ORC TECHNICAL BULLETIN #2.5.3

Oxygen Release Compound, ORC®

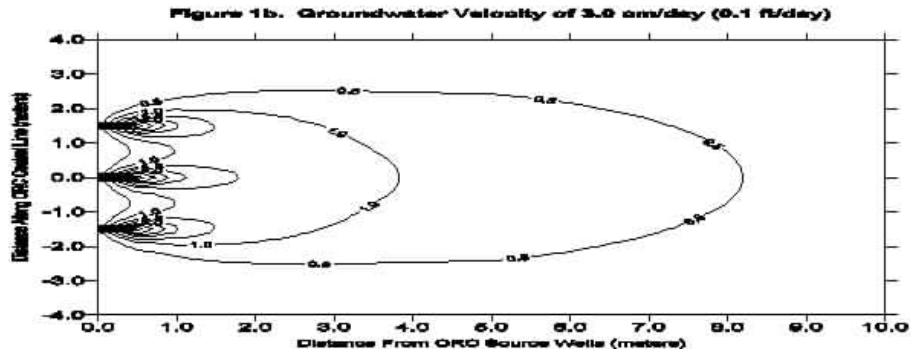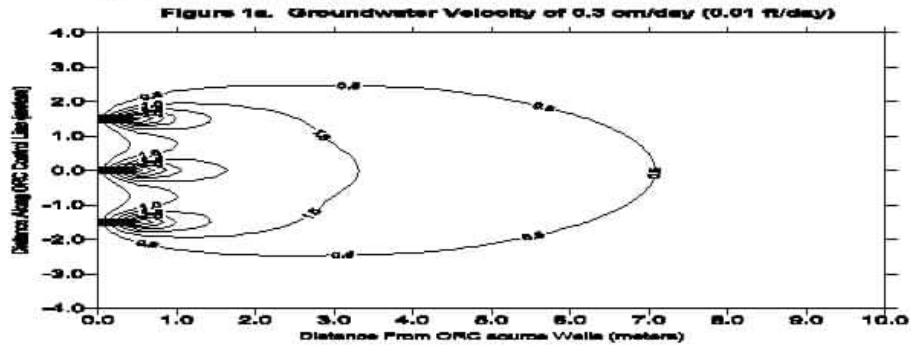## Computer Modeling Results for a Full Cut-Off Barrier

The following graphical representations are generated by a unique version of the Cleary Ungs model, adapted for interactive, menu driven use. The program is written in Visual Basic with three dimensional graphical output. The spatial condition is two dimensional - along the barrier axis and downgradient. Molecular concentrations, whether they be oxygen or contaminant are represented in the third (height) dimension. The three dimensional images can be rotated and viewed from any position.

Given a, 1) groundwater seepage velocity, 2) initial oxygen concentration and, 3) the initial contaminant concentration, one can generate the following for a specified time period and spatial array:
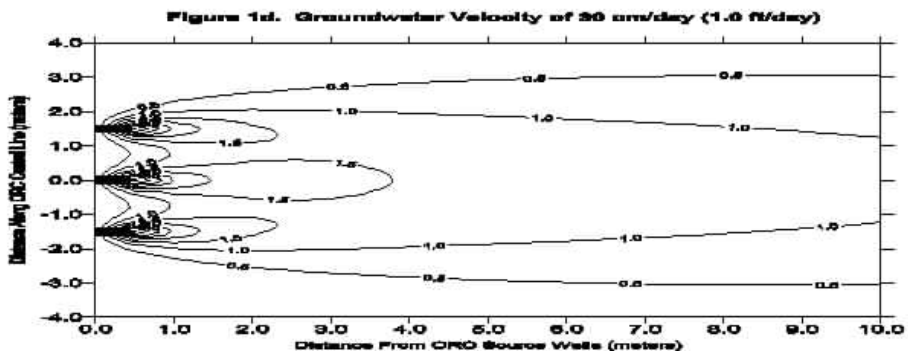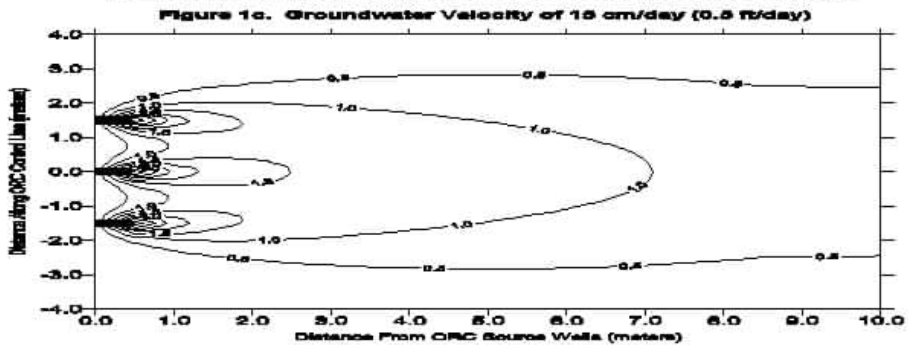
1. Oxygen distribution as a function of advection, dispersion and retardation without utilization.

2. Oxygen distribution as a function of advection, dispersion and retardation with utilization.

3. Reduction of dissolved-phase contaminants in relation to the available oxygen.

Figures 1a through 1d represent the distribution of oxygen after 90 days at the four different velocities indicated, after insertion of ORC filter socks into a 4" diameter well. The .01 ft/day groundwater velocity (1a) represents a static site. The .1, .5 and 1 ft/day flows in the other figures (1b-1d), represent a typical range of groundwater velocities seen on most sites. Figures 2 a-d repeat this series for 180 days after contact of ORC with the groundwater. In all cases, an initial oxygen concentration of 20 ppm is used and is mildly conservative based on actual field measurements. Oxygen contours are presented in plan view. The 5 foot on center spacing of the wells provides full coverage across the barrier. Another option is to space wells at 10 foot centers and fill in the contaminant breakthrough points as necessary ; this is called an *iterative approach* and is the subject of Technical Bulletin 2.5.4.

Dissolved Oxygen Distribution after 90 Days from Three 4-inch (0.1meter) Diameter Sources Spaced 1.5 meters (5 Feet) on Centers
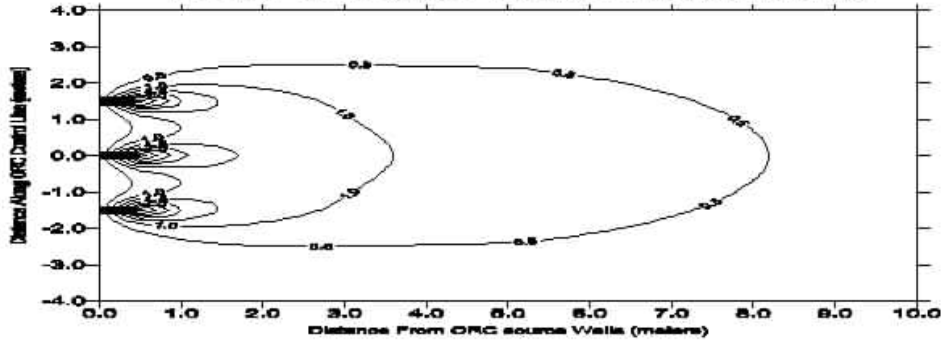
Figure 1a. Groundwater Velocity of 0.3 cm/day (0.01 ft/day)

Figure 1b. Groundwater Velocity of 3.0 cm/day (0.1 ft/day)

Dissolved Oxygen Distribution after 90 Days from Three 4-inch (0.1meter) Diameter Sources Spaced 1.5 meters (5 Feet) on Centers

Figure 1c. Groundwater Velocity of 15 cm/day (0.5 ft/day)

Figure 1d. Groundwater Velocity of 30 cm/day (1.0 ft/day)

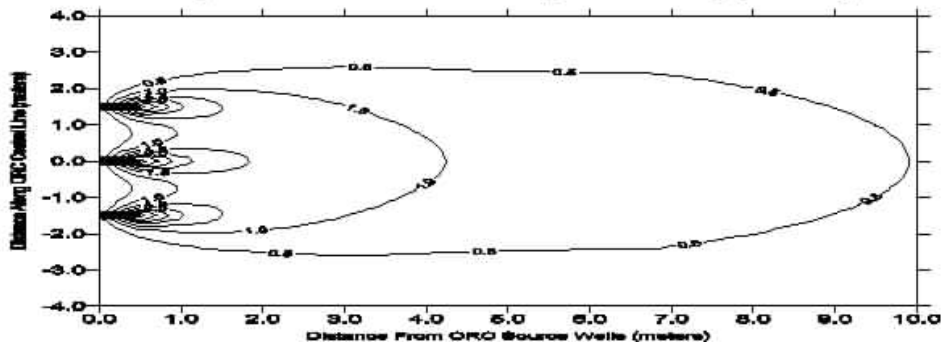**Dissolved Oxygen Distribution after 180 Days from Three 4-inch (0.1 meter) Diameter Sources Spaced 1.5 meters (5 Feet) on Centers**

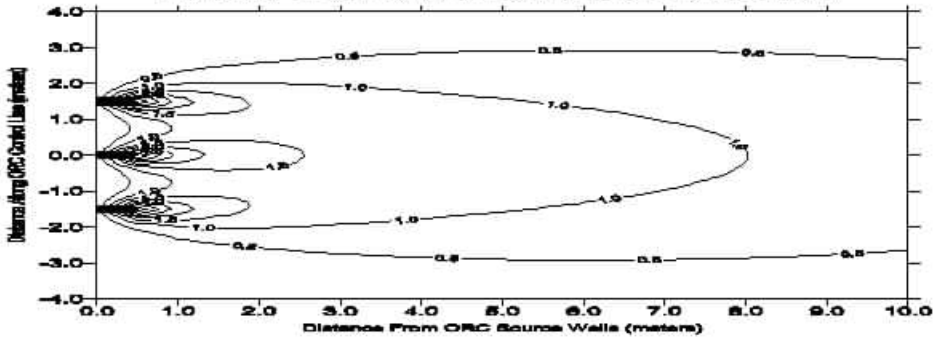Figure 2a. Groundwater Velocity of 0.3 cm/day (0.01 ft/day)

Figure 2b. Groundwater Velocity of 3.0 cm/day (0.1 ft/day)

Dissolved Oxygen Distribution after 180 Days from Three 4-inch (0.1 meter) Diameter Sources Spaced 1.5 meters (5 Feet) on Centers

Figure 2c. Groundwater Velocity of 15 cm/day (0.5 ft/day)

Figure 2d. Groundwater Velocity of 30 cm/day (1.0 ft/day)

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