WELLHEAD AREA SURVEY
TOWN HILL RESTAURANT AND HOTEL
ACHD SITE NO. 82
Belle Grove, 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 Town Hill Restaurant and Hotel (the Hotel), located on the north side of the Old National Pike (Scenic U.S. Route 40) at the summit of Town Hill, approximately 1.5 miles southwest of the intersection of the National Freeway (I-68) and Orleans Road at Belle Grove, in northeastern Allegany County, Maryland. The Hotel operates food service on a daily basis and offers rooms for rent. This site, designated No. 82 by ACHD, is served by two closely spaced production wells completed in the perched bedrock.

The draft 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." Hotels serve transient populations by definition insofar that 25 employees are not present, this site is designated Transient Non-Community (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 and Interview** – ALWI observed the on-site wellhead, storage, treatment, and distribution infrastructure to the degree exposed without excavation or exposure to personal hazards. The owner of the Hotel described its history, water use and other issues potentially germane to wellhead protection.

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 Hotel is situated within the Appalachian Valley and Ridge physiographic province and is underlain by the Purslane Sandstone of the Pocono Group, of Mississippian age. At Town Hill, these rocks have been intensely folded resulting in a large syncline (concave-upward fold). Alternating synclines and anticlines typify the structural geology of eastern Allegany County.

In three dimensions, the rock formations of such folds dip at right angles to the direction of plunge of the entire fold system. In general, dip directions may help govern groundwater (and contaminant) movement directions in the bedrock but plunge directions have no relation. As aforementioned, at this location the bedding planes are nearly flat-lying but curve upward sharply on the flanks of the hill. Topography is so marked that deep groundwater flow directions are also more likely influenced by topography than by structure. Reported local well yields are sparse but doubtfully exceed 5 gpm.

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 Purslane Sandstone 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.

Because of the compressional tectonic forces that formed the Town Hill syncline, the underlying bedrock is resistant to erosion (hence forming a hill) and typified as a poor aquifer because fractures are few, narrow and of limited length.

3.0 WATER QUALITY ASSESSMENT

Slaughter and Darling (1962) reported the regional water quality as extremely irony (20 micrograms per liter [mg/l]) slightly acidic (pH of 6.6). ALWI interpreted that the reddish colors of the local rock exposures as likely attributable to the presence of iron.

At this location, ALWI collected baseline groundwater samples on December 14, 1998, in accordance with the MDE sampling procedures specified in COMAR 26.08.05. ALWI collected the samples from a sink in the bathroom 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 with respect to the analyses performed. Based on its location at the top of Town Hill, the supply appears not to be at risk for surface water influence as defined in the MDE guidance document.

4.0 DELINEATION

ALWI delineated a surveyed area 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 but noted that the site is located at the summit of a steep hill whose flanks exceed 2,000 feet in width. Further considering the rural setting and the depth of the wells (only 110 feet) ALWI herein considered the surveyed area to extend 1,000 feet parallel to the trend of Town Hill but laterally only until elevation had descended 110 feet.

The resultant delineation is shown on the "Water Plant Information" survey form (Appendix B) and encompasses approximately 15% of the circle (originally 72 acres in size) or 12 acres. Within an assumed 600 gallons per day per acre (gpd/ac) of annualized groundwater recharge (Slaughter and Darling, 1962, Table 37) and taking a further 50% reduction for steep slopes, over 3,600 gallons per day exists within the aquifer beneath this surveyed area. In actuality, the modest demand on this well (doubtlessly less than 500 gpd) is nearly one full order of magnitude smaller than 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 14, 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. No interview information was available to corroborate these limited 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 tags were visible. Accordingly, ALWI could not assess the initial design nor present condition of the casing or grout seal. ALWI observed that the top of each well casing terminates in a shallow, open-air, non-watertight subsurface vault, sometimes termed a "frost pit." This in apparent violation of several provisions[1] within COMAR 26.04.04.07F.

ALWI observed the vaults to be filled with fallen leaves on the day of its reconnaissance. Stormwater and other liquids may accumulate in this vault and enter the well, entraining microbial contaminants from the dark recesses of the vault as well as various other potential contaminants. Extension of the casing to above natural grade would provide greater protection against possible contamination.

5.2 Other Local Contamination Risks

Based solely on visual observation and interview information, ALWI identified the following potential sources of contamination within the surveyed area: possible remnant surficial and subsurface fuel spills from gasoline USTs formerly on site[2], various remnant hydrocarbons from a former speed shop situated on a neighboring property[3]possible stormwater infiltration along the wells' casing, salt from parking lot deicing, a basement fuel oil AST, the on-site septic system, and the aforementioned risks associated with the wells' frost pits.

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.

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[1] This regulation prohibits frost pits, requires pitless adapters, and specifies that the finished height of well casings extend at least 8 inches above natural grade.

[2] Any finding of petroleum-contaminated groundwater must be reported to the MDE Oil Control Program, whether or not coincident with UST removal work. Such a report would open or reopen an Oil Control Program case file and could result in an enforcement action from MDE given the possibility that a remnant UST remains on site. MDE Oil Control Program representatives may order additional sampling, monitoring well drilling, and/or other investigative and remedial measures. ALWI suggests that site ownership interests consult legal counsel before taking (or choosing not to take) any action that could have adverse financial or environmental liability consequences.

[3] Typical contaminants from automotive repair shops include heavier petroleum hydrocarbons and halogenated solvents.

Nevertheless, ALWI provides recommendations to assess and mitigate the risk from the following hazards:

1. **Subsurface Well Completion** – The wells should be retrofitted with pitless adapters and their casings should be extended above-grade. The frost pits should be backfilled with inert material with care taken to adhere to casing grouting requirements in so doing. Access for pump repairs and replacements should be maintained as well.

2. **Remnant Petroleum from Former USTs and Neighboring Former Speed Shop** - Based solely on the former on-site USTs and off-site automotive repair practices, ALWI recommends a single round of analytical testing to confirm the absence of gasoline and halogenated solvent constituents. Analyses 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. **Roadway and Parking Area Deicing** – Highway and parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. The Maryland State Highway Administration is unlikely to curtail or otherwise change deicing practices. 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.

4. **Above-Ground Fuel Tank** – ALWI observed an above-ground storage tank (AST) that contains fuel oil. ALWI recommends regular maintenance of this basement-located fuel storage and delivery system, including development of specific protocols to be employed in case of a leak or overfill.

5. **Subsurface Disposal Facilities** – Older septic tanks of the type likely present may have seams. Though the low nitrate concentrations in groundwater indicate no present release, property ownership interest 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.

Depending on the results of the analyses indicated above, the Hotel may find greater cost-effectiveness in converting to bottled sources of potable water. Retrofitting the existing groundwater supply with an extended casing may not be cost-effective considering the nature and quantity of on-site uses. If the site owner concurs, appropriate placarding should be provided so as to warn against use of an untested source for potable purposes.

7.0 SELECTED REFERENCES

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: Town Hill Restaurant and Hotel

2. WAS: 82

. System Information:

Address: Scenic Route 40
Little Orleans, Maryland

Phone No.: (301) 478-2794

4. ADC Map/Grid: N/A

5. Tax Map/Plat: N/A

6. Population:

Transient
Regular 25
Total 25 +/-

7. Property Information:

Owner's Name H.A. Essers

Address: Scenic Route 40
Little Orleans, Maryland

Phone No. (301) 478-2794 (301) 377-6857

8. No. Service Connections:

9. Type of Facility:

Food Service x
Church
Campground
Daycare
Other (specify) Hotel

10. Contact Person:

Name: H.A. Essers

Phone No. (301) 478-2794

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: 12/02/98

16. System Vulnerability

Protected Vulnerable

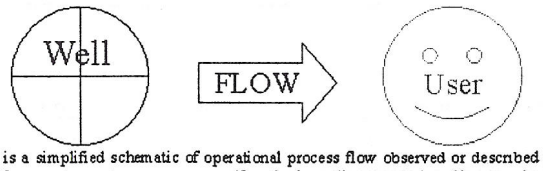
WATER PLANT INFORMATION

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: not visible

Year Drilled: 110 feet

Casing Depth: _____

Well Depth: _____

Well Yield: _____

Casing Height: _____

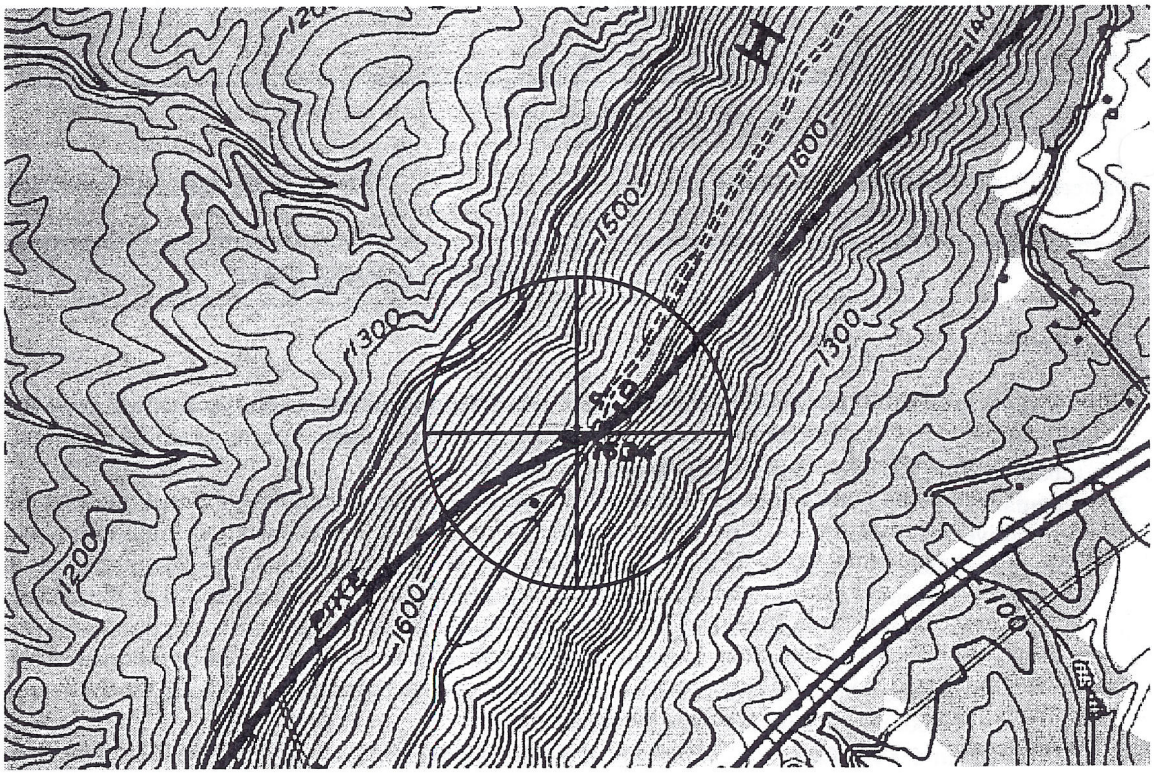
Grout Depth: _____

Pitless Adapter?_____

Wiring OK? unknown

Pump OK? unknown

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



23. Well Type:

Drilled __x____
Driven _____
Dug _____

25. Aquifer:

Name: Pocono
GAP #: _____
Confined _____
Unconfined _x____
Semi-confined _____

26. Quantity Used:

Daily Avg (gpd) <3,600
Pumping Rate (gpm) _____
Hours run per day _____

27. Well Cap:

Type? _____
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 _____
Concrete_____