WELLHEAD AREA SURVEY
DAN'S MOUNTAIN STATE PARK
ACHD SITE NO. 3
Lonaconing, 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 Survey Area for Dan's Mountain State Park, located on the east side of Recreation Area Road, in southwestern Allegany County, Maryland. This site, designated No. 3 by ACHD, is served by one 6-inch diameter, steel-cased production well completed in the local bedrock aquifer.

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." Despite the year-round operations, this site is mostly visited by tourists, which make it 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 Survey Area following ACHD requirements, which followed MDE guidelines for transient system operation and wellhead protection.

1. **Site Reconnaissance, Photographic Documentation and Interviews** – ALWI intended to observe the on-site wellhead, storage, treatment, and distribution infrastructure to the degree exposed without excavation or exposure to personal hazards. However, on three separate site visits, the

facility was unmanned and the well could not be located. Attempts to contact the facility manager by telephone and mail went unanswered.

2. **Baseline Water Quality Assessment** - ALWI purged the water system from the outdoor spigot 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

Dan's Mountain State Park is situated within the Appalachian Plateau physiographic province and is underlain by consolidated sedimentary rocks of Pennsylvanian age. The Conemaugh Formation underlies the site and consists of fine-grained sedimentary rock (Cleaves, 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 Conemaugh Formation are sparse but range from 5 to 170 gpm (Slaughter and Darling, 1962). Conemaugh 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 Conemaugh 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 Conemaugh 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 treated water samples from a camper water refilling station located at the maintenance shop. However, ALWI was unable to collect raw water samples as the well could not be located and the treatment equipment was inaccessible. 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. The supply appears to be at low risk for surface water influence as defined in the MDE guidance document

4.0 DELINEATION

ALWI delineated a surveyed area surrounding this site's wells 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 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 50% of the circle (originally 72 acres in size) or 36 acres. Within an assumed 600 gallons per day per acre (gpd/ac) of annualized groundwater recharge (Slaughter and Darling, 1962, Table 37), over 21,000 gallons per day exists within the aquifer beneath this surveyed area. In actuality, the modest demand of this well (approximately 5000 gpd when school is in session) is 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 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.

5.1 Potential Hazards At the Wellhead

Design, construction and present condition are important factors in determining a well's susceptibility to contamination. However, ALWI was unable to locate the well, and no personnel were present at the time of the site visit or on several returns thereafter. Accordingly, ALWI could not assess the initial design nor present condition of the casing or grout seal. ALWI observed a pressure tank in a maintenance shop and assumed that the well must be nearby; the water samples described herein were collected from an outdoor spigot connected to this pressure tank.

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. These included an on-site above-ground storage tank (AST), on-ground storage tank (OST), an adjacent swimming pool, and outdoor vehicle and parts storage. ALWI performed a site reconnaissance, unsupported by 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. The severity of these risk may change based on the physical location of the well. ALWI provides specific recommendations at the conclusion of each respective observation or interpretation.

1. **Uncertain Well Location** – The on-site well could not be located. Common potability hazards such as casing and cap integrity could not be assessed. Similarly, ALWI could not verify the well's proximity or topographic setting with respect to the other potential contamination hazards observed on site.

2. **Outdoor Equipment Storage** – ALWI observed both functional and derelict maintenance equipment of the maintenance shop. Some of this equipment appeared abandoned and inoperable. ALWI did not observe widespread leakage of fluids (e.g., oil, antifreeze, etc.) beneath the parked vehicles but some minor drips were visible. ALWI suggests that functional equipment should not be stored outdoors for extended periods unless all of their liquid contents (oils, antifreeze, etc.) have been drained and appropriately stored or disposed. Non-functional equipment should be removed from the site for appropriate off site disposal.

3. **On-Ground Storage Tank –** ALWI observed an abandoned OST on the rear side of the park maintenance building. The contents of the tank were unknown. ALWI recommends removal of the tank from site to prevent the possibility of contamination with residual tank contents.

4. **Above-Ground Fuel Tank** – ALWI observed an above-ground fuel storage tank (AST) near the maintenance building at the top of Dan's Mountain. This AST appeared fairly new in good condition. ALWI recommends regular maintenance of this fuel storage and delivery system, including development of specific protocols to be employed in case of a leak or overfill.

5. **Maintenance Supplies Storage Sheds** – The well is likely located near the maintenance shop. The shop could not be entered at the time of the reconnaissance because there was no attendant present. ALWI recommends that potential liquid and solid contaminants be stored in sealed containers in precise accordance with manufacturers and distributors recommendations. Leaks and spills should be cleaned up at once using non-reactive absorbent materials whenever possible. The use of water for cleanup and fire-fighting should be limited so that potential contaminants are not entrained for uncontrolled, down-gradient release.

6. **Subsurface Disposal Facilities** – ALWI observed that there was a septic system of unknown age and condition located on-site. Though the low nitrate concentrations detected in the groundwater sample collected indicate no present release, park maintenance interests should embark on a regularly scheduled program of pump-outs.

7. **Parking Area Deicing** –Parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. However, consideration should be given to using non-chemical abrasives on the parking lots and roadways for deicing to the degree possible. Baseline and bi-annual sampling for sodium and chlorides should be considered.

8. **Swimming Pool** - ALWI observed a swimming pool approximately 400 feet down-gradient of the maintenance shop. Treatment chemicals, mainly bromine and sodium hydroxide, are probably housed there. Depending on their specific method of containment, floods could mobilize the treatment chemicals and discharge them outdoors. ALWI recommends that all filtration equipment and chemical storage facilities be regularly serviced and maintained.

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: Dan's Mountain State Park	2. WAS: 3	
3. System Information: Address: Water Station Run Lonaconing Phone No.: (301) 463-5564	4. ADC Map/Grid: N/A	5. Tax Map/Plat: N/A
	6. Population: Transient ____ Regular ____ Total unknown	
7. Property Information: Owner's Name State of Maryland, DNR Address: Water Station Run Lonaconing Phone No. (301) 463-5564	8. No. Service Connections:	
	9. Type of Facility: Food Service ____ Church ____ Campground ____ Daycare ____ Other (specify) Park	
10. Contact Person: Name: State of Maryland, DNR Phone No. (301) 777-2138	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:	15. Date inspected:	16. System Vulnerability
Mark W. Eisner	12/16/98	Protected ____ Vulnerable Yes (see report)

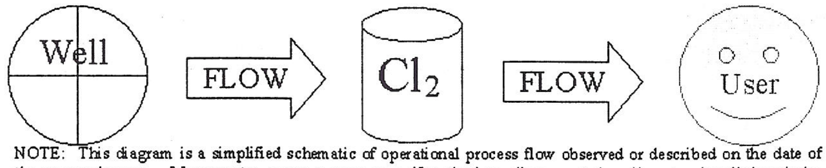
WATER PLANT INFORMATION

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

Disinfection
- Gas Chlorine: ____
- Sodium Hypochlorite x
- 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 ____ No x

WELL INFORMATION

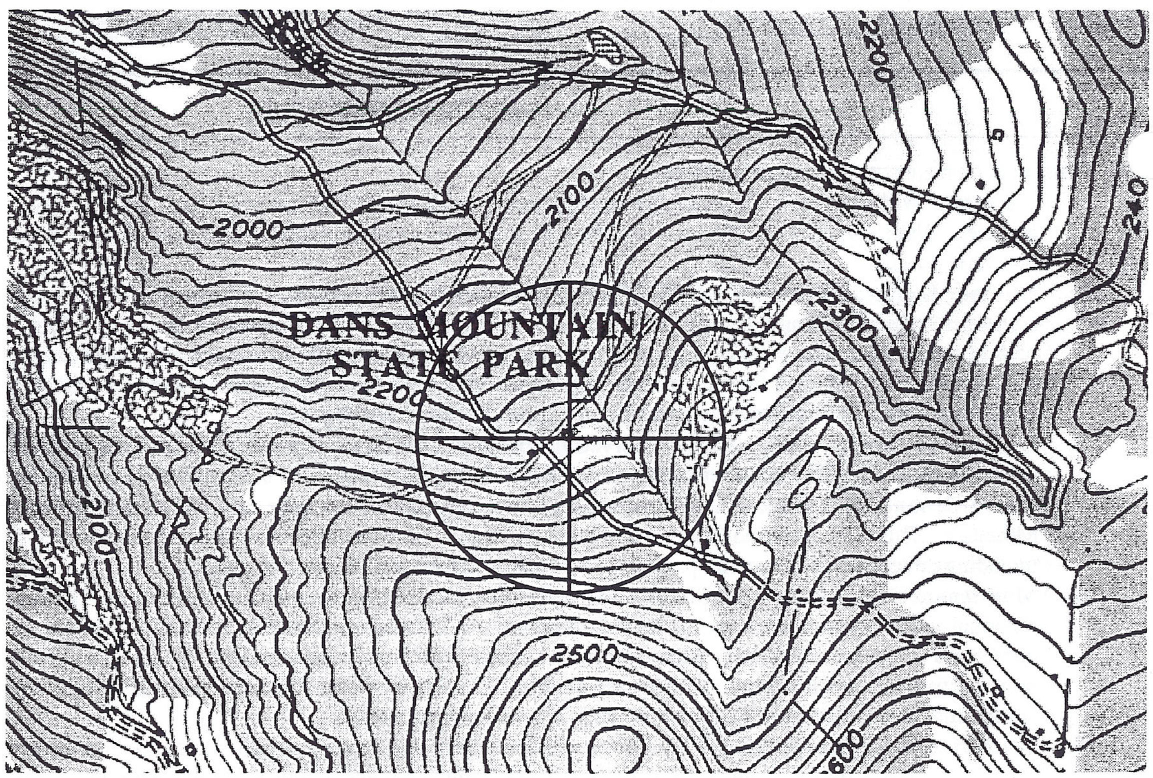
22. Well Information:

Tag Number: not visible
Year Drilled: ____
Casing Depth: ____
Well Depth: ____
Well Yield: ____
Casing Height: ____
Grout Depth: ____
Pitless Adapter? ____
Wiring OK? 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: Conemaugh
GAP #: ____
Confined ____
Unconfined x
Semi-confined ____

26. Quantity Used:

Daily Avg (gpd) >500
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 x
Concrete ____