

## **Opinion of Thomas P. Ballestero in the Matter of the Spruce Hole Formation.**

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The Town of Durham shares water supply and service with the University of New Hampshire. In the early 1900's Town and university populations were less than 1/10<sup>th</sup> of what they are today, and the water supply that served this system for decades was the Old Town Reservoir, located behind the UNH equestrian complexes on Main Street. The Old Town Reservoir was created by a small dam, and the impoundment was fed by a one square mile area watershed. From 1920 to 1940, the Town and university populations increased rapidly, and the Old Town Reservoir was no longer capable of supplying the increased demand. So the water supply source switched to the Oyster River, who's 12 square miles of watershed seemed more than abundant for the needs of the people. However after World War II, population continued to skyrocket to a level over five times of what it was at the beginning of the century. So within 2 decades of moving to the new, abundant water supply, it became clear that in the drier years, the Oyster River supply was inadequate to meet the needs of the water customers. The old Wiswall Dam and reservoir on the Lamprey River seemed to be a nearby source that would be more than adequate to make up the deficiency of the Oyster River flows. The Lamprey River has over 170 square miles of watershed upstream of Wiswall Dam plus upstream there are some larger impoundments that assist with flood control, recreation, and low flow control. To secure the Lamprey River water supply, a pipeline was constructed from the Lamprey River, through the Spruce Hole Formation, and to the Oyster River. (More recently, this pipeline was plumbed right into the water treatment plant). As growth continued to the end of the 1900's, which included land developments west of Town, wells were installed in the sand and gravel deposits next to the Oyster River, and this water served the western portion of the water distribution network.

So by the end of the last century, Town and university populations grew by 10-fold, the old water supply was abandoned, and three new water supplies were developed and added. As the century came to an end however, the reality proved that in roughly one third of the years, during the August-September low flow period, the wells and the Oyster River were insufficient to meet system demand. The Lamprey River is necessary to make up this difference. But guess what, independent of any other demands, these sources will not suffice long into the future. Although the rate of population growth has decreased since the start of this millennium, Town and university populations continue to increase.

Now some stark realities: neither the Oyster River nor the Lamprey River is entirely in Durham. In fact, Durham is downstream from most Towns in the watershed. The populations of the upstream towns are also increasing (some of the fastest growing in the state at the moment), and they will soon start to place their own demands on these same rivers. Given our current water law, Durham has no senior right to the water in these rivers. In addition, topography is not a barrier: just as Durham uses transbasin diversion to move water from the Lamprey to the Oyster,

other Towns can certainly follow suit. Also, downstream towns can divert water from locations upstream of Durham.

Another demand that will soon occur on these rivers is for instream flows: the minimum flows necessary to preserve instream, water-dependent resources. When the instream flows are established, water will be all the more critical at low flow times necessitating towns to add storage capacity, new water supplies, and conservation plans for their drinking water infrastructure.

There should be no false sense of security in the water supply. The Town and university need to be thinking in terms of securing water supplies for the next century or longer. Water is not like energy: there are no alternatives. Water is not like money, you can't print more. You either have it or you do not. The more insidious aspect is that you can have the water, but if it is contaminated it could be rendered unpotable. Or the treatment costs could be prohibitive.

One existing water supply that can be a short term supplementary supply consideration is the Spruce Hole Formation. I say short term, because with just a production well and pumping groundwater, this formation can supply about 20% more water to the existing system supply. At the present rate of population growth, this will suffice for another 2 to 3 decades. Unless controls are placed on population, density, or growth, an additional water supply will then be necessary by mid-century.

Having taught and consulted on development of water supplies and designs of water transmission systems for 3 decades, I can identify that there are some simple ways to deal with water supply issues. As we have seen in the past 10 years, there is phenomenal potential for flooding in our rivers. So one way out of the water supply problem is to build enough storage to save some of the flood waters in order to then have water when the rivers are at very low stages. Conventionally this is either done with dams or with storage tanks. But the magnitude of storage that we are talking about is in the millions of gallons. This alternative is not cheap. Plus, there really are no strong possibilities for dams to meet these needs. Even if there were, there is no guarantee that a new dam would make it through the review and permitting process. Interestingly, the Spruce Hole Formation already possesses a fantastic amount of storage, and most of the infrastructure necessary to get the water to the formation already exists. This is almost a no cost option. If operated as a reservoir (what is known as aquifer storage and recovery), the Spruce Hole Formation could help the Durham/UNH water system suffice for at least another century.

What is the value of the Spruce Hole Formation? At least 2 to 3 decades of new water supply if the water quality is maintained and it is used solely to pump groundwater. If the formation is operated as artificial storage and recovery, this is could provide additional water supply for well

over a century. If you want to place a dollar value on this formation, ask yourself what it would cost to replace the Oyster River supply.

What is critical is that once this formation is lost, it is lost forever. Don't kid yourself. If you do think that you can bring back developed areas, turn them into natural areas, and use them for natural resources, imagine a very productive aquifer being right under the center of Town, with the best site for a well at Young's Restaurant. To develop this site, all buildings within 400 feet of the well would need to be removed. Let's be honest, this just would not happen.

The slippery slope that you find yourselves on now is the slow but steady erosion of the protection that you once afforded the Spruce Hole Formation. At some point your decisions will become irreversible and the formation, its water supply, or its storage ability will be untenable. Any development proposal on the heart of the Spruce Hole Formation has the potential to render the formation unusable. Maybe not today or in the next decade, but it will happen. We cannot be so careless as to think that just because we employ prudent stormwater and land use management strategies that this insures us against the loss of this formation. This simply is not true. The best way to secure the integrity of this formation and the water it contains is to protect it from any development. Anything less erodes its integrity and sanctuary. Employing modern stormwater management strategies may remove 99% of some pollutants from stormwater, but not all. In addition, the 1% that is not removed, in this case, goes to the Spruce Hole Formation. And this 1% is relentless: it occurs day after day after day. Ultimately you would surpass the ability for the formation to accept these contaminants without consequence. If the Superfund program has taught us anything, it is that prevention is much more cost-effective than the cure. If you do not believe this, ask Dover when the groundwater in the sand and gravel formation at the Tolend Road landfill will again be potable, and at what cost?

Be fully aware that your actions on this matter will not go unnoticed. A good portion of the Spruce Hole Formation is in the neighboring Town of Lee. How do you expect to convince Lee to protect this same formation from development if you do not do so yourself? Similarly, if you do not create the protective buffers at the rivers which serve as your water supplies, what will persuade the upstream towns to do so? If your own actions do not display the importance of this formation when the decisions are in your own hands, how do you expect to convince others that the resource is worth protecting?

100 years from this day, your successors will consider you either people with great vision and foresight, or foolish enough to let this opportunity slip through your hands and go to waste. The opportunity now is before you, and once it is lost there is really no going back without a lot of cost, difficulty, and pain.