********** FLOW CLASS DESCRIPTION **********

The following description of flow class S3 applies to the LOWER LAYER ONLY of the specified ambient stratification condition C. Note that the lower layer will be overlaid by the surface layer of the ambient density stratification. The surface layer will remain undisturbed by the near field discharge flow (with the exception of some possible intrusion along the pycnocline).

FLOW_CLASS_S3

This flow configuration is profoundly affected by the linear ambient density stratification. The predominantly jet-like flow issues horizontally, or near-horizontally, into the density stratified layer and gets trapped at some terminal (equilibrium) level. The crossflow is weak in the present situation.

Following the trapping zone, the discharge flow forms an internal layer that is further influenced by buoyant spreading and passive diffusion.

The following flow zones exist:

1) Weakly deflected jet in linear stratification: The flow is initially dominated by the effluent momentum (jet-like) and is weakly deflected by the ambient current and the density stratification.

2) Terminal layer injection / upstream spreading: The weakly bent jet/plume approaches (injects into) the terminal layer at a near-horizontal angle. After injection the flow spreads more or less radially at the terminal level forming an internal layer. The residual horizontal momentum flux within the jet affects that spreading process. In particular, the flow spreads some distance upstream against the ambient flow, and laterally across the ambient flow. This spreading is dominated by the buoyant collapse of the internal layer within the linear ambient stratification.

*** The zones listed above constitute the NEAR-FIELD REGION in which strong initial mixing takes place. ***

3) Buoyant spreading in internal layer: The discharge flow within the internal layer spreads laterally while it is being advected by the ambient current. The plume thickness may decrease during this phase. The mixing rate is relatively small. The plume may interact with a nearby bank or shoreline.

4) Passive ambient mixing: After some distance the background turbulence in the ambient shear flow becomes the dominating mixing mechanism. The passive plume is growing in depth and in width. The plume may interact with the upper layer boundary, channel bottom and/or banks.

*** Predictions will be terminated in zone 3 or 4 depending on the definitions of the REGULATORY MIXING ZONE or the REGION OF INTEREST. ***

SPECIAL CASE: If the ambient is stagnant, then advection and diffusion by the ambient flow (zones 3 and 4) cannot be considered.

The mixing is limited to the NEAR-FIELD REGION (zones 1 and
2) and the predictions will be terminated at this stage. Such
stagnant water predictions may be a useful initial mixing indicator
for a given site and discharge design.
For practical final predictions, however, the advection and
diffusion of the ambient flow - no matter how small in magnitude
- should be considered.

END OF FLOW CLASS DESCRIPTION **********