

**DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED CONSERVATION**

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TITLE: Implementation Guidance for Evaluating Wastewater Discharges to Drainage Ditches and Swales

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AUTHORITY:

Federal Safe Drinking Water Act of 1974, P.L. 93-523. Pennsylvania Code, Title 25, Environmental Protection. Chapter 93, Water Quality Standards

POLICY:

Whenever wastewater is discharged to a drainage ditch, public health, nuisance problems, potential ground water pollution, and the potential impact on designated uses in perennial streams must be considered.

PURPOSE:

To provide information for evaluating proposals involving wastewater discharges to drainage ditches and swales where, in the absence of a wastewater discharge, stream flows are normally zero

APPLICABILITY:

This technical guidance applies to all wastewater dischargers in the commonwealth of Pennsylvania.

DISCLAIMER:

The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

PAGE LENGTH: 16 pages

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DEFINITIONS: See Table 1, page 13.

**IMPLEMENTATION GUIDANCE FOR EVALUATING WASTEWATER DISCHARGES
TO DRAINAGE DITCHES AND SWALES**

**May 30,1987
REVISED JULY, 1997**

**WATER QUALITY STANDARDS AND IMPLEMENTATION SECTION
DIVISION OF WATER QUALITY ASSESSMENT AND STANDARDS
BUREAU OF WATERSHED CONSERVATION**

I. Introduction

This technical guidance provides information for evaluating proposals involving wastewater discharges to drainage ditches and swales where, in the absence of a wastewater discharge, stream flows are normally zero. The guidance also applies to man-made surface water drainage systems. Whenever wastewater is discharged to a drainage ditch, public health, nuisance problems, potential ground-water pollution, and the potential impact on designated uses in perennial streams must be considered.

This guidance supersedes all other policies and procedures, memoranda, letters, and/or guidances for evaluating discharges to drainage ditches and swales, so called “dry streams,” and other man-made conveyance systems described in the guidance.

Table 1 in the Appendix includes definitions of certain words to better understand this technical guidance.

II. Regulatory Requirements

The Pennsylvania Clean Streams Law prohibits the discharge of any substance to the waters of the Commonwealth if the discharge will or is likely to create a nuisance, or if it is detrimental to public health or livestock, wild animals, birds, fish, or other aquatic life. The Department will not approve an application for a discharge permit if ground water will be degraded outside the mixing zone to a level that will adversely impact existing or potential ground or surface water uses. Public water supply uses of ground water must be maintained within the levels established in the Primary Drinking Water Standards of the Federal Safe Drinking Water Act unless specifically protected at more restrictive levels by the Department. In cases where the mixing zone extends to surface water, the criteria established by Chapter 93 of the Department’s Rules and Regulations must be met.

III. Wastewater Discharge to Ground and Surface Waters

As is the case with wastewater discharges to a surface stream, pollutants entering ground water tend to become diluted down gradient due to dispersion. Unlike stream flow, which is largely turbulent, ground-water flow is nearly always laminar. Where stream dilution results from macroscopic dispersion, ground-water dilution results as contamination diffuse around individual grains. Where stream flow velocities are measured in terms of feet per second, ground-water flow velocities are measured in terms of feet per day or feet per year. The major difference in the dispersion and ultimate dilution of pollutants added to both systems is time. The average residence time for ground water might be on the order of many years; whereas, the comparable residence time for surface water can be measured in days. Obviously, rapid assimilation of pollutants by ground water is not possible.

Because ground-water flow is laminar, pollutants in ground water tend to move slowly down gradient in a plume with only limited lateral and vertical dispersion. An analogous situation would be the dispersion of smoke from a smokestack as it drifts downwind on a relatively calm day. The existing ground-water flow path can be altered by ground-water withdrawals. A pumping well causes a cone of depression to form in the water table at the point of removal.

The permeability controls in the aquifer material cause different types of cones of depression. For wells drilled in slowly permeable materials, the cone of depression that forms at the pumping well is deep and

steep-sided but very limited in areal extent. Consequently, pollutants may not be drawn into the pumping well even when the source appears to be relatively close. In contrast, for highly permeable materials, the cone at the pumping well is very shallow but may extend for extensive distances from the pumping center. Therefore, pollutants can be drawn from sources which are relatively far away. High permeability materials are often found in flood plain sediments, alluvial channel and outwash deposits, and other terrain having unconsolidated material.

Pollutants are not readily assimilated once a wastewater enters ground water and can remain as a long term influence on water quality. Some ionic species (anions) move through the soils directly to the water table with little or no change in concentration. Considering the above and the fact that most drainage ditches readily transmit wastewater to ground water, all wastewater discharges to drainage ditches should be considered as potential direct discharges to ground water.

Historically, the primary use of ground water in Pennsylvania has been for individual domestic drinking water supplies. Pennsylvanians drill water wells expecting to find potable water. With rare exceptions, man is largely the source of pollution. When an existing or potential ground-water use is within the dispersion plume created by a wastewater discharge to ground water, discharge limits must be developed to protect the ground-water use. If the mixing zone portion of the dispersion plume does not affect an existing or potential ground-water use, the discharge limits must protect the designated stream uses. Consequently, a discharger of wastewater to a drainage ditch must demonstrate that ground water, as well as surface water uses, are protected.

There are basically two types of drainage ditches or conveyances that are of concern. These are:

1. Natural drainage swales, controlled by topography, which may intermittently flow when surface runoff is collected, or when ground water discharges to the channel under highwater table conditions, normally in the winter and spring. This latter flow is normally a seasonal stream, being dry during a portion of the year, and
2. Man-made earthen drainage ditches which are used to convey waters from one area to another.

A drainage swale is nearly always located in a natural linear depression and may be intermittently charged by ground-water inflow to it. During the dry season, the water table drops causing the drainage swale to go dry. Since the configuration of the underlying water table generally mimics surface topography, ground-water flow during drier periods is most likely to conform to the same configuration as the surface flow does during the wet periods. The major difference is that the flow is now subsurface. Wastewater discharges infiltrating through drainage swales to ground water will, thus, flow in the same general direction defined by the swale, and absent any man-induced hydrologic modifications, will eventually flow into a perennial stream. Local wells might be affected if they are located within the resulting wastewater dispersion plume or if they are located close enough that the plume could be intercepted by their pumping cone of depression.

A man-made drainage ditch may have no direct relationship to surface topography or to the ground-water flow system. A drainage ditch of this type generally acts as a "losing stream" with water being lost through the bottom of the ditch to the ground-water system most of the time. A ditch whose flow is maintained by a wastewater discharge during periods when it would otherwise be dry, will likely recharge ground water. The resulting leakage may transport pollutants away from the channel along its entire length similar to a surface sheet wash, only in the subsurface. Because stormwater drainage

ditches are usually constructed above the water table, some attenuation occurs as the wastewater infiltrates into the ground water; however, the amount of attenuation depends on soil conditions and depth to the water table. Ground-water flow and the direction of the drainage ditch are likely to be different. Consequently, a much larger area could be affected than in a natural drainage swale which discharges “down-stream” of the disposal point. Thus a larger number of water supplies might be adversely affected by discharges to artificially constructed drainage ditches than to natural drainage systems.

IV. Implementation

A. General

1. The Regional Office Planning Section has the lead role for determining water quality-based waste treatment requirements when issuing permits for treated waste discharges. An NPDES Discharge Pollution Report (ER-BWQ-65) will be prepared for each discharge to a “drainage ditch.” Treatment requirements should be developed to prevent public health and nuisance problems.

2. Whenever a wastewater discharge is proposed to a drainage ditch or swale, the Regional Office Planning Section will take the following action and/or request that the following preliminary information be included and documented in the planning stage:

- a. For sewage-type wastewater discharges, complete Section III-B(1) of Component III of the Planning Module for Land Development and include:
 1. A copy of the most recent 7 ½” topographic map with location of the wastewater discharge accurately plotted.
 2. Waste discharge rate and proposed effluent quality, including any seasonal variations.
 3. Identification on a map, of any existing or potential ground-water uses for at least 200 feet on each side of the channel downstream from the discharge to the point where perennial stream conditions exist.
- b. People living in the area and/or those that could be affected, should be notified about the proposed discharge by the applicant.
- c. The Regional Hydrogeologist will review the preliminary information in consultation with the Department’s Soil Scientist, if necessary, using the hydrogeologic variables shown in Table 2 in the Appendix. Based upon the review, he will determine whether local ground-water uses will be impacted by the proposed discharge. If the Hydrogeologist determines that ground-water uses will not be adversely impacted by a wastewater discharge, effluent and treatment requirements should be established, based on the point of first stream use as identified by the Water Pollution Biologist, using specific criteria from Chapter 93 and/or the Department’s toxic management strategy. The criteria which are imposed should be the most stringent of the aquatic life, human health, or technology-based limits. If it is believed that such limitations may result in public health and/or nuisance/aesthetic problems upstream of the point of first use, then additional treatment requirements should be imposed.

If the Hydrogeologist determines that the discharge will adversely impact or has the potential to adversely impact on ground-water use, applicable human health-related criteria should be imposed at the point of discharge.

- d. In situations where discharges to drainage ditches or swales are required to dispose of partially treated waters originating from required corrective actions at ground-water pollution sites, the following conditions must be met:

CASE ONE - Discharges Within a Mixing Zone (Figure 1)

1. A discharge may occur within a mixing zone at concentrations exceeding ground- or surface-water standards as long as it does not extend the area of the mixing zone, and it is necessary to abate the original pollution problem or to dispose of treated wastewater originating from the abatement activity,

and

2. A discharge may occur within a mixing zone as long as it does not increase the contaminant concentration to a level that exceeds the surface water criterion at the point of discharge into surface waters.

CASE TWO - Discharges Outside a Mixing Zone (Figure 1)

1. A discharge may occur to waters outside a mixing zone only when the contaminant concentration at the point(s) of entry into the receiving waters is equivalent to or better than appropriate ground- or surface-water standards.

Note: A mixing zone is defined as that portion of the dispersion plume emanating from a pollution source in which ground-water quality does not meet applicable ground-water quality standards.

EFFLUENT LIMITS - In determining effluent limits to ensure protection of ground water for the drinking water use, the following considerations apply:

1. If a maximum contaminant level (MCL) has been promulgated for a chemical in question, the MCL is the effluent limit.
2. If no MCL has been finalized, the effluent limit will be set equal to the human health based criterion developed specifically for ground water by the Division of Water Quality.

The criteria will follow the guidelines for surface water criteria development, but with exposure conditions set to more accurately assess ground water. Specifically, these include drinking water consumption of 2 liters per day (L/day) by a 70 kg person, and direct application of the 1×10^{-6} CRL criterion (which is the overall risk management level of the BWC).

- e. If the Regional Hydrogeologist determines that more information is necessary before he can make a decision, he may request that the discharger make a detailed hydrologic review. Since the proposal is still in the planning evaluation stage, completion of Component III of the Planning Module for

Land Development of the Act 537 Planning Process should be used to obtain needed information. Additional information should include at least detailed definitions of the mixing zone, buffer zone, and existing and potential ground-water uses that may be affected. After reviewing these data, the hydrogeologist will make a determination whether ground-water uses will be adversely affected, and if necessary, DEP may require monitoring of existing uses.

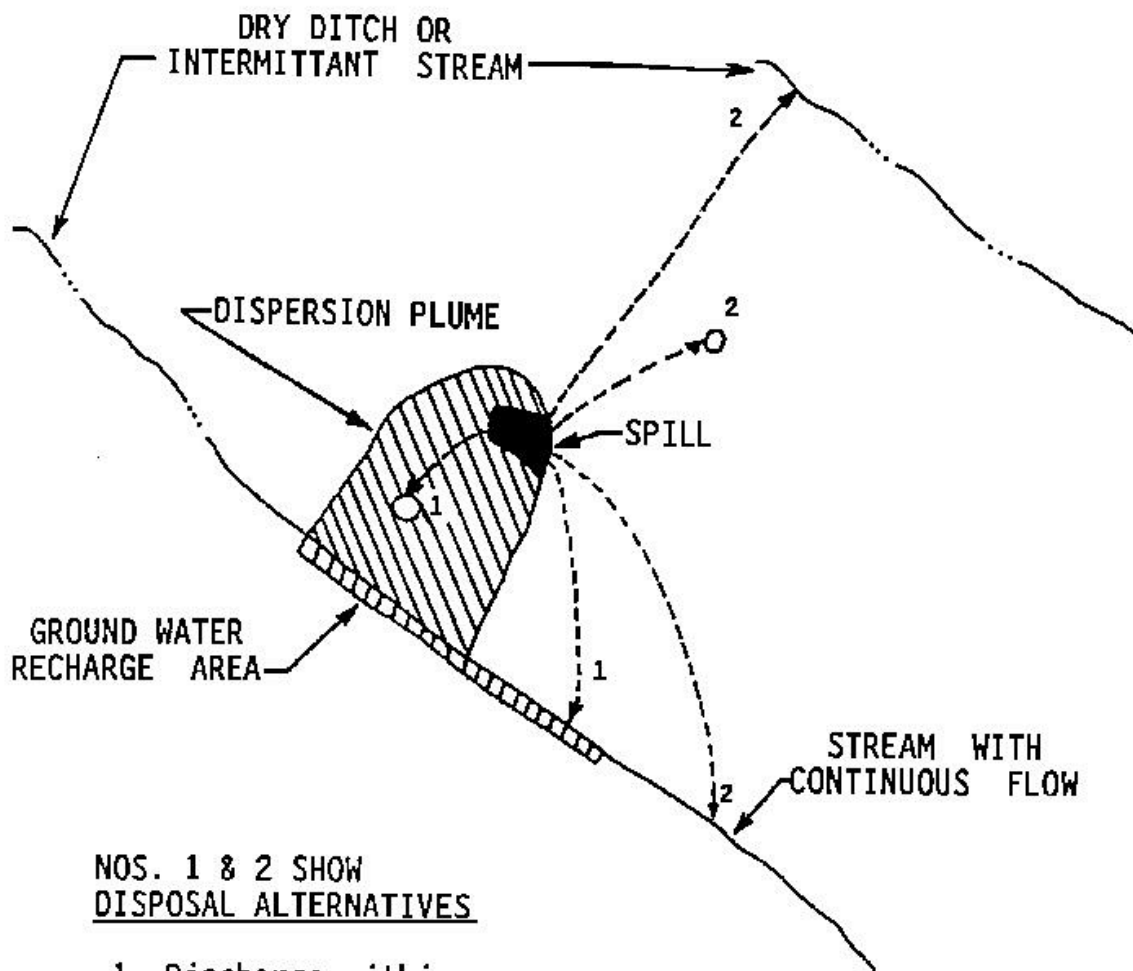
f. If it is determined that ground- or surface-water uses will be adversely impacted, the reasons will be detailed. The application for waste discharge and/or Act 537 plan revision should then be denied or revised to meet planning and water quality management requirements.

3. Whenever an existing wastewater discharge permit is being developed as part of the NPDES renewal process and no significant change in wasteload (pollution load) is indicated, the Regional Planning Section will review the case file to see if the files have information indicating that the discharge caused public health and/or nuisance problems. (A significant change in wasteload is 10% above the permitted wasteload.) If no adverse data exists, it may be assumed that the discharge is not causing public health and/or nuisance problems. If the file show a history of the discharge causing public health and/or nuisance problems, then more stringent waste treatment requirements should be developed. The Regional Office Planning Section should review the existing discharge using any or all procedures in this guidance for determining more stringent treatment requirements.

4. Whenever an existing wastewater discharge permit is being considered for renewal and the wasteload has been increased by more than 10% of the previous permitted conditions, an evaluation should be made assuming that the discharge is in the “new discharge category” and the procedures presented in Paragraph 2 should be followed.

FIGURE 1

WASTE DISPOSAL ALTERNATIVES TO
SURFACE OR GROUND WATERS



NOS. 1 & 2 SHOW
DISPOSAL ALTERNATIVES

1. Discharge within a mixing zone
2. Discharge outside a mixing zone

5. The Water Pollution Biologist will provide information concerning the point of first stream use and physical, chemical, bacteriological and aquatic biology involved. Determining the point of first stream use is required because it establishes where Chapter 93 Water Quality Standards must be complied with. The point of first stream use is also important because it represents the location where continuous stream flow may be available for treated waste assimilation. A stream use determination should ordinarily be limited to well defined stream channels in which flow usually occurs. The impact of the waste discharge at the point of first stream use and down stream from this point should be made in accordance with the EPA-DEP Simplified Modeling Procedure and the procedure in this guidance. The design streamflow that is to be used in the development of waste treatment requirements where a stream has continuous flow is the actual or estimated lowest seven-consecutive day average flow that occurs once in ten years (Q₇₋₁₀). Note that Q₇₋₁₀ may equal zero, in which case, the discharge itself must meet applicable water quality criteria.

In order to evaluate permit applications for drainage ditch and natural swale discharges, it may be necessary to conduct field surveys to determine the point at which fish and aquatic life uses first occur for the purpose of establishing the design stream flow. The mere observation of flowing water may not be sufficient evidence in some cases to conclude that an aquatic use occurs or is possible at a particular point. Intermittent flows may preclude the establishment of aquatic uses and additional analyses may be required to identify these situations and to determine the point at which a stream supports a use.

In case a discharge to a drainage swale or ditch eventually involves an acid mine drainage-affected stream, the Water Pollution Biologist will determine the point of first stream use that applies specifically to Chapter 93.

In researching the literature on the subject, it became apparent that there are no published hard and fast rules for these types of determinations. Therefore, rather than rely on limited subjective analysis, it was decided to enlist the expertise of all the DEP Regional Biologists who have a combined total of over 50 years experience. Basically, all the Biologists indicated that determination of the point of first stream use is very subjective judgment based on the analyses of certain physical and chemical characteristics. Not surprisingly, all the biologists specified similar procedures and methods which they employ in a first stream use determination evaluation. The time to conduct stream channel surveys to determine first stream use should be left to the discretion of the biologist, after resumption of the flow, usually from November through April.

The Appendix includes Table 3. Outline of Methods and Procedures for Determining Point of First Stream Use. It should be emphasized that the purpose of this listing is to provide general guidance. It is not all inclusive and should not preclude evaluation of factors which are not listed. The intent is to distinguish insofar as possible between perennial streams, ephemeral streams, drainage ditches, and “wet weather” types of flowing waters.

B. Waste Treatment and/or Effluent Requirements for Discharges to Drainage Swales and Ditches

1. For sewage and industrial discharges having similar oxygen consuming type wastes

a. Conditions where “minimum treatment” requirements should be used (See B.1(b) and (c) for explanation of “minimum treatment” requirements).

(1) Where the discharge is in a developed area near one or more dwellings or the drainage ditch is easily accessible; or

(2) Where a picnic area and/or other recreation facility is located nearby; or

(3) When the first stream directly below the drainage ditch is classified for HQ special protection.

(4) "Minimum treatment" requirements should be required if any of the above three conditions are met for a new or proposed discharge. In cases where there is an existing discharge, then Conditions IV.A.3 and 4 should be considered before recommending that a discharge upgrade to meet "minimum treatment" requirements.

b. The 'minimum treatment' requirements for a discharge into this type of a drainage ditch are:

BOD and TSS -	10 mg/l as a monthly average 20 mg/l as an instantaneous maximum
NH3 - N -	3 mg/l as a monthly average number
D.O. -	3 mg/l or greater, as a monthly average
Bacteria -	(1) For the summertime, provide effective disinfection as described in Sections 95.2 and 95.7 in the Rules and Regulations (2) For the remainder of the year, provide effective wintertime disinfection in the ditch at the point of discharge in accordance with Bac ₁ , in Section 93.7 in the Rules and Regulations.

c. Sand filters or equivalent are required as part of the "minimum treatment" requirements for discharges covered by Section IV.B.1.

2. For sewage and industrial discharges having similar oxygen consuming type wastes and where best practicable treatment may be acceptable. This section applies to all conditions not covered by "IV.B.1.a" above.

a. The best practicable treatment requirements for this type of discharge are:

C-BOD5 -	25 mg/l as a monthly average 60 mg/l as a maximum
D.O. -	3 mg/l or greater
TSS -	30 mg/l as a monthly average
Bacteria -	(1) For the summertime, provide effective disinfection as described in Sections 95.2 and 95.7 in the Rules and Regulations. (2) For the remainder of the year, provide effective wintertime disinfection in the ditch at the point of discharge in accordance with Bac ₁ , in Section 93.7 in the Rules and Regulations.

b. For discharges covered under IV.B.2, sand filters would not be required.

3. For industrial discharges that are not similar to sewage type discharges. These are wastes that do not primarily contain oxygen-consuming wastes. Toxic and hazardous wastes are included in this category.

a. Conditions where “minimum treatment” is required. (Only discharges in this section that meet IV.B.3.b. “minimum treatment” requirements at point of discharge should be approved.)

(1) Where the discharge is in a developed area near one or more dwellings or the drainage ditch is easily accessible; or

(2) Where a picnic area and/or other recreation facility is located nearby; or

(3) Where the first stream use directly below the drainage ditch is classified for HQ special protection.

b. The “minimum treatment” requirements for a discharge involving the above IV.B.3.a. conditions:

(1) Use established EPA BAT requirements where they exist for specific wastes.

(2) For industrial discharges where EPA BAT requirements have not been established, equivalent “minimum treatment” requirements will be developed by the Regional Office Permits and Grants Section using best professional judgment.

(3) For minimizing public health, nuisance and/or ground-water concerns, guidances provided in this guidance will be used to evaluate discharges in this section.

C. Conditions where best practicable treatment may be acceptable. This section applies to all conditions not covered by above IV.B.3.a. for industrial discharges.

(1) Use EPA requirements if they exist for the specific waste involved.

(2) If EPA requirements do not exist, the Regional Office Permits and Grants Section will develop equivalent “minimum treatment” requirements using best professional judgment.

D. Other Stipulations and Conditions

1. It is possible that all of the above treatment requirements and evaluations may not cover all types of wastes and conditions. For discharges not covered by the above treatment requirements, the Regional Office Permits and Grants Section will develop the needed treatment requirements using best professional judgment. Water quality modeling evaluations should be performed as may be needed. In cases where modeling evaluations involve ammonia, the Bureau's latest ammonia technical guidance should be used.

2. Effluent requirements shall protect the public health, prevent nuisance conditions, and prevent pollution of waters of the Commonwealth. Dissolved oxygen treatment requirements of 3.0 mg/l for sewage and industrial discharges should be maintained, providing a “minimum treatment” of 2.0 mg/l in the drainage swale or ditch.

3. An NPDES permit will not be approved if it is: (1) practicable and financially feasible to discharge to an existing satisfactory treatment works which has adequate capacity; or (2) if it is practicable and

financially feasible to discharge the effluent from the proposed treatment works to a stream where the discharge would be more desirable from a water quality management standpoint

4. The permit that is issued shall require abandonment of the facilities if other facilities become available for conveying and treating the waste at a more suitable point.

APPENDIX

TABLE 1 DEFINITIONS

The following definitions are included as an aide for understanding and for implementing the Technical Guidance for Evaluating Wastewater Discharges to Drainage Swales and Ditches.

Buffer Zone - The volume of ground water extending beyond the mixing zone that will provide for restoration activities, adequate distance to prevent pumping activities from distorting the mixing zone, and additional protection to water uses outside the mixing zone should ground water not meeting applicable water quality standards leave the mixing zone as the result of seasonal flow characteristics.

Dispersion Plume - The portion of the ground-water system which transports a foreign substance such as treated wastewater and whose natural quality is changed by the wastewater discharge.

Drainage Ditch - A trench dug into the earth, for the purpose of conveying overland stormwater runoff away from a site or area. A drainage ditch may be open or covered (i.e., a culvert).

Drainage Swale - A natural topologic depression that collects overland stormwater runoff, and conveys it away from a site or area.

Ephemeral Stream - A reach of stream that flows only in response to precipitation and whose channel is at all times above the water table. The term is often used interchangeably with intermittent stream but the difference is in length of continuous flow (less than one month).

Maximum Contaminant Level (MCL) - MCLs are based on health, economic and technological considerations, and are considered to be the maximum permissible level of a contaminant in water which is delivered to a public water system.

Mixing Zone - The portion of the dispersion plume emanating from a pollution source in which ground-water quality does not meet applicable water quality standards. (Until ground-water quality use protection criteria are formally established, the criteria are assumed to be equivalent to those established for drinking water quality as cited by the Federal Safe Drinking Water Act of 1974, P.L. 93-523.)

Perennial Stream - A body of water in a channel that flows continuously throughout the year and is capable, in the absence of pollution (or other man-made stream disturbances), of supporting a benthic macroinvertebrate community which is composed of two or more recognizable taxonomic groups of organisms which are large enough to be seen by the unaided eye and can be retained by a U.S. Standard No. 30 sieve (28 meshes per inch. 0.595 mm openings) and live at least part of their life cycles within or upon available substrates in a body of water or water transport system. A perennial stream can have Q_{7-10} flow of zero

TABLE 2

Hydrogeologic Variables Which should Be Considered When Evaluating Discharges to Drainage Swales and Ditches

A. Type of Discharge

- a. Natural Drainage Ditch (swale or dry stream bed)
- b. Artificially Constructed Drainage Ditch

B. Relationship of Channel to Ground-Water Flow

C. Depth to Water Table (seasonal variations)

D. Physical Characteristics which Control Ground-Water Flow

- a. Fractures
- b. Solution Channels
- c. Bedding Features
- d. Structure

E. Rock Characteristics

- a. Physical (consolidated, unconsolidated, texture, etc.)
- b. Chemical (mineralogy, weathering, etc.)

F. Background Ground-Water Quality/Quantity

G. Ground-Water Use Characteristics - Downgradient Users, Spring and Well Locations, Volumes of Ground Water Pumped, Estimated Cones of Depression, Influence of Pumping on Ground-Water Flow Direction for both Existing and Potential Users

H. Existing or Potential Dispersion Plume Characteristics

I. Site Runoff Characteristics - Expected Quality, Flow Characteristics, Volumes, Frequencies

J. Effluent

- a. Volume
- b. Quality (chemistry)
- c. Location of Discharge

K. Distance to Perennial Receiving Stream

L. Downstream Characteristics - Flow Characteristics, Volume, Quality

M. Other Discharges to Channel and Receiving Stream which Might Influence Quality

TABLE 3
Outline of Methods and Procedures for Determining
Point of First Stream Use

1. Biological Considerations

a. Macroinvertebrate Community

Indicators of Perennial Flow: Evidence of a diverse community which includes species which have relatively long aquatic life stages (Megaloptera, clams, and some Plecoptera and Ephemeroptera).

Indicators of Intermittent Flows: Low diversities, absence of fall emergence forms, dominance of forms with short aquatic life states (Baetis, chironomids, Simulium).

Cautions: Some invertebrates can compensate for intermittent dry stream periods (i.e. eggs which can withstand dessication); some streams have interstitial flows which support diverse. "subterranean type" macroinvertebrate communities.

b. Fish

Indicators of Perennial Flow: Diverse community composed of adults, juveniles in intermediate stages include forage and predator types.

Indicators of Intermittent Flow: Low diversity or dominance by one age group, absence of predators.

Caution: Fish are mobile and can move in and out of an area with relative ease as flow or other conditions become unsuitable.

c. Macrophytes

The presence of rooted aquatic plants is a possible indicator of perennial flows. However, due to the influence of other physical factors on macrophyte growth (i.e., substrate, canopy, stream velocities), the absence of macrophytes is not an indicator of intermittent conditions.

2. Physical Considerations

There are no generally applicable rules of thumb for consideration of physical factors, such as channel width and depth or substrate composition, that are relative to this subject other than the suitability of these to support an aquatic community. However, consultation with a geologist can yield valuable information on stream flow potentials based on geological factors in the region.

3. Other Factors

Existence of Ponds or Impoundments: Streams with a pond or an impoundment generally have flows throughout the year.

Topographical Maps: The depiction of a stream as intermittent (dashed line) or perennial (unbroken line) on a topographical map is generally based on some reliable historical data.

Knowledge of Area: This can be from personal experience or information from local residents or sportsmen who are familiar with the area.

4. Summary

Obviously, it is best to consider all, or as many as possible, of the above factors in making a first use determination. In any event, professional judgment tempered with experience is currently the best tool available for making a stream use determination.