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March 28, 2007

Mr. David Bjorklund, P.E.
Spath Bjorklund Associates, Inc.
P. O. Box 324
Monroe, CT 06468

RE: Aquifer Impact Assessment
Proposed Newtown Technology Park
Commerce Road, Newtown, Connecticut
Newtown Aquifer Protection District

Dear Mr. Bjorklund:

As requested, Leggette, Brashears & Graham, Inc. (LBG) has completed an Aquifer Impact Assessment of the proposal by the Town of Newtown to develop a 10-lot light-industrial park off Commerce Road in Newtown, Connecticut. The proposed development, known as Newtown Technology Park, has no specific tenants or types of light-industrial users at this time. However, the property is adjacent to similar land uses to the north, off Commerce Road, and would be accessed from Commerce Road. The property is a relatively small part of the property formerly known as Fairfield Hills Hospital, and lies just to the east of the boundary of Newtown Borough, which in the local area coincides with the railroad tracks on the westerly side of the site.

This assessment is required because part of the site lies within the Newtown Aquifer Protection District, Section 4.04 of the Newtown Zoning Regulations. The western part of the site is mapped as a Secondary Recharge Area, whereas the eastern part of the site is mapped as a Primary Recharge Area. This designation is discussed below.

This report is based on a site walk and "windshield tour" of the surrounding area, review of site-specific data and plans provided by Spath Bjorklund Associates, Inc. (SBA), review of pertinent published hydrogeologic maps and reports, and similar data from LBG project files.

In contrast with most Aquifer Impact Assessments that deal with site-specific development plans for a specific use, this Assessment analyzes the potential overall impacts of this type of development and identifies the key issues that future lot owners will have to address in their site development plans to comply with the provisions of Section 4.04. It is noted that SBA reports that the "Layout Plan" (2-20-07) represents maximum site build-out under the Newtown Zoning regulations.

1.0 Proposed Development

The overall property consists of approximately 76.5 acres that is proposed to be divided into ten lots for light-industrial development. Currently, 42 percent of the site is mowed for hay and the remaining 58 percent is wooded. The proposed development lots range in size from 2.34 to 6.47 acres, for a total of 37.80 acres of industrial lots, 4.0 acres of roads, and approximately 34.91 acres of open space are planned, mainly along a wide corridor adjacent to Deep Brook (Layout Plan). The Layout Plan is subject to change by individual buyers of industrial sites, but has been designed for the maximum development of the site to assure that storm-water facilities and other infrastructure will be properly sized, such that further extensive review and approvals will not be required for less intensive site plans.

The conceptual Layout Plan envisions buildings ranging in size from 8,050 sf (square feet) to 60,000 sf in one-story and two-story configurations. The site would be accessed from its northwest corner by reconstructing the present right-angle curve of Commerce Road into a tee-intersection, and the interior roadway would consist of two roadways ending in cul-de-sacs. Appropriate parking areas for the envisioned buildings are shown on the Display Map.

The proposed Newtown Technology Park would be served by public water and public sanitary sewers. The source of the public water supply has yet to be determined, and might come from the town-operated Fairfield Hills system coming in beneath the bridge over Deep Brook, or from an extension of the United Water Company main on Commerce Drive.

2.0 Hydrogeologic Setting

The site is bounded by Commerce Road on its northwesterly corner, by the rear property lines of commercial properties along the southerly side of Commerce Road to the northeast, by Deep Brook along its entire easterly and southeasterly boundary, and by a railroad right-of-way and tracks along its westerly boundary.

A large municipal sewage treatment plant lies off the northeast corner of the property and westerly of Deep Brook. Three unnamed intermittent tributaries of Deep Brook enter the site along its westerly boundary with the railroad track and traverse across the site, with associated floodplain wetland areas, cross the proposed open space area, and join Deep Brook. Of these three tributaries, the most northerly appears to be less intermittent than the other two, and is mapped by the USGS, erroneously in our view, as a perennial stream. Deep Brook joins the Pootatuck River about 500 feet upstream of the cul-de-sac end of Commerce Road. A trunk sewer main traverses the site essentially in a generally south to north direction to the sewage treatment plant. Former sludge-drying beds are shown on the available topographic maps, but these were abandoned and removed in the recent past.

The topography of the property slopes downward from a high elevation of approximately 385 feet above sea level along the northwestern boundary of the site with the railroad property, in a generally fan-shaped pattern toward Deep Brook. The low elevations occur where the three water courses leave the property to flow into Deep Brook, with the lowest elevation being about 256 feet along the northernmost water course, to the rear of the sewage treatment plant building.

The surficial geology of the site consists of glacial till soils over bedrock in the western 80 percent of the site, and glacial outwash soils in the valley of Deep Brook. According to Haeni (1978), the glacial outwash aquifer is thin on the eastern side of the property, with the main and thick aquifer zone about 2,200 feet to the east-southeast.

The upland soils on the site are mapped by the Soil Conservation Service as belonging to the Charlton, Paxton and Woodbridge series soils, and the associated upland wetland as Ridgebury series soils, all of which are derived from glacial till. The soils in the aquifer area associated with Deep Brook and the Pootatuck River are mapped as belonging to the Hinkley series, glacial outwash soils, or as Saco or Scarboro series soils of alluvial origin which commonly overlie outwash deposits (Wolf, 1981).

Bedrock beneath the surficial sediments is known as the Brookfield Gneiss, a light to dark, medium to coarse grained dioritic gneiss (Rodgers, 1985), previously known as the Newtown Gneiss (Stanley & Caldwell, 1976). Locally, the foliation in the gneiss dips to the west-northwest at about 45 degrees.

Ground-water recharge on the surface of the Pootatuck River Aquifer has been estimated by ground-water flow modeling as about 25 inches annually (Haeni, 1978). This figure varies from year to year depending on the quantity and frequency of precipitation. Some of that recharge comes from runoff from the till-covered uplands that infiltrates into the more pervious soils over the aquifer and a large fraction comes from direct infiltration of precipitation that falls on the relatively flat valley-floor soils.

3.0 Aquifer Protection District Mapping

The Newtown Aquifer Protection District (APD) map was initially prepared by Cahn Engineering, Inc. and was based on mapping by the U. S. Geological Survey (USGS). The APD map became effective on June 27, 1959, and was most recently amended to July 1976. Subsequently, the USGS performed a study titled "Computer Modeling of Ground-Water Availability in the Pootatuck River Valley, Newtown, Connecticut" (Haeni, 1978), which includes mapping of the Pootatuck River aquifer boundaries. Over the course of many Aquifer Impact Assessments, LBG has noted flaws in the APD mapping that were not particularly important.

With respect to the site of the proposed Newtown Technology Park, the APD map is egregiously different from the USGS mapping by Haeni. For reasons LBG is unable to fathom in this geologic setting, the APD map shows a "tongue" of aquifer, of both primary and secondary recharge areas, extending westward from the Deep Brook section of the Pootatuck River aquifer to west of the railroad and into the squared circle end of Grand Place. Most of this area is mapped, correctly in LBG's viewpoint, as glacial till uplands by Haeni, and this mapping is further supported by the Fairfield County Soil Survey (Wolf, 1981) and by the "Surficial Materials Map of Connecticut" (Stone et al., 1992).

It is further noted that the Primary and Secondary Recharge Areas are essentially archaic terms under the Model Municipal Regulations, Aquifer Protection Areas, promulgated by the Connecticut Department of Environmental Protection (CTDEP), effective June 1, 2005. It is understood that the Town of Newtown has contracted with the USGS to perform Level A aquifer

mapping of the Pootatuck River, and that the USGS assignment has been enlarged to include the United Water Company well field on the east side of Route 25, opposite the Sand Hill Plaza shopping center. When the Level A mapping is completed and accepted by the CTDEP, the Town of Newtown will be notified by the CTDEP to adopt the Model Municipal Regulations for Aquifer Protection Areas.

Nevertheless, in LBG's opinion, the entire site should be treated as within the Aquifer Protection District, as part of the site, the eastern 5 to 10 percent, lies on the western edge of the Pootatuck River aquifer, and the remaining 90 to 95 percent of the site drains directly to this aquifer area, including both surface-water runoff and ground-water flow.

4.0 Hydrologic Budget

The pre-development condition of the site comprises hayfields and wooded land sloping downward, or generally easterly to southeasterly, toward Deep Brook. Deep Brook lies just beyond the downhill property boundary and is considered a valuable cold water fishery and spawning stream, as well as being underlain by the Pootatuck River aquifer.

The site receives an average of 48 inches of precipitation annually, with a historic range of 33 to 72 inches per year. Of that average precipitation, nearly half, or about 22 inches, is returned to the atmosphere as evapotranspiration (Haeni, 1978) – evaporation from wet surfaces and transpiration from the photosynthesis growth process of vegetation.

The remainder of the average annual precipitation, about 26 inches annually, is combined surface-water runoff and ground-water runoff. For areas underlain by the stratified drift aquifer of the Pootatuck River valley, including Deep Brook, the ground-water runoff, also known as ground-water recharge, is about 95 percent of the total runoff, or about 25 inches (ibid.). For areas underlain by glacial till, the ground-water runoff is about 34 percent of the total runoff, or about 9 inches (ibid.). In other words, in a year of average precipitation, about 66 percent of the precipitation on the upland slopes, or about 17 inches, becomes surface water runoff that enters Deep Brook and discharges through the Pootatuck River system. It should also be noted that the rates of ground-water runoff, or recharge, on the upland till vary to relatively small degrees in wet or dry years, whereas the rates of surface-water runoff vary markedly in wet or dry years.

It is LBG's best interpretation of the geology of the property that all of the proposed light-industrial lots, with the possible exception of the extreme east side of proposed Lot 9, are underlain by glacial till soils. On that basis, these lots generate an average annual ground-water recharge of about 1.20 million cubic feet per year, or 9.00 million gallons per year. The proposed open space areas, which are all contiguous, contribute 1.29 million cubic feet or 9.64 million gallons per year. Thus, the entire site contributes about 2.49 million cubic feet per year, or 18.64 million gallons of ground-water runoff to Deep Brook and the Pootatuck River system. With the possible exception of the extreme east side of Lot 9, the individual lots have no characteristics that would permit a lot-specific hydrologic budget to be calculated; i.e., the ground-water recharge of each lot can be estimated by multiplying the lot area by 9 inches and applying the appropriate factors for the units desired.

If that ground-water flow were evenly distributed throughout the year, it would represent about 51,000 gpd (gallons per day). Ground-water flow is greater in the spring and smaller in the fall, so the seasonal range of ground-water flow from the site probably ranges from about 70,000 gpd to 35,000 gpd.

For Lot 9, the small sliver of stratified drift along its easterly edge represents about 0.15 to 0.30 acre and has the potential to increase the average ground-water runoff from this lot to a weighted average of 9.8 to 10.5 inches annually, or a total of about 113,000 to 122,000 cubic feet per year, or 0.845 to 0.913 million gallons per year, for this 3.20-acre parcel. On a full-year basis, these flow rates average 310 to 334 gpd, not materially different from the 286 gpd if this lot were considered as fully underlain by stratified drift.

The proposed development of 10 light-industrial lots will add impervious surfaces consisting of roofs, access drives, parking areas and walkways to each lot. SBA reports that the Layout Plan (2-20-07) represents both maximum build-out, as well as drainage systems to meet the Newtown regulations. The drainage system has been designed to capture, hold and infiltrate the first inch of runoff from each storm. Depending on where you are in Connecticut, 80 to 85 percent of storms consist of one inch or less of rainfall and, of course, it is the initial rainfall that generates first-flush runoff that requires treatment. Therefore, if any site plan represents less intense development of the lot, and particularly, smaller impervious surfaces, the site development plans will be within the conceptual Layout Plan developed by SBA.

The use of ground water derived from the Pootatuck aquifer, from either the Fairfield Hills supply or from United Water Company, can only be regarded as speculative until specific lot uses are identified. Consistent with the concept of a likely maximum but reasonable use of the site, LBG has assumed that there will be one employee per 300 square feet of building space, and that half of the space will be occupied only in normal business hours and half of the buildings will be 3-shift light industrial uses. This conservative assumption suggests a possible work-day population of about 1,280 persons. This calculation also works well with the SBA assumption of 1.1 persons per parking space.

For offices and light-industrial uses, the maximum day per-capita water use is generally considered to be between 10 and 25 gpd (Connecticut Public Health Code, Section 19-13-B103-IV), depending on the type of facility, but facility-specific uses can vary widely. These numbers include a 50-percent safety factor, so the average day usage is generally on the order of 6.7 to 16.7 gallons per day per capita. Using the upper maximum-day value, the estimated maximum daily water use of the full development would be on the order of 32,000 gpd. According to Haeni (1978), the Pootatuck River Valley aquifer has a yield potential of about 4.0 million gpd; thus, the estimated maximum-day water use of the proposed Newtown Technology Park would likely be about eight-tenths of one percent of the yield potential of the aquifer system or less.

5.0 Compliance with Newtown Aquifer Protection District Regulations

Section 4.04.610 of the Newtown Aquifer Protection District regulations lists the requirements for an Aquifer Impact Assessment/Review. These are discussed in order below.

5.1.1 Sections 4.04.200 and 4.04.300 detail permitted uses and prohibited uses, respectively. The proposed uses are not permitted uses and it is understood that prohibited uses are not contemplated, but rather the proposed uses are covered by Section 4.04.400 Uses and Activities Requiring a Special Exception.

5.1.2 Section 4.04.500 describes the procedure to be followed when an application requires a Special Exception, and Sections 4.04.600 and 4.04.610 outline the Aquifer Impact Assessment and the Requirements for same.

5.1.3 LBG offers the following comments and recommendations regarding the numbered Requirements under Section 4.04.610.

1. Each applicant for use of a lot to be purchased from the Town of Newtown within the Newtown Technology Park must file a written document concerning the environmental impact of the proposed activity on the aquifer, including how the subject property site plans comply with this Aquifer Impact Assessment of the Layout Plan for the Newtown Technology Park, and to the extent that the proposed site plans differ from the Layout Plan, how the differences have been resolved to equal or exceed the environmental protections to the aquifer provided by the Layout Plan. The document should identify how the site plan for the individual lot complies with the Lot Development Criteria of the Stormwater Management Plan.

2. The language of Item 2 is clear, but LBG recommends that disposal of hazardous materials on the property should be prohibited.

3. The language of Item 3 is similarly clear, but LBG recommends that site plans require detail about the legal offsite disposal of hazardous material.

4. Item 4 is a simple mapping requirement that is irrelevant at present, because there are no public water supply wells within 1,000 feet of the property. But this requirement could become relevant if new public water supply wells are developed in the nearby part of the Pootatuck River aquifer.

5. Item 5 is a simple requirement for any site development plan.

6. It is presumed that action on the approval of the Newtown Technology Park will constitute approval of public sanitary sewers and water supply to the individual lots.

7. There will be no onsite septic systems.

8. The applicants will be required to submit a pre- and post-development hydrologic budgets that quantify the natural and man-induced sources of recharge (onsite withdrawals are not contemplated with public water supply provided). This exercise will mainly deal with pre- and post-development storm-water management. The primary goal of such water budget assessments should be no increase in the proportion of surface water runoff as compared to ground water recharge as a result of storm-water management systems.

9. With public water supply and public sewers provided, there should be no discharges or withdrawals associated with the Newtown Technology Park, with the exception of the incremental increases in treated sewage effluent from the Newtown sewage treatment plant, which occur downstream of Deep Brook along the Pootatuck River.

10. The developer of each lot will be required to file a stormwater management plan that is consistent with the plan developed by SBA for the Newtown Technology Park. Such plans should also be consistent with the "2004 Connecticut Stormwater Quality Manual" (Connecticut Department of Environmental Protection, 2004), and each such plan should include a "treatment train" approach including at least one Primary Stormwater Treatment Practice. Such practices may include, but are not necessarily limited to, those practices identified in Chapter 6 of the 2004 Connecticut Stormwater Quality Manual. The use of onsite infiltration measures, as well as the proposed detention/infiltration basin, will be beneficial for mitigation of thermal impacts of initial runoff from sunlight-heated impervious surfaces during the summer season. The onsite ground water represents a slow-moving heat sink with an average ground-water temperature in the range of 48^{o} to 50^{o} F.

11. The need for emergency plans and their scope if needed will depend on each proposed use.

I shall be pleased to respond to questions or comments.

Very truly yours,

LEGGETTE, BRASHEARS & GRAHAM, INC.

R. G. Slayback, CPG, LEP
Principal

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Qualifications

Founded in 1944, LBG was the first consulting firm in the nation to specialize in hydrogeology, and now operates 17 offices in 13 states from our new headquarters in Shelton. For the past 25 years, the firm has also offered services in environmental engineering to complement our hydrogeologic projects. The firm has performed previous Aquifer Impact Assessments in Newtown and other communities, and has assisted several towns with the development of Aquifer Protection District regulations.

The writer is a geologist by education, B. S., Rensselaer Polytechnic Institute, and a hydrogeologist by more than 40 years of work experience. I am a licensed professional geologist in several jurisdictions that offer such licensure (Connecticut does not) and am a Licensed Environmental Professional (LEP) in Connecticut. In 1995 the governor appointed me to the initial Board of Examiners of Environmental Professionals, and since 1996 I have served as secretary of that licensing board. I have completed several Aquifer Impact Assessments in Newtown and other Connecticut and New York communities.