MID-HUDSON GEOSCIENCES
1003 Route 44/55
P.O. Box 332
Clintondale, NY 12515-0332
Phone & FAX (845) 883-5866

rockdoctor@optonline.net

October 9, 2008

Mr. Willard Wilson, Chairman
Planning Board
Town of Deerpark
420 Route 209
PO Box 621
Huguenot, NY 12749-0621

RE: Review of DEIS for Basher Kill Subdivision at Deerpark, dated July 23, 2008

Dear Chairman Wilson and Planning Board Members,

Mid-Hudson Geosciences has been retained by Basha Kill Area Association to review the details of the above referenced project with respect to geologic, hydrogeologic, and water usage and disposal issues. The July 2008 DEIS has been reviewed carefully and found to be incomplete and erroneous in many ways. The omissions and errors are discussed below.

Review of Chapter VI. Unavoidable Adverse Impacts

In the first paragraph, the applicant states "none of these impacts would be significant." And the last paragraph, the statement is made: "Overall, as discussed in the DEIS, none of the unavoidable impacts are considered significant adverse impacts." It is not the applicant's place to decide if impacts are significant. The applicant is to conduct scientific studies and investigations to determine potential impacts and describe them in the DEIS and the FEIS. Then the applicant should provide descriptions of mitigation measures. The SEQRA lead agency is to decide if the impacts are significant and if mitigation will or will not be adequate. Based on this review of only two chapters of the DEIS, the applicant has made so many errors and omissions that the lead agency may not be able to assess the following potential unavoidable impacts were not identified, nor described in the DEIS:

- Removal of Groundwater from the Aquifer.
- Return of Wastewater to the Basha Kill.
- Degradation of Water Quality in wastewater systems and in stormwater.
- Loss of permeable landscape (reported as 27% of project).
- Potential Damage to Karst Bedrock Aquifer below.
- Disturbance of Slopes over 15% Grade.
- Blasting and Removal of 35,000 cubic yards of bedrock.
- Potential Impacts to Groundwater Quality from Upgradient Landfill.

Section III. F [Chapter III, Section F] Groundwater Resources

There is a discrepancy between the three-word title of Section F as "Ground Water Resources" on page III.F-1 and two-word title "Groundwater Resources" on the title page and successive page headings.

Existing Conditions a. Describe local hydrogeology aquifers and the local groundwater usage (page III.F-1).

A comma seems to be omitted between hydrogeology and aquifers, since they are both nouns and could be separate topics in the scoping document. The discussion under that section has nothing to do with hydrogeology, aquifers, or groundwater use. The paragraph may fit into a discussion of physiography, which belongs in Section E.

The next paragraph under the heading "Bedrock Geology" refers to a NYSDOT Geologic Map. This author, an expert in the sedimentary geology of New York, is not familiar with any geologic map of New York produced by the NYS Department of Transportation. The statement that Orange County is underlain by the Hudson Highlands Province is irrelevant to this project because it is not near the Hudson River, nor the associated Highlands. The bedrock at this site is certainly not "garnet, biotite, quartz, feldspar, gneiss, quartz-feldspar gneiss and calcsilicate rock from the Proterozoic age." Such rock types are igneous and metamorphic varieties and the bedrock at this site is sedimentary.

As mentioned in the next paragraph, sources from the New York State Geological Survey are appropriate for this site; however, the information in Table III.F.2-A entitled "On-Site Geology" is not correct. The top rock unit of the table identified with [map] symbol Dou is the Onondaga Limestone, which underlies the western edge of the site and the Basha Kill Floodplain. The middle box for the central area or high hills and steep slopes is actually the map symbol Dhg or Helderberg Group consisting of dolostone and limestone. For the third symbol "Srp" is found on the eastern edge of the site where the lake is located and east of the high hills to County Route 61. Those rocks are identified as Undifferentiated Silurian Rocks and specifically the Rondout Formation consisting of carbonates or limestone and dolostone. Clearly, whoever looked at the map and prepared the table had no knowledge of geologic maps and interpretation of them.

Proterozoic rocks are a more than 600 million years ago, whereas the rocks at this site are of Silurian age (440-400 million years ago) and Devonian age (400-350 million years ago).

Also at the top of page III.F-2, there is a statement "A copy of this map [referring to the NYSGS map or gis] is included in Appendix F. However, Figure 2 in Appendix F references the Orange County Water Authority, not the NYSGS.

Also the on-site geology topic should include information about overburden, that is unconsolidated sediments above the bedrock. Such deposition may be the result of glaciers, streams, lakes, or wind.

Next a statement that " A geophysical investigation was not performed for the site. This is recommended for all drilling targets identified in the fracture trace study and shall be preformed in the future if necessary." First of all, this comment refers to a task, which should be done after the Fracture Trace Study, which is not mentioned until the next paragraph. Second, if it is recommended for all drilling targets, it is done prior to drilling. So why bother to mention it now that at least one well has been drilled? And then state that it will be performed?

The next heading introduces a "Fracture Trace Study" as documented in Appendix F. The critical figures for such a study are supposedly shown as Figure 2 and 3. However, neither of those figures is legible. They are black blobs and cannot begin to be interpreted, nor reviewed. Without good figures to review, the report is useless.

The geologic map referred to as "OCWA Mapping" (on page III.F-3) shows lines, which are the contacts between geologic formations at the ground surface, but does not show the names of those formations for the areas between the lines. Also the report does not mention the presence and significance of the structural geologic situation of the bedrock layers or strata dipping to the west in this region.

A test well was drilled in September 2004 (page III.F-3). However, there is no driller's well log provided for the well. It is important to document the construction of the well and the material drilled, especially the grain size of sand and gravel. "A detail of this test well titled 'Figure 4—Well Profile' is contained in Appendix F." stated on page III.F-4. However, that well construction diagram does not specify depths for casing and says "sand" aquifer, whereas the text says "sand and gravel."

A pumping test at a rate of 347 gpm was reported to have been conducted for 24 hours with a maximum drawdown of 2.2 feet from the static water table of 9.5 feet below grade. However, other details of the testing procedure were not given and the following questions arise about how the test was conducted:

- How was the specific capacity of 155 gpm/ft calculated from pumping test data?
- What was done with the pumped water?
- How was the pumped water isolated from the unconsolidated aquifer?
- Where is the recovery data showing the recovery of the water table over the following 24 hours after the pump was shut off.
- How does the static water table in the well compare with the static water level of the Basha Kill?
- What is the distance of the well from the Basha Kill?
- What is the distance of the well from the floodplain associated with the Basha Kill?
- Does the well draw water from the waters of the Basha Kill stream by infiltration?
- Or does the water come strictly from the unconsolidated sediments?
- Is the aquifer a confined or unconfined aquifer?
- At the end of pumping and recovery, was there any difference in static water table?
- Is the applicant aware that a permit for taking water from the Basha Kill aquifer or stream

requires a permit from the Delaware River Basin Commission?

For a public water supply application, at least two wells will be needed to demonstrate that the second or more wells will be needed to provide the project needs when one or more wells is out of service. The yield of 347 gpm may be bogus because of recirculation of water to the aquifer depending on how the pumped water was isolated from the aquifer. Based on the maximum drawdown of only 2 to 3 feet below grade during pumping, the cone of depression or area of influence of the pumping well is most likely a very broad area, perhaps a few thousand feet in diameter.

Existing Conditions b. Describe present uses and level of use of groundwater including location of existing local wells, and any public water supply or industrial uses (page III.F-5).

Observation wells will be needed to record drawdown effects at distances from one hundred to three hundred to 2000 feet from the pumping well(s). Water levels in the two wells supplying Deepark Manor will need to be monitored during future pumping tests for a public water supply application. Those wells are considered within the vicinity of this project, contrary to the statement that "There are no public water supply systems in the vicinity of this project." (page III.F-7) The interference of all water supply wells must be determined because the cones of depression most likely will intersect, so two wells capable of 350 gpm independently will most likely will not be capable of 700 gpm total. Given the uncertainty of the results of the pumping test, the planning board and the applicant may both want to install additional wells and conduct testing before site plan approval to verify the location, interference, and yield of wells.

Existing Conditions c. Complete a recharge analysis of the local aquifer, including the site and overall drainage basin (page III.F-7).

On pages III.F-7 and –8, a Recharge Analysis is described. The 40 to 50 percent of annual precipitation that is used for groundwater recharge by infiltration is much too high. A rate of 20 percent is probably more accurate according to the USGS. Steep slopes and bedrock outcrops have a tendency to reduce infiltration and increase sheet runoff. The estimate of 160,000 gpd under drought conditions is too close to the project needs of 131,890 gpd to assure a constant supply of recharge equivalent or greater to the project needs. Also on page III.E-21, the area of impermeable surfaces is given as 176 acres. How would that huge area effect the groundwater recharge estimate?

Existing Conditions d. Describe well pump test protocol per Orange County Health Department requirements (page III.F-7).

Using 10 pages (pages III.F-9 to III.F-18) to reiterate the Orange County Health Department and NYSDEC protocol for pumping tests is a waste of trees for paper. If you must include the regulations, use quotes and single space. This directive in the scoping document does not mean to copy the protocols, but it means to describe the testing that will be conducted in site

wells to characterize site- specific conditions and local aquifer conditions. In other words, tell what specific actions will be taken to conduct pumping tests to estimate safe yield of the wells producing form the local unconfined aquifer. Are there any existing wells, which can be used as observation wells during pumping tests? Will any new observation wells or piezometers be drilled for monitoring? Are there monitoring wells at the nearby landfill, which can be monitored? How often will depth to water be measured in pumping and observation wells? Will state of the art electronic water level measuring and recording transducers will used? How long will water levels be monitored prior to and after the pumping part of the test and the recovery part of the test. What will be done with pumped water to isolate it from the aquifer? How will the water levels be monitored in the onsite streams and the lake and in the Basha Kill? In other words, go through the protocols step by step and describe how they relate to the wells that will be drilled and tested at the Basher Kill Subdivision site. How will the testing be unique to the site and specific hydrogeologic conditions.

Additional Potential Impacts Not Identified from Existing Groundwater Conditions. Karst Terrain.

Also the site is located in an area of carbonate bedrock. Carbonate rocks are soluble in water and especially soluble in acid rainwater. Karst conditions often exist in carbonate rocks and have been identified in various part of the Sandberg Creek farther north and the Minisink drainage basin as well. Karst features include dissolved openings from the size of fractures to caves. Such openings in bedrock allow water to travel very quickly through the voids and can spread contamination very quickly from a spill or release. For that reason, it is very important to properly characterize the nature of and groundwater beneath this site.

Additional Potential Impacts Not Identified from Existing Groundwater Conditions. Town of Deerpark Inactive Landfill.

Another hydrogeologic concern is the upgradient former Town of Deerpark Landfill. It is important to ascertain if any contaminants reside in the groundwater at the landfill and if they could be flowing onto the subject site. Pumping of new water wells for the subdivision may move any potential contaminants more quickly downgradient through unconsolidated sediments. Alternatively, depending on the bedrock configuration and the potential presence of karst features, contaminants could be introduced into waters in the bedrock upgradient and move downgradient and emerge into unconsolidated sediments under the site. To characterize those potential hazards, a thorough hydrogeologic study must be conducted.

Potential Impacts: a. Describe loss of recharge area based on hydrogeologic study, which includes calculations of pre- and post-construction changes in groundwater recharge (page III.F-18).

This section discusses stormwater runoff and does not address provide a comparison of impervious surfaces before and after construction and the effect of increased impervious surface on decreased areas of surface water infiltration to recharge groundwater. It does not

address how permeability may be changed in specific areas, either reduced or increased with site construction and the associated effect on total site recharge.

Potential Impacts. b. Identify the project's water supply requirements and it's effect on neighboring wells (page III.F-19).

This section at a bare minimum provides an estimate of water supply requirements but does not address either positive or negative potential impacts on neighboring wells.

Potential Impacts. c. Identify herbicides and pesticides to be used in this project (page III.F-19).

This section refers the reader to section III.D. Upon looking through that section, on page III.D-23, under heading m. the following list of herbicides and pesticides is given: 2,4-D, DiCamba, MCPP, Malathion, and Permethrin. All of those chemicals are found to have deleterious effects on wildlife, humans, and plants. Mitigation measures should be proposed to not use any of them***.***

Also, will any chemicals be used to deal with scale (hardness) or corrosion in pipes, pumps, or tanks in the water supply system? Will any chlorination, fluorination or other water treatment be used?

Section III.E [Chapter III, Section E] Geology, Soils and Topography

Somehow the title of this section was listed as "Geology, Soils and Topography" on the title page of the section, but on subsequent pages it is shown as "Geography, Soils, and Topography." Perhaps that is why, no geologic information is provided in the section. And a "physiography" discussion in the groundwater section could loosely be considered geography. Also there is no discussion of topography as it relates to the proposed site plan.

Existing Conditions a. Identification of physiographic and geologic conditions, depth to bedrock and include large rock outcrops (page III.E-1).

Nothing is mentioned of physiographic conditions (until next section).
Geologic conditions refers to Appendix E, which I think is really in Appendix F.
With respect to Bedrock, the geologic discussion is actually in Section III.F.
A very brief discussion of overburden or glacial geology is provided on page III.E-2.
The depth to bedrock refers to Table III.E-3 (page III,E-17), which is labeled "Soil Characteristics" and tells us that bedrock is between 10 and 20 inches for some soils and greater than 60 inches for other soils. That section does not refer the reader to the test pits on Exhibit III.E-3, where soil descriptions and depth to refusal or bedrock might be found from test pits dug on the site.

Existing Conditions b. Slope Analysis: Including a Map (page III.E-1)

Reference to a Topographic map would be most helpful here. As mentioned above, a topographic map was found in the Site Plans. There are topographic contours on Exhibit III.E-3, but they are not labeled and no contour interval is given.

Table III.E-1 (page III.E-1) is referred to with the comments:
"The majority of the site has slopes less than 15%."
"The slopes on the balance of the site are fairly evenly distributed."
What could that last statement mean? That the steep slopes are all over the site, rendering it unbuildable?
No mention or map of large outcrop areas is given. Where are the outcrops on the site?

"Site slopes are also depicted in Exhibit III.E-1."
Are they shown somewhere else?
Exhibit III.E-1 is a disaster of a depiction. Because an air photo was used as the base of the exhibit, the colors shown on the legend are altered on the map and one cannot determine where any class of slope is located. A fine job in obfuscation or an author not looking at their work before publication. The slopes should be colored in on the topographic map on white paper such as used in Exhibit III.E-3 Test Pit Location Map. Also two yellow colors are used in the legend and that will surely lead to difficulty in distinguishing the 10-15 % from the 15-25% slopes. Select another color for the light yellow. No source is given for it on Exhibit III.E-3.

Existing Conditions c. Description of soil types… (page III.E-2)

The Soil Type Map (Exhibit III.E-2) has the same color problem that the slopes map has because the colors are superimposed on an air photo. Again the areas on Exhibit III.E-3 should be colored and labeled. The actual soil name should be given next to the two- or three-letter abbreviation. The same set of letters can refer to a different soil in other counties, so it is confusing to show only the abbreviations.

Table III.E-2 Soil Types (page III.E-3)
Table should be renamed "Soil Type Areas and Zoning Classification."
Use the actual soil names with the abbreviations (as mentioned above).
Define RR and HM-U
Define SBLs.
Define Hydrologic Groups A, B, C, D
What units are the numbers in the boxes? Use a standard abbreviation.

Devoting 13 pages (pages III.E-3 to III.E-17) to duplicate soil descriptions from the Orange County Survey is a waste of trees. If you must quote, use single spacing and quotation marks.

A map showing permeability by soil type would be much more useful than the exhibit provided, especially for estimating groundwater recharge over the site.

A discussion of soil type and its characteristics and compatibility with respect to proposed features on the site plan would be useful rather than regurgitating the Orange County Soil Survey. A discussion of erosion potential and drainage characteristics (given in Table III.E-3) would also be useful.

Potential Impacts a. Impacts on Physiographic and Geologic Conditions. Identify areas of potential blasting (page III.E-18).

With respect to blasting, Exhibit III.E-4 is provided. That map would be much more useful if provided on a topographic map, so one can see the slopes and elevations relative to the blasting locations. Also if an outcrop map were provided, it could be used in conjunction with the topographic map to access areas of bedrock blasting.

Actually where blasting will occur is confusing because of two seemingly conflicting statements: "In excess of four feet" and "less than 8 feet" are referenced on page III.E-8.

"Approximately 35,000 cubic yards of rock would be removed."
What will be done with this rock rubble?

Potential Impacts b. Changes in topography, including acreage of soil disturbance and a conceptual clearing and grading plan (page III.E-19).

What impact will grading have on the permeability of the surface materials? How will the loss of trees and existing vegetation impact the vertical infiltration or permeability? How will changes in permeability affect the estimated site recharge to groundwater?

Potential Impacts c. Identify disturbance to slopes over 15% including a map (page III.E-20).

Statement reads: "Exhibit II-4 shows the proposed limit of disturbance as compared to slopes in excess of 15%"
The referenced exhibit is the Composite [Site] Plan and it does not show any slopes over 15% or any other description, although Table II-E91 indicates that over 40% of the site meets that criteria of over 15%

Potential Impacts. e. Impacts on poorly drained soils, erosion-prone soils, and shallow bedrock (page III.E-20).

Those soils and bedrock may have a significant impact on groundwater recharge, which has not been evaluated. If fill is introduced over poorly drained soils, it could easily lead to downslope emergence of shallow groundwater. Similar conditions can arise if water is introduced into soil or overburden above shallow bedrock when the easiest path of flow is downslope and out onto the surface.

Potential Impacts f. Propose acreage of impervious surfaces for full build-out of site

(page III-E.21)

Statement: "At full build-out, the Project will contain approximately 176 acres of impervious surface, representing roughly 27% of the total project area of 636 acres. (page III.E-21) Given that Table III.E-1 shows that 382 acres of 0-15% slopes, that is buildable area; having 46% of the site [176 acres /382 acres] is unacceptable. This town is not an urban setting. How does that factor effect the site-wide groundwater recharge calculation?

Potential Impacts h. Suitability of on-site soils for subsurface disposal of Waste Water Treatment Plant effluent (page III.E-22).

Statement reads: "The discharge from the proposed WWTP would be designed as a surface discharge into the Basher Kill River. Although the onsite soil characteristics are adequate to support a subsurface disposal system, this is not the most environmentally sound alternative." The confusion of the word "this" instead of "that" casts doubt on the meaning of the second sentence. Where is there evidence to support the statement that the soils could support a SSDS? Why would discharge to the Basha Kill be better than subsurface disposal? Show a map of the of acceptable percolation and septic soils from Orange County Soil Survey.

If NYSDEC does not issue a SPDES permit, what would be the alternative?

General Comments about the DEIS

The document is poorly written and organized. Too little information is provided in the Chapter III sections with references to the Appendices. At a minimum, summaries of important observations, fieldwork, and conclusions of appendices should be incorporated into the chapters of the main document.

The Tables are incorporated into the text of the chapters, which is handy to find right away. However, the titles of tables are sketchy and sometimes misleading. Sources of information, dates, and units of measurement are not included. Each Table title should define what the data is and where it comes from. Notes at the bottom can be used to define items in the table or abbreviations.

The Exhibits are confusing because some are 11x17 inches in the document and others are D-size (24x36 inches) folded in a pocket. The numbers are not sequential. The exhibits in the text should be called "Figures" and the folded maps or plans, called "Plates" or "Sheets." Indices of Tables, Figures, and Plates should appear in the Table of Contents. The big sheets should be at the same scale, so one can overlay the topography with the wetlands or blasting areas or site plan or soils or whatever is of interest. A D-size topographic map should be provided with contour lines labeled. After public testimony of September 10, such as map was found in the large sheets of the Site Plan. The soils and slopes map should be colored on exhibit IIIE3.

Tick marks, single for inches and double for feet [‘ and “] should not be used for units of measurements because they are blurred when copies are reduced or printed. In fact all units of measurements should be written out or standard abbreviations used. For instance, “SF” is not a standard abbreviation for square feet. However, sq-ft, sq ft, sqft and ft^2 are all acceptable.

Plans and maps should have legends for coloring and stippling and patterns. On the Composite Site Plan (Exhibit II-4), the wetlands do not have NYSDEC identifications numbers. Does the existing lake have a name? What elevation is the lake surface? Where is the existing well? Or wells?

Important information requested in the Scoping Document should not be omitted or obfuscated. Also the actual information and a discussion as it relates to the subdivision plans are needed, not just a reiteration of the soil survey descriptions or the NYSDEC pumping test protocols. Specific information as it relates to the site should be included in a topic such as defining future pumping tests. Or information about the soils as they relate to the proposed development.

Yours truly,

Katherine J. Beinkafner, Ph.D.
Certified Professional Geologist #6611