



# MONITORED NATURAL ATTENUATION (MNA) TOOL INSTRUCTIONS

(REVISED 5/15/2013)

## MNA Calculation Tool

This worksheet is a simple tool designed to help determine if monitored natural attenuation (MNA) is appropriate as a corrective action method for a site. The worksheet will calculate the decay rate, time to cleanup, cleanup levels, and milestones as described in the [MNA Guidance Document](#).

## Concentration vs Distance Method

The following steps are instructions for the concentration versus time method (Conc-vs-Distance worksheet) of calculating the decay rate, etc., that is used if at least four consecutive quarters of sampling data is not available. For this method to be valid, the site must have at least three contaminated wells along the axis of the plume.

### Step 1: Data Entry

- Enter the appropriate data in the un-shaded cells in the Site Data table (Table 1) and enter the site well designations, distance data, and concentration data (at least three contaminated wells) in Table 2.
- The example data in Table 2 assumes that there are four contaminated wells along the primary axis of the plume and MW-C is the well located at the property boundary. Using the entered data, the travel times are calculated.

### Step 2: Data Plot

- The graph will automatically plot the data points, add a trend line for the data set, display the equation for the trend line, and display the R<sup>2</sup> value (degree of fit of the data set to its trend line). The [MNA Guidance Document](#) describes each of these components in more detail and how to evaluate the components and MNA appropriateness.
- Helpful Hints
  - The equation and R<sup>2</sup> value may be displayed in a location other than to the right of the graph, so left-click and hold the display to move it.
  - After all data has been entered, the data range must be verified so that all data is displayed on the graph. To check the data range, left-click on any one data point (black square) of a data set and a highlighted box will outline the data used in Table 2. Left-click and hold the bottom right corner of this highlighted box and drag it to encompass all travel time or concentration data for the set.

### Step 3: Time to Cleanup

- If there is a decreasing trend line (negative decay rate) and the R<sup>2</sup> value is within the appropriate range, the decay rate is selected from the valid data set and entered in the appropriate box in Table 3. The current concentration in the property boundary or most downgradient well (protecting a POE other than and inside the property boundary) is then entered in Table 3. The table will automatically compute the time to cleanup for the site in years and days.

### Step 4: Milestones at POE Well

- The current concentration of the property boundary (or most downgradient well) is entered in the un-shaded cell in Table 4 which calculates the milestones, in concentration and cumulative days, at 25%, 50% and 75% towards the cleanup goal of 5 ug/L.

### Step 5: Cleanup Levels and Milestones at Source and In-Plume Wells

- Enter the current concentrations of the source and other in-plume wells in the un-shaded cells in Table 5. This table will calculate the cleanup level of each in-plume well (concentration at the time to cleanup of the site) and each milestone along the way towards the cleanup levels.

## Decay Rate as a Model Input

- If data indicates that the bulk decay rate is valid (decreasing trend and R2 in acceptable range), this bulk decay rate may, with OPS approval, be used to calculate a biological decay rate that can be used in a fate and transport or Tier 2 model in which physical degradation is already calculated.
  - The biological decay rate can be estimated by multiplying the bulk decay rate by 80%.
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## Concentration vs Time Method

The following steps are instructions for the concentration versus time method ("Conc-vs-Time" worksheet) of calculating the decay rate, etc., that is used if at least four consecutive quarters of sampling data is available.

### Step 1: Data Entry

- Enter data in the un-shaded cells in Table 1 by simply typing over the data that already exists.
- The date can be entered in formats of 6/14/2000 or 6/14/00 and the concentration in micrograms per liter (ug/L).
- The actual site well designations at the site are placed in the second row under Well 1, Well 2 and Well 3 labels.
  - The Well 1 column can be the source well data, Well 2 an in-plume well, and Well 3 the property boundary well or most downgradient well between the source and the closest point of exposure (POE) other than and inside the property boundary.
- Helpful Hints
  - Non-detect data must be entered as the laboratory detection limit, not "0".
  - Lines can be inserted in Table 1 as necessary. If no data exists for a particular well on a particular date, leave that cell blank.

### Step 2: Data Plot

- The graph to the right of Table 1 will automatically plot the data points, add a trend line for each data set, display the equation for the trend line of each data set and display the R2 value (degree of fit of the data set to its trend line).
- The [MNA Guidance Document](#) describes each of these components in more detail and how to evaluate the components with respect to MNA appropriateness.
- Helpful Hints
  - The equation and R2 value may be displayed in a location other than directly under the Well 1, 2, and 3 labels; therefore, if desired, left-click and hold the display to move it.
  - After all data has been entered, the data range must be verified so that all data is displayed on the graph. To check the data range, left-click on any one data point of a data set (green diamond, blue square, or red triangle) and a highlighted box will outline the data used in Table 1. Left-click and hold the bottom right corner of this highlighted box and drag it to encompass all concentration data for the set and all days for the set. Repeat this procedure for each data set.

### Step 3: Time to Cleanup

- If there is a decreasing trend line (negative decay rate) and the R2 value is within the appropriate range, the most conservative (lowest) decay rate is selected from all valid data sets and entered in the appropriate box in Table 2.
- The current concentration in the property boundary or most downgradient well (as identified in Step 1) is then entered in Table 2. The table will automatically compute the time to cleanup for the site in years and days.

### Step 4: Milestones at POE Well

- The current concentration of the property boundary (or most downgradient well) is entered in the un-shaded cell in Table 3 which calculates the milestones, in concentration and cumulative days, at 25%, 50% and 75% towards the cleanup goal of 5 ug/L.

### Step 5: Cleanup Levels and Milestones at Source and In-Plume Wells

- Enter the current concentrations of the source and other in-plume wells in the un-shaded cells in Table 4.
- This table will calculate the cleanup level of each in-plume well (concentration at the time to cleanup of the site) and each milestone along the way towards the cleanup levels.