Function of the Natural Resources Inventory

Carrying Capacity

The foregoing discussion has highlighted the scope and variation of the natural resource base in Sussex County. As this document is prepared in a larger context, the following discussion relates the strengths and weaknesses of the available natural resources to their ability to support development and redevelopment. This ability is termed carrying capacity. Carrying capacity is a function of topography, geology, available water supply, the ability of soils to accept effluent treated to one extent or another, necessary protections for surface water bodies, and accommodation to wildlife needs. Of these, the most critical is available water supply.

Water Supply

Water supply is critical to agriculture, residential and commercial development and recreation development. Attempting to use land beyond the ability of the area to supply sufficient water during periods of drought is a guarantee of hardship during times of short supply. Available water is a function of geology, soils and recharge. The geology of an area defines the ability of the rock or unconsolidated material to store water. Soils directly affect the ability of an area to allow recharge of precipitation and treated wastewater, making possible the densities required for Center creation. This is of particular importance in Sussex County, where there are few surface water supplies. Those that do exist are limited and comprise; Franklin Pond, Heaters Pond, Lake Rutherford and Morris Lake. These serve Franklin and Ogdensburg as back up supply and Sussex and Newton as principal sources. Creation of additional surface water impoundments may prove beneficial from the standpoint of supply, as well as storm water management.

As an example of the changing impact on resources, the former Limecrest Quarry in Andover, Sparta and Lafayette Townships once diverted five to seven million gallons of water per day from the subsurface aquifer generally feeding the Pequest watershed and discharging it on the surface in the Paulinskill watershed. That has now changed with water table impact felt on existing development and an equilibration period required of the Paulinskill.

In the Highlands Physiographic Province, described earlier in this report, we made the point that the geology of the area is of resistant, dense rock. These kinds of rock do not function well as sources of water. While there are some wells drilled in the Highlands which produce substantial quantities of water, overall the area is a very poor aquifer.

Moving west into the Kittatinny Valley, the Martinsburg and Kittatinny formations are generally better yielding, although, again, the occasional high-productive well is offset by many marginal supplies. Here again, distribution and supply is not uniform. Wells which intercept solution channels and caverns in the Kittatinny formation may be highly productive, while others intercepting low yield units may produce no water at all. There is an additional concern with regard to the highly productive elements of the Kittatinny formation, and that is that access to them brings with it the potential introduction of pollutants and consequent degradation of a significant water supply.

West of the Kittatinny Valley, the Shawangunk and High Falls formations are again resistant, dense formations. These, in Sussex County, are limited to the vast areas owned by State and Federal governments. Dropping into the Delaware River Valley and more soluble limestone, the rock aquifers become higher yielding, although with the same variability exhibited by the Kittatinny supergroup in central Sussex County.

The last significant aquifer in the County is the most highly productive and vulnerable aquifer. This aquifer, comprised of sands and gravels, laid down by the Illinoisan and Wisconsin glaciers are the only formations which exhibit what is known as primary porosity. These formations store water in and amongst its components, rather than simply in cracks, fractures and solution features. Notwithstanding the fact that this is a highly productive aquifer, yielding, in many cases, wells supplying hundreds of thousands of gallons of water per day, it is also highly susceptible to drought events and the introduction of pollutants. This formation tends to be found in northeast/southwest trending valleys in Hardyston, Sparta, Frankford, Andover, Lafayette, Green and Stillwater Townships and Andover Borough.

Aquifer Recharge

The capacity of an aquifer to yield water is only a part of the picture. The other side of the equation is the extent to which an aquifer can be recharged once that water has been withdrawn. Other than in the glacial drift formations, this is a function of soil type and topography. The more porous soils more readily accept precipitation and runoff. The steeper soils are less able to accept recharge. This is due to the fact that increased slopes increase the velocity of storm water flows, thereby reducing the time available for infiltration. This is particularly critical in the areas of relatively resistant bedrock (the Highlands, Kittatinny Ridge), already limited by their character as sources of water. See **Map 8 Aquifer Recharge in Sussex County**. This exhibit illustrates the point that areas of greatest recharge are found in the valleys while lesser recharge is found along the ridges, and most particularly, in the Highlands.

Interestingly, one inch per acre of recharge equals approximately 27,000 gallons. Even in the areas of lowest recharge, there are substantial quantities of water reaching the aquifer. Only a portion of the water reaching the aquifer as recharge is available for consumption, particularly in times of drought without adversely affecting stream base flows and existing withdrawals. For example, six inches of recharge per year over an acre provides approximately 160,000 gallons to the aquifer. Of this, no more than 32,000 gallons (twenty percent) is available for consumption. A single family, utilizing approximately 250 gallons per day, will consume slightly more than 90,000 gallons per year. From a recharge perspective, an acre receiving sixteen inches of recharge per year will sustain this hypothetical single family. As the amount of recharge diminishes, the contributing area must correspondingly increase. This may be somewhat offset in areas served by septic systems or other waste treatment facilities which discharge treated effluent to ground water.