II. Points of Compliance for Discharges to Surface Waters

INTRODUCTION AND PROBLEM STATEMENTS:

Problem #1: The location at which the discharge enters a water of the state may not be straightforward. See Section I above. Setting that location is the first step toward solving the problems listed below, and in defining the point of compliance with AKART requirements and water quality standards.

Problem #2: The water quality standards require that "all" mixing zones for stormwater shall be based on a volume *(read: volumetric flow rate)* of runoff corresponding to a design storm approved by the department." Ecology has not established an approved design storm for use in this application.

Problem #3: Expanded mixing zones are allowed for storms above the "approved design storm." To obtain a larger mixing zone, certain prerequisites must be met. There isn't any formalized criteria or process available concerning how to meet the prerequisites.

Problem #4: Mixing zones determinations are to consider critical discharge conditions. Critical receiving water conditions for stormwater discharges have not been established.

DISCUSSION OF PROBLEM #1:

If option #1 (see above discussion) is selected to address the waters of the state issue, and a mixing zone is not expressly allowed, the point of compliance is that location at which the discharge enters waters of the state. The quality of the discharge at that location must meet state surface water quality standards.

The following list of example situations is provided to help identify that location.

Example Situations:

1) An urban storm sewer, closed-pipe collection system, collecting runoff from catch basins and discharging to a naturally-occurring or man-altered stream, impoundment, estuary, or marine water. The point of

compliance is the discharge to the naturally-occurring or man-altered water. The point of compliance remains the same if (a) treatment system(s) is/are added anywhere in the collection system.

2) Storm sewers or ditches constructed on private property for stormwater transport which discharge to a naturally-occurring or man-altered stream, impoundment, estuary, or marine water. The point of compliance is the discharge to the naturally-occurring or man-altered water. The point of compliance remains the same if (a) treatment system(s) is/are added anywhere in the collection system.

3) An urban storm sewer pipe collection system, which mixes a closed-pipe collection system with naturally occurring channels and impoundments. The point of compliance is the location at which runoff enters a natural system. If the discharge from the natural system re-enters a closed pipe system which continues to collect stormwater, the point of compliance for the mixed waters is the next location of discharge to a naturally-occurring or man-altered waterway.

4) A roadside storm drainage ditch discharging to a naturally-occurring or man-altered stream, impoundment, estuary, or marine water. The discharge point is the point of compliance provided the ditch did not replace a naturally-occurring or man-altered water.

If option #1A is selected for implementation, there could be more than one point of compliance. First, there would be a location at which any standards applicable to "drainage" uses must be met. Secondly, there would be a location at which standards applicable to any other beneficial uses must be met.

In example #3 above, Ecology would have to decide the applicable standards for the naturally-occurring or man-altered waters on a case-by-case basis. In cases where the waters continue or can support beneficial uses other than drainage, Ecology would assign the water a beneficial use status other than drainage. An example would be a naturally-occurring wetland in the middle of an urban drainage system.

Ecology would be more likely to assign a highest use of "drainage" to instances where the waters lost beneficial uses other than drainage years ago. For example, water in a storm sewer pipe, in an urban setting, which replaced a small creek system and was covered over many years ago.

DISCUSSION OF PROBLEM #2:

Introduction:

Our existing Water Quality Standards (Chapter 173-201A WAC) allow the establishment of mixing zones for discharges, provided supporting information meets four prerequisites:

- the mixing zone would not have a reasonable potential to cause a loss of sensitive or important habitat,
- substantially interfere with the existing or characteristic uses of the water,
- result in damage to the ecosystem, or
- adversely affect public health as determined by the department.

Water quality criteria must be met outside the boundary of a mixing zone. A smaller zone, within the mixing zone, in which acute criteria may be exceeded can also be established provided the duration and frequency of exposure to the discharge will not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

The rule also: establishes maximum size limitations; places restrictions on overlapping of mixing zones; and requires minimization of mixing zone sizes.

For stormwater discharges up to a volumetric flow rate associated with a design storm event, a mixing zone may be granted in accordance with the above limitations and restrictions. ~~The permit writer must use the design storm flow rate, in conjunction with discharge concentrations and receiving water conditions to establish the boundaries of the mixing zone.~~ The mixing zone can not be larger than necessary to meet standards, and can not exceed the maximum size limitations.

Establishment of a larger mixing zone applicable to precipitation events greater than the approved design storm may be allowed if the discharger demonstrates:

- all appropriate BMP's have been applied,
- it can meet the four prerequisites listed above, and

- the proposed mixing zone does not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

Establishment of the Design Storm:

Given the difference in the time frames of the acute and chronic standards (acute standard is of one hour duration or instantaneous; chronic standard is four days) it is appropriate to use different design storms from which to estimate possible mixing zones, and whether more stringent effluent standards are necessary.

For the acute standard, the recommendation is to use the ~~peak one-hour flow generated by the 2-year, 72-hour storm~~ event, or 2) use the ~~average flow generated by the 2-year, 2-hour storm event~~. The latter is probably more appropriate. The run-off flowrate from this storm event is likely to be higher than the peak from the 2-year, 72-hour event. However, it may be appropriate to verify that assumption through run-off modeling of both storms.

72hr = 1.23x 24hr

2-year, 2-hour event: These short duration intense storms typically occur in the summer, regardless of geographic location in the state. This corresponds with lower receiving water flows, and greater potential for greater pollutant build-up on the urban landscape. The Ecology publication, Dam Safety Guidelines, Technical Note 3: Design Storm Construction, includes isopluvials for this storm event. They can also be found in NOAA Atlas No. 2, Precipitation - Frequency Atlas of the Western United States, Volume IX. For purposes of this exercise, the appropriate regional short duration hyetograph in Appendix C of the reference can be used to develop a synthetic storm. This hyetograph then serves as the input for producing a runoff hydrograph. *The above-referenced text explains how to calculate adjustments to the precipitation volume depending upon size of the watershed (see page 5).*

2-year, 72-hour event peak flow: This would represent the peak intensity of a long duration event. It typically occurs during the rainy season. Though the peak runoff flow may not be as high as the 2-year, 2-hour event, ~~and the receiving water flow not as low, it~~ could still be the critical discharge situation depending upon other variables, such as the concentration of pollutants of concern in the receiving water and in the runoff.

For the chronic standards, the logical choice is to use an estimate of the average run-off from the 2-year, 72-hour event. An event of 3-years, 96-hour return interval would correspond with the chronic water quality standards. However, the rainfall amounts for events of that duration/frequency are not readily available. Also, the actual discharge time period from a rain event can extend significantly beyond the actual rain event due to a long basin runoff time of concentration. So, it is appropriate to use an event with a more frequent return interval.

2-year, 72-hour event isopluvials are readily available in the references cited above. The hyetographs in Appendix C of the Ecology document can be used to develop the synthetic storm. For increased accuracy, the directions in the referenced document can be followed to correct for basin size and elevation. Once the runoff hydrograph is generated, the suggestion is to use the average discharge flow rate for the highest 72-hour period. The actual flow rate will be higher and lower than this value for the course of the storm. The actual amount of runoff fluctuation depends upon the runoff characteristics of the watershed (e.g., time of concentration).

The time of concentration, and the discharge characteristics of a basin can be drastically changed through implementation of BMP's. For example, a large detention basin can dampen runoff peaks, extend the period of discharge, and reduce pollutant concentrations. It may be appropriate to use additional storm events of higher frequency, and shorter duration for modeling purposes if application of retention facilities in the basin extends the discharge period to around 96-hours or longer.

Permitting Strategy:

Application of these storm events to predict compliance with water quality standards is necessary given the time/frequency nature of the standards. However, Ecology has encouraged use of the 6-month, 24-hour storm event for sizing of treatment BMP's. This storm event was selected because of size and cost considerations. For storm volumes in excess of that generated by the 6-month, 24-hour event, the incremental cost of treatment vs. volume treated begins to escalate rapidly.

Ecology's strategy for bringing most municipal and industrial dischargers into compliance with all the requirements of the Clean Water Act and state laws, is to

initially require all dischargers to apply AKART, and in the case of municipal dischargers, MEP. Thus, Ecology is not routinely requiring assessments of stormwater dischargers for compliance with water quality standards. However, where Ecology has identified certain discharges as a high priority for concern, it reserves the right to require monitoring and analyses for determining compliance with standards. The goal is to eventually verify that the discharges are in compliance.

Ecology anticipates that any required monitoring will focus on the discharge quality and quantity. Where mixing zones aren't assigned, the discharge must meet water quality standards applicable to the receiving water. Where mixing zones are granted, the discharge must meet an assigned effluent limitation which is computed based upon modeling of the discharge and the critical receiving water condition. Receiving water monitoring at the downstream edge of an assigned mixing zone, i.e., at the actual point of compliance, will not be the preferred option.

DISCUSSION OF PROBLEM #3:

Introduction:

In regard to establishment of mixing zones, the Permit Writer's Manual notes that there are not criteria or processes for making determinations regarding achievement of the prerequisites listed above (with the exception of the application of all appropriate BMPs), nor in how to minimize the mixing zone. In the absence of any site specific information to guide the decision, the manual directs the permit writer to "authorize dilution zones up to the maximum size allowable under the discharge situation."

That guidance is not applicable to stormwater dischargers given the first sentence of WAC 173-201A-100(10)(c). For storms up to the design storms recommended above, the permit writer must determine a mixing zone, no larger than necessary to meet standards, but not larger than the maximum allowed by the water quality standards. The writer then applies any site specific information which would indicate an even smaller zone is advisable.

The water quality standards allow larger mixing zones, and overlapping zones, for larger storm events provided the prerequisites are met. But there currently isn't any guidance to the permit writer concerning how to set the boundaries of such larger zones other than the restrictions of the prerequisites.

I DISAGREE W/ECOLOGY'S INTERPRETATION THAT LARGER STORMWATER MZ MAY BE ALLOWED SOLELY FOR EVENTS EXCEEDING THE APPROVED DESIGN STORM. RATHER, I FEEL IOC IS INTENDED TO EXPRESSLY ALLOW EXCEEDANCES DUE TO EVENTS GREATER THAN THE APPROVED DESIGN STORM, NOT EXCLUDE EXCEEDANCES FOR OTHER REASONS.

Here are some options to this situation:

1) Ecology allows use of the usual maximum mixing zone size criteria for stormwater discharges from storms exceeding the design storm, and without allowances for overlap, on a routine basis as it does with other discharges. Dischargers who apply for larger mixing zones as allowed by WAC 173-201A-100(10) must provide evidence to allow a decision concerning compliance with the prerequisites;

2) Ecology establishes default criteria for larger mixing zones which can be used unless site specific information is available which makes authorization of a larger zone questionable in light of application of the prerequisites.

As a point for further discussion, an option for larger mixing zone criteria is presented here:

· *the mixing zone within which chronic standards may be exceeded can extend across the full stream width, and as far downstream as necessary to ensure complete mixing with the receiving water.*

· *allow up to the maximum size allowance for the chronic mixing zone (WAC 173-201A-100(7)) for the zone within which acute criteria may be exceeded.*

Rationale: Many stormwater discharges are to small streams. In storm situations, a significant portion of the flow in small urban streams is stormwater runoff.

DISCUSSION OF PROBLEM #4:

Mixing zone determinations are to consider "critical discharge conditions" (WAC 173-201A-100). Critical discharge conditions include assumptions of flow and background concentrations. For continuous discharges to streams, ~~critical conditions have typically been established as the seven consecutive day, ten year low flow with background receiving water concentrations estimated from the 90th percentile value derived from a cumulative frequency distribution analysis.~~

Pollutants in stormwater discharges which are most likely to cause an exceedence of a numerical water quality standard include: temperature, turbidity, fecal coliform bacteria, and metals. The first three parameters do not have a time dependent aspect. The critical receiving water conditions for them are the same as they are for continuous discharges.

The standards for metals include time and frequency components, and a more detailed discussion of appropriate critical conditions is in order.

Temperature: The critical condition is when the ambient temperature of the receiving water is the highest. The point of compliance is the edge of the chronic mixing zone, if one is allowed.

Bacteria: The critical condition is the 7-day/10-year flow. The bacteria standard applies at the edge of the chronic mixing zone, if one is allowed. The suggestion is to use the chronic mixing zone boundary established for metals.

Turbidity: The permit writers manual indicates that turbidity does not have a linear response to dilution. Any data that indicates a violation of standards should be verified in the field. The suggestion is to use the chronic mixing zone boundary established for metals as the point of compliance.

Metals: For estuaries and marine waters the critical flow conditions should be determined in the same manner as for continuous discharges. For freshwater streams, a 7-day/10-year flow regime seems to be more conservative than necessary for determining the reasonable potential of stormwater discharges to cause a violation of standards for metals, and in estimating a point of compliance.

Stormwater discharges are not continuous discharges. The relative amount of time per year in which discharges occur varies across the state with rainfall patterns. But the chances of having a precipitation event (or snowmelt) which causes a four-day stormwater discharge (corresponding to the chronic water quality standards for most metals) during a 7-day/10-year flow are small for any region of the state. A different critical flow condition should be defined for stormwater discharges. From the standpoint of convenience [illegible] flow data is desireable.

Acute standards: The acute standards for metals are one-hour concentrations not to be exceeded more than once every three years. USGS standard flow data includes estimates of the lowest mean flow for a single day, for one through 100-year time periods. The standard flow rates which correspond best with the acute standards are the [illegible] within a physical boundary determined by the restrictions of WAC 173-201A-100(8), the permit writer may use the above flow rates to estimate

compliance with acute criteria for metals.

If historical flow data to this level of detail are not available, explore possibilities of drawing streamflow rate analogies with data from the first downstream water for which the data exist. Estimates can be made based on relative drainage basin sizes and percentages of impervious surface.

Chronic Standards: The chronic standards for metals are four-day averages not to be exceeded more than once every three years. Based on 24-hour rainfall records at Sea-Tac Airport, and using 0.10 inches as the threshold for rain producing significant runoff, the only months which did not have four consecutive days of rain less frequently than once every three years were June and July. For Puget Sound area stormwater discharges, the suggestion is to use the lowest reported monthly mean receiving water flow rate occurring from August through May at a discharge exceedence probability of .20 (i.e., a five-year mean low flow for the lowest month). The selection of the five-year return interval is intended to offset the lack of a readily available four-day low flow for these months. August through October are the likeliest months for the lowest rate.

Background Receiving Water Concentrations:

The permit writer must make assumptions or have data for background receiving water concentrations to:

determine the size of the chronic mixing zone, or

to require lower effluent concentrations if the available dilution is inadequate to meet standards at the edge of a maximum size dilution zone.

The permit writer should follow the recommendation of the Permit Writers' Manual, to use the 90th percentile value derived from a cumulative frequency distribution analysis of all of the available concentration data unless more pertinent data is available. More pertinent data could include:

1) data taken within the receiving water during and immediately after rainfall events. Receiving waters in urban areas are likely to have elevated background concentrations of heavy metals and bacteria, and have higher temperatures during rainfall events. This is due to the stream being impacted by non-point and point source

stormwater run-off. The result could be that a mixing zone is not possible because background concentrations already exceed water quality standards. It is doubtful that the permit writer will have easy access to records indicating weather conditions for days on which a stream was gauged.

2) data taken during the wet season months of November through March, which may be more appropriate for use in determining the chronic mixing zone. Data taken in dry months may be more appropriate for use in determining compliance at the edge of an assigned acute mixing zone, since a one-day low flow is the critical flow condition.