Deer Creek Water Availability Study

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**Statutory Citations: Federal - Pub. L. 91-575, 84 Stat. 1509 (December 1970); Maryland - Natural Resources Sec. 8-301 (Michie 1974); New York - ECL Sec. 21-1301 (McKinney 1973); and Pennsylvania - 32 P.S. 820.1 (Supp. 1976).*

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DEER CREEK WATER AVAILABILITY STUDY

EXECUTIVE SUMMARY

The objectives of the Water Availability Study are to inventory and assess key water resources of the Deer Creek Watershed, establish an estimated sustainable yield from the watershed, describe and inventory current water uses, project demands for different use sectors, and evaluate potential issues and problems related to future water availability through the year 2025.

The Deer Creek Watershed is situated within a rapidly developing area of Maryland and Pennsylvania, occupying approximately 171 square miles. The predominant land use within the Deer Creek Watershed, representing roughly 60 percent of the total land area, is associated with agricultural operations. Forested regions cover about 34 percent of the watershed and developed areas, primarily low density residential areas, comprise roughly 5 percent of the watershed. Major population centers include portions of the towns of Shrewsbury and Stewartstown in Pennsylvania, with substantial growth and development in the area of Bel Air, Maryland, in the past decade.

The Deer Creek Watershed is located within the Piedmont physiographic province, and the underlying bedrock is mantled with weathered bedrock called saprolite. This mantle is typical of the Piedmont region in the Mid-Atlantic states and has a porosity that is orders of magnitude higher than in the underlying fractured bedrock. As a result, the relative amount of extractable water is much higher in the saprolite than in the unweathered bedrock. Hydrologic statistics indicate that the watershed is groundwater-dominated, and that base flow is a large component of the total flow in Deer Creek. An examination of hydrologic records showed the months that most typically exhibit the lowest flows are July through October.

During the study, stream gaging data were collected within subwatersheds of Deer Creek over a period of 6 months under varying base flow conditions for the purpose of characterizing recharge rates within the watershed. On average, there is a geographic variation in recharge; the recharge per unit area in the upper portion of the watershed is 1.02 cubic feet per second per square mile (cfs/mi^2), and the recharge in the lower portion of the watershed is 0.76 cfs/mi^2.

Water budget exercises were conducted to assess the disposition of available water in the watershed. Results of these exercises showed that, in average years, about 60 percent of precipitation to the watershed is lost to evaporation and plant transpiration; the remainder is discharged to Deer Creek either as direct surface runoff or as base flow via groundwater. A base flow separation exercise on Deer Creek flow records showed that, on average, 67 percent of the total flow in Deer Creek is base flow, and the remaining third is surface runoff. Once these natural components are understood, the potential impacts of projected water demands can be assessed.

Water use in the Deer Creek Watershed is comprised of commercial, industrial, agricultural, and residential uses. For water users in these categories that hold permits from Maryland, Pennsylvania, or the Susquehanna River Basin Commission (SRBC), there were available data to estimate current and future uses. For water users not subject to regulation, it was necessary to make assumptions about land use, population density, and population projections in order to estimate current and future water use. Based on the data and estimates, less than 1 percent of the total available water is consumptively used under current conditions, although for drought years, that amount may rise to 3 percent.

The greatest challenges for water supply in and adjacent to the Deer Creek Watershed are population growth and urbanization, including the Base Realignment and Closure (BRAC) plan for Aberdeen Proving Ground. Possible conflicts with future availability were evaluated using tables of water supply and demand to estimate timing and location of potential impacts. Under existing conditions, water demand exceeds available flow during some summer months in moderate drought years. In years with average hydrologic conditions, approximately 40 cfs remain available at the lower end of the watershed during the lowest flow months of August and September.

Projections for future water demand are based on the expected 25-year population increase of approximately 24 percent in the Deer Creek Watershed. Under drought conditions, a number of subwatersheds show the potential for resource deficits. The deficits are concentrated in the lower watershed and the Pennsylvania headwaters, which reflect both lower recharge values and higher growth in projected water use.

Based on analyses of the hydrologic setting, anticipated water demands, and riparian and aquatic needs of Deer Creek, existing reliability problems are expected to be more severe under increased demand scenarios. The results of a numerical model of groundwater and surface water interaction suggest that the conjunctive use of wells and surface water intakes could offer a reasonable solution to the problem of an interrupted supply. The SRBC plans to use the findings of this study to guide future regulatory and planning decisions affecting the Deer Creek Watershed.

As the demand for Deer Creek water grows, the following recommendations will help ensure the protection of current uses, aquatic and riparian needs, and the prevention of adverse impacts or degradation to the resources of the Deer Creek Watershed:

- Continue the collection of reported water use data;
- Monitor tributary flows and groundwater levels in high demand and sensitive areas;
- Implement stormwater management to maintain aquifer recharge and base flows;
- Encourage water conservation;
- Recognize and plan for the various hydrology, activities, and demands of the watershed;
- Conduct an evaluation of the specific passby flow needs of each subwatershed; and
- Compile information on critical seasons and hydrologic conditions associated with recreational needs.

I. INTRODUCTION

In 2005, the Susquehanna River Basin Commission (SRBC) initiated the Water Availability Study of the Deer Creek Watershed. SRBC identified the need to assess the water resource availability of the Deer Creek Watershed, located in the lower portion of the Susquehanna River Basin in southern Pennsylvania and northern Maryland, based on potential conflicts between various water uses in the watershed during low flow periods when the issue of water supply sustainability was becoming critical.

The objectives of the study are to inventory and assess key water resources of the Deer Creek Watershed, establish an estimated sustainable yield from the watershed, describe and inventory current water uses, project demands for different use sectors, and evaluate potential issues and problems related to future water availability.

The assessment includes a characterization of existing water resources, as well as the ability of the watershed to reliably meet anticipated water demands through the year 2025. The SRBC plans to use the findings of this study, within the framework of the Susquehanna River Basin Compact (Compact) and in cooperation with the State of Maryland and Commonwealth of Pennsylvania, to guide future regulatory and planning decisions affecting the Deer Creek Watershed.

SRBC contracted S.S. Papadopulos & Associates (SSP&A) to prepare the study, with the assistance of Chesapeake Environmental Management. Draft text and figures were prepared by SSP&A and incorporated into this final report by SRBC staff with assistance from the contractors.