WELLHEAD SURVEY AREA
INDIAN CHEERS RESTAURANT AND BAR
ACHD SITE NO. 30
Mount Savage, 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 the Indian Cheers Restaurant and Bar, located on the south side of Mount Savage Road, immediately north of Jennings Run in Mount Savage, in northwestern Allegany County, Maryland. Indian Cheers has restaurant and bar facilities on two levels, including restrooms for employees and patrons. This site, designated No. 30 by ACHD, is served by one 6-inch diameter, steel-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 the bartender suggested that the regular clientele (30 to 50 most nights of the week), the year-round operations, and the lack of nearby tourist attractions drawing transient customers all combine to suggest that this water system is indeed a non-transient non-community system (NTNC).

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 B).

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

Indian Cheers is situated within the Appalachian Plateau physiographic province and is underlain by consolidated sedimentary rocks of Pennsylvanian age. The Casselman Formation underlies the site and consists of fine-grained sedimentary rock (Cleaves and others, 1968). These rocks have been gently folded, resulting in broad synclines (concave-upward folds) and anticlines (convex-upward folds).

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. However, at this location, the bedding planes are nearly horizontal, which suggests that the gentle southwesterly structural plunge may exert greater-than-usual control on deep groundwater flow directions.

Reported well yields within the Casselman Formation are sparse but range from 1 to 170 gpm (Slaughter and Darling, 1962). Casselman Formation wells completed within sandstone beds generally have a higher yield because the greater competence of the rock allows the development of longer and wider fractures both along and across bedding planes.

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 is generally 2 to 10 feet, but it varies considerably over short distances. 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 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.

2.4 Geology-Controlled Groundwater Flow

Generally, bedding plane partings and cross-bedding fracture 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.

Despite the bedrock's overall hardness and resistance to erosion, hydraulic permeabilities in bedding planes and fracture zones within the Casselman Formation may be several times greater than in surrounding less-fractured rock. This intrinsic characteristic portends the possibility for the existence of specific zones with higher-than-normal well yields, higher-than-normal groundwater flow velocities and higher-than-normal susceptibility to groundwater contamination.

3.0 WATER QUALITY ASSESSMENT

Slaughter and Darling (1962) reported the groundwater quality from the Casselman Formation as locally variable (iron concentrations range from 0.02 to as much as 6.0 micrograms per liter (mg/l); hardness ranges from 17 to 303 mg/l; and pH ranges from 6.5 to 8.3). ALWI interpreted that the slight reddish colors of the local rock exposures as likely attributable to the trace presence of iron.

At this location, ALWI collected baseline groundwater samples on December 16, 1998, in accordance with the MDE sampling procedures specified in COMAR 26.08.05. ALWI collected raw water samples as specified in COMAR 26.04.01.14. 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 close proximity of the well to Jennings Run places it at moderate to 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 nightly consumption of approximately 1.5 to 2 5-gallon jugs 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. ALWI began by using a fixed radius of 1,000 feet around the well. From this radial area, ALWI then excluded downgradient areas more than 100 feet from the wellhead as well as areas unlikely to contribute recharge to the well based on intervening streams and/or drainage divides. ALWI also excluded steeply-sloping cross-gradient areas.

The resultant delineation is shown on the "Water Plant Information" survey form (Appendix B) and encompasses approximately 90% of the circle (originally 72 acres in size) or 65 acres. Within an assumed 600 gallons per day per acre (gpd/ac) of annualized groundwater recharge (Slaughter and Darling, 1962, Table 37), slightly less than 40,000 gallons per day exists within the aquifer beneath this surveyed area. In actuality, the modest demand of this well (doubtlessly less than 1,000 gpd) is more than one full order of magnitude smaller than the total available in the surveyed area, lending a high degree of conservatism to this analysis.

An interview with the owner suggested little if any seasonal peaking in demand, and ALWI used this to interpret little, if any, seasonal fluctuation of the surveyed area boundary. 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 16, 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 upon the accuracy of historical interview information provided by the owner and his employees to provide context for some of its observations.

5.1 POTENTIAL HAZARDS AT THE WELLHEAD

Design, construction and present condition are important factors in determining a well's susceptibility to contamination. However, no well tag 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. A watertight cap would also provide greater protection from occasional flooding of Jennings Run.

5.2 OTHER LOCAL CONTAMINATION RISKS

On December 16, 1998, ALWI observed several potential contamination sources in the delineated area. ALWI identified the following potential sources of contamination within the surveyed area: USTs located down the street, an upgradient cemetery, and the location of the well in town and in a floodway. ALWI performed a site reconnaissance and conducted limited personal interviews to identify and describe these potential contaminant hazards.

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

6.0 CONCLUSION AND RECOMMENDATIONS

ALWI did not find acute conditions suggesting non-potability of a type warranting immediate reporting, resampling, or other emergency corrective action. ALWI developed the recommendations within this section following MDE guidelines but also in light of site-specific practicalities. For example, ALWI acknowledges that the on-site well cannot be relocated so far from Jennings Run so as to eliminate all risk of contamination of the groundwater supply from surface water. ALWI also acknowledges that Indian Cheers' topographic setting (at the bottom of a hill and in the middle of Town) places it potentially down-gradient from various possible contaminant sources. ALWI also acknowledges that use of water is intrinsic to restaurant and bar functions.

6.1 SUPPLEMENTAL INVESTIGATIVE MEASURES

ALWI developed the following recommendations to better assess the vulnerability of this water supply.

1. **Surface Water Influence** - 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. **Underground Storage Tanks** - ALWI observed a gasoline station approximately ¼ mile west of and cross-gradient to the site. USTs are located there, but of unknown number, age and integrity. Given the proximity of these USTs to the well and its understood long history of use, ACHD should consider contacting the station owner and/or reviewing appropriate enforcement and compliance records at MDE. An on-time check for volatile organic hydrocarbon compounds should also be considered. Periodic monitoring and other corrective actions as necessary should then be considered based on the findings.

3. **Cemetery** - ALWI observed a cemetery upgradient of the property. Grave sites may be sources of microbial and/or hydrocarbon contamination of groundwater (e.g., aldehydes and ketones sometimes used in embalming practices). Embalming constituent sampling should be repeated during both seasonal high and low water table conditions, then repeated bi-annually or more frequently if warranted by the findings

4. **Highway and Parking Area Deicing** – Highway and parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. The State Highway Administration (SHA) is unlikely to curtail or otherwise change deicing practices on Mount Savage Road. However, consideration should be given to using non-chemical abrasives on the parking lot for deicing to the degree possible. Baseline and bi-annual sampling for sodium and chlorides should be considered.

6.2 Source Reduction Measures

Depending on the results of the analyses indicated above, business ownership interests should evaluate the comparative cost and feasibility of converting to bottled sources of potable water vs. retrofitting the existing groundwater supply system with appropriate filtration measures to better protect from human health pathogens typically found in surface water (e.g., *Giardia* and *Cryptosporidium*). Connection to the existing Mount Savage community system likely is the best option. If bottled water is the preferred option or if no action is taken to investigate and mitigate this risk, appropriate placarding should be provided so as to warn against use of an untested source for potable purposes.

7.0 SELECTED REFERENCES

Brezinski, David K., 1988, Geologic Map of the Avilton and Frostburg Quadrangles, 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: Indian Cheers

2. WAS: 30

3. System Information:

Address: Main Street, Route 36

Mt. Savage

Phone No.: (301) 264-3402

4. ADC Map/Grid: N/A

5. Tax Map/Plat: N/A

6. Population:

Transient	unknown
Regular	30 - 50
Total	unknown

7. Property Information:

Owner's Name Mary Louise Burkett

Address: Main Street, Route 36

Mt. Savage

Phone No. (301) 264-3402 (301) 722-7886

8. No. Service Connections:

9. Type of Facility:

Food Service	x
Church	
Campground	
Daycare	
Other (specify)	

10. Contact Person:
Name: Mary Louise Burkett

Phone No. (301) 722-7886

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:

ALWI developed the following recommendations to better assess the vulnerability of this water supply.

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14. Inspected by:
Mark W. Eisner

15. Date inspected:
12/16/98

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 __x__

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 _____ No _x___

WELL INFORMATION

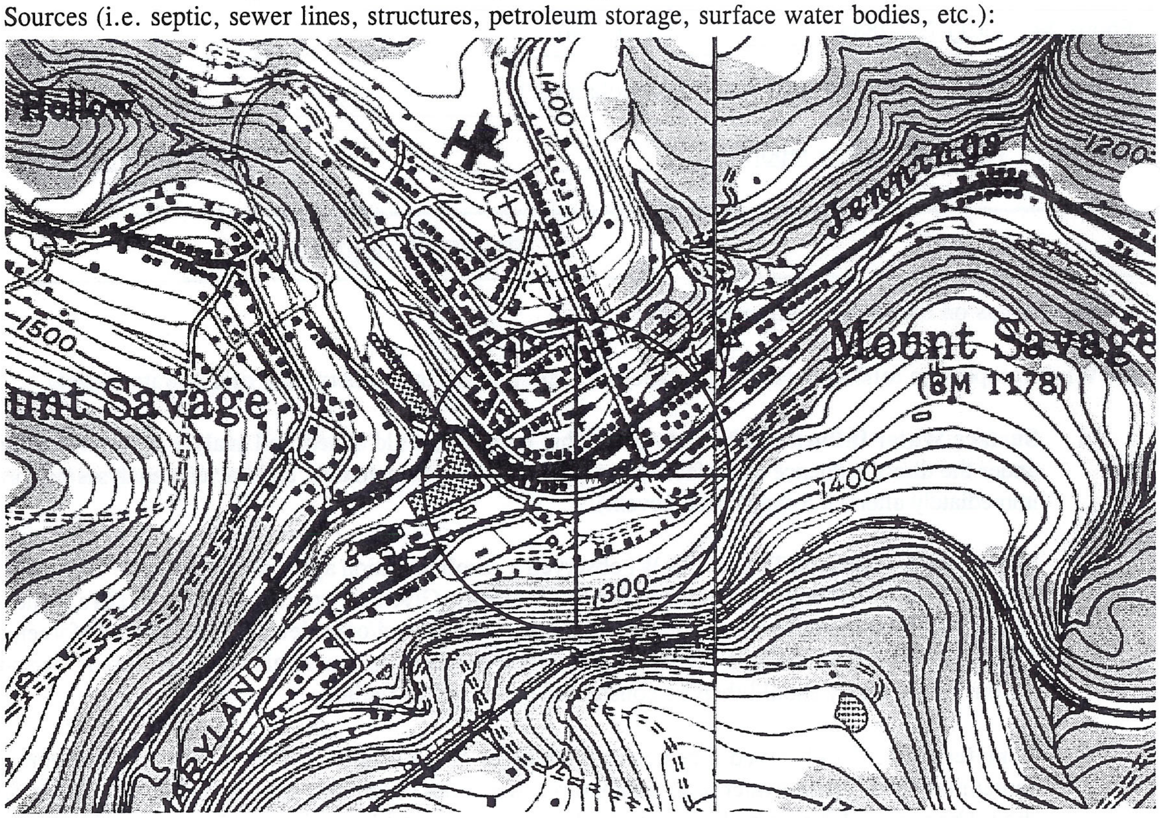
22. Well Information:

Tag Number: not visible
Year Drilled: ______
Casing Depth: ______
Well Depth: ______
Well Yield: ______
Casing Height: ______
Grout Depth: ______
Pitless Adapter? ______
Wiring OK? ______
Pump OK? ______

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: Casselman______
GAP #: ______________
Confined ______
Unconfined __x__
Semi-confined ______

26. Quantity Used:

Daily Avg (gpd) < 1000
Pumping Rate (gpm) unknown
Hours run per day unknown

27. Well Cap:

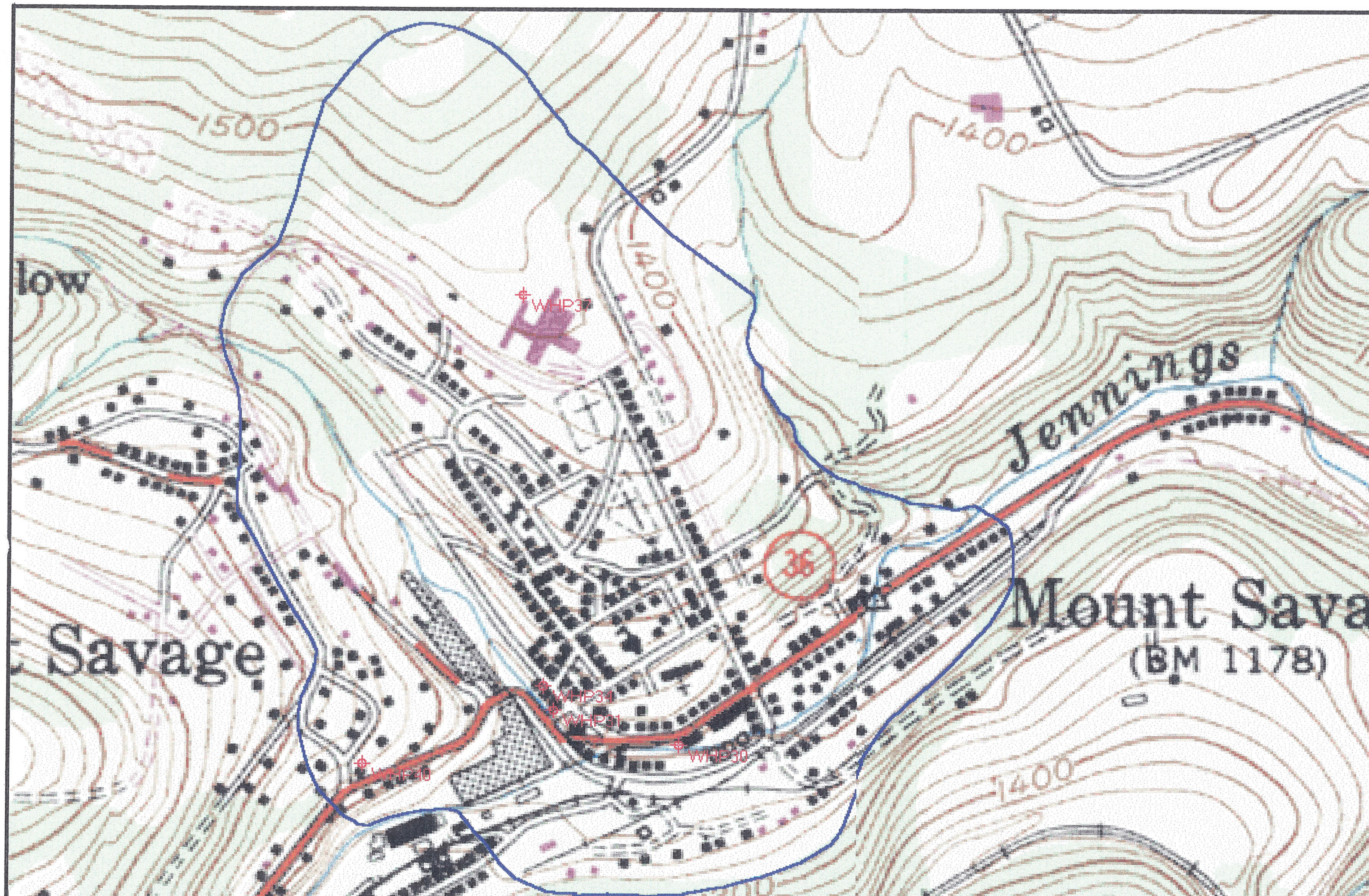
Type? pitless
Seal Tight? O.K.
Vented? O.K.
Screened? No
Conduit OK? unknown

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**

30 → Indian Cheers
31 Green Arrow Restaurant
34 Mount Savage Comm. Center
37 Mount Savage School
40 The Castle

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"=1100 FT

0 1100 2200

Notes:

1 Base map imported from digital USGS topographic quadrangle maps for Frostburg and Cumberland, MD (1981 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

Global Environmental Solutions
ADVANCED Land and Water, Inc.

Project:
NON-COMMUNITY GROUNDWATER SOURCE ASSESSMENT PROGRAM

Prepared Pursuant to the Requirements of:
MD DEPT. OF THE ENVIRONMENT
PUBLIC DRINKING WATER PROGRAM

Figure 2. Composite Source Water Protection Area for Mount Savage

October, 1999