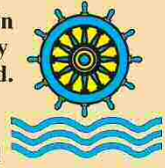




# HydroQuest

email: [hydroquest@yahoo.com](mailto:hydroquest@yahoo.com)  
web site: [hydroquest.com](http://hydroquest.com)

Paul A. Rubin  
414 E. Kerley  
Corners Rd.  
Tivoli, New  
York, 12583  
845-657-8111



January 08, 2022

## Ground Water/Aquifer Protection in the Town of Saugerties

### Name of Action or Project:

*Denier Car Wash: Rezoning Petition and Site Plan Application*

### Brief Description of Proposed Action:

*“A proposed zone change to allow car washes in the General Business (GB) and amend the Aquifer Protection Overlay (APO) Districts to remove motor vehicle washing, cleaning, and polishing facilities, or facilities for the self-service washing of motor vehicles (e.g., car washes) from the list of prohibited uses.*

*Along with zoning amendment is the proposed redevelopment to create a new six lane car wash with two car vacuuming stations (four vacuums total) requiring site plan and special use permit. **The project is classified as a Type 1 action under SEQRA** as the zoning amendment associated therewith for the GB and APO Districts affects greater than 25 acres of land [6 NYCRR Part 617.4(b)(2)] Site Plan and per Special Use Permit, approval will also be required at law.”*

### Introduction

The Town of Saugerties Conservation Advisory Committee is to be commended for working with Steven Winkley of the New York Rural Water Association (NYRWA) in preparation of the October 2005 Ground Water Protection Plan for the Town of Saugerties; Ulster County, New York. This insightful plan recognizes that ground water is a valuable resource for the Town of Saugerties. It carefully documents existing groundwater supplies, well yields, contaminant threats, and potential future water supplies that are not yet fully developed. After identification of these features, the NYRWA makes very specific recommendations designed to protect the most environmentally vulnerable water resources within the Town of Saugerties. If faithfully followed, this Ground Water Protection Plan will ensure water resource protection far into the future.

The overriding concept or backbone behind ground water resource protection is that once a Town's vulnerable resources are identified, actions can be taken to protect them. Importantly, this is best done by formulating an aquifer protection plan that delineates areas of particularly valuable water resources and resolutely adheres to recommendations specific to protecting vulnerable water quality zones. The rigor and forethought that goes into such excellent water protection planning is that, if recommended tenets are followed, long-term resource protection is assured.

A critical component in water resource protection is the recognition that vulnerable water resources can be irreparably contaminated and that efforts made to exempt small (e.g., Denier car wash parcel) or large land parcels from recommended land use practices should not be viewed in isolation. Rather, special use permits, variances, amendments, or zoning changes made for any portion of an aquifer protection zone, small or large, may chip away protection from the Town's most important resource - water. Aquifer protection zones are carefully delineated areas where only specific land uses are permitted so that the long-term future of the Town's water assets are forever protected. Piecemeal exemptions to ground water protection districts bear the risk of setting legal precedent that may open the door to a second and then another larger exempted parcel.

The long-term integrity of the Town of Saugerties' water resources is best maintained by adhering to the tenets of the NYRWA's Ground Water Protection Plan. This plan provides a Table of High Risk frequently prohibited land uses in high priority water supply protection areas. The checklist in this table was taken from the U.S. Environmental Protection Agency's Handbook: Ground Water and Wellhead Protection. This "High Risk" EPA listing includes car washes because their operation involves pollutants. This report examines the hydrogeologic setting of the proposed Denier car wash site, water supply considerations, and provides recommendations supportive of long-term water quality protection, with emphasis on protection of a largely untapped, high yield, confined sand and gravel aquifer.

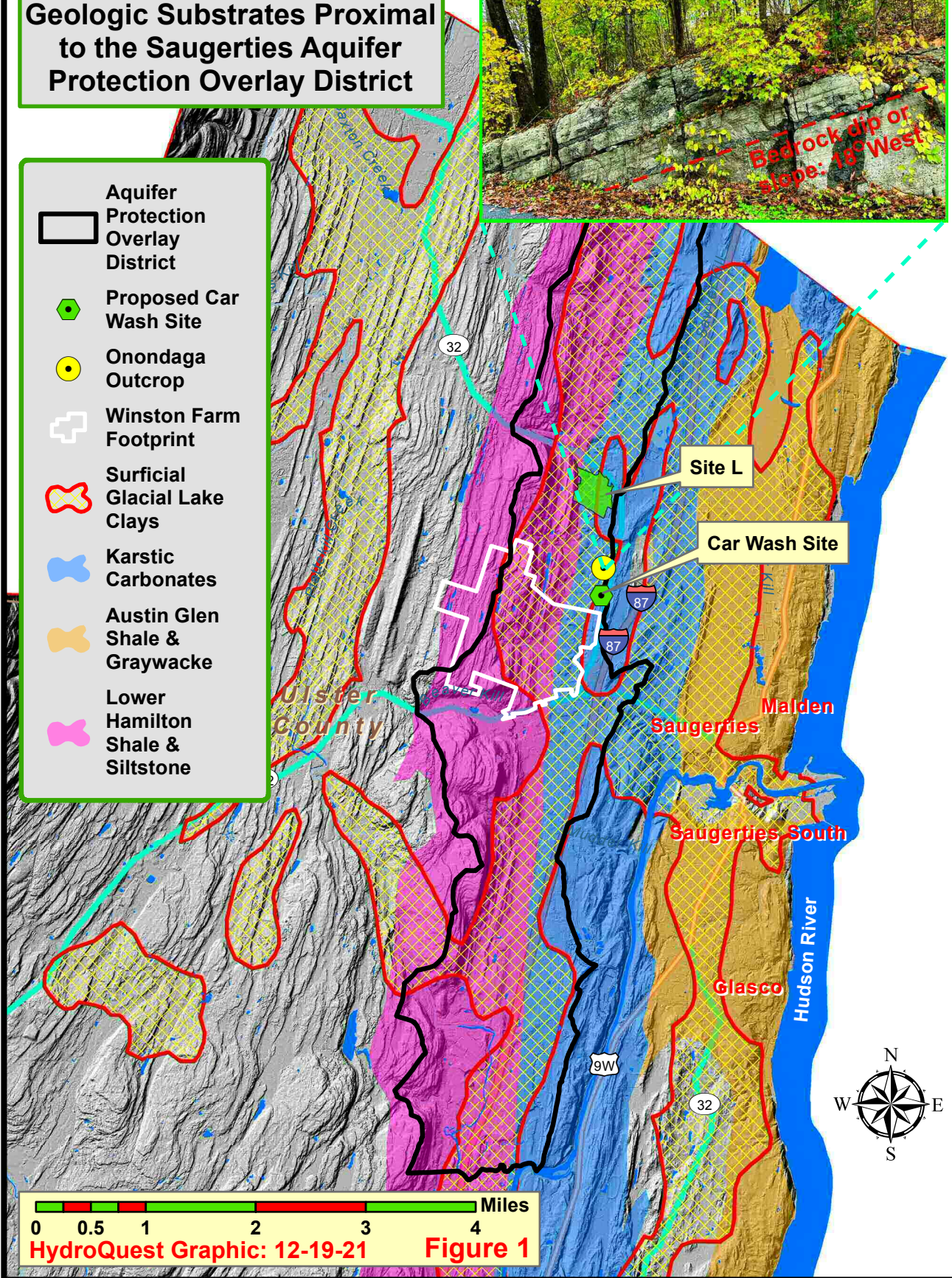
The location of the proposed Denier car wash operation is depicted on Figures 1, 2, and 3. The original 2005 Aquifer Protection Overlay District boundary put forth by NYRWA is shown on Figure 3. Sometime after 2005, the overlay district boundary was updated to more accurately reflect hydrologic boundaries without large regard to parcel boundaries. The General Business District is shown on Figure 2. The Highway Business District along Route 32 by Fawn Road is not within the Aquifer Protection Overlay District. **Where portions of the General Business District and the Aquifer Protection Overlay District overlap, they share the same water quality and hydrologic concerns.** The proposed Denier car wash property was originally not included within the 2005 NYRWA Aquifer Protection Overlay District but is on the upgraded, but very difficult to read, version that is provided at the end of the 2021 Town Comprehensive Plan (Zoning District Overlays, page 68). The Town of Saugerties provided a more complete version of this Comprehensive Plan map that is kept on file with a labeled *Aquifer Watershed Zone* that portrays the upgraded Aquifer Protection Overlay District. HydroQuest used computer and GIS technology to zoom in on this zone, create a graphic shapefile of it, georeference and plot it within a GIS database, and determine its area. It is now portrayed on Figures 1, 2, and 3 of this report. It is as a result of this district boundary upgrade that Denier seeks to amend the Aquifer Protection Overlay District to remove car washes as a prohibited land use.

For reference and interpretation purposes, HydroQuest initially digitized the Aquifer Protection Overlay District based on reference to Plate 6 of the 2005 NYRWA Ground Water Protection Plan for the Town of Saugerties; Ulster County, New York and placed it within a Geographic Information System (GIS) database (Figure 3). The area encompassed by the NYRWA 2005 Aquifer Protection Overlay District is 4,575± acres. The upgraded 2021 version of the Aquifer Protection Overlay Area encompasses approximately 7,111± acres. This acreage value appears to correlate well with the 7,083-acre value provided in Kaaterskill Associates' October 5, 2021 D.1.b.a response in Section F of FEAF, Part 1.

# Geologic Substrates Proximal to the Saugerties Aquifer Protection Overlay District



- Aquifer Protection Overlay District
- Proposed Car Wash Site
- Onondaga Outcrop
- Winston Farm Footprint
- Surficial Glacial Lake Clays
- Karstic Carbonates
- Austin Glen Shale & Graywacke
- Lower Hamilton Shale & Siltstone



0 0.5 1 2 3 4 Miles  
 HydroQuest Graphic: 12-19-21 **Figure 1**

# Overlay of the General Business District and the Aquifer Protection Overlay District

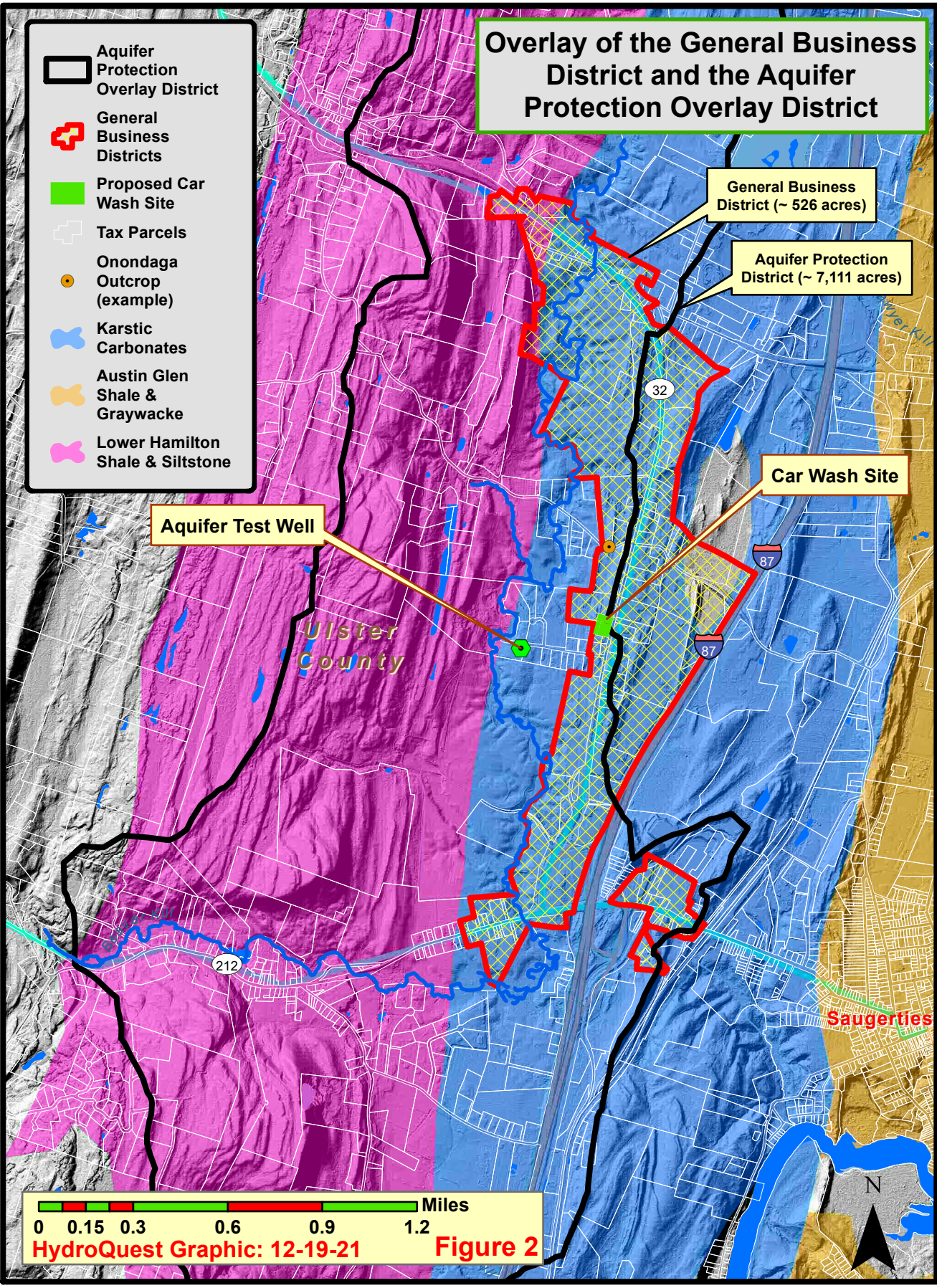
- Aquifer Protection Overlay District
- General Business Districts
- Proposed Car Wash Site
- Tax Parcels
- Onondaga Outcrop (example)
- Karstic Carbonates
- Austin Glen Shale & Graywacke
- Lower Hamilton Shale & Siltstone

General Business District (~ 526 acres)

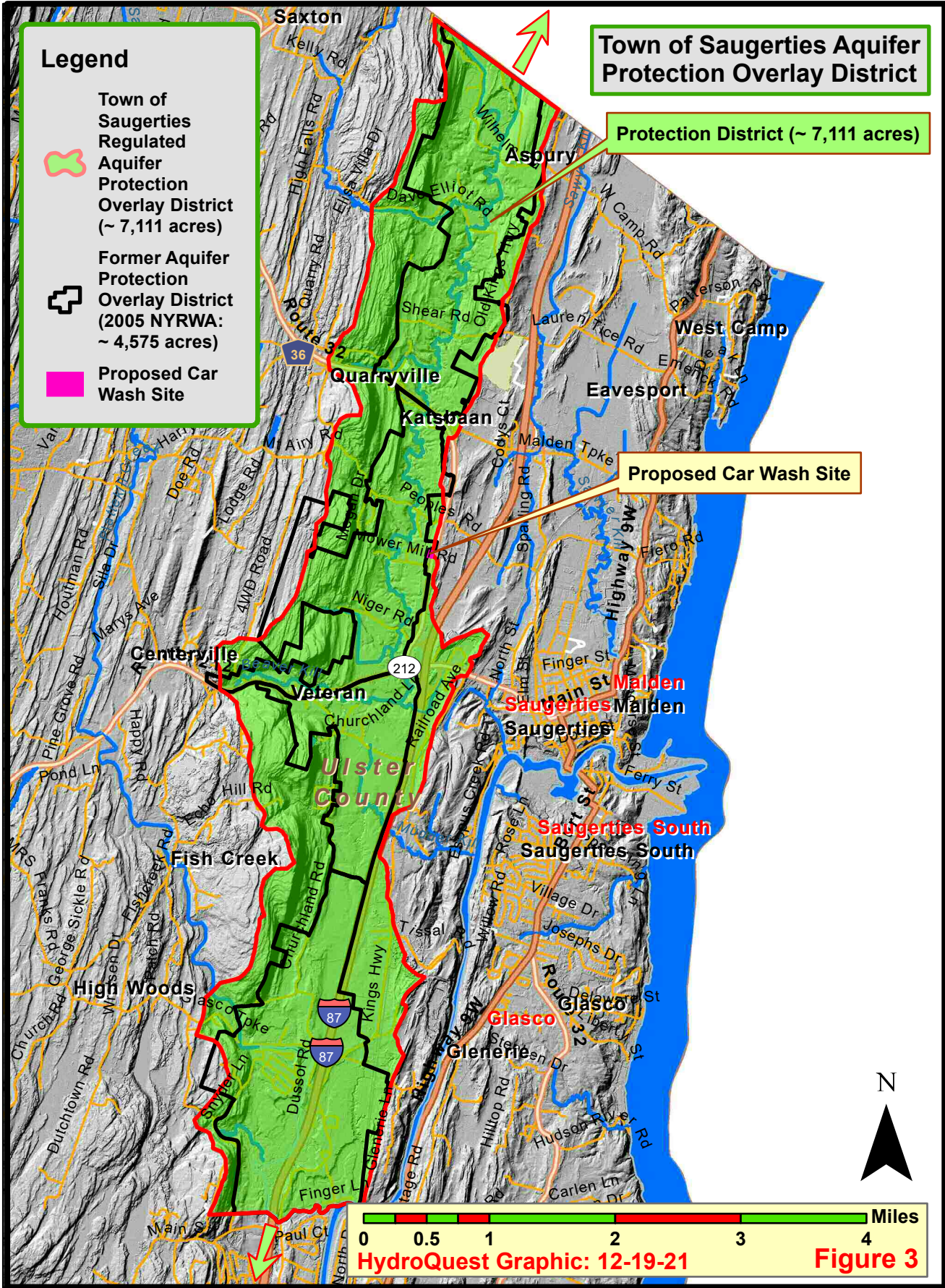
Aquifer Protection District (~ 7,111 acres)

Car Wash Site

Aquifer Test Well



0 0.15 0.3 0.6 0.9 1.2 Miles  
HydroQuest Graphic: 12-19-21 Figure 2



**Legend**

- Town of Saugerties Regulated Aquifer Protection Overlay District (~ 7,111 acres)
- Former Aquifer Protection Overlay District (2005 NYRWA: ~ 4,575 acres)
- Proposed Car Wash Site

**Town of Saugerties Aquifer Protection Overlay District**

**Protection District (~ 7,111 acres)**

**Proposed Car Wash Site**

0 0.5 1 2 3 4 Miles

**HydroQuest Graphic: 12-19-21** **Figure 3**

This same procedure was followed to digitize the General Business District area proximal to the proposed car wash site. The area encompassed by the General Business Area that includes the proposed car wash site is approximately 526± acres (Figure 2).

**The 2.11± acres of the car wash project area are small compared to the 7,111± acre Aquifer Protection Overlay District area. They encompass only about 0.03 percent of the larger area. However, it is essential to recognize that the proposed action would, if approved, amend the entire Aquifer Protection Overlay District by forever removing car washes as prohibited activities. Furthermore, as portrayed by the green arrows at the north and south ends of Figure 3, hydrologically the aquifer extends beyond the boundaries depicted. Thus, the potential to adversely impact water quality within a pristine aquifer is truly not limited by the 7,111± acre area boundary. It is for these reasons, and others presented in this report, that this proposed project should be either denied or reviewed as the Type I SEQRA action it is.**

### **Highlights of NYRWA's 2005 Ground Water Protection Plan (Environmental Considerations)**

NYRWA's 2005 Ground Water Protection Plan for the Town of Saugerties provides much support oriented toward the long-term protection of the "*Beaver Kill Aquifer*", a high-yield confined sand and gravel aquifer present beneath the floor of the Bakoven Valley (i.e., northern Beaver Kill Valley). As stated in the plan: "*In order to preserve the ground water resources of Saugerties for today and the future, the following Ground Water Protection Plan has been prepared by the New York Rural Water Association (NYRWA) with the assistance of the Town of Saugerties Conservation Advisory Committee.*" Related NYRWA report highlights include:

- \* Higher yield zones are also noted in the Onondaga Limestone of the Bakoven Valley (aka Beaver Kill Valley). Yields here may be enhanced due to dissolution of fractures in the limestone. (page 24)
- \* The most productive bedrock formation in Town appears to be the Onondaga Limestone with average yields of 25 gpm. It is also a productive aquifer. (page 25)
- \* A number of residential wells tap confined sand and gravel in the valley stretching from Veteran north to nearly Katsbaan. (page 27)
- \* The highest potential rates of ground water recharge areas for bedrock generally occur in areas where soluble limestone bedrock is at or near the land surface. (page 28)
- \* NYRWA Figure 15. Preferential Ground Water Recharge Areas highlights a number of shallow limestone recharge areas, including one encompassing the proposed car wash site, where the highest rates of ground water recharge are found. (page 29)
- \* Ground water resources are susceptible to contamination from a variety of manmade sources. Once contaminated, ground water is very difficult and costly to cleanup. (page 31)
- \* Contamination still exists in the limestone bedrock (Onondaga Formation) near the Ferroxcube inactive hazardous waste site. (page 31)

- \* Nearly half of the spill sites affecting ground water have occurred in the relatively narrow band of Onondaga and Saugerties limestone bedrock. (page 31)
- \* Salt contamination from the New York State Thruway has been reported in the area wells (page 31). Paul Rubin helped to resolve (not eliminate) this ground water contaminant situation that occurred within the Onondaga limestone while employed as a hydrogeologist with the NYS Attorney General's Office.
- \* NYRWA Figure 17. This figure shows a spill site at or very near the proposed car wash site that affected ground water. (page 32)
- \* NYRWA Table 5. Lists potential contaminant sources that typically pose a High Risk of contamination, adopted from the USEPA Handbook: Ground Water and Wellhead Protection. The checklist of categories Frequently Prohibited in High Priority Water Supply Protection Areas includes car washes. (page 34)
- \* NYRWA Figure 18. This figure depicts areas with the highest density of potential sources of contamination. **It includes the proposed car wash site.** (page 35)
- \* The Town of Saugerties has an existing Aquifer Protection Overlay District (see Article V of Zoning Law). The regulations for this overlay district prohibit a number of uses that could contaminate ground water. (page 46)
- \* NYRWA has delineated the proposed Aquifer Protection Overlay District boundaries. These are depicted on Plate 6. NYRWA, with the approval of the Conservation Advisory Committee, has proposed revisions to the regulations governing the Aquifer Protection Overlay District (see Appendix C). (page 46)
- \* Section 7.5 Future Infrastructure Planning Areas. Some areas in the Town have legitimate water quality concerns. Such areas could include locales that have experienced contamination and/or **are most susceptible to ground water contamination in the future**. One such area is zoned business/industrial and lies along the border between the Bakoven Valley and the Kalkbergs regions. This is an area of predominantly shallow limestone bedrock paralleling the New York State Thruway from nearly Mount Marion northward to Katsbaan along Kings Highway and State Route 32. (page 48)
- \* A potential water source for a future water supply system could be the confined sand and gravel aquifer (Beaver Kill Aquifer) in the Bakoven Valley. (page 48)
- \* ***“The Aquifer Protection Overlay District is established to preserve the quality and quantity of the Town’s ground water resources in order to ensure a safe and adequate water supply for present and future generations; and to preserve ground water resources currently in use and those aquifers having potential for a future use as a public water supply.”*** (page 60)
- \* **PROHIBITED USES: The following uses and activities are specifically prohibited in the Aquifer Protection Overlay District in order to safeguard ground water resources which serve as present or future drinking water supplies: f. Car wash.** (pages 64 and 65)

Article VI, General Regulations § 245-25. Aquifer Protection Overlay District, Section A. Purpose and area of applicability (1) states:

*“The Aquifer Protection Overlay District is established to preserve the quality and quantity of the Town's groundwater resources in order to ensure a safe and adequate water supply for present and future generations and to preserve groundwater resources currently in use and those aquifers having potential for a future use as a public water supply.”*

Section C. Prohibited uses, item (q) lists *“Motor vehicle washing, cleaning, and polishing facilities, or facilities for the self-service washing of motor vehicles (e.g., car washes).”* This car wash prohibition exactly meshes with hydrologic recommendations made by the New York Rural Water Association and, as discussed below, goals and recommendations provided in the Town of Saugerties’ Comprehensive Plan update. Clearly, the importance of adhering to aquifer protection recommendations and regulations is underscored when reviewing applications that, individually or collectively, may compromise water quality and the long-term future growth of Saugerties.

### **NYRWA’s Bakover Valley Setting and Beaver Kill Aquifer**

**Evaluations of proposed changes in land use that have the potential for adversely impacting aquifer water quality warrant full SEQRA review, especially when the land use applies to a large area.** NYRWA’s 2005 Ground Water Protection Plan for the Town of Saugerties; Ulster County, New York divides the Town of Saugerties into eight physiographic regions (NYRWA report, Figure 4). The Town of Saugerties’ Aquifer Protection Overlay District largely overlies the Bakoven Valley physiographic region. This valley extends north to south across the entire Town of Saugerties, and beyond (Figure 3). It occupies a topographic low with unconsolidated fill over a buried bedrock valley that reaches depths of over 200 feet. Buried bedrock valleys are valleys that are no longer occupied by the streams that cut them. These ancestral valley bottom depths extend well below the present level of the Hudson River. Thus, this bedrock floored valley bottom once coursed with a major stream or river that graded downslope to an ancestral lower level of the Hudson River and Atlantic Ocean. In this valley’s early stage of sediment filling, it was partially infilled with highly permeable sand and gravel. Later in time the sand and gravel were covered with confining glacial lake clays and silts. Groundwater within the elongate, sand and gravel filled, valley floor comprises a major aquifer referred to as a strip aquifer or parallel channel aquifer. For reference purposes here, this confined strip aquifer is referred to as the *“Beaver Kill Aquifer.”* While relatively little hydrogeologic testing has been conducted to ascertain the volume of aquifer water available for future use, it is likely to be considerable (aka a significant quantity; millions of gallons per day). HydroQuest’s review of well logs and limited aquifer test data from this valley revealed that some drillers simply cased through this high-yield sand and gravel aquifer, instead completing wells in low-yielding underlying bedrock formations.

NYRWA (2005) found that the median Town of Saugerties bedrock well yield is 8 gpm. Some wells screened and completed within the sand and gravel Beaver Kill Aquifer have yields extending to over 100 gallons per minute (gpm). **The high yielding Beaver Kill Aquifer may one day be extensively developed to meet future Town of Saugerties water demand. It is in the Town’s best long-term interest to protect it.**



Much of the Beaver Kill Aquifer's source water comes from infiltrating recharge water entering along the margins of the glacial lake clays and silts. To the east, steeply sloping or dipping beds of the Onondaga limestone provide a significant source of recharge water to the strip aquifer - locally along the Route 32 corridor on the Denier project area side of the valley. Figure 4 below depicts steeply westerly dipping beds of the Onondaga limestone that direct infiltrating rainwater and snowmelt downgradient and into the Beaver Kill Aquifer, as well as to a number of homeowner wells. These westerly dipping Onondaga limestone beds underlie the proposed Denier car wash project site. While the thickness of the soil mantle underlying the Denier site is not provided, based on nearby bedrock outcrop exposures, it is likely to be relatively thin.

### **Karst Hydrology**

The proposed Denier car wash site is situated in a karst terrain composed of Onondaga limestone. Karst landscapes are those where, in places, groundwater and any contaminants in it move rapidly through conduits with little or no dilution to down-gradient receptors. This rapid recharge area has the potential of degrading aquifer water quality. Groundwater resources present in bedrock formations with conduits developed in them are referred to as karst aquifers. They represent the most vulnerable aquifers anywhere. Contaminants in karst aquifers can travel miles in hours versus groundwater flow rates in non-karstic (i.e., non-conduit or cave-bearing) aquifers of feet per day or less. **Any Denier car wash site contaminants that infiltrate into the ground surface beneath the project site will flow downgradient to the west within the recharge area of the Beaver Kill Aquifer.**

Figure 5 has yellow elevational contour lines that show a significant westerly decrease in elevation between the proposed project site, homeowner wells, and the Beaver Kill. The vertical elevational difference between the project site area and the Beaver Kill is greater than 50 feet over a distance of 1,300 feet. The elevation of the Beaver Kill corresponds to the hydrologic base level. Because there is a large elevational difference between the site area and the Beaver Kill, westerly groundwater flow (as denoted by the light blue flow arrows) will, in part, be driven by a steep gradient or hydraulic head toward homeowner wells. Any stormwater or other contaminant excursions (leaks, spills, runoff) that might leave the project site would flow toward homeowner wells and the buried valley aquifer.

Again, karstic flow routes provide little or no natural cleansing of contaminants. The karstic (aka conduit bearing) nature of the Onondaga limestone proximal to Site L and elsewhere within and beyond the Town of Saugerties is well documented. For example, Rubin (1985) addressed the Dynamics of Karst Speleogenesis in the Onondaga Limestone; with Emphasis on the Indian Cave System, Mt. Marion, New York in an article. While this nearby cave has only about 1200 feet of physically enterable cave passage, other caves developed in the same geologic formation have over a mile of traversable conduits. This geologic work involved analysis of various factors that are nearly identical to those present close to the proposed Denier car wash project site (e.g., bedrock dip and strike, structural controls, conduit development, tracer testing). Importantly, even finger-sized conduits in the Onondaga limestone can rapidly conduct contaminants at velocities equivalent to those present in surface streams - all with no dilution or cleansing of incident contaminants. For these reasons, karst aquifers are the most hydrologically vulnerable of all

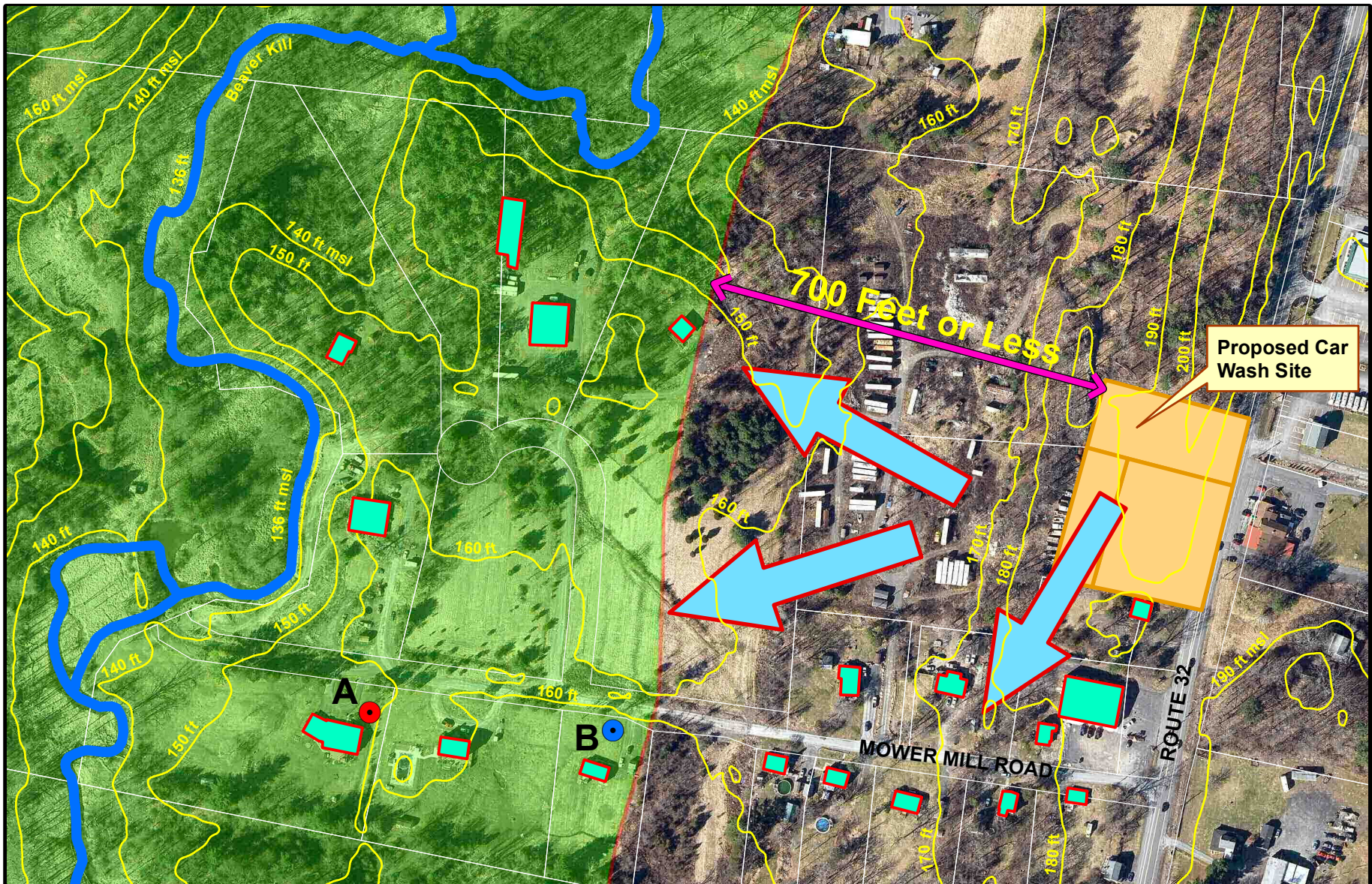
aquifers. Many of the contaminant issues related to the Onondaga limestone are reflected in the bulleted NYRWA items above.

The proposed Denier car wash property lies on the Onondaga limestone that has bedding planes that dip to the west and control ground water movement to the Beaver Kill Aquifer. These same geologic beds are portrayed in Figure 4 just a short distance to the north and along Hommelville Road (see location on Figure 1). Thus, the car wash site lies within this aquifer recharge zone and poses a risk to water quality should any retention pond infiltration or other contaminated water infiltration or offsite excursions occur. Perhaps of even greater importance is the potential compounded aquifer water quality risk that might occur in the future if other now prohibited high risk activities follow the same approval pathway now before the Planning Board.



*Figure 4. Steeply dipping Onondaga limestone along Hommelville Road. The Denier site is ~ 1,125 feet to the south where the bedrock dip is somewhat lower but still steeply dipping to the west.*

As discussed above, the Onondaga limestone is karstic, meaning it exhibits solution conduits, joints, and enlarged bedding planes dissolved by groundwater. Groundwater moves rapidly through these channels downgradient to the underlying strip aquifer. The magnitude of recharge water incident to the strip aquifer is indicated by examination of boring logs obtained some 36 years ago when the Winston Farm Alliance and the Town of Saugerties were assessing proposed megadump Site L in the hamlet of Katsbaan (Figure 1). Upward hydraulic pressure (to more than 100 feet above the base of confining clay beds) exerted from this strip aquifer on the bottom of the overlying glacial clay beds made them so soft that they were easily penetrated during drilling. Driller's logs had "WR" footnotes. This refers to Weight of Rods, meaning use of a standard 140-pound weight was not needed to advance borings due to excessive water saturation stemming from the upward pressure head exerted by the underlying confined strip aquifer. The presence of these soft sediments was also of great importance when examining risk to the Beaver Kill Aquifer from siting a mega-dump on top of them. This vulnerability is because the soft sediments are structurally weak and are not likely to be capable of supporting overlying heavy loads (e.g., landfill material).



Proposed Car Wash Site

700 Feet or Less

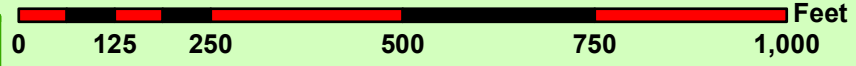
ROUTE 32

MOWER MILL ROAD

A

B

- Proposed Car Wash Site
- Mower Mill Road Buildings
- ~ Buried Valley Aquifer
- Mower Mill Rd Well A
- Mower Mill Rd Well B
- Beaver Kill
- Parcels
- Contaminant Flow



Contaminant Migration Directions to Homeowner Wells, Buried Sand and Gravel Aquifer & Beaver Kill



## Potential Beaver Kill Aquifer Yield

A reasonable approximation of potential well yield present within the Beaver Kill Aquifer may be made based on well log and aquifer test information. Praetorius and Conrad, P.C. (1989, Saugerties Water Company Engineering Report: Water Supply Potential Veteran Aquifer) conducted a 24-hour aquifer test on a Mowers Mill Road well (Figures 2 and 5). The test well (A) was approximately 187 feet deep and was pumped at 102 gallons per minute (gpm). The well extended through approximately 99 feet of glacial lake clays and silts, then about 31 feet of sand (as logged in the nearby Baldelli well), followed by 57 feet of Onondaga limestone. A reduction in the potentiometric surface during aquifer pumping and high well yield indicate efficient hydraulic connectivity between bedrock and overlying highly permeable sand. During the test, the static or potentiometric surface in the test well dropped 20 feet within the 15 minutes corresponding with equilibrium conditions that then remained stable throughout the test, except temporarily when the pumping rate was reduced to allow for homeowner usage. The total static potentiometric surface above the base of the confining clay horizon was approximately 79 feet. This very large pressure head indicates substantial recharge to the aquifer. Since well yield is directly proportional to drawdown in a confined aquifer, this one well is capable of continuously yielding approximately 400 gpm or 575,000 gallons per day. This value is based on testing conducted to date in a single well.

Additional insight into the prolific nature and sustained yield of the Beaver Kill Aquifer was documented in another aquifer test conducted by the firm of Praetorius and Conrad, P.C. (1989). Well No. 2, located near Churchland Lane, was pumped at approximately 75 gpm for 24.5 hours. At this discharge, equilibrium conditions prevailed and corresponded with a 34.5-foot reduction in the potentiometric surface. The total static potentiometric surface above the base of the confining clay horizon (i.e., top of the aquifer) was 195.5 feet. For a well such as this, operating under confined conditions, the yield is directly proportional to drawdown. Thus, this one well is capable of continuously yielding approximately 425 gpm or 612,000 gpd. This quantity is equivalent to that allocated to the Town's water districts daily. These aquifer test results provide evidence that the Beaver Kill Aquifer is a major Town resource that should be protected far into the future.

## Primary and Principal Aquifers

If the Beaver Kill Aquifer were not partially covered by a thick glacial lake clay and silt deposit, the currently underutilized groundwater resource could be considered as a principal aquifer because it 1) receives substantial recharge from the *surrounding* land surface, 2) is known to be highly productive based on hydrogeologic characteristics and yield testing indicative of a potentially abundant source of water, and 3) is not presently used as a major source of water for public water supply.

New York State's Technical and Operational Guidance Series (TOGS) 2.1.3 Primary and Principal Aquifer Determinations provide definitions for Primary Water Supply Aquifers and Principal Aquifers:

- \* Primary Water Supply Aquifers: Highly productive aquifers presently being utilized as sources of water supply by major municipal water supply systems.
- \* Principal Aquifers: Aquifers known to be highly productive or whose geology suggests abundant potential water supply, but which are not intensively used as sources of water supply by major municipal systems at the present time.

In regard to the ability of an aquifer to yield water by pumping wells, there is intended to be no difference between a Primary Water Supply Aquifer and a Principal Aquifer. The only difference is that one is used intensively now, and the other is not. The Principal Aquifers are, in effect, the potential Primary Water Supply Aquifers of the future. Recognition of the value of protecting high yield groundwater resources embraces the concept of responsible and effective management. All told, based on the geology present and hydrogeologic setting, **it is reasonable to estimate that the Beaver Kill Aquifer is capable of producing a safe yield of several million gallons per day, or more.**

### **Beaver Kill Aquifer - The Town of Saugerties' Crown Jewel**

The Beaver Kill Aquifer is a largely unrecognized jewel present within the borders of the Town of Saugerties. Every effort should be made to protect its quality. Aquifer protection and related land use management require detailed knowledge of aquifer dimensions (e.g., thickness, width, lateral extent, and depth below ground surface for confined aquifers), recharge area(s), discharge zone, and safe yield. Because a significant portion of the Beaver Kill Aquifer is directly overlain by low permeability glacial lake clays and silts, aquifer protection must emphasize land use practices and protection of 1) valley flank recharge areas where infiltrating water flows downgradient toward and into the valley bottom aquifer (including through deltaic deposits), and 2) upgradient areas of the strip aquifer where recharge water may be able to move into and beneath capping/confining clay beds. In addition, the presence of small sinkholes in an area somewhat north of the Site L area indicates that some downward water infiltration does occur through glacial lake clays via leaky confining beds. Thus, from an aquifer protection standpoint, it is important to thoroughly delineate a number of factors to facilitate long-term water quality protection of the Beaver Kill Aquifer. Some of the steps involved in full characterization of the Beaver Kill Aquifer include: 1) compilation and analysis of all available well logs within the Bakoven Valley with assessment of aquifer dimensions, 2) vertical and lateral correlation of subsurface geology between wells and bedrock outcrops, 3) review and reassessment of existing aquifer test data, 4) additional, rigorous, aquifer testing, 5) water quality testing and characterization, 6) field measurement of potentiometric head in available wells to assess confining pressures and ground water flow direction, 7) field assessment of bedrock outcrops within the aquifer recharge zone (e.g., type, strike, dip), 8) potential additional aquifer dimension information using geophysical technology, 9) determination of the location of the aquifer discharge zone, 10) flow measurements in the discharge zone, and 11) refinement of aquifer and recharge boundaries to best protect aquifer water quality.

Some adjustment of Beaver Kill Aquifer recharge boundaries (i.e., aquifer protection boundaries) may be warranted. Delineation of recharge boundaries should be based on reproducible geologic and hydrologic factors including bedrock type, dip, and strike; soil and sediment type and

hydrologic properties; surface and subsurface flow patterns; topography; and hydrogeologic factors.

Relative to the immediate issue before the Board (car wash project approvals, or not), as discussed above, the primary source of recharge to the confined Beaver Kill Aquifer is from the upgradient valley flank areas that specifically include the Denier car wash parcels.

### **Consistency with the Town's Comprehensive Plan**

**As growth continues in the Town of Saugerties and beyond, it would be prudent to fully safeguard the Town of Saugerties' future and most valuable asset - its ground water supply. This can best be done by rigorously adhering to the tenets of the existing aquifer protection regulations.** This is what was envisioned by the New York Rural Water Association (NYRWA) and the Town of Saugerties Conservation Advisory Committee.

The Town and Village of Saugerties Comprehensive Plan: 2021 Update was reviewed to ascertain whether a proposed zone change to allow car washes in the General Business (GB) district and amendment of the Aquifer Protection Overlay (APO) District to remove motor vehicle washing, cleaning, and polishing facilities, or facilities for the self-service washing of motor vehicles (e.g., car washes) from the list of prohibited uses are consistent with goals set forth in the Plan. They are not.

The key issues at hand are whether making these changes will in any way unnecessarily jeopardize aquifer water quality or potentially provide a precedent for a means to remove other currently prohibited land uses from the Aquifer Protection Overlay District. As discussed within this report, the buried valley aquifer beneath the Beaver Kill valley may well be the crowning jewel within the Town of Saugerties - a high-yield water supply that can contribute to the Town's bright future. Contemplated zoning and overlay district changes should be fully examined within the broad context of the entire aquifer and its watershed. In keeping with this mantra, review is provided of key elements of the updated Comprehensive Plan and the 2005 New York Rural Water Association (NYRWA) Ground Water Protection Plan for the Town of Saugerties; Ulster County, New York, along with detailed discussion regarding the productive nature of the Beaver Kill Aquifer.

### **Water Quality Protection Components of the Town's Comprehensive Plan**

The Town's Comprehensive Plan is laced with statements that address resource protection, many with emphasis on aquifer and water supply protection. As stated in the Comprehensive Plan update: *"A comprehensive plan is a public document that defines what is important to the community."* It *"Provides a rationale for the specific land use regulations and other local government functions, which will govern the structure of the community in the future."*

The Groundwater and Public Water Supply section of the Comprehensive Plan states: *"The Town/Village are dedicated to protecting all freshwater resources."* Section 5.0 Goals and Implementation Strategies recognizes that for the Plan to be effective: *"... the Saugerties Town Board and Village Board of Trustees must actively apply the goals and policies that are contained within the Plan. Furthermore, their respective Planning Board and Zoning Board of Appeals*

*should use the Plan as a framework to guide their decisions with respect to the review of development proposals and land use decisions.”*

The Town’s Comprehensive Plan has Goals, Recommendations, and Implementation Strategies that include Land Use and Development Policies (Goal #6) and Natural Resource Protection (Goal #8). Key tenets of the Comprehensive Plan hold that 1) the Town and Village support, and encourage, planning policies that promote environmentally-sound development in all zoning districts, and 2) Town and Village efforts should promote awareness and protection of natural resources, wilderness, and scenic areas.

Recommendations within the Plan include:

- \* *Protect natural resources to the greatest extent practicable when evaluating future development proposals. (Goal #6: Land Use and Development Policies)*
- \* *Take full advantage of the State Environmental Quality Review Act and other impact analysis to obtain detailed information on the environmental and community impacts of proposed development, make potential concerns open to public comment, and explore alternatives to continue the project. (Goal #6: Land Use and Development Policies)*
- \* *Protect the aquifer (Goal #6A: Policy Regarding Certain Large Parcels)*
- \* *Promote a land use pattern that protects air quality plus surface and groundwater resources, while working to eliminate (or minimize) all sources of pollution, but not limited to road salt and leaching dump sites. (Goal #8: Natural Resources Protection)*
- \* *Enforce and improve policies to protect and enhance water supply systems. (Goal #8: Natural Resources Protection)*
- \* *Support the development of a Watershed Management Plan which will increase the understanding of current conditions, trends, and risks to the watershed. (Goal #8: Natural Resources Protection)*

Clearly, the Comprehensive Plan puts forth the Town of Saugerties’ intention to protect, enhance, and manage water supply resources. This plan is consistent with the findings and recommendations that stem from the 2005 New York Rural Water Association’s (NYRWA) Ground Water Protection Plan for the Town of Saugerties; Ulster County, New York. While engineering drawings and text are presented that detail plans designed to minimize and hopefully remove potential contaminant excursions from much of the proposed Denier Car Wash facility (via wastewater reuse and collection), stormwater would be directed to various infiltration features where gravity would move it and any contaminants in it downward into the underlying aquifer. The following related topics require examination to understand their impact on the local environment.

## **Change in Land Use Considerations**

When considering issuance of variances or rezoning options within a presently regulated and protected Aquifer Protection Overlay District it is beneficial to 1) fully consider the chemicals involved should contaminant excursions occur (leaks, spills, or runoff), 2) assess the potential chemical and loading impact on surface and groundwater resources, 3) determine the nearest downgradient water users (i.e., receptors) whose supplies may be adversely impacted, 4) have conducted full water quality testing on all downgradient wells for all car wash related chemicals to serve as baseline reference for future litigation, 5) consider potential legal impacts relating to change in land use decisions, and 6) assess any short or long-term benefits to the Town and its currently protected aquifer that might result from removing existing water quality protections.

### **Type 1 Actions and Unknown Nearby Land Use**

Review of high resolution 2016 and 2021 orthoimagery suggests that similar and, quite possibly, interrelated land use activity is or has occurred between the proposed car wash lots shown in light orange on Figure 5 and two adjacent parcels: SBL: 17.2-5-44 (3.4 acres) to the west and SBL: 17.2-5-21.100 (8.4 acres) to the northwest and north. Interconnected dirt roads and equipment appear to show contiguous and similar land use or site activities. Should this situation prevail and any future expansion of operations is contemplated, it would be important to disclose any future interrelated land use initiatives now to ensure that the SEQRA process is not inadvertently segmented.

### **Car Wash Chemicals**

Car wash wastewater, as well as facility stormwater, can be a significant source of environmental pollution. Car wash wastewater may contaminate soil, groundwater, and surface water and can be harmful to humans, plants, and animals. For example, the NYC Environmental Protection Cross-Connection Control Program lists car wash facilities among properties that pose an actual or potential risk of contamination to their water supply. Toxic wastewater can contain numerous pollutants including assorted toxic heavy metals (e.g., cadmium, chromium, copper, iron, lead, and zinc).

As part of this assessment, it is informative to examine the extensive suite of chemicals a variance or zoning change might potentially allow to be released into groundwater resources within the Aquifer Protection Overlay District. Knowledge of car wash chemicals is valuable when considering approvals that might potentially degrade groundwater quality of downgradient homeowners (Figure 5) and that of the Beaver Kill Aquifer.



Car wash chemicals and related parameters are well documented. They include:

Total Phosphorus (TP)	Total Suspended Solids (TSS)	Surfactants
Petroleum hydrocarbons (benzene, toluene, xylene et al.)		Nitrogen
Ammonia	Sodium	Chloride
Turbidity	Chemical Oxygen Demand (COD)	Road salt
Total Dissolved Solids (TDS)	Oils	Greases
Car wash grit (sediment)	Heavy metals	Arsenic
Hydrofluoric acid	Alkyl Benzene Sulfonates (ABFs)	Nitrate
Detergents (methylene blue active substances: MBAS)		Phenol

### **Hydrogeologic Factors Implicit in Approvals Associated with the Car Wash Application**

It is important to recognize that changes in zoning or land use can have water quality impacts that extend far beyond the lot size of individual parcels. In regard to the current application that would, if approved, permit a car wash facility, it is useful to mentally visualize the physical setting present to fully grasp the hydrogeologic implications. Figure 5 was constructed to assist with this visualization.

Much of this HydroQuest report has discussed the benefits to the Town of Saugerties of fully maintaining the long-term water quality protection now afforded to the Beaver Kill Aquifer. Discussion is provided regarding the high yield of a well located close to Mower Mill Road. Its approximate location is shown on Figure 2 and also on Figure 5 where it is labeled Well A. As discussed previously, this well has a very high yield - on the order of 575,000 gallons per day. The three light blue arrows on Figure 5 document potential contaminant flow toward this location, as well as toward other properties with wells, as being hydrologically downgradient of the proposed car wash site. Stormwater contaminants or, potentially, spills from the car wash site pose an environmental and water quality risk. As planned, stormwater would be directed to sediment basins, bio-retention areas, level spreaders, a trench drain, and a swale (Kaaterskill Associates, Drainage & Utility Plan, Drawing SP-4). These features are designed to allow stormwater to infiltrate downward into the underlying aquifer flow system.

As another means for stormwater treatment, the project applicant proposes to reduce the impervious surface from pre development to post development. As stated in the Kaaterskill Associates Engineers Report:

*“A reduction in site imperviousness will reduce the volume of stormwater runoff and **increase infiltration**, thereby achieving, at least in part, stormwater criteria for both water quality and quantity. ... The proposed reduction in impervious surface meets the NYSDEC stormwater treatment for re-development projects. The proposed project is located in the Aquifer Protection Overlay (APO) District. The proposed project has been designed to exceed these requirements and additional*

*stormwater treatment practices have been proposed to provide additional water quality treatment and to further treat stormwater runoff and enhance treatment of runoff. The proposed treatment practice, in addition to the reduction in impervious surface, include two Bioretention Areas. The two Bioretention Areas have been sized to provide 25% of the Water Quality Volume to meet the redevelopment if a reduction in impervious surface was not provided. This essentially doubles the required stormwater treatment.”* (Pages 2-2 and 2-3) (Emphasis added)

Additional treatment of stormwater is planned that will increase infiltration of contaminants into the underlying aquifer. Page 3-2 of the April 5, 2021 Kaaterskill Associates’ report states:

*“No surface discharge or storm sewer connection will be allowed for wash water. Carry out water from the final rinse will be minimized by using modern driers at the end of the wash **and will be collected by the proposed onsite drainage system and sent to the stormwater treatment practices.**”* (Emphasis added)

Key hydrologic issues associated with this proposed stormwater treatment method are 1) it would increase infiltration of contaminated stormwater into a hydrologically vulnerable setting, and 2) it is not likely to work well or at all on frozen ground in the winter.

Another important consideration relative to the bio-retention features is whether they would effectively function or function at all under winter frozen ground conditions. Their sizes are small which to some degree makes them different from, but also analogous to, wetlands constructed for wastewater treatment. Wang, Zhang, Dong, and Tan (2017) reviewed constructed wetlands for wastewater treatment in cold climates (Journal of Environmental Sciences 57) and examined pros and cons related to pollutant removal efficiency. For some chemical parameters, treatment performance was reasonably comparable between warm and cold climates. But not so for other parameters. A key consideration they put forth is: *“Although constructed wetlands have emerged as a potential technological solution for the treatment of various wastewaters, the removal efficiencies of contaminants, especially nutrient substances are relatively low in cold climate and the performance of constructed wetlands in winter is not satisfying due to the lower natural metabolic activities of microbes and the wetland plants.”* An underlying question is: Is the stormwater treatment methodology and sizing proposed suited to cold northeastern winters? A second question might seek to understand why a contaminant-generating facility that proposes to discharge storm wastewater into a vulnerable groundwater flow system (via infiltration) would be considered immediately upgradient of homeowner wells and a high-yield aquifer?

Is this scenario real? As an example, road salt is a common car wash contaminant that is nearly infinitely soluble in stormwater runoff. If it drains into on-site stormwater collection features, it will move rapidly downgradient to homeowner wells and the Beaver Kill Aquifer. Dennis Larios, P.E. has also raised concern relative to high chlorides in wastewater (1-04-22 email). This exact road salt migration mechanism has been documented nearby through solution features in the Onondaga limestone to a number of homeowner wells (Figure 6).



*Figure 6. Solution conduits in the Onondaga limestone can rapidly transmit contaminants with little or no dilution and cleansing, including through finger-sized conduits. This is analogous to open pipe flow, resulting in the most vulnerable of hydrogeologic settings.*

Additional examination of the geologic setting sheds valuable light on the close distance and physical relationship between the proposed car wash site, the Beaver Kill Aquifer (i.e., buried valley bottom area aquifer), downgradient homeowner wells, and the Beaver Kill. Figure 5 shows what is believed to be the correct lot placement of the former Baldelli well, plotted as Well B (SBL: 17.2-5-43.222). This well was drilled in February 1988. The driller's log shows 86 feet of clay, followed by 31 feet of sand, and then the Onondaga limestone that the car wash site sits on in its upslope location. Thus, the high-yielding Beaver Kill Aquifer is 31 feet thick at Well B. It is laterally extensive and, undoubtedly, varies in thickness and composition along the formerly incised valley. Based on the presence of bedrock outcrops in the area, well logs, and nearby aquifer testing, we know that the buried aquifer extends far to the north and south. The high yield and sand thickness at Wells A and B, respectively, provide evidence that the buried valley aquifer also extends some distance to the east of Well B. It would require drilling or geophysics to further bound the aquifer's exact physical extent to the east toward the proposed car wash site. Thus, the eastern boundary of the buried valley aquifer that is portrayed on Figure 5 may extend farther eastward than depicted. Based on geologic and hydrologic factors discussed, it is reasonable to conclude that contaminant excursions or stormwater infiltration that might occur from the proposed car wash site would have to move less than 700 feet downgradient before reaching the Beaver Kill Aquifer, about 1,300 feet before reaching the Beaver Kill, and even less distance before reaching homeowner wells. Hydrologically, these are very short distances.

Based on HydroQuest's combined hydrogeologic and litigation experience from former work at the NYS Attorney General's Office (Environmental Protection Bureau), as well as in other contaminant transport cases, it is important to stress the importance of obtaining baseline water chemistry data from all nearby and downgradient potential contaminant receptor/homeowner wells. Should the Town determine that it is prudent to change existing aquifer protection regulations to allow car wash facilities, it would be judicious to conduct extensive chemical testing for all car wash-related chemicals listed above prior to startup of car washing operations. This testing should be conducted at all wells situated proximal to homes and businesses highlighted with teal-colored polygons on Figure 5. Due to unequal or anisotropic groundwater flow along

interconnected fractures, coupled with potential pumping induced flow inward to homeowner wells, water quality testing should include those home wells located south of the proposed car wash facility. As discussed above, contaminant transport within even small solution conduits within the Onondaga limestone can be extremely rapid.

### Source Water Protection

A true zero-discharge facility would be completely self-contained and would have no need for on-site treatment through sediment basins, bio-retention areas, and downward infiltration into an underlying aquifer. Instead, all of the site's waste stream would be collected and/or discharged into an engineered Town or Village municipal sewer system. **If, in fact, there were no risk to the waters of the State from site car wash operations, there would be no requirement for the project applicant to obtain a NYSDEC SPDES permit. This regulatory requirement alone provides evidence that well-intentioned wastewater reuse and containment is not considered sufficient to protect groundwaters of the State.**

The stated purpose and area of applicability of the Aquifer Protection Overlay District (Town of Saugerties Zoning Code, Article VI, General Regulations, § 245-25) is:

*“The Aquifer Protection Overlay District is established to preserve the quality and quantity of the Town's groundwater resources in order to ensure a safe and adequate water supply for present and future generations and to preserve groundwater resources currently in use and those aquifers having potential for a future use as a public water supply.”*

The NYS Department of Environmental Conservation and many others advocate source water protection as a viable means of protecting drinking water sources. **By creating the Aquifer Protection Overlay District, the Town of Saugerties established protection of water quality as a top priority.** It is essential to recognize that while the hydrogeologic concepts discussed and portrayed on maps in this report focus heavily on one particular potential contaminant source (a car wash facility), that the concepts, assessment of geologic factors, and hydrogeologic considerations should also be applied elsewhere throughout the Aquifer Protection Overlay District. As a Type 1 action, potential water quality degradation and related land use implications must be considered equally throughout the entire 7,000-acre Aquifer Protection Overlay District. This district is worthy of long-term protection and will, likely, one day markedly contribute to future use by the Town of Saugerties.

Spills, leaks, runoff or permitted infiltration of car wash contaminants into the underlying substrate would jeopardize the water quality of downgradient homeowner wells and the buried valley Beaver Kill Aquifer. From a hydrogeologic, contaminant risk, and natural resource protection perspective, approval of a zoning change to allow car washes in the General Business District and amendment of the Aquifer Protection Overlay District to remove motor vehicle washing, cleaning, and polishing facilities, or facilities for the self-service washing of motor vehicles (e.g., car washes) from the list of prohibited uses must acknowledge and accept a number of factors discussed in this report. **Key environmental factors may be summarized as follows:**

- The project is classified as a Type 1 action under SEQRA and may, if approved, ultimately result in adverse environmental impact to an area in excess of 7,000 acres;
- Numerous chemicals are associated with car washes, including hydrocarbons (e.g., benzene, toluene, xylene), toxic heavy metals, oil, grease, detergents, phosphates, and surfactants;
- The Onondaga limestone that underlies the project site is recognized for its karstic nature that includes solution conduits and caves that may rapidly transmit contaminants in a downgradient direction;
- Karst aquifers are the most vulnerable aquifers in the world (highly permeable);
- Groundwater contamination within the Onondaga limestone has occurred elsewhere in the Town of Saugerties;
- Both the Onondaga limestone and the land surface slope steeply to the west from the proposed project site;
- Any contaminants that infiltrate into the ground from trench drains, swales, level spreaders, sediment basins, bio-retention areas (as per Kaaterskill Associates Proposed Site Plan Drawing SP-4 - Drainage & Utility Plan), or from runoff would have a direct route downward into the underlying aquifer;
- The ability of any drainage infiltration basins or bio-retention areas to function under winter frozen ground conditions is questionable;
- Groundwater and any project contaminants will flow downgradient, predominantly to the west (Figure 5);
- Numerous homeowners drinking water wells are located within hundreds of feet of the proposed car wash facility;
- Pumping of homeowner wells will increase the likelihood of pulling car wash contaminants into them because pumping artificially increases the hydraulic gradient toward them;
- There is a high yield aquifer steeply downgradient of proposed car wash site;
- The high yield Beaver Kill Aquifer is within 700 feet of proposed car wash site;
- There is a steep hydraulic gradient between proposed project site and downgradient water resources;
- The Beaver Kill, a Class C fishing stream, is downgradient of the proposed car wash site (within 1,300 feet);
- The Aquifer Protection Overlay District was created to protect groundwater quality;
- The hydrogeologic issues under consideration for amending the Aquifer Protection Overlay District to remove car washes from the list of prohibited uses are likely the same issues that led to formation of the district (i.e., potential contamination of the valley bottom aquifer by mega-dump waste); and
- If the Aquifer Protection Overlay District is amended to no longer prohibit car wash facilities, it may serve as a precedent leading to relaxation of other currently prohibited land uses (e.g., gasoline service stations, junkyards).

## **Kaaterskill Associates' Recommendation**

Kaaterskill Associates prepared a Full Environmental Assessment Form (FEAF) Part 1 (Section F - Additional Resources) for Duncan Properties, LLC dated October 5, 2021 as part of the car wash application. This is, apparently, updated from an earlier version dated September 7, 2021. The important bolded section below did not appear in the September 7, 2021 FEAF, Part 1, Section F version. They state that:

*“The greatest potential impact from a car wash is associated with the discharge of industrial process wastewater. The New York State Department of Environmental Conservation (NYSDEC) does not allow the direct discharge of wastewater from car wash facilities to surface waters or ground waters without a being treated and permitted under a Private, Commercial & Institutional (P/C/I) Discharge of Treated Sanitary Sewage. Unless a car wash is proposed to be a zero-discharge facility, as is the case with the proposed car wash, or discharges to a municipal wastewater treatment facility, a treatment system and permit would be required for any future facility.”*

*“According to the New York State Department of Environmental Conservation “A Framework for Creating a Drinking Water Source Protection Program Plan” a carwash with a surface waters or ground waters discharge is identified as a Potential Contaminant Source. We would recommend any car wash with a surface waters or ground waters discharge remain prohibited.”* (Emphasis not added)

This an excellent and appropriate recommendation, particularly in light of the bulleted items above.

## **Conclusions and Discussion**

Application advancement without more detailed examination of the broader aquifer and watershed land use related implications would be premature. Furthermore, project advancement would conflict with Town regulations designed to protect the Beaver Kill Aquifer.

Evaluation of proposed changes in land use, especially to prohibited ones, that have the potential for adversely impacting aquifer water quality warrant full SEQRA review, regardless of whether review is for a small or large project area. The Beaver Kill Aquifer, situated within the Aquifer Protection Overlay District, is a largely untapped aquifer with a potential safe yield of several million gallons per day, or more. Hydrologic characterization conducted by NYRWA and HydroQuest document the high-risk vulnerability of the aquifer. If protected, it may one day be crucial for future growth in the Town of Saugerties. Considerable research, funding, and planning have gone into delineating the present boundary of the aquifer and its recharge or watershed area, as well as the production of maps and regulations designed to ensure its long-term protection.

Hydrogeologically, it would be wise to conduct additional aquifer characterization as detailed within this report. However, there is no immediate rush to refine aquifer characteristics, areal and vertical extent, or safe yield. This can wait. **What matters now, and what is in the best interest of the Town of Saugerties, is that no short-term actions be taken or approvals granted that might potentially jeopardize the long-term quality of the resource.**

**The proposed zoning change and proposed amendment to the Aquifer Protection Overlay District would potentially result in activities not protective of groundwater resources in the Aquifer Protection Overlay and General Business districts.** Any discharge of treated or untreated stormwater or process water, whether potentially via downward infiltration through swales, a trench drain, pretreatment sediment basins, overflow of bioretention areas on frozen ground, accidental excursion, or point source outflow poses a water quality risk to homeowners, the Beaver Kill Aquifer, and the Beaver Kill.

The proposed Denier car wash site is situated in a karst terrain composed of Onondaga limestone. Karst aquifers are the most vulnerable aquifers anywhere. Contaminants in karst aquifers can travel miles in hours versus groundwater flow rates in non-karstic (i.e., non-conduit or cave-bearing) aquifers of feet per day or less. **Any car wash site contaminants that infiltrate into or are discharged onto the ground surface at the project site will flow downgradient to the west within the recharge area of the Beaver Kill Aquifer.**

The Denier car wash application (2.1-acre area) should be reviewed within a broad watershed context in that land use and zoning amendments would be applicable to, and potentially impact, a regulated and protected aquifer protection area **extending over more than 7,000 acres** (based on calculation of the Aquifer Protection Overlay District area). Consideration of site plan approval, special use permits, and a NYSDEC SPDES permit should carefully weigh hydrologic studies and resource protection recommendations discussed in this report, as well as Beaver Kill Aquifer yield information also presented in this report. Question whether the approvals sought by Denier within a highly vulnerable, high risk, setting are warranted and whether they would reflect the best interest of the Town of Saugerties. There are other nearby potential project sites only a short distance away. Have the applicant consider alternate project locations outside the Aquifer Protection Overlay District.

The Planning Board should be wary of potentially establishing a land use precedent that may jeopardize the long-term future use of the Town's most valuable resource - water. Reference should be made to recommendations within the 2021 Comprehensive Plan update. One states:

*“Take full advantage of the State Environmental Quality Review Act and other impact analysis to obtain detailed information on the environmental and community impacts of proposed development, make potential concerns open to public comment, and explore alternatives to continue the project.”*

It is important to maintain the quality and integrity of water resources in the Aquifer Protection Overlay District. Long before NYRWA completed the Ground Water Protection Plan for the Town of Saugerties (2005), the Town of Saugerties and the Winston Farm Alliance worked together to protect the Beaver Kill Aquifer from contaminant inputs from a proposed mega-dump

at Site L. HydroQuest provided paid hydrogeologic expertise to both entities. Key factors instrumental in thwarting the mega-dump project in 1995 included the presence of the Onondaga limestone and its karst features in the aquifer recharge area, contaminant risk to the valley bottom aquifer, and protection of a high-yield aquifer that might one day serve as the cornerstone for future growth in the Town of Saugerties.

**These are the same factors that face the 2021 Planning Board relative to the Denier application, albeit much has been done since 1995 to codify and legally protect this same watershed area and its high-yield sand and gravel aquifer. It is likely that the environmental concerns stemming from the proposed mega-dump led to the development of today's Aquifer Protection Overlay District.**

### **Recommendations**

- Strictly endorse and adhere to NYRWA recommendations and Town of Saugerties Article VI General Regulations § 245-25. Aquifer Protection Overlay District, Section A that prohibit motor vehicle washing, cleaning, and polishing facilities, or facilities for the self-service washing of motor vehicles (e.g., car washes). The purpose and area of applicability states:  
*“The Aquifer Protection Overlay District is established to preserve the quality and quantity of the Town's groundwater resources in order to ensure a safe and adequate water supply for present and future generations and to preserve groundwater resources currently in use and those aquifers having potential for a future use as a public water supply.”*
- Do not approve the proposed zoning change and proposed amendment;
- Have the applicant consider alternate project locations outside the Aquifer Protection Overlay District;
- If the applicant requests that the Planning Board further consider the proposed zoning change and proposed amendment after project denial, require the applicant to take the “hard look” contemplated in SEQRA Type I actions and require preparation of an EIS, complete with scoping and public review. Zoning changes affecting 25 or more acres are Type I actions that may have a significant adverse impact on the environment. The proposed zoning change would affect more than 7,000 acres. Potential project related zoning changes and amendments to the large Aquifer Protection Overlay District should be considered within the broad scope of the entire potential impact area, its environmental resources, and the long-term best interest of the Town of Saugerties;
- Should project approval be given, conduct comprehensive water quality testing for all parameters listed in this report for all well/home locations depicted on Figure 5 well in advance of project construction; and
- Initiate planning to more fully characterize the Beaver Kill Aquifer and its safe yield.



## **Paul A. Rubin: Hydrogeologist Qualifications**

I am a hydrogeologist, professional geologist, hydrologist, and cartographer with forty years of professional experience. I earned a B.A. degree from the State University of New York at Albany in 1977 and an M.A. degree in geology with a specialty in hydrogeology from the State University of New York at New Paltz in May, 1983. I am a New York State licensed Professional Geologist. My professional experience includes work conducted for the New York State Attorney General's Office (Environmental Protection Bureau) and Oak Ridge National Laboratory (Environmental Sciences Division), and work as an environmental consultant as President of HydroQuest. I have extensive experience in surface and groundwater hydrology, including the assessment of groundwater flow, stream flow, runoff, watersheds, aquifers and water supply. This experience includes analyses for multiple reports, professional guidebook papers, affidavits, public presentations, trial exhibits, and expert testimony. As part of my work, I routinely review and interpret environmental reports, groundwater issues, surface water flow and flooding issues, aquifer analyses, aerial photography, and topographic maps.

I have extensive experience and many publications that focus on karst hydrology and related land use planning. This experience includes professional hydrogeologic work in and for the Town of Saugerties that was instrumental in thwarting use of Site L in the hamlet of Katsbaan for use as a regional landfill site around 1995 (Figure 1). Key reasons behind removing this site from consideration were the presence of vulnerable karst geology, protection of the high-yield confined sand and gravel aquifer present beneath the proposed landfill site, and protection of Beaver Kill water quality. The same concerns that applied to removing Site L from mega-dump consideration directly apply to the proposed car wash site - both locations now being within the Town of Saugerties' Aquifer Protection Overlay District. My educational background and professional experience are more fully set forth in my Curriculum Vitae which may viewed on my web page at: <http://www.hydroquest.com>.