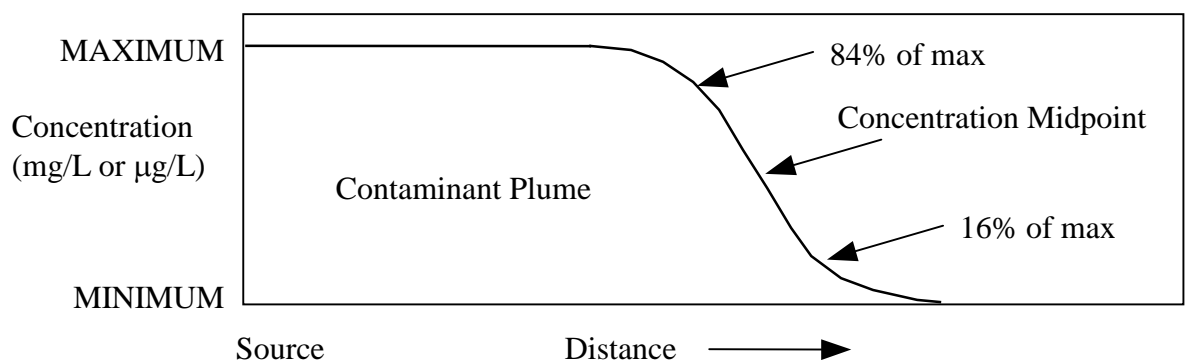


Groundwater Contaminant Plumes

Contaminant Plume = A mixture of waste chemicals, or leachate, and groundwater, usually in solution form, but other insoluble forms are possible.

Front of Plume = Not strictly defined, a function of concentration and toxicity. The figure below illustrates concentration level of the plume with distance from the source. The length over which the concentration remains at a maximum level depends on flow rate and waste input, which may or may not be constant. The plume front will be defined by some useful parameter, usually the **detection limit** of the analytical technique. So, a plume that was originally **not** detected by chemical analyses of water from monitoring wells might now be detected and well-defined by newer techniques that have lower detection limits!



Plume Shape = Can be long and thin, short and stubby, distorted, sinuous, or any imaginable shape depending on aquifer conductivity, flow rate, and ability for the plume to disperse. A fast flow rate with low dispersion potential will lead to a high aspect ratio (length to width ratio) of, perhaps 10:1 or higher; a low flow rate with high dispersion potential will yield a short, broad plume with a low aspect ratio. The actual shape is given in the form of **isopleth contours** which are simply lines of equal concentration level, like topographic contours on a map except that the contours are pollutant concentrations. The midpoint concentration of the plume, between 16 and 84 percent of the maximum concentration, is normally used to define the movement and velocity of the plume. Obviously, analyses of water in monitoring wells need to be performed regularly to determine the velocity and predict future size, shape and concentration levels.

Groundwater Flow Lines = are lines that indicate the direction of groundwater movement. They do not indicate velocity and they always cross water table contours (elevation of the water table) at a perpendicular angle. In other words, they indicate that groundwater, just like surface water, indeed flows downhill. A map that shows both **water table contours** (or contours of the piezometric surface) and **flow lines** is called a **FLOW NET**. Study the sheet that illustrates flow nets and learn to construct flow lines when water table contours are provided. Note: Qal is “Quaternary alluvium” a general term for unconsolidated, loose sediment, usually with a relatively high water conductivity. The two contrasting materials shown in the handout, Qal aquifer and granite aquitard, could be any other materials with aquifer and aquitard characteristics, respectively. Use the handout to help with the **Magic Gulch** exercise.