



# Mixing Zones in Oregon

## Water Quality Permitting and Program Development

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# Oregon's Mixing Zone Rule

## Narrative

- “small as feasible”
- Avoid overlap with other mixing zones
- Minimize adverse effects on indigenous biological community, allow for fish passage
- Not threaten public health
- Minimize adverse effects on other designated beneficial uses

Regulatory Mixing Zone (RMZ) must be described in the permit itself

# How is “Small as Feasible” Determined?



Must use the best available treatment technology that is economically achievable as required by applicable federal effluent limitation guidelines



Must use the best technology that is economically achievable to design and locate the outfall to allow for adequate mixing while avoiding sensitive areas

# In addition to that...



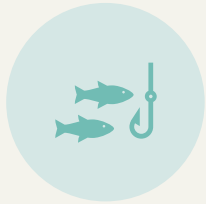
Avoid impingement on cold water refugia.



Avoid sensitive habitat for fish spawning or rearing



Avoid drinking water intakes



Avoid known areas frequently used for fish harvesting



Avoid known, public swimming areas



Generally limit RMZ width to no more than 25% of stream width



Keep the total area affected by all RMZs small when compared with the total area of the water body.

# How do we determine this?

- Environmental Mapping
  - Sensitive areas
  - Other permittees
- Once mapping is complete
  - determine if RMZ size is still appropriate
- Describe RMZ and ZID as
  - Distance based or Percent
  - Flow based



Environmental Map with Clamming areas (green) and native oyster habitat (blue)

# Distance Based RMZs

- Described as a distance downstream and a width
  - The Regulatory Mixing Zone (RMZ) for Outfall 001 is that rectangular portion of the Nehalem River that is 100 ft downstream of the discharge point and 20 ft wide centered on the discharge point.
- Can also be described as a radius
  - reserved for tidal or ocean dischargers
- Dilutions are determined using modeling software such as CORMIX



Example of mapped RMZ and ZID

# Percent Flow RMZs

- MZ is defined as a percentage of the flow of the river
  - The Regulatory Mixing Zone (RMZ) for Outfall 001 is defined as 25% of the Beaver Creek flow.
- Dilutions are determined using
  - low flow statistics (1Q10, 7Q10, 30Q5) for the receiving stream
  - high estimates of effluent flow (reported maximum daily flow, maximum monthly average flow)

Table 3: Percent Flow Based Dilutions

Criteria	Ambient Low Flow Value (cfs)	Percentage of Flow from MZ Description	Effluent Flow	Formula
Acute Aquatic Life	4.2	10%	1.57 MGD = 2.43 cfs	$\frac{0.10(Qa) + Qe}{Qe} = \frac{0.10(4.2) + 2.43}{2.43} = 1.2$
Chronic Aquatic Life	9.3	25%	0.90 MGD = 1.39 cfs	$\frac{0.25(Qa) + Qe}{Qe} = \frac{0.25(9.3) + 1.39}{1.39} = 2.7$
Human Health Non-Carcinogen	22.3	25%	0.90 MGD = 1.39 cfs	$\frac{0.25(Qa) + Qe}{Qe} = \frac{0.25(22.3) + 1.39}{1.39} = 5.0$

Example of Dilutions determined for a Percent Flow ZID and RMZ

# When to use Distance vs Percent Flow

## Distance

- If there is a particular habitat nearby that RMZ should avoid
- Larger waterbodies
- Ocean and Tidal discharges
- When plume modeling programs give accurate results

## Percent Flow

- Small streams where there is no sensitive habitat nearby
  - Low flow statistics <100 cfs
- When plume modeling programs (e.g. CORMIX, VP) don't give accurate dilutions
  - aren't designed for the stream morphology or outfall configuration

# Advantages and Disadvantages

## Distance

### Advantages:

- Defined area – easy to conceptualize

### Disadvantages:

- Determining dilution requires plume modeling – costly and time intensive

## Percent Flow

### Advantages:

- Dilutions are very easy to determine
- No modeling = low cost, low time

### Disadvantages:

- Hard to conceptualize – can't map it

# Thank You!

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