



Susquehanna River Basin Commission

a water management agency serving the Susquehanna River Watershed

Policy No. 2003-01

GUIDELINES FOR USING AND DETERMINING PASSBY FLOWS AND CONSERVATION RELEASES FOR SURFACE-WATER AND GROUND-WATER WITHDRAWAL APPROVALS NOVEMBER 8, 2002

INTRODUCTION

Surface-water and ground-water withdrawals are limited to the amount of water (quantity and rate) that is needed to meet the reasonably foreseeable needs of the project sponsor. Project sponsors must comply with the Susquehanna River Basin Commission's (Commission's) Water Conservation Requirements listed in Section 804.20 of the regulations.

The Commission utilizes passby flows, conservation releases, and consumptive use compensation to help protect aquatic resources, competing users, and instream flow uses downstream from the point of withdrawal. Additionally, these requirements are intended to prevent water quality degradation and adverse lowering of streamflow levels downstream from the point of withdrawal.

Passby Flows

A passby flow is a prescribed quantity of flow that must be allowed to pass a prescribed point downstream from a water supply intake at any time during which a withdrawal is occurring. When the natural flow is equal to, or less than, the prescribed passby flow, no water may be withdrawn from the water source, and the entire natural flow shall be allowed to pass the point of withdrawal. Natural flow in the stream channel below the point of withdrawal is maintained at the same level as may prevail above.

Passby flows may be associated with surface-water and ground-water withdrawal approvals under Commission Regulations §803.44 and §803.43. Approved surface-water withdrawals from small impoundments, intake dams, continuously flowing springs, or other intake structures in applicable streams will include conditions that require minimum passby flows. Approved ground-water withdrawals from wells that, based on an analysis of the 120-day drawdown without recharge, impact streamflow, or for which a reversal of the hydraulic gradient adjacent to a stream (within the course of a 48-hour pumping test) is indicated, also will include conditions that require minimum passby flows. Three exceptions to these rules are as follows:

1. If the surface-water withdrawal or ground-water withdrawal impact is minimal in comparison to the natural or continuously augmented flows of a stream or river, no passby flow will be required. Minimal is defined as 10 percent or less of the natural or continuously augmented 7-day, 10-year low flow (Q7-10) of the stream or river.

Q7-10 is the lowest average, consecutive 7-day flow that would occur with a frequency or recurrence interval of one in ten years. A 10-year low flow event has a 10 percent chance of occurring in any one year. Accepted hydrologic practices must be used to determine the Q7-10 flow.

2. For projects requiring Commission review and approval for an existing surface-water withdrawal where a passby flow is required, as determined by these guidelines, but where a passby flow has historically not been maintained, withdrawals exceeding 10 percent of the Q7-10 low flow will be permitted whenever flows naturally exceed the passby flow requirement plus the taking. Whenever streamflows naturally drop below the passby flow requirement plus the taking, both the quantity and the rate of the withdrawal will be reduced to less than 10 percent of the Q7-10 low flow. This interim operating procedure will be permitted for a period of 4 years from the date of the approval, unless extended for the project by the Commission, in order to allow the project sponsor time to develop additional storage or supplies that will permit withdrawals at the approval rate, while still maintaining the passby flow requirement. Within 2 years from the date of the approval, the project sponsor shall file a plan with the Commission outlining the proposed development of additional on-site storage or supplies.
3. If a surface-water withdrawal is made from one or more impoundments (in series) fed by a stream, or if a ground-water withdrawal impacts one or more impoundments fed by a stream, a passby flow, as determined by the following criteria or the natural flow, whichever is less, will be maintained from the most downstream impoundment at all times during which there is inflow into the impoundment or series of impoundments.

Conservation Release Applicability

A conservation release is a prescribed quantity of flow from an impoundment structure that must be continuously maintained downstream from the impoundment structure. Conservation releases are intended to help protect aquatic resources and downstream uses. Additionally, conservation releases are intended to prevent water quality degradation and adverse lowering of streamflow levels downstream from the impoundment. Conservation releases achieve these purposes through flow augmentation from storage, not only during periods of low flow, but throughout the life of the reservoir, including periods when the reservoir is replenishing its storage during refilling.

Conservation releases are only associated with surface-water withdrawal approvals under Commission Regulation §803.44, if the surface-water withdrawal is being drafted from, or augmented from, a large impounding structure. In these cases, the conservation release shall be equal to, or greater than, the Commission's low flow criterion.

State approvals of dams having impoundments that are intended to be used as water supply sources should include conditions that require minimum conservation releases.

Passby Flow Determination

In cases where a passby flow is required, the following guidance will be followed for determining the appropriate passby flow.

- I. Within the Pennsylvania portion of the basin, in approving applications for water withdrawals in those cold-water streams of generally 100-square-mile drainage area, or less, and located within the hydrologic regions delineated on Plate 2, "Pennsylvania-Maryland Instream Flow Study: Hydrologic Regions," of the Commission's Publication 191, Instream Flow Studies Pennsylvania and Maryland (May 1998), the Commission will condition such approvals on passby flows determined using Figures 6.4 through 6.13 of that publication. Passby flows will be based upon the following Special Protection water designations found in Chapter 93 of the Pennsylvania Department of Environmental Protection regulations, in priority order:
 - A. **Exceptional Value (EV) Waters**—Withdrawals may not cause greater than a 5 percent loss of habitat. The Instream Flow Incremental Methodology (IFIM) analyses that were used to develop habitat losses for the Instream Flow Studies Pennsylvania and Maryland (May 1998) are based on the assumption that population losses for the study species are proportional to habitat losses. However, population estimation methods cannot accurately determine population changes of 5 percent or less. For this reason a 5 percent habitat loss is acceptable to the Pennsylvania Fish and Boat Commission (PFBC) for Exceptional Value waters.
 - B. **High Quality (HQ) Waters**—Withdrawals may not cause greater than a 5 percent loss of habitat; except a habitat loss of 7.5 percent may be allowed if the following conditions are met:
 - The project is in compliance with the Commission's water conservation regulations of Section 804.20;
 - No feasible alternative source is available; and
 - Available project sources are used in a program of conjunctive use approved by the Commission, and combined alternative project source yields are inadequate.
 - C. **Cold-Water Fishery (CWF) Waters:**
 - Streams that meet Pennsylvania Fish and Boat Commission (PFBC) Class B Wild Trout Stream standards—Withdrawals may not cause greater than a 10 percent loss of habitat. Class B streams are those that support a brook, brown, or combined brook and brown trout biomass of at least 20 kilograms/hectare.

- Streams that meet PFBC Class C or D Wild Trout Stream standards—Withdrawals may not cause greater than a 15 percent loss of habitat. Class C streams are those that support a brook, brown, or combined brook and brown trout biomass of at least 10 kilograms/hectare. Class D streams are those that support a brook, brown, or combined brook and brown trout biomass of less than 10 kilograms/hectare.

D. In no case, shall the passby be less than the Q 7-10 flow.

E. Specific procedures for applying the above guidance are as follows:

1. Determine the Chapter 93 designated and existing use classification of the stream for which the water withdrawal approval is being requested. In consultation with the PFBC, determine the PFBC Wild Trout Stream classification standard that is met by the stream.
2. Choose the appropriate figure from Figures 6.4 through 6.13 of the Commission's Publication 191, based upon the physiographic region, the general geology and segment class of the stream, and the species of trout present.

Alternatively, the Instream Flow Model, developed as part of the Instream Flow Study, may be run to evaluate habitat impacts resulting from passby flow reductions at specific project sites. Originally, the model was developed to generate the curves presented in Figures 6.4 through 6.13 of the report, and the curves are an approximation of the results obtained by running flows from various stream gages in each physiographic region through the model. For limestone streams, it is particularly desirable to run the model, since the habitat curves for these streams are not sensitive to small changes in withdrawals. The input required to run the instream flow model is a set of median monthly flows for the period-of-record from an acceptable reference stream gage.

In the glossary of the IFIM study, a limestone stream is defined as a stream having a drainage area at least partially underlain by carbonate bedrock and having a total alkalinity greater than 70 milligrams per liter (mg/l). Also, those streams identified by Shaffer in his 1991 Pennsylvania Fish and Boat Commission publication, The Limestone Streams of Pennsylvania, are considered as limestone streams. Within the Ridge and Valley Physiographic Province (See Plate 1 in the IFIM study.), the Limestone Group 1 IFIM figures should be used whenever a limestone drainage area is underlain by greater than 50 percent limestone bedrock by area. The Limestone Group 2 figures should be used whenever a limestone drainage area is underlain by less than 50 percent limestone bedrock by area.

Within the Unglaciaded Plateau Physiographic Province, Segment Class 1 streams are those stream segments within the upper-most 5 miles of a perennial stream. Segment Class 2 streams are those stream reaches from stream mile 5 to the mouth.

Generally, brook trout prefer small, forested headwater streams. A forested watershed typically maintains the brook trout's colder water temperature requirements. Conversely, brown trout are more temperature-tolerant than brook trout. Therefore, they are more likely found in watersheds having agricultural land uses and not having a continuous canopy of trees across the watershed. The Water Resources Management Division's staff biologist is available to assist staff in determining the trout species present in specific cold-water streams.

3. On the figure, choose the Habitat Loss Curve that represents the percentage of habitat loss allowed by the guidance provided above. In some cases, interpolation between curves may be necessary.
4. If necessary, modify the Habitat Loss Curve(s) by extending the curve(s) in a straight line from the point where the curve(s) cross the 5 percent passby abscissa line to the origin of the axes. On Group 1 limestone streams, extend the curve in a straight line from the point where the curve crosses the 15 percent passby abscissa line to the origin of the axes.
5. Determine the average daily flow (ADF) of the stream at the point of withdrawal by proportioning ADFs based on drainage area from an acceptable U.S. Geological Survey reference stream gage. In general, the stream gages listed in Table 6.8 of the Commission's Publication 191, Instream Flow Studies Pennsylvania and Maryland (May 1998), are acceptable reference stream gages. However, Commission staff is available to assist project sponsors in determining reference stream gages or average daily flow statistics for a specific project site.
6. Compute the requested withdrawal as a percentage of ADF. $\text{Withdrawal percent} = \text{Withdrawal} \times 100 / \text{ADF}$.
7. Using the modified Habitat Loss Curve(s), and interpolating, if necessary, determine the passby (as a percentage of ADF) required for the requested withdrawal.
8. Compute the actual passby quantity. $\text{Passby} = \text{Passby Percent} \times \text{ADF} / 100$
9. If the computed passby is less than the Q 7-10 for the stream, then apply the Q 7-10 as the passby requirement.

II. In all areas of the Susquehanna River Basin not covered by the passby criteria of Part I above, Commission staff will review the state-designated use classification, published species and habitat condition information, and when necessary, consult with state fishery management agencies or conduct its own field studies to determine the stream or waterbody's fishery classification. This information will be utilized to apply the following guidance:

- A. On all EV and HQ streams, and those streams with naturally reproducing trout populations, a passby flow of 25 percent of ADF will be maintained downstream from the point of withdrawal whenever withdrawals are made.
- B. On all streams not covered in "A" above and not degraded by acid mine drainage, a passby flow of 20 percent of ADF will be maintained downstream from the point of withdrawal whenever withdrawals are made. These streams generally include both trout stocking and warm-water fishery uses.
- C. On all streams partially impaired by acid mine drainage, but in which some aquatic life exists, a passby flow of 15 percent of ADF will be maintained downstream from the point of withdrawal whenever withdrawals are made.
- D. In no case, shall the passby flow be less than the Q 7-10 flow.
- E. The ADF and Q 7-10 of the stream at the point of withdrawal shall be determined using accepted hydrologic practices. The procedure for determining a point of withdrawal's ADF is discussed in section I-E5 above. Q7-10 flows may be determined using one or more of the following methods: (1) method presented in U.S. Geological Survey Water Resources Investigation 76-51, Technical Manual for Estimating Low-Flow Frequency Characteristics of Streams in the Susquehanna River Basin, by Jeffrey T. Armbruster, (June 1976); (2) method presented in Pennsylvania Department of Environmental Resources, Water Resources Bulletin No. 15, Technical Manual for Estimating Low-Flow Characteristics of Pennsylvania Streams, by Herbert N. Flippo (October 1982), as modified by U.S. Geological Survey, Water Resources Investigations Report 99-4068, Comparison of Methods for Computing Streamflow Statistics for Pennsylvania Streams, by Marla H. Ehlke and Lloyd A. Reed (1999), or by proportioning Q7-10, based on drainage area from an acceptable U.S. Geological Survey reference stream gage. In general, the stream gages listed in Table 6.8 of Commission Publication 191, Instream Flow Studies Pennsylvania and Maryland, (May 1998), are acceptable reference stream gages. Commission staff is available to assist project sponsors in determining reference stream gages or Q7-10 flow statistics for a specific project site.

While the project sponsor should determine the ADF and Q 7-10 flow at the point of withdrawal, when required, Commission staff reserves the right to compute these flow statistics using all available methodologies and to determine

appropriate passby flows based the results of these analyses using one or more of the methods.

In general, reference stream gages used to determine low flow statistics at a project site should be unregulated, of a similar drainage area size when compared to the project site (within the one-third to three-fold range), of similar geology and physiographic province, of similar yearly rainfall and evapotranspiration, and ideally be located on the same stream or on a nearby stream, if possible. In order to satisfy two of the above criteria, the reference gage should be selected from Table 34 of Water Resources Bulletin No. 15 listed above, such that the reference station has a similar Geologic Index and Precipitation Index, as compared to those parameters determined for the project site. In the case where the reference gage selected is from a different physiographic province or topography, a significantly different geology, or remote from the project site, the selection of the stream gage should be justified by computing the Q7-10 for the stream gage using the methodology of Water Resources Bulletin No. 15 and comparing the computed Q7-10 with the Q7-10 determined from actual stream flows at the gage. If there is close agreement (plus or minus 30 percent), the reference gage is acceptable.

III. Exceptions to using the Desktop Methodology presented in Parts I and II

- A. Passby flows other than those derived from guidelines A through E above will be acceptable: (1) if an appropriate instream flow study demonstrates that lower releases will provide an acceptable level of aquatic habitat protection; (2) if in the case of an existing supply, it can be demonstrated that no viable alternative supply exists; or (3) if after coordination between a signatory party, project sponsor, and the Commission another acceptable passby flow criterion can be established that meets the Commission's passby flow objectives.
- B. According to Sections 803.43 (a)(1) and 803.44 (a)(1) of the regulations, the Commission reserves the right for any project to increase the passby flow requirement above that passby flow determined using these guidelines in cases where sensitive environmental resources (i.e., wetlands, threatened and/or endangered species, migratory fish passage) or water quality may be adversely impacted.
- C. The June 1999 Memorandum of Understanding between the Commission and the Pennsylvania Department of Environmental Protection (Pa. DEP), requires a joint coordinated review for those projects under the Pennsylvania Water Rights Act of 1939 and the Pennsylvania Safe Drinking Water Act. In these cases, the passby requirement will be coordinated between the two agencies. Where the Pa. DEP Region Office has conducted a field study of aquatic life downstream from the project, the results of these field studies will determine the existing aquatic community at the project site, and therefore, the appropriate passby flow. The recommendations of these field studies will take precedence over the results of any Commission desktop passby flow analysis.