**WELLHEAD AREA SURVEY**
**ALPINE PANTRY**
**ACHD SITE NO. 86**
**Flintstone, Allegany County, Maryland**

**ALWI Project No. AL7N001**

# 1.0 INTRODUCTION

Advanced Land and Water, Inc. (ALWI) was retained by the Allegany County Health Department (ACHD) to prepare a Wellhead Area Survey for Alpine Pantry (The Pantry), located on Flintstone Drive, 0.1 mile north of the National Freeway (I-68), in northern Allegany County, Maryland. This site, designated No. 86 by ACHD, is served by one 6-inch diameter, PVC-cased production well completed in the local bedrock aquifer.

The draft Maryland Department of the Environment (MDE) "Transient Water Systems Operations Guidance" manual (herein termed the "Guidance Manual") defines a Non-Transient Non-Community (NTNC) Water System as one that "...serves at least 25 regular consumers over 6 months per year." An informal interview with an employee suggested that the transient clientele and the highway interchange location combine to suggest that this water system is a transient non-community system (TNC).

## 1.1 PURPOSE

The Safe Drinking Water Act (SDWA) of 1974 required the U.S. Environmental Protection Agency (EPA) to develop enforceable drinking water quality standards to protect the public health. In 1986, amendments made to the SDWA strengthened provisions for the protection of underground sources of drinking water. These amendments included provisions for establishing Wellhead Protection Programs by individual states under "umbrella" EPA oversight. The EPA approved a statewide Wellhead Protection Program developed by MDE in June 1991.

The MDE program originally applied to community water supplies, only. A newly proposed broadening of the federal Clean Water Act will have the result of expanding the MDE Wellhead Protection Program to encompass non-community supplies both transient and non-transient in nature. ACHD, in cooperation with MDE, established this program to bring existing non-community supplies into compliance with the coming regulations.

## 1.2 SCOPE

ALWI prepared this Wellhead Area Survey following ACHD requirements, which followed MDE guidelines for transient system operation and wellhead protection.

1. **Site Reconnaissance, Photographic Documentation and Interviews –** ALWI observed the on-site wellhead, storage, treatment, and distribution infrastructure to the degree exposed without excavation or exposure to personal hazards. ALWI used an ACHD-owned digital camera to photograph conditions surrounding the wellhead at the time of the field reconnaissance. Said photographs are stored on ACHD's computer system. ALWI interviewed the owner/operator and/or employee(s) to document information on the use patterns, history, and problems associated with the supply.

2. **Baseline Water Quality Assessment** - ALWI purged the water system and collected samples for analysis in the ACHD laboratory that is affiliated with the Maryland Department of Health and Mental Hygiene (DHMH). ALWI performed this fieldwork in accordance with MDE potable water sampling criteria including in-field measurements of turbidity, chlorine, and pH. ACHD selected the analyte list based on countywide experience with potability concerns and the capabilities of the aforementioned laboratory. The analytes included total and fecal coliform bacteria, nitrates, nitrites, iron, sulfur and manganese (Appendix A).

3. **Contamination Hazard Assessment** – ALWI identified existing and potential contaminant hazards within the delineated area based on visual observations and the techniques enumerated above. ALWI ranked these hazards in term of relative risk and provided concrete suggestions for their appropriate address. More generally, herein ALWI provides specific recommendations for source reduction measures, contingency plans, and other methods that may help better protect against occurrences of groundwater contamination.

## 2.0 HYDROGEOLOGIC FRAMEWORK

ALWI used published information from the United States Geological Survey and the Maryland Geological Survey to identify and describe the characteristics of the local hydrogeologic setting.

### 2.1 BEDROCK GEOLOGY

The Pantry is situated within the Valley and Ridge physiographic province and is underlain by limestone of Silurian age. The McKenzie Formation underlies the site and mainly consist of limestone (Glaser, 1994). These rocks have been folded and faulted, resulting in synclines (concave-upward folds) and anticlines (convex-upward folds). The Keyser and Helderberg formations consist mainly of limestone. Such carbonate aquifers can be subject to dissolution in the presence of groundwater. Limestones can dissolve in the presence of groundwater resulting in the formation of sinkholes, caves and other topographic features. These features termed karst topography store and transmit unusual large quantities of groundwater that is often non-potable due to microbial contamination or high concentrations of particulates. The absence of karst features despite the favorable lithology may be explained by the intense structural deformation of the rocks.

In three dimensions, the local rock formations dip at right angles to the direction of plunge of the fold system. In general, dip directions may help govern groundwater (and contaminant) movement directions in the bedrock but plunge directions have less relation. At this location, the bedding planes dip to the east, which suggests that the gentle southwesterly plunge may exert greater-than-usual control on deep groundwater flow directions. Reported local well yields are sparse but average around 5 gpm (Slaughter and Darling, 1962).

### 2.2 Saprolite and Soil Mantle

Natural chemical weathering of the shallow portion of the bedrock, due to percolating water, has chemically altered many of the original rock-forming minerals to clays and other secondary minerals. This has resulted in the development of shallow saprolite (weathered bedrock) and the overlying soil mantle. The thickness of the soil and saprolite varies considerably over short distances depending on the thickness of Quaternary alluvial deposits and other factors. In highly fractured zones, enhanced groundwater storage and movement has accelerated the breakdown of the rock-forming minerals and has caused formation of a thicker saprolitic deposit.

### 2.3 Aquifer Recharge

Precipitation infiltrating through the soil and Quaternary alluvium on site and/or in up-gradient areas is the primary source of aquifer recharge to the on-site supply well. Generally, overlying soil horizons act to absorb and then slowly release infiltrating precipitation. However, in areas where fracture zones have formed, percolating groundwater can reach the water table quickly. A portion of the precipitation percolates downward through the soil mantle and then migrates through narrow, interconnected joints, fractures, faults, and cleavage planes in the bedrock. Such downward percolation could occur rapidly through dissolution zones (if present).

### 2.4 Geology-Controlled Groundwater Flow

Generally, bedding plane partings and cross-bedding fracture and dissolution zones (where present) function as both downward and lateral water conduits. Consequently, such zones receive and transmit water at a rate higher than would otherwise be achievable and, accordingly, are preferential conduits for groundwater flow and contaminant transport.

## 3.0 WATER QUALITY ASSESSMENT

Slaughter and Darling (1962) reported the groundwater quality from the Wills Creek Formation as locally variable (hardness averages 46 mg/l; and pH ranges from 7.5 to 8.3). ALWI interpreted that the slight reddish colors of the local rock exposures as likely attributable to a trace presence of iron.

At this location, ALWI collected baseline groundwater samples on December 15, 1998, in accordance with the MDE sampling procedures specified in COMAR 26.08.05. ACHD's laboratory analyzed the samples for those constituents of countywide concern. These included total coliform bacteria as specified in COMAR 26.04.01.11A-C, alkalinity, color, conductance, hardness, iron, manganese, nitrate-nitrite nitrogen (COMAR 26.04.01.14(4)(a)), nitrite nitrogen (COMAR 26.04.01.14(4)(b)), pH, and total dissolved solids.

The results are included as Appendix A, and suggest potability relative to the samples collected. However, the proximity of the well to the nearby stream and it's location in a carbonate aquifer places it at "high risk" for surface water influence as defined in the MDE guidance document. This risk would be better quantified with better information on subsurface borehole conditions (e.g., depth of casing) and the potential for variance in surface water indicator parameters (raw water bacteria; temperature and turbidity) with differing precipitation regimes. Ultimate decisions regarding possible filtration retrofits or bottled water conversion are appropriately driven by economic considerations (the capital and operational costs of domestic-scale filtration vs. the daily consumption of water).

## 4.0 DELINEATION

ALWI delineated an area of potential concern surrounding this site's well using generalized criteria developed by MDE for non-community supplies, as modified by ALWI (with ACHD consent) based on the specific topographic setting of the site. The resultant delineation is shown on the "Water Plant Information" survey form (Appendix B). ALWI used a fixed radius of 1,000 feet around the well, which creates an area of approximately 72 acres. Within an assumed 600 gallons per day per acre (gpd/ac) of annualized groundwater recharge (Slaughter and Darling, 1962, Table 37), slightly more than 43,000 gallons per day exists within the aquifer beneath this surveyed area. In actuality, the modest demand of this well (doubtlessly less than 1000 gpd) is much smaller than the total available in the surveyed area, lending a high degree of conservatism to this analysis.

Negligible nitrate-nitrogen concentrations were detected in the sample ALWI collected. This obviated the need for a nitrate balance assessment.

## 5.0 CONTAMINANT THREATS ASSESSMENT

ALWI performed a site reconnaissance on December 15, 1998. During the reconnaissance, local land use conditions were observed with emphasis on the potential use, storage and disposal practices of hazardous materials and petroleum products. Such conditions may have included visual evidence for present or former spills, stained or discolored ground surfaces, stressed vegetation, unusual odors, or visible underground storage tank (UST) facilities. Adjacent and nearby properties were also visually scanned for such evidence from the property and nearby public right-of-ways. Off-site properties were not entered. ALWI relied on the accuracy of interviews for this information.

### 5.1 Potential Hazards At the Wellhead

Design, construction and present condition are important factors in determining a well's susceptibility to contamination. A well tag was found, but no completion report was visible. Accordingly, ALWI could not assess the initial design nor present condition of the casing or grout seal. ALWI observed that the portion of the casing exposed at ground surface appeared intact and was equipped with a conventional pitless-style cap of the type that can sometimes allow insects to enter the well. An upgrade to a more modern cap would provide greater protection against microbial contamination.

The casing was constructed out of PVC pipe. Due to the nature of this material, it may not penetrate two feet into bedrock as required under commission. This potentially creates the possibility of surface water infiltration along the well casing.

### 5.2 Other Local Contamination Risks

ALWI observed several potential contamination sources in the delineated area. No discharge to groundwater has been confirmed by any of the facilities or practices ALWI observed. ALWI identified the following potential sources of contamination within the surveyed area: a stormwater discharge and an adjacent contractor's yard. ALWI performed a site reconnaissance and conducted limited personal interviews to identify and describe these potential contaminant hazards.

## 6.0 CONCLUSION AND RECOMMENDATIONS

ALWI found that the supply is potable relative to the analyses performed. No discharge to groundwater has been confirmed by any of the facilities or practices ALWI observed. ALWI has ranked its observation in decreasing order of overall relative risk. ALWI provides specific recommendations at the conclusion of each respective observation or interpretation.

1. **Surface Water Influence** – The possibility of surface water infiltrating along the well casing is heightened by the proximity of a stormwater management area to the well. Property ownership interests should collect and analyze groundwater samples for indicators of groundwater under the direct influence of surface water (e.g., turbidity, temperature, and bacteria analyses performed daily for four consecutive days immediately after a 0.5-inch rainfall event).

2. **Adjacent Contractor's Yard** – ALWI observed a contractor's yard directly adjacent to the well. The yard reportedly traces its origins to the initial construction of the National Freeway (I-68) in the 1980s. During highway construction, various materials and large equipment were doubtlessly stored here. Hazardous wastes and petroleum products are intrinsic to highway construction work and may have been stored as well. ALWI recommends a single

round of analytical testing to confirm the absence of petroleum and halogenated hydrocarbon constituents. An analysis by EPA Method 502 is likely the most expedient considering the spectrum of compounds possibly present. Periodic monitoring and other corrective actions as necessary should then continue based on the findings.

3. **Subsurface Disposal Facilities** – Though the low nitrate concentrations detected in the groundwater sample collected indicate no present release, property ownership interests should embark on a regularly scheduled program of pump-outs. When the septic system needs replacement, the tank should be replaced with a seamless model and no facilities should be relocated uphill or within 100 feet of the well.

4. **Parking Area Deicing** –Parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. Consideration should be given to using non-chemical abrasives on the parking lot for deicing to the degree possible both on-site and at the adjacent contractor's yard. Baseline and bi-annual sampling for sodium and chlorides should be considered.

## 7.0 SELECTED REFERENCES

Glaser, John D., 1994, Geologic Map of the Flintstone Quadrangle, Allegany County, Maryland: Maryland Geological Survey, 1:24,000.

MDE Public Drinking Water Program, 1998, Transient Water System Operations Guidance; Guidance For Counties With Delegated Responsibilities (Draft), 45p.

Slaughter, Turbit H. and John M. Darling, 1963, The Water Resources of Allegany and Washington Counties: Maryland Department of Geology, Mines, and Water Resources, Bulletin 24, p. 408.

# NONCOMMUNITY WATER SUPPLY SANITARY SURVEY

1. System Name: Alpine Pantry

2. WAS: 86

. System Information:

Address: 21505 Flintstone Dr. NE

Flintstone, Maryland

Phone No.: (301) 478-3696

4. ADC Map/Grid: N/A

5. Tax Map/Plat: N/A

6. Population:

| | |
|---|---|
| Transient | <25 |
| Regular | |
| Total | <25 |

7. Property Information:

Owner's Name Ray Eby

Address: 21505 Flintstone Dr. NE

Flintstone, Maryland

Phone No. (301) 478-3696

8. No. Service Connections:

9. Type of Facility:

| | |
|---|---|
| Food Service | x |
| Church | |
| Campground | |
| Daycare | |
| Other (specify) | |

10. Contact Person:

Name: Ray Eby

Phone No. (301) 478-3696

11. Operator:

Name:

Cert. No.

12. Sample History (Has the system had any violations?):

Bacteria: None apparent or reported

Nitrate: None apparent or reported

## SURVEY RESULTS

13. Comments on System, Recommendations:

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14. Inspected by:
Mark W. Eisner

15. Date inspected:
12/14/98

16. System Vulnerability
Protected ______ Vulnerable yes (see report)

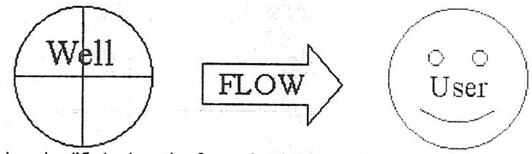
## WATER PLANT INFORMATION

**17. Type of Treatment:**
(Check all that apply)

Disinfection
- Gas Chlorine: ______
- Sodium Hypochlorite ______
- Ultraviolet Radiation ______

Iron Removal ______
Nitrate Removal ______
PH Neutralizer ______
Other ______
Unknown ______

**18. System Schematic (Process Flow):**




NOTE: This diagram is a simplified schematic of operational process flow observed or described on the date of the reconnaissance. Many water systems possess malfunctioning, disconnected and/or occasionally/regularly-bypassed equipment. Actual treatment processes may differ, therefore, from those shown herein.

**19. System Storage:**

Ground Storage ______
Elevated Storage ______
Hydropneumatic Tank __x__
Other ______

**20. Storage Capacity:**

Typical Domestic

**21. Untreated water sampling tap?**

Yes _x_ No _____

## WELL INFORMATION

**22. Well Information:**

Tag Number: AL-81-0770
(report unavailable)

Year Drilled: ______

Casing Depth: ______

Well Depth: ______

Well Yield: ______

Casing Height: ______

Grout Depth: ______

Pitless Adapter? ______

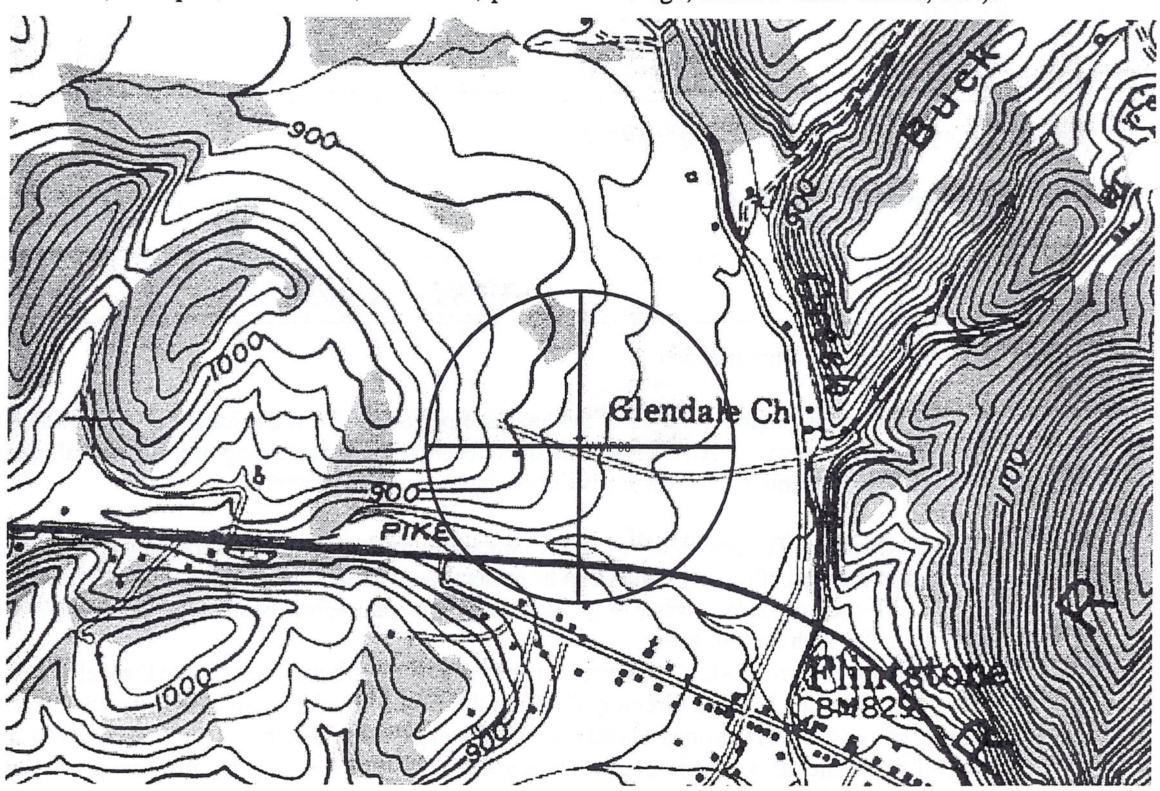
Wiring OK? unknown

Pump OK? unknown

**23. Well Type:**

Drilled __x__
Driven ______
Dug ______

**24. Well Location Diagram (1 in. = 1250 ft.) with Approximate Distances from Potential Contaminant Sources (i.e. septic, sewer lines, structures, petroleum storage, surface water bodies, etc.):**




**25. Aquifer:**
Name: McKenzie
GAP #: ________
Confined ______
Unconfined _x_
Semi-confined ______

**26. Quantity Used:**

Daily Avg (gpd) <3,000
Pumping Rate (gpm) unknown
Hours run per day unknown

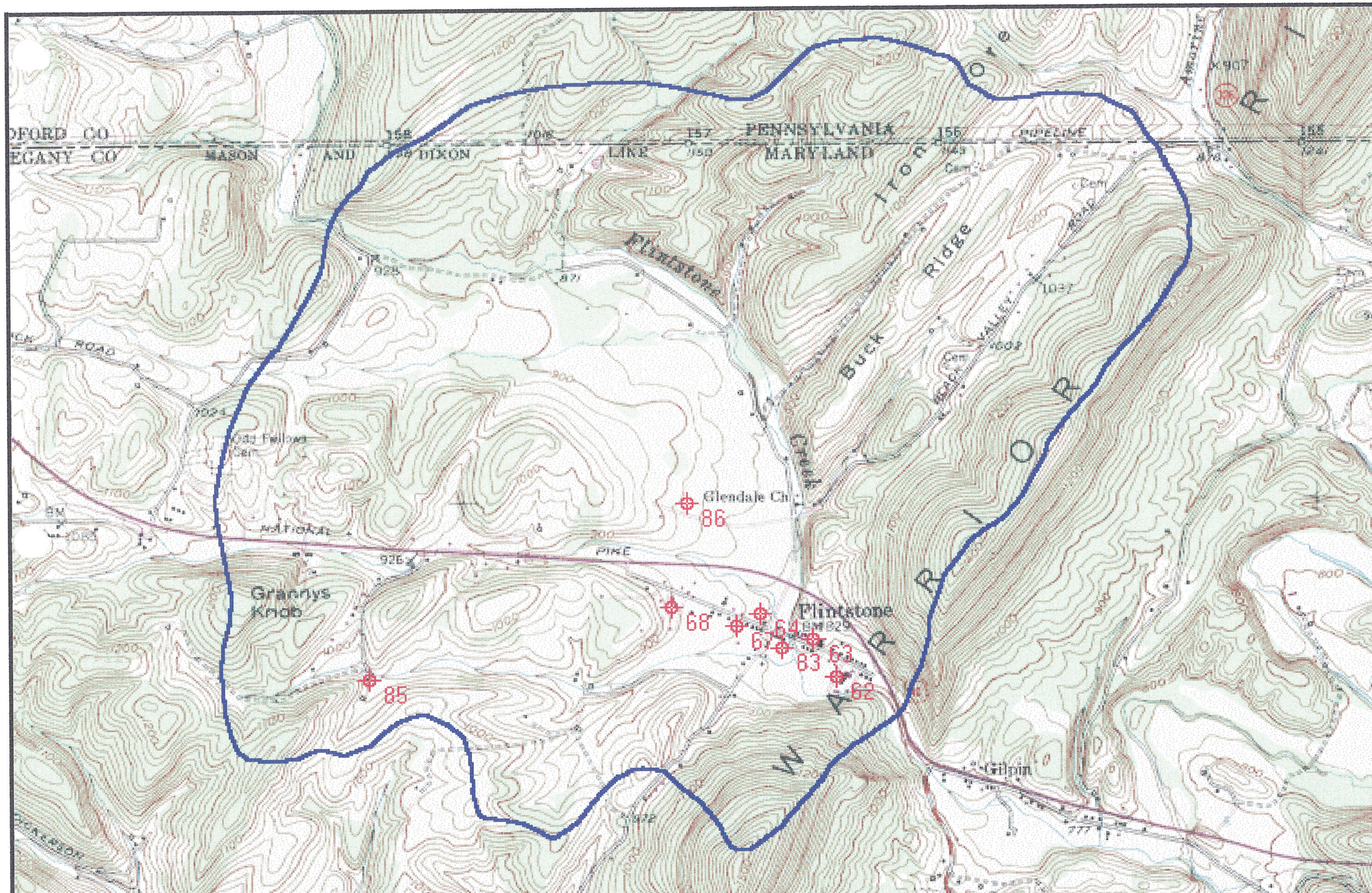
**27. Well Cap:**
Type? Pitless
Seal Tight? O.K.
Vented? O.K.
Screened? No
Conduit OK? O.K.

**28. Casing Diameter:**

2" ______
4" ______
6" _x_
Other ______

**29. Casing Type:**

PVC ______
Metal _x_
Concrete ______




*Preliminary Draft*

*Subject to Revision*

N

**EXPLANATION:**

⊕ TNC or NTNC well

- 62 → Flintstone High School
- 63 Flintstone VFD
- 64 Dawn's
- 67 Helmick's Grocery
- 68 National Pike Sunoco
- 83 Vanmeter's Gas & Grocery
- 85 Mt. Valley Farm Bed & Breakfast
- 86 Alpine Pantry

topographically-constrained sourced water protection area [includes areas within 1,000 feet of each surveyed well unless clear hydrogoelogic evidence suggested a need for a site-specific modificaiton of this MDE criterion.

*APPROXIMATE SCALE 1"=3000'*

0 3000 6000

Notes:

1 Base map imported from digital USGS topographic quadrangle maps for Flintstone, MD (1974 revision), provided to ALWI under liscence by Maptech, Inc.

2 This figure is integral to a written report and should only be used in that context.

3 This figure is solely intended to facilitate regulatory review and is not intended to be used for boundary verification, well location or survey control purposes.

Client:

ALLEGANY COUNTY HEALTH DEPARTMENT

ADVANCED Land and Water, Inc.

Global Environmental Solutions

Project:

NON-COMMUNITY GROUNDWATER SOURCE ASSESSMENT PROGRAM

Prepared Pursuant to the Requirements of:

MD DEPT. OF THE ENVIRONMENT

PUBLIC DRINKING WATER PROGRAM

**Figure 3. Composite Source Water Protection Area for Flintstone**

October, 1999