWSID # 070248

Source ID	Source Name	Permit No.	Total Depth (ft)	Casing Depth (ft)	Aquifer
01	Maybelle Manor MHP 1	CE920286	500	80	Balto. Gabbro Complex
02	Maybelle Manor MHP 2	CE920287	500	40	Balto. Gabbro Complex

Well 1 (CE920286) is located next to the treatment plant and although it does not have any protective barrier around it, it is located in an area that is set apart as open space and therefore is not likely to be damaged by human activities. Well 2 is located about 15 feet from the back door of a home in the park (Figure 2). This plastic well casing is less than 1 foot above the ground and as a result is vulnerable to accidental damage. MDE Public Water Supply System identification list the wells as 0070248. The wells are pumped alternately to a 20,000 gallon buried storage tank each time the system needs water.

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, 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 Maybelle Manor MHP is from production wells drilled into the Baltimore Gabbro Complex. This rock unit occurs as hypersthene gabbro with subordinate amounts of olivine gabbro, norite, anorthositic gabbro, and pyroxenite. A hydrogeologic base map is presented in Figure 3. Above the bedrock is a zone of partially decomposed, weathered iron/manganese stained, and fractured rock. Above the weathered zone is clayey, silty saprolite which is a result of complete weathering of the gabbro at the surface.

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. Most of the ground water available to a well exists in the weathered rock zone and in the overlying saprolite. The amount of fracture openings penetrated by the well also contribute ground water to the well. The Maybelle Manor wells have 80 feet of saprolite and weathered rock above the crystalline rock zone of the gabbro complex.

2.0 SOURCE WATER ASSESSMENT AREA DELINEATION

For ground-water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment and protection area 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, 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 wells.

For Maybelle Manor MHP, the current Water Appropriation Permit issued by the MDE Source Protection and Appropriation Division is for an average of 9,600 gpd for the two wells. To determine the total ground-water contribution area during a drought, the following equation was used:

$$\text{Recharge Area (acre)} = \text{Average Use (gpd)} / \text{Drought Condition Recharge (gpd/acre)}.$$

From the equation above, the required ground-water contributing area during a drought is approximately 24 acres. The delineated WHPA is approximately 29 acres (Figure 1), and is therefore adequate to meet the average daily ground-water usage during a drought.

3.0 INVENTORY OF POTENTIAL CONTAMINANTS WITHIN THE DELINEATED AREA

MDE Water Supply Program staff conducted a field survey on February 9, 2005 to check for potential sources of contamination within and near the area surrounding the park.

Previously, the MDE database was queried for contaminant sources within and near the park. The contaminant 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 Pipeline, and Controlled Hazard Substances (CHS) generator sites. None of these sites were within the delineated wellhead protection area.

3.1 POINT SOURCES

A 300-gal above ground residential heating oil tank (AST) was observed at a house up gradient of the development about a quarter of a mile away from the wells location. Failure of an AST may impact the ground water with petroleum hydrocarbons.

3.2 NON-POINT SOURCES

The Maryland Department of Planning's 2002 Land Use/Land Cover map for Cecil County was used to determine potential non-point sources within the wellhead protection area (WHPA). The evaluation was based on land use designation (Figure 4). A summary of the percent and acreage of each type of land use, using the 2002 map is presented in the table below:

2002 PERCENTAGE OF EACH LAND USE TYPE WITHIN WHPA

MHP Name	Maybelle Manor MHP
Wells	1,2
Low Dens Res (acre)	11.0
Low Dens Res (%)	39.0
Medium Dens Res (acre)	1.0
Medium Dens Res (%)	2.0
Forest (acre)	17.0
Forest (%)	59.0
TOTAL ACRE	29.0
TOTAL %	

It is noted that since 2002, the area within the MHP has developed significantly. The area that was considered forested in 2002 is now categorized as medium density and the updated table is as follows: Figure 5 is an updated map.

2005 PERCENTAGE OF EACH LAND USE TYPE WITHIN WHPA

MHP Name	Maybelle Manor MHP
Wells	1,2
Low Dens Res (acre)	11.1
Low Dens Res (%)	39.0
Medium Dens Res (acre)	12.1
Medium Dens Res (%)	42.0
Forest (acre)	5.8
Forest (%)	19.0
TOTAL ACRE	29.0
TOTAL %	

Residential areas account for a significant portion of the total WHPA area. Septic systems and the use of fertilizers and pesticides are potential sources of pollution generally associated with residential land uses.

The septic system drain fields serving the MHP were observed on-site but they were located down gradient of Maybelle Manor's wells recharge area. Homes located along School House Lane (1/4 mile away) are also served by septic systems. Septic systems discharge contain contaminants of concern such as pathogenic microorganisms and inorganic compounds such as nitrogen. The removal of pathogenic microorganisms is dependent on the filtration capacity of the soil and saprolite matrix around the drainfield. Negative impacts from excessive nitrate-nitrogen is controlled by large lot zoning to ensure adequate dilution. Septic system discharge could also contain contaminants that the systems were not designed to treat, such as solvents and fuels.

4.0 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 otherwise noted). Currently, the raw ground water is treated with sodium hypochlorite (bleach) for disinfection. The finished water is stored in one approximately 20,000-gal hydropneumatic tank prior to distribution.

A review of the water quality data from initial samples collected in 1993 and subsequent samples collected from 2002 through 2004 was performed for Maybelle Manor MHP's water samples. A Certificate of Portability (COP) for the system was issued 10/15/02 making this a fairly new system with limited water quality data. All detected compounds from ground-water samples collected are shown in tables. Ground-water analytical results were evaluated to establish susceptibility to contaminants.

4.1 GENERAL WATER QUALITY PARAMETERS

Results from ground-water samples analyzed from each of the wells in August 2002 for secondary standards are given in Table 2 below. The water from both wells met the secondary standards for all constituents except iron, manganese and turbidity. These were

exceeded in the initial sample from well 2. The repeat sample from well 2 was acceptable. The results indicate a relatively hard water with a near neutral pH.

TABLE 2. RAW WATER QUALITY DATA- SECONDARY STANDARDS

Parameter Measured	Well 1 CE920286	Well 2 CE920287	Remarks
Turbidity (<10 NTU)	0.6	140	High turbidity in well 2 may be related to iron
Temperature	20° C	24° C	
pH (6.5-8.5)	7.3	6.7	
Conductivity	310	210	
Chloride(<250 mg/l)	7.8	5.9	
Alkalinity	170	48	
Hardness	190	180	
Total Dissolved Solids (<500 mg/l)	260	<10	
Sulfide	<0.1	<0.1	
Calcium	39	2.3	
Iron (<0.3 mg/l)	0.01	13	Well 2 retested @ 0.03 on 9/30/02
Manganese (<0.05 mg/l)	0.01	0.1	Well 2 retested @ 0.02 on 9/30/02
Zinc (5 mg/l)	2	2.2	
Color (15 color units)	<5	<5	

4.2 VOLATILE ORGANIC COMPOUNDS (VOCs)

Low levels of Xylene and Toluene were detected in 2004 from well 1. Sampling data for well 1 taken in 2004 are listed in table 3. Four samples were taken in the year but none of the results exceeded or even came close to the MCL for any of the contaminants. No volatile organic compounds (VOCs) were reported in the ground-water samples above 50 percent of the USEPA MCL. The presence of bromoform, chloroform, bromodichloromethane, and dibromochloromethane is due to the reaction of chlorine from the water treatment plant with naturally occurring organic compounds. The concentrations observed are well below the maximum allowable level of 80 parts per billion for the sum of these four compounds. No other VOCs have been detected in the ground-water samples collected.

TABLE 3. VOCs DETECTS DATA

PWSID	Plant ID	Contaminant ID	Contaminant Name	MCL (ppb)	Sample Date	Result (ppb)
070248	1	2955	XYLENES, TOTAL	10000	20-Jan-04	1.6
070248	1	2943	BROMODICHLOROMETHANE	80	20-Jan-04	1.7
070248	1	2941	CHLOROFORM	80	20-Jan-04	1.2
070248	1	2944	DIBROMOCHLOROMETHANE	80	20-Jan-04	2.2
070248	1	2942	BROMOFORM	80	20-Jan-04	0.7

Table 3. VOCs Detects Data continued

070248	1	2962	p-XYLENE		20-Jan-04	1
070248	1	2997	o-XYLENE		20-Jan-04	0.6
070248	1	2991	TOLUENE	1000	8-Jun-04	0.6
070248	1	2942	BROMOFORM	80	8-Jun-04	1.2
070248	1	2943	BROMODICHLOROMETHANE	80	8-Jun-04	4.1
070248	1	2955	XYLENES, TOTAL	10000	8-Jun-04	5.3
070248	1	2941	CHLOROFORM	80	8-Jun-04	4
070248	1	2997	o-XYLENE		8-Jun-04	1.3
070248	1	2962	p-XYLENE		8-Jun-04	4
070248	1	2944	DIBROMOCHLOROMETHANE	80	8-Jun-04	3.6
070248	1	2991	TOLUENE	1000	23-Aug-04	2.4
070248	1	2955	XYLENES, TOTAL	10000	23-Aug-04	3.1
070248	1	2942	BROMOFORM	80	23-Aug-04	1.9
070248	1	2943	BROMODICHLOROMETHANE	80	23-Aug-04	2.7
070248	1	2944	DIBROMOCHLOROMETHANE	80	23-Aug-04	2.8
070248	1	2962	p-XYLENE		23-Aug-04	1.7
070248	1	2997	o-XYLENE		23-Aug-04	1.4
070248	1	2941	CHLOROFORM	80	23-Aug-04	4.6
070248	1	2991	TOLUENE	1000	12-Oct-04	0.6
070248	1	2943	BROMODICHLOROMETHANE	80	12-Oct-04	1.8
070248	1	2944	DIBROMOCHLOROMETHANE	80	12-Oct-04	1.2
070248	1	2997	o-XYLENE		12-Oct-04	0.6
070248	1	2962	p-XYLENE		12-Oct-04	0.8
070248	1	2994	ISOPROPYLBENZENE		12-Oct-04	0.6
070248	1	2941	CHLOROFORM	80	12-Oct-04	2.4
070248	1	2955	XYLENES, TOTAL	10000	12-Oct-04	1.4

4.3 SYNTHETIC ORGANIC COMPOUNDS (SOCs)

Di (2-Ethylhexyl) phthalate was detected in the finished water from a sample collected in January 2004. The results were about 10% of the maximum contaminant level. This contaminant is commonly found in laboratory blank samples accompanying these detections, and therefore should not be presumed to represent the water quality of the system. As part of the COP application in August 2002, raw water sampled for well 2 detected 1.52 ppb for Pentachlorophenol, a contaminant found in wood preservatives. Subsequent sampling of the raw water yielded a result of 0.79 ppb. Water samples taken in the plant and tested in January 2004 did not detect any SOC. Both wells are pumped alternately to a 20,000 gallon storage tank from which the sample is collected. The finished water is likely to be a mixture from both wells.

TABLE 4. SOCS DETECTS DATA

PWSID	Plant ID	Contaminant ID	Contaminant Name	MCL (ppb)	Sample Date	Result (ppb)
070248	2	2326	Pentachlorophenol*	1.0	8/27/2002	1.52
070248	2	2326	Pentachlorophenol	1.0	10/01/02	0.79
070248	1	2039	DI (2-ETHYLHEXYL) PHTHALATE	6	20-Jan-04	0.7

*mcl exceeded, Retested.

4.4 INORGANIC COMPOUNDS (IOCs)

No inorganic compound has been detected above 50% of the MCL for any finished water sample taken since the system began operating in 2003. A summary of all detected IOCs concentrations in the ground-water samples collected is shown in Table 5.

TABLE 5. SUMMARY OF IOC DETECTS

PWSID	Plant ID	CONT	Contaminant Name	MCL (mg/L)	Sample Date	Result (mg/L)
070248	1	1055	SULFATE		28-May-93	15
070248	1	1017	CHLORIDE		28-May-93	5.2
070248	1	1052	SODIUM		28-May-93	8.5
070248	1	1049	SILICA		28-May-93	0.75
070248	1	1031	MAGNESIUM		28-May-93	18
070248	1	1005	ARSENIC*	0.01	28-May-93	0.01
070248	1	1016	CALCIUM		28-May-93	40
070248	1	1040	NITRATE	10	28-May-93	1.2
070248	1	1925	pH		28-May-93	8
070248	1	1005	ARSENIC*	0.01	30-Aug-02	0.011
070248	1	1005	ARSENIC*	0.01	1-Oct-02	0.007
070248	2	1032	MANGANESE*		1-Oct-02	0.02
070248	2	1028	IRON*		1-Oct-02	0.03
070248	1	1032	MANGANESE		28-Oct-02	0.1
070248	1	1028	IRON		28-Oct-02	0.44
070248	1	1005	ARSENIC*	0.01	28-Oct-02	0.008
070248	1	1040	NITRATE	10	11-Aug-03	0.912
070248	1	1052	SODIUM		20-Jan-04	7.72
070248	1	1040	NITRATE	10	20-Jan-04	1.3
070248	1	4000	GROSS ALPHA ☼	15	20-Jan-04	1
070248	1	1041	NITRITE	1	20-Jan-04	0.005
070248	1	1005	ARSENIC	0.01	20-Jan-04	0.002
070248	1	4000	GROSS ALPHA ☼	15	21-Jun-04	1
070248	1	4020	RADIUM-226 ☼	5	23-Aug-04	0.1

Table 5. Summary of IOC Detects continued

070248	1	4010	COMBINED RADIUM (226 & 228) ♣	5	23-Aug-04	0.1
070248	1	4000	GROSS ALPHA ♣	15	23-Aug-04	1
070248	1	1040	NITRATE	10	24-Sep-04	1.04

***WELLS WERE NOT PLACED IN SERVICE UNTIL NOV 2002
♣ REPORTED AS PICO CURIES/LITER**

Initial tests of raw water sample for well 1 indicated elevated levels of arsenic. Subsequent tests were carried out and the results were declared acceptable because they were below the new MCL for arsenic that was adopted by the EPA in 2002. See Table 5 for sample dates. The most recent analysis for Arsenic in January 2004 was well below the MCL for arsenic.

The current MCL is 0.050 mg/L but beginning January 2006 the MCL will be 0.010 mg/L.

4.5 MICROBIOLOGICAL CONTAMINANTS

Coliform samples were required prior to receiving a certificate of portability. The samples were taken on August 20, 2002 and the results indicated no fecal or total coliform.

In addition, to assess the potential of Ground Water Under the Direct Influence (GWUDI) of surface water, ground-water sampling records were reviewed. Ground water supplies are tested for surface water influence to determine their susceptibility to surface water microorganisms such as giardia and cryptosporidium. These microorganisms are resistant to simple disinfections treatment.

If surface water directly recharges an aquifer through major fractures in rock that do not pass through the soil overburden then the aquifer is likely to have elevated levels of coliform bacteria. These values would be particularly high following a significant rainfall event. Sampling carried out following such events is used to determine the potential for a water supply well to be under the direct influence of surface water. Table 6 is a result of GWUDI test carried out on November 29, 2004 by MES following a rainfall of two (2) inches. The results are negative for coliform organisms. We do not have an explanation for the elevated turbidity reported for well 2 and recommend additional sampling to determine the cause.

From an assessment of the ground-water sampling results from Wells 1 and 2 by MES, the ground water at these wells is not under the direct influence of surface water.

TABLE 6. GWUDI TEST RESULTS

Rainfall				Field Test			Lab Results		
	Date	Rain Amount (in)	Location	Sampling tap location	Temp °C	pH	Turbidity	Total Coliform	Fecal Coliform
1	29-Nov 2004	2	Maybelle Manor MHP	Raw Port #2	14.5	7.82	<0.11	<2.0	<2.0
2	29-Nov 2004	2	Maybelle Manor MHP	Raw Port # 1	14.0	8.4	15	<2.0	<2.0

4.6 RADIONUCLIDES

A summary of all radionuclides concentrations in the ground-water samples collected is shown in Table 5.

Radionuclides have primary drinking water standard parameters. Gross alpha particles and Radium 226 & 228 were not detected at levels of concern in any of the samples collected since the system became operational in 2002. See table 5 (IOC table) for details.

5.0 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 WHPA
3. aquifer characteristics
4. well integrity
5. the likelihood of change to the natural conditions

Wells drilled at the Maybelle Manor MHP's withdraw water from an unconfined aquifer. Wells using unconfined aquifers are in general more susceptible to contamination from surface activities. Table 7 summarizes the susceptibility of Maybelle Manor MHP's water supply to the various classes of contaminants.

5.1 VOLATILE ORGANIC COMPOUNDS

One source of VOC was identified within the WHPA. While no point sources of gasoline were identified within the WHPA, there is a heating oil AST within one mile of the supply wells. Unknown or unreported gasoline tanks spills could also be the cause of the low-level concentrations of Toluene and Xylenes reported in water samples taken in 2004.

Based on the water quality data reviewed, the location of the well in the back yard of a home and the potential point source of VOCs in the WHPA, the water supply at Maybelle Manor MHP may be susceptible to VOCs.

5.2 SYNTHETIC ORGANIC COMPOUNDS

There were no identified point sources containing SOC's within the WHPA.

In addition, from the well information, there is approximately 50 to 80 ft of soil overburden above the bedrock aquifer. Most SOC's have a high affinity to sorb to soil particles and with the significant soil overburden thickness reported, application of pesticides or herbicides on residential areas are not likely to infiltrate into the ground-water aquifer.

In August 2002 pentachlorophenol was detected at a level in excess of the MCL in raw water sample taken from well 2. Subsequent sampling done in October 2002 showed detects below the MCL. Repeat sampling by the State laboratory on October 28, 2002 did not detect Pentachlorophenol. Water sampling for pentachlorophenol from well 2 have been conducted since then. The results indicate no pentachlorophenol.

Based on the water quality data reviewed and the non occurrence of pentachlorophenol in raw water sample from well 2, the water supply at Maybelle Manor MHP is not susceptible to SOC's.

5.3 INORGANIC COMPOUNDS

Raw water from the wells and finished water from the treatment plant have been tested on several occasions from 1993 to 2004 for the presence of IOC's. The only contaminant in this category that deserves observation is arsenic.

Arsenic is a naturally occurring element that is present in aquifer material. Prior to the June 2002 water sample result (0.0078 mg/L), arsenic was reported in only one prior water sample (May, 1993). On 22 February 2002, USEPA lowered the MCL for arsenic from 0.050 mg/L to 0.010 mg/L. Existing water systems must meet the new MCL by 23 January 2006. The arsenic results from the June 2002 level are below the future MCL.

Based on the water quality data reviewed and the current nitrate concentrations, the water supply at Maybelle Manor may be susceptible to arsenic but not to other regulated inorganic compounds (IOC's).

5.4 RADIONUCLIDES

Based on the water quality data, the water supply at Maybelle Manor MHP is not susceptible to radon-222 and other radionuclides.

5.5 MICROBIOLOGICAL CONTAMINANTS

From an assessment of GWUDI ground-water results by MDE, Wells 1 and 2 are not under the direct influence of surface water. Based on the water quality review and the condition and construction of the wells, the water supply at Maybelle Manor MHP is not susceptible to bacterial or protozoan contaminants present on the surface including Giardia & cryptosporidium.

TABLE 7: SUSCEPTIBILITY LOGIC CHART – PWSID # 070248

Contaminant Name	Are Contaminant Sources Present in WHPA?	Are Contaminants Detected in WQ Samples at Levels of Concern?	Is Well Integrity a Factor?	Is the Aquifer Vulnerable?	Is the System Susceptible?
VOC	YES	NO	NO	YES	MAYBE*
SOC	NO	NO	NO	YES	NO
IOC	YES	YES (arsenic)	NO	YES	YES(arsenic)
RADIONUCLIDES	NO	NO	NO	NO	NO
MICROBIOLOGICAL PATHOGENS	YES	NO	NO	NO	NO

* more data is needed to determine conclusively

6.0 RECOMMENDATIONS FOR PROTECTING THE WATER SUPPLY

With the information contained in this report, Maybelle Manor MHP has a basis for better understanding of the risks to its drinking water supply. Being aware of the WHPA, 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 WHPA limits 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 WHPA 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 WHPA. 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. As the well is located on lot 39 very close to a residential dwelling, it is recommended that the park management specifically discuss the need to protect the well with the residents of this lot.

Placing signs at the WHPA 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 WHPA.

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.

Due to the high level of turbidity detected in well 1 in November 2004, raw water sampling for each well should be carried out and reported to MDE this year (2005).

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 USE

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 WHPA.

6.7 CONTAMINANT SOURCE INVENTORY UPDATES/INSPECTIONS/ IMPROVEMENTS TO WELLHEAD

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

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

The management of the mobile home park should consider placing a protective barrier around well two (CE920287) to prevent accidental damage to the well.

Depressions around well 2 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.

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. Maryland Department of the Environment, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36. p.
3. Maryland Geologic Survey 1968. *Cecil County Geologic Map adapted from Maryland Geological Survey's Geologic Map of Maryland*.
4. Otton, E. G, Willey, R. E., McGregor, R. A., Achmad, G., Hiortdahl, S. N., Gerhart, J.M. 1988. *Water Resources and Estimated Effects of Ground-Water Development, Cecil County, Maryland*. United States Department of the Interior, Geologic Survey. Bulletin 34.
5. Overbeck, R.M., Slaughter, T.H., and Hulme, A.E., 1958. *Water Resources of Cecil, Kent, and Queen Anne's Counties*: Maryland Department of Geology, Mines and Water Resources Bulletin No. 21.
6. United States Environmental Protection Agency (USEPA). 1999. *Proposed Radon in Drinking Water Rule*. Office of Water. EPA 815-F-99-006. October.
7. 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.

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 2002 Cecil County Land Use Map
USGS Topographic 7.5 minute Quadrangle Map – 1953 (1985) Maybelle Manor Dam,
Maryland Quad

FIGURES

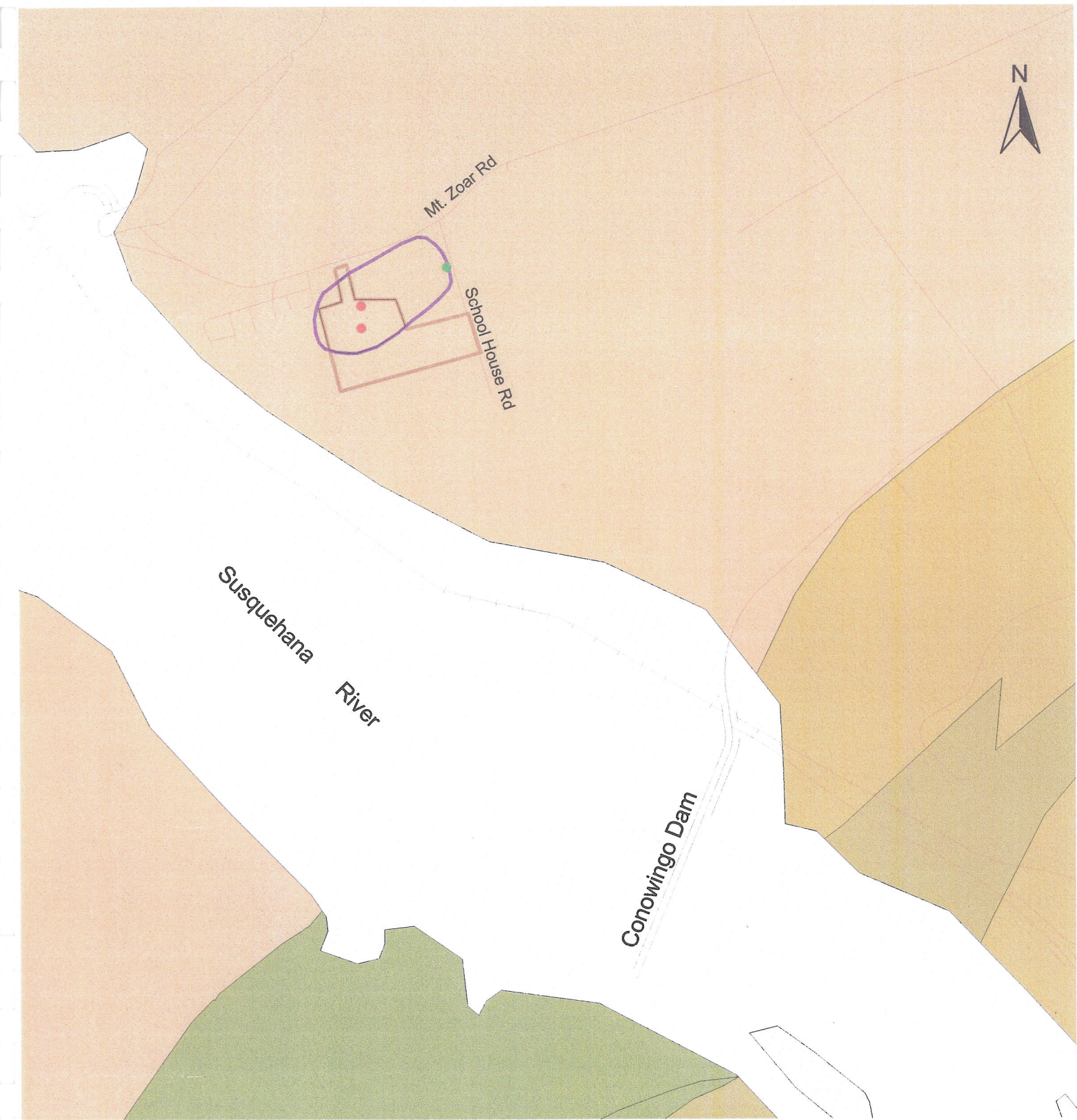
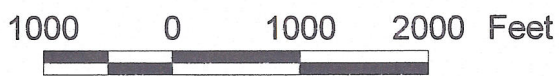








Figure 3: Geology Map of Cecil County with Maybelle Manor MHP Wells Identified

Legend



-  Baltimore Gabbro Complex
-  Boulder Gneiss
-  Lowland Deposits
-  Metagabbro and Amphibolite
-  Quartz Gabbro and Diorite Gneiss
-  Port Deposit Gneiss

Legend

-  Wells
-  WHPA
-  AST
-  M H Park Boundary

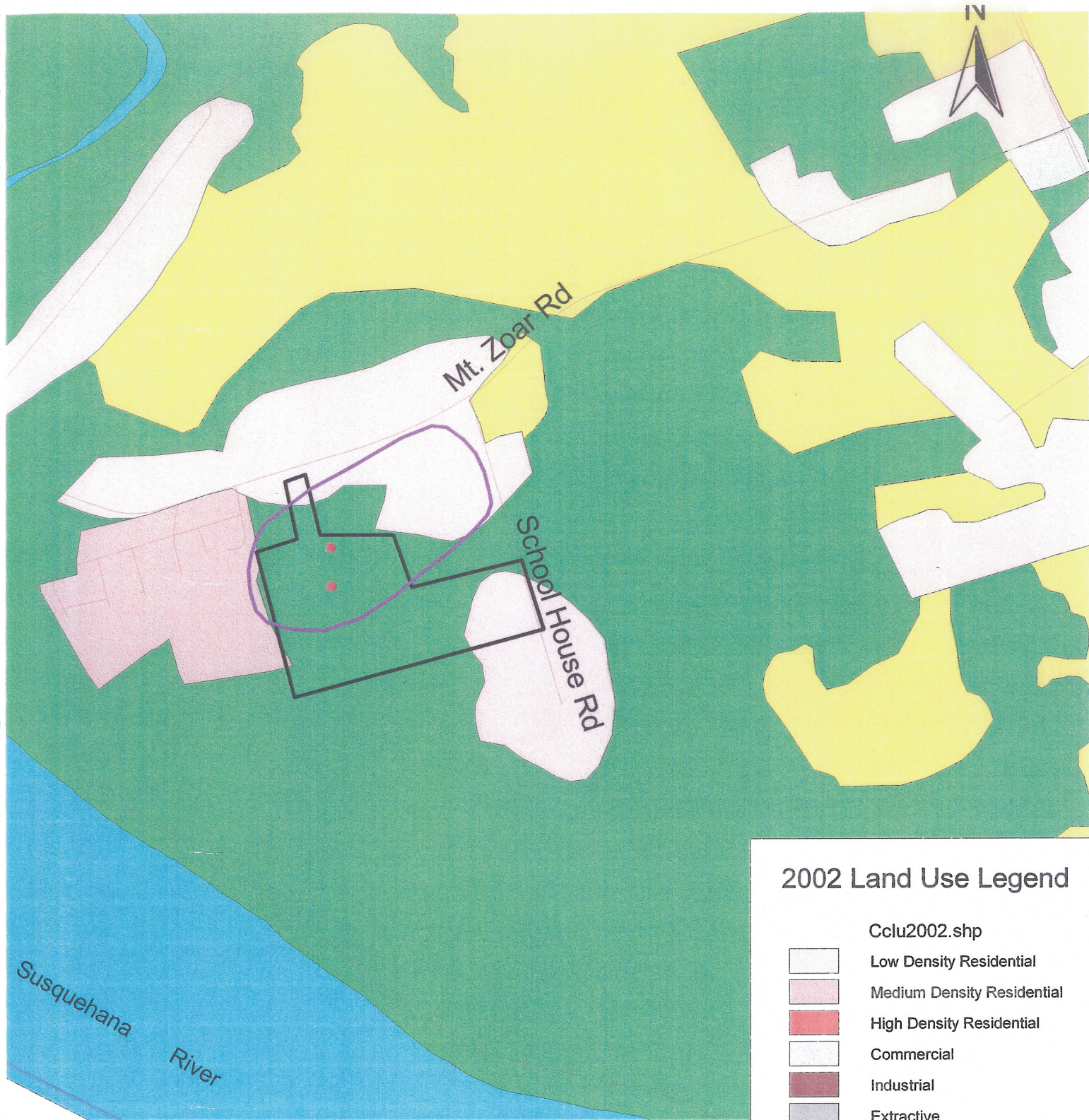
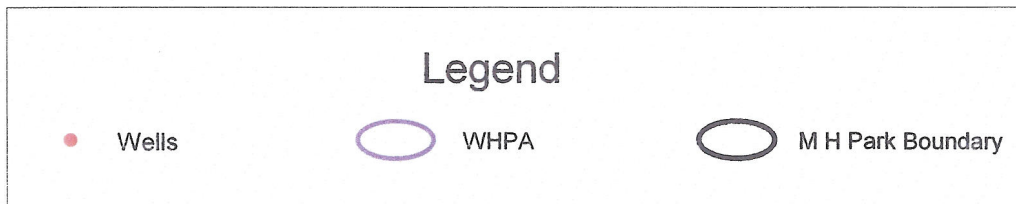
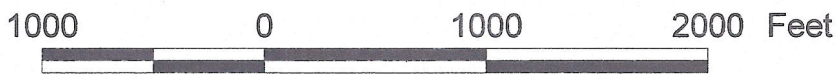


Figure 4. Land Use map of Maybelle Manor MHP



2002 Land Use Legend



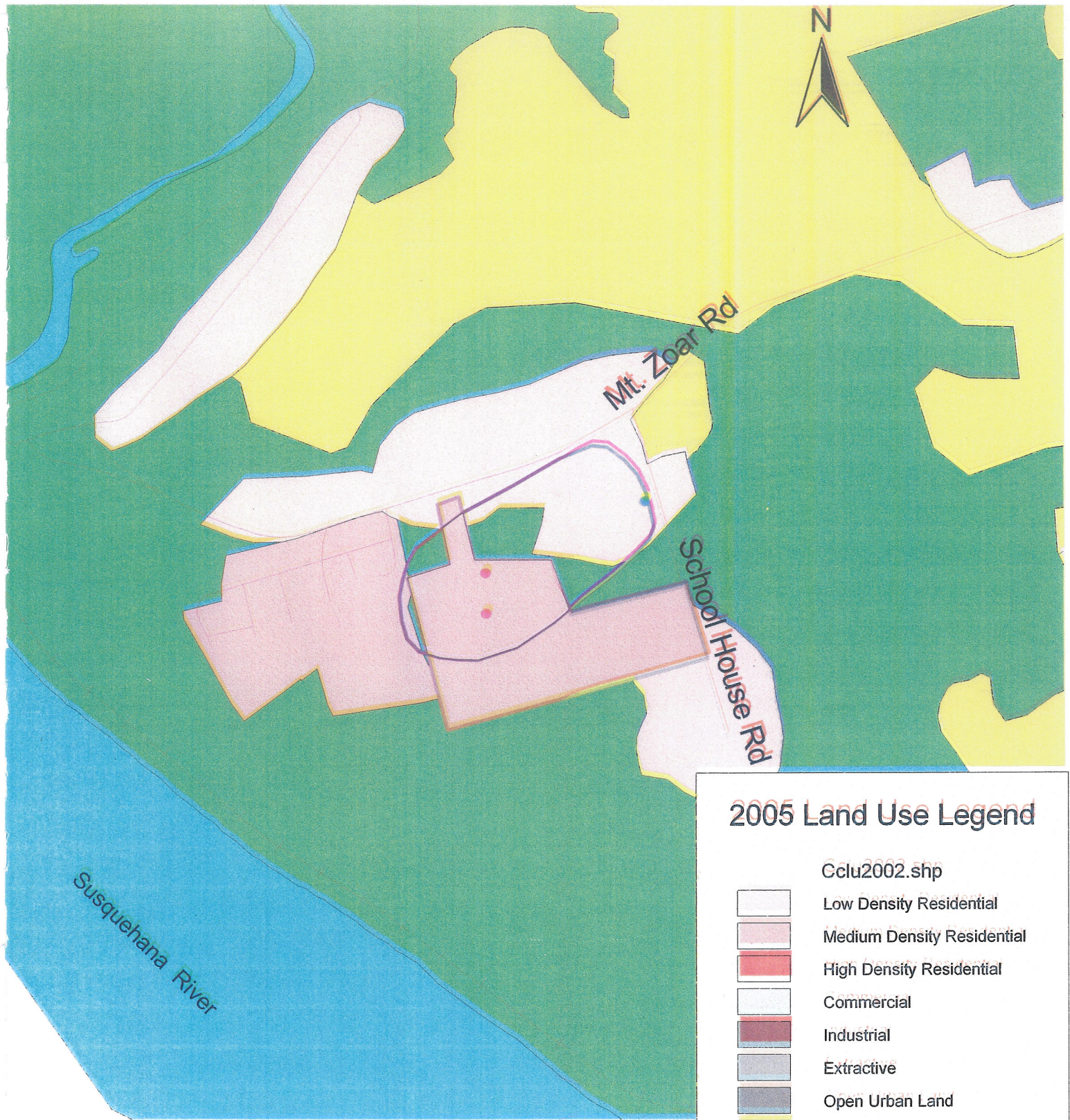
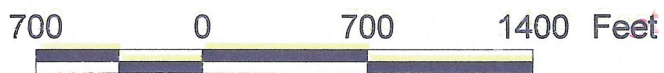


Figure 5: Updated (2005) Land Use map of Maybelle Manor MHP



2005 Land Use Legend

Cclu2002.shp

-  Low Density Residential
-  Medium Density Residential
-  High Density Residential
-  Commercial
-  Industrial
-  Extractive
-  Open Urban Land
-  Cropland
-  Pasture
-  Orchards
-  Forest
-  Water
-  Wetlands
-  Feeding Operations
-  Barren Land

Legend

-  Wells
-  WHPA
-  AST