4.1 Overview/Symbols and Notation

The tutorials in this manual are designed to help the user setup and run RBCA Tier 2 Analyzer for simple cases. They are broken into parts as follows: **1)** Flow Model, **2)** Initial Condition Plume Model, and **3)** Transport Option One,

Symbols and Notation

The following Symbols and Notation are used

☞	Click on the left mouse button
☞☞	Double click on the left mouse button
☜	Click on the right mouse button
type	Print values into the dialog box

4.2 Creating a Groundwater Flow Field

Starting RBCA Tier 2 Analyzer

From the windows environment:

☞ Start button
☞ RBCA_Tier_2_Analyzer

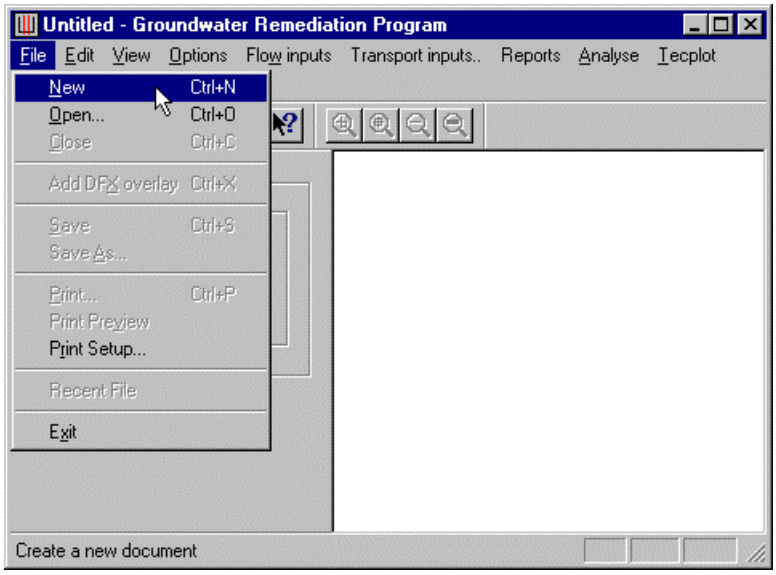
This will start the program.

1) Creating a Groundwater Flow Field

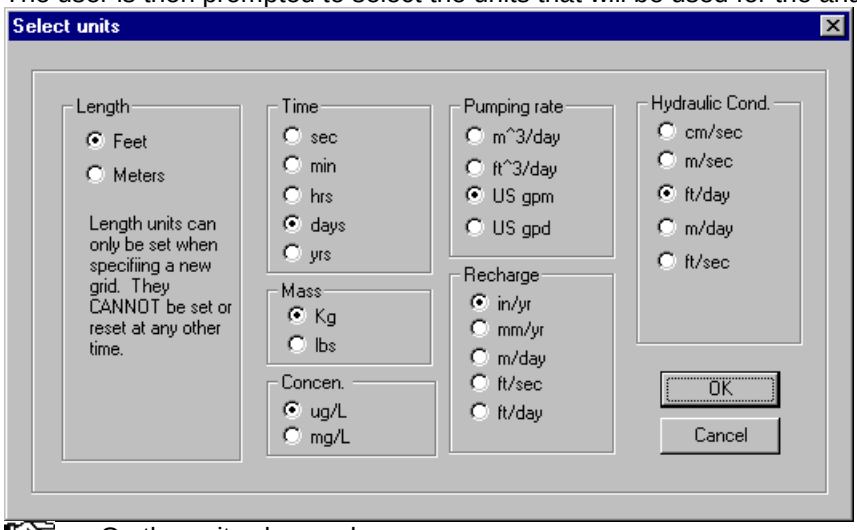
To start a new project

☞ File/New

The opening screen is shown below:

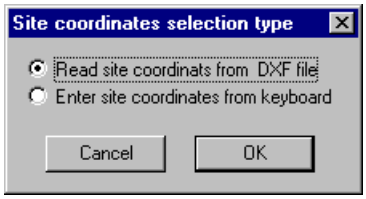


The user is then prompted to select the units that will be used for the analysis.



☞ On the units shown above
☞ OK

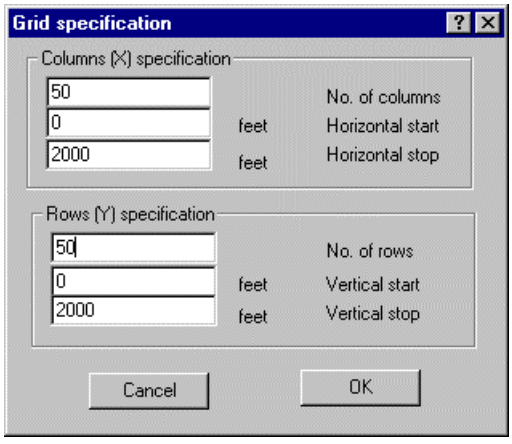
At this point the user has the option to read in a dxf overlay map



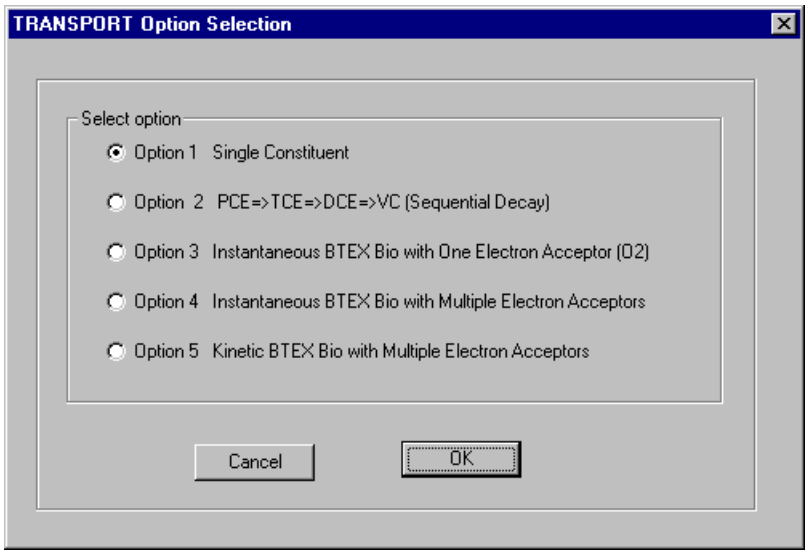
☞ Read site coordinates from dxf file
☞ OK
☞☞ Airport.dxf

Note that **Airport.dxf** should be in the C:\RBCA_Tier_2_Analyzer\turotials directory

type grid specifications shown below:



☞ OK
☞ Select the transport Option 1. This selection can be changed later from inside the program.



☞ OK
☞ OK

Now the basic model has been constructed.

Note that the user can use the **Options/Show/Hide Overlay** menu to turn on and off the dxf overlay, the dxf text or the dxf arcs.

☞ Flow Inputs**/**Wells

Notice that the bar on the left screen has changed to facilitate adding and removing wells.

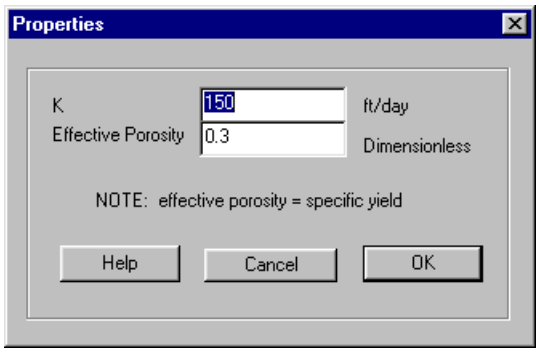
☞ Add
☞ Row 31, Col 17
type 50 gpm
☞ Finish

☞ Add
☞ Row 27, Col 30
type 50 gpm
☞ Finish

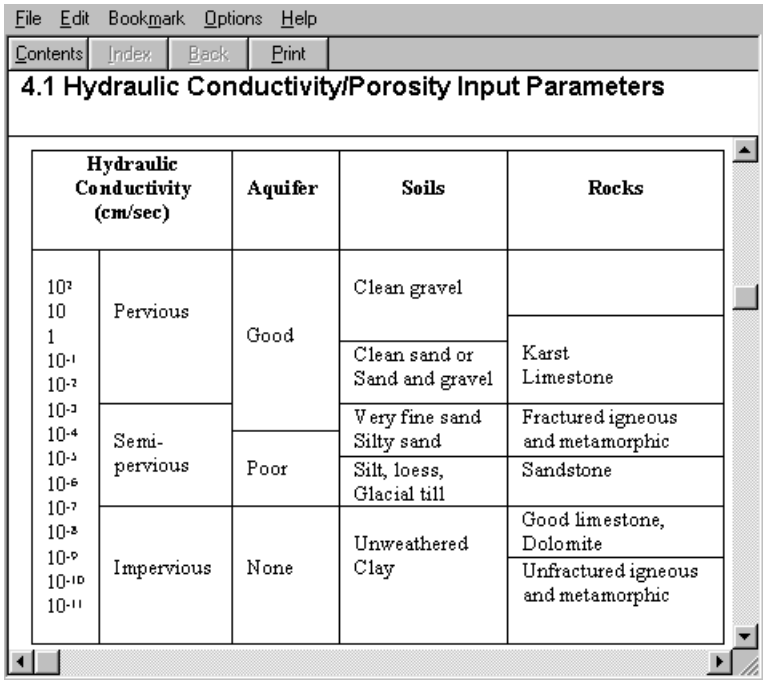
☞ Add
☞ Row 20, Col 46
type 50 gpm
☞ Finish

☞ Flow Inputs**/**Properties**/**Aquifer properties

type the following values



Note that example input parameters are available under the Help button on most dialog boxes



☞ OK

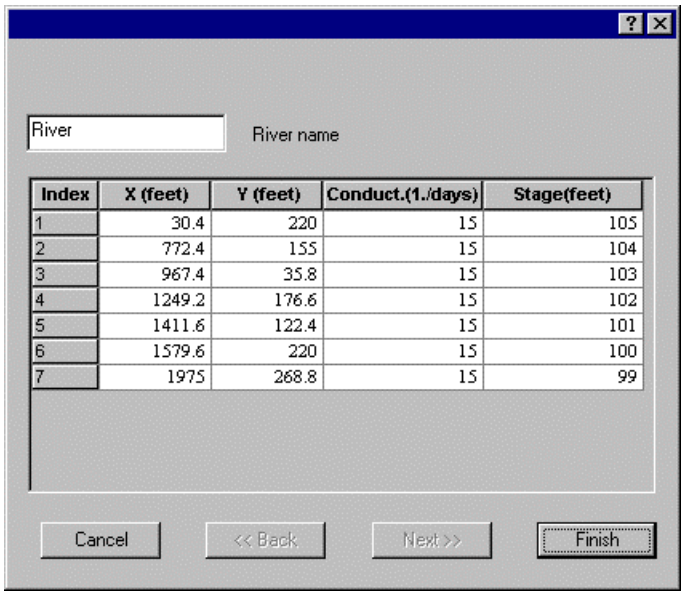
☞ Flow Inputs/Properties/Saturated Thickness
type 100
☞ OK

☞ Flow Inputs/Boundary conditions/No Flow/Bedrock
☞ Add Boundary Line ***from left bar***
☞ Row 42, Col 1
☞ Row 48, Col 50
☞ Add Inactive Point
☞ Row 47, Col 11 ***which indicates the inactive side of the line***

☞ Flow Inputs/Boundary conditions/Rivers
☞ Add ***from left bar under the "River" label***
☞ Row 6, Col 1
☞ Row 4, Col 20
☞ Row 1, Col 25
☞ Row 5, Col 32

☞ Row 4, Col 36
☞ Row 6, Col 40
☞ Row 7, Col 50

type river conductance and stage parameters shown below:



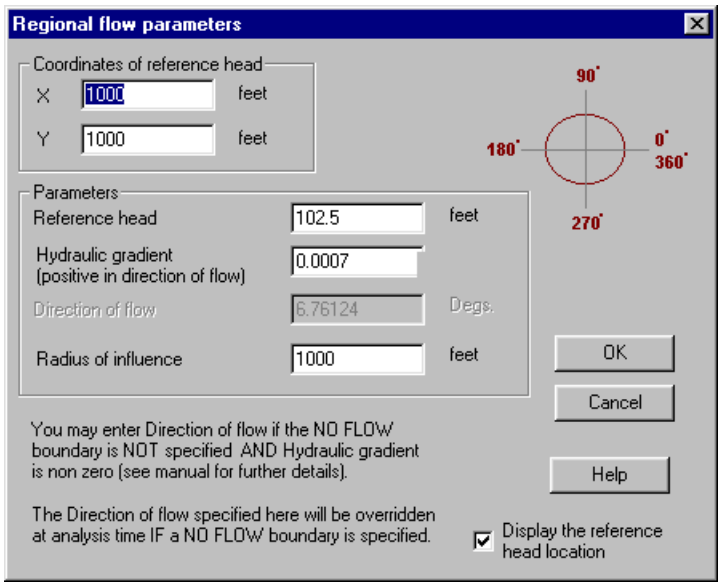
☞ Finish

☞ Flow Inputs/Boundary conditions/Recharge

type 24

☞ OK

☞ Flow Inputs/Regional Flow Parameters
type the following parameters



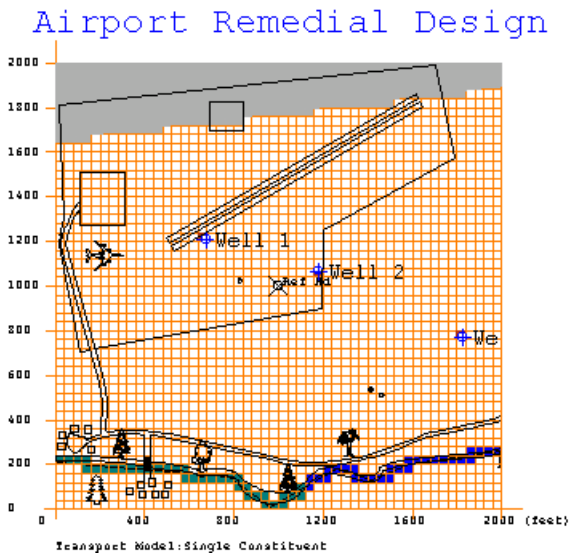
☞ OK

☞ Edit/Title

type Airport Remediation Design

☞ OK

Now you have set up a typical flow model by specifying boundary conditions and aquifer parameters. You are ready to run the Flow model. Make sure to save you work periodically. Your screen should look similar to the screen shot shown below:



Note that after the user calculates flow the river cells change color. Green indicates loosing river cells and blue indicates gaining river cells.

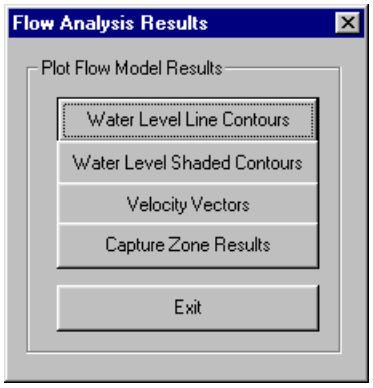
☞ Analyze/Flow
☞ Start Analysis

Once the flow solution is complete

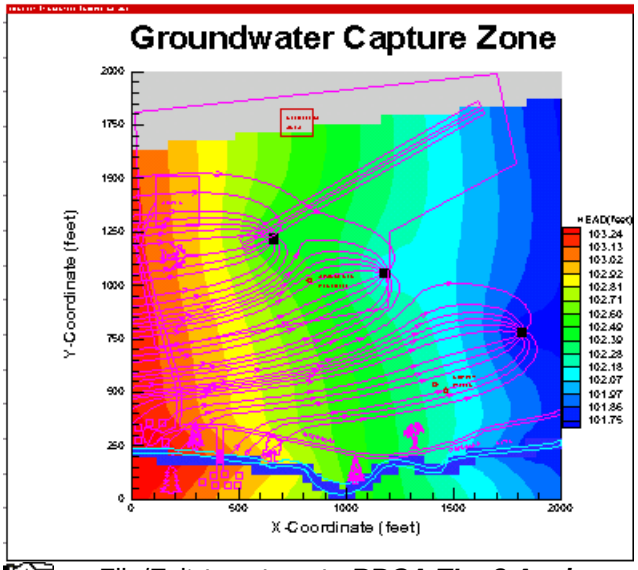
☞ Yes ***to Would you like to save analysis settings and results***

☞ On one of the four options for viewing flow.

Note that the user has the option to customize the figures in Tecplot and save them as layout files for future use.



Capture Zone Results



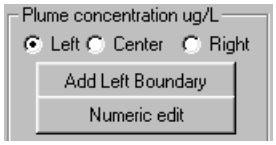
☞ File/Exit ***to return to RBCA TIer 2 Analyzer***

4.3 Defining the Initial Condition Plume

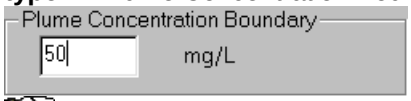
Three options are available for creating the Initial Condition Plume:
a) Reading in a Surfer file,
b) Specifying a background concentration, or
c) Using the built-in Gaussian Plume Generator.

For this example we are going to use the **built-in Gaussian Plume Generator**.

☞ Transport Inputs**/**Select TRANSPORT inputs**/**Initial Conditions**/**Plume
☞ Left ***as shown***



☞ Add Left Boundary
☞ Row 34 Col 13
☞ Row 32 Col 22
☞ Row 30 Col 29
☞ Row 27 Col 38
☞ Row 24 Col 43
type Plume Concentration Boundary



☞ OK

☞ Center
☞ Add Center Line
☞ Row 33 Col 9

☞ Row 30 Col 21
☞ Row 28 Col 29
☞ Row 26 Col 35
☞ Row 22 Col 42
☜ Row 21 Col 45
type Concentrations along center line ***shown below***

Index	X(L) (feet)	Y(L) (feet)	X(C) (feet)	Y(C) (feet)	Concentration (mg/L)	X(R) (feet)	Y(R) (feet)
1	482.2	1347	344.4	1286.4	1000		
2	856.8	1253.4	801.6	1176.2	800		
3	1143.2	1198.4	1126.6	1088.2	600		
4	1506.8	1066.2	1391.2	1011	500		
5	1705	961.4	1650	878.8	400		
6			1782.2	812.8	200		

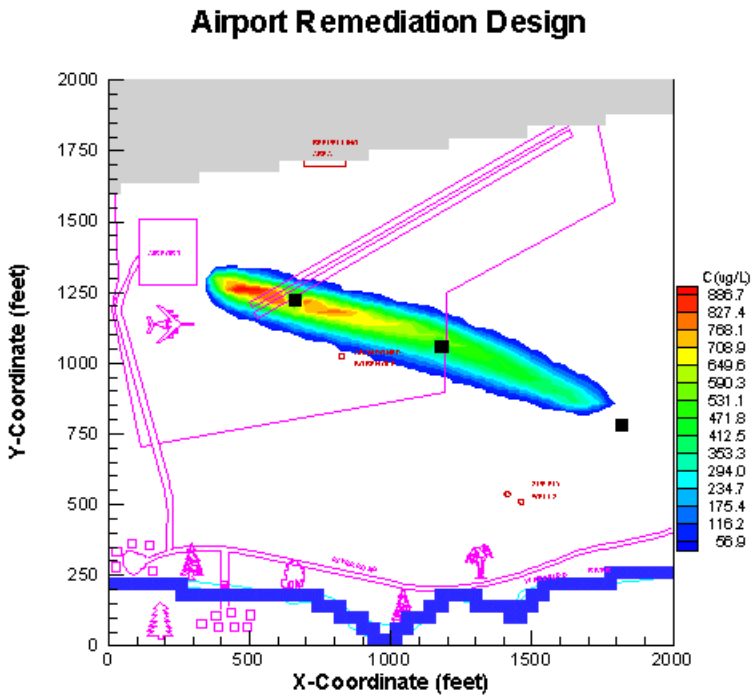
☞ OK

☞ Right
☞ Add Right Boundary
☞ Row 30 Col 11
☞ Row 27 Col 20
☞ Row 25 Col 28
☞ Row 23 Col 34
☜ Row 20 Col 41
☞ OK

☞ Calculate ***as shown***

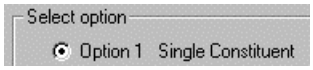


☞ Start Analysis
☞ Yes ***to answer Analysis Complete***
☞ Plot Results ***to see initial condition results***

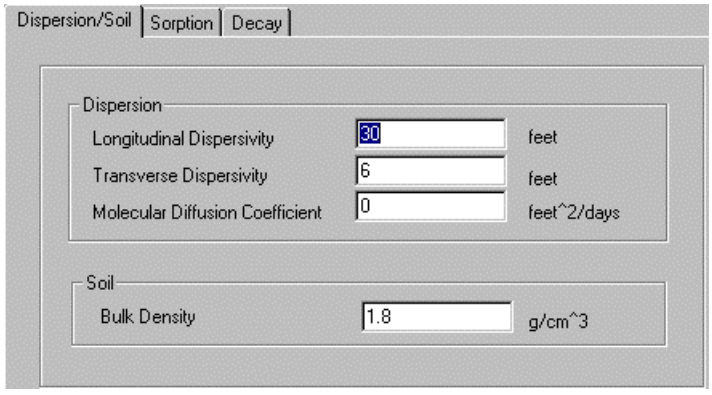


4.4 Running Transport Option 1 (Single Constituent)

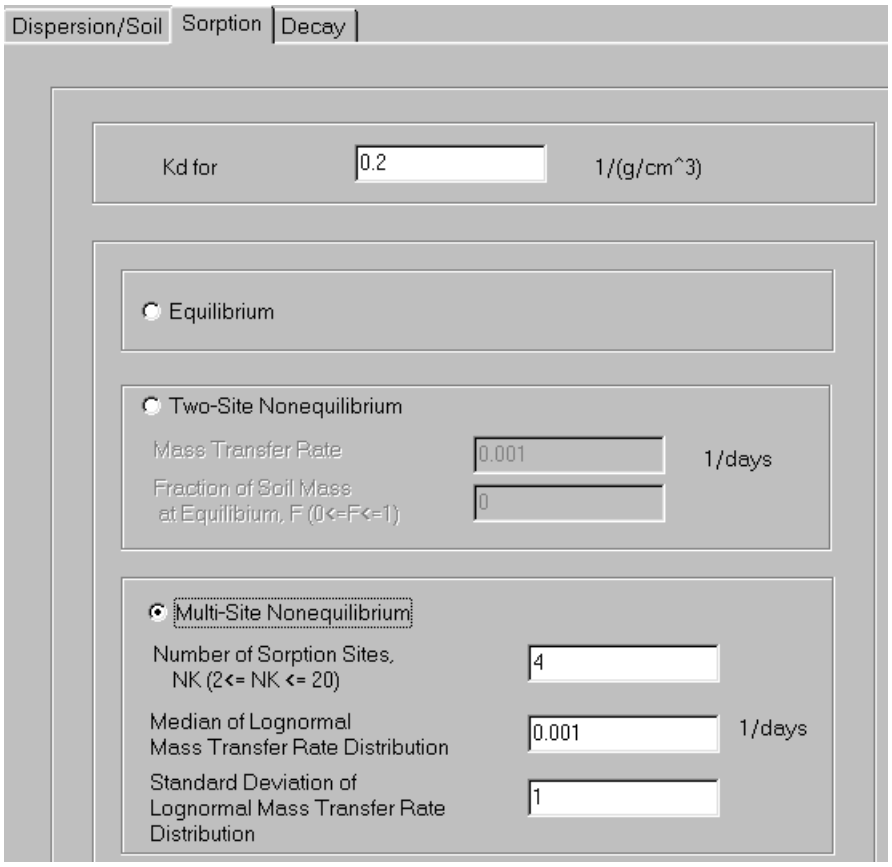
☞ Transport Inputs/Select TRANSPORT option
☞ Option 1 Single Constituent



☞ OK
☞ Transport Inputs/Select TRANSPORT inputs/Input Parameters
type *Dispersion/Soil Parameters as follows*



☞ Sorption tab
type ***Sorption parameters as follows***



Note that example input parameters are available under the Help button on most dialog boxes

File Edit Bookmark Options Help

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4.8 Rate-Limited-Desoption Input Parameters

Lognormally-Distributed, Multi-Site Mass Transfer Rate Distribution
(m=median mass transfer rate; σ=standard deviation of lognormal mass transfer rate distribution)

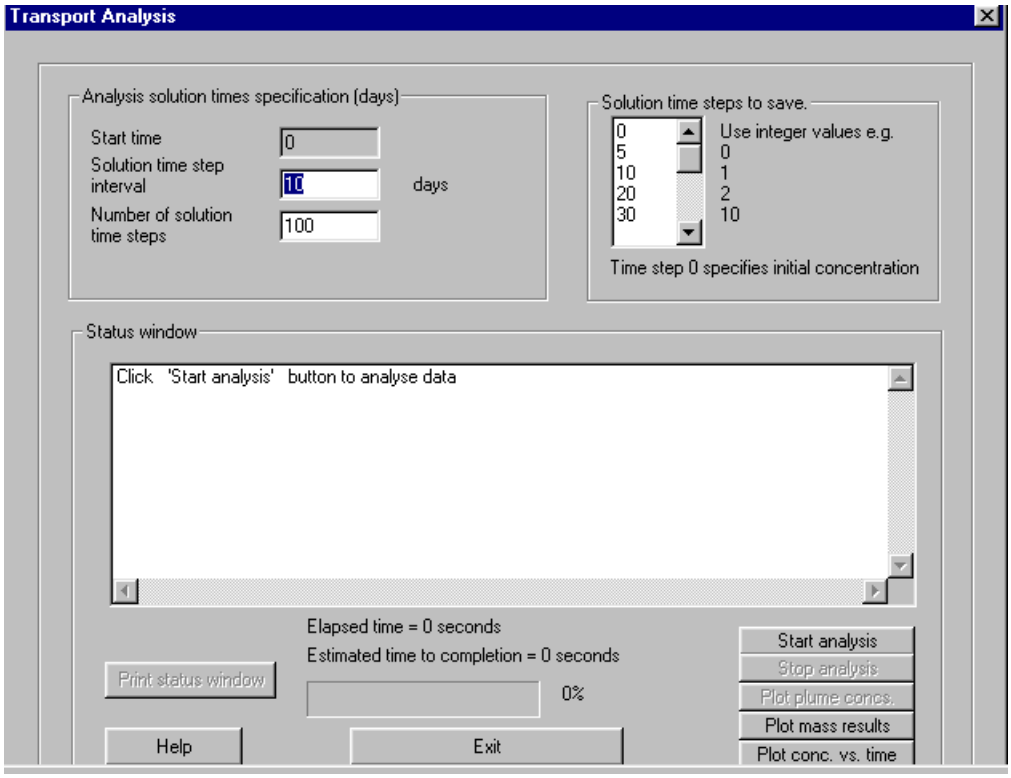
Source of Estimate	m (days^{-1})		σ	Material		Reference
				Description	f_{oc}	
Laboratory desorption studies with TCE in continuous-flow stirred reactors (CFSTR; lab-contaminated soil) and batch and column desorption experiments with field-contaminated soil (25-40 days)	CFSTR	0.11	2.57	peat	0.24	Soil samples from Picatinny Arsenal, New Jersey [Culver et al., 1997; ES&T 31(6)]
	Batch	3.2E-7	6.32	sand	0.010	
	Column	0.00040	3.68	sand	0.010	
Laboratory desorption column experiments with PCE and TCE (7days)[1]	110		4.63	Borden aquifer fine sand, Ontario	0.00013	Haggerty and Gorelick, 1998 [Soil Science Society of America Journal 62(1)]
	0.083		10.0	Livermore Valley aquifer sand, California	0.00064	
	0.13		6.81	Livermore Valley aquifer silt and clay, California	0.0011	
	79		3.84	Montmorillonite clay	0.00071	
Laboratory batch sorption experiments (160 days) with diuron (herbicide) and subsurface material from sand and gravel pit	0.0030		3.6	fine to very coarse sand	0.00043	Pedit and Miller, 1994, 1995 [ES&T 28(12), ES&T 29(7)]

[1]First-order mass transfer rate converted from linear diffusion value using first term of the first-order, multi-rate series approximation to the diffusion model [Haggerty and Gorelick, 1995; WRR 31(10)]

☞ Decay ***tab***
☞ OK ***to accept default decay values***

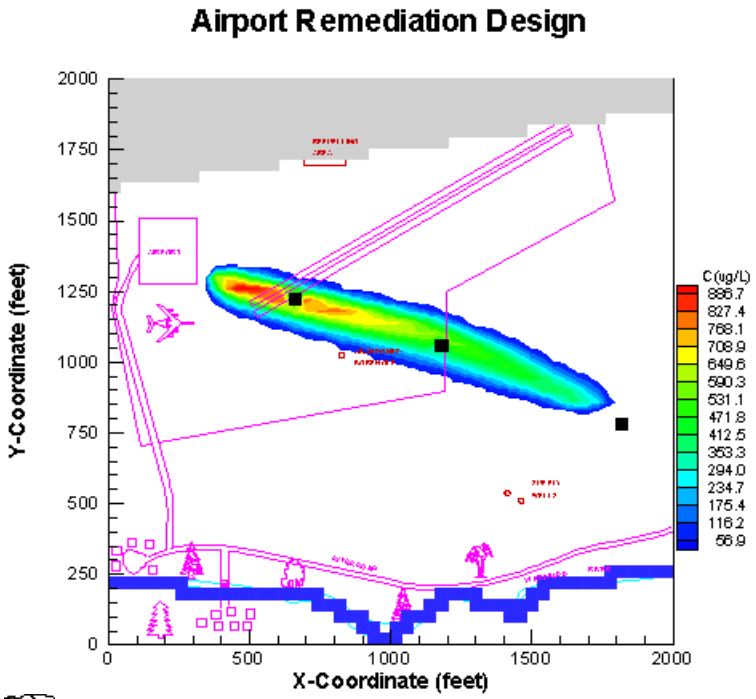
☞ OK
☞ Analyze/Transport

Type ***Run parameter as follows***



☞ Start Analysis
☞ Plot Plume Concs.

Results at Time 0 days



☞ Plot Attributes

Plot Attributes...

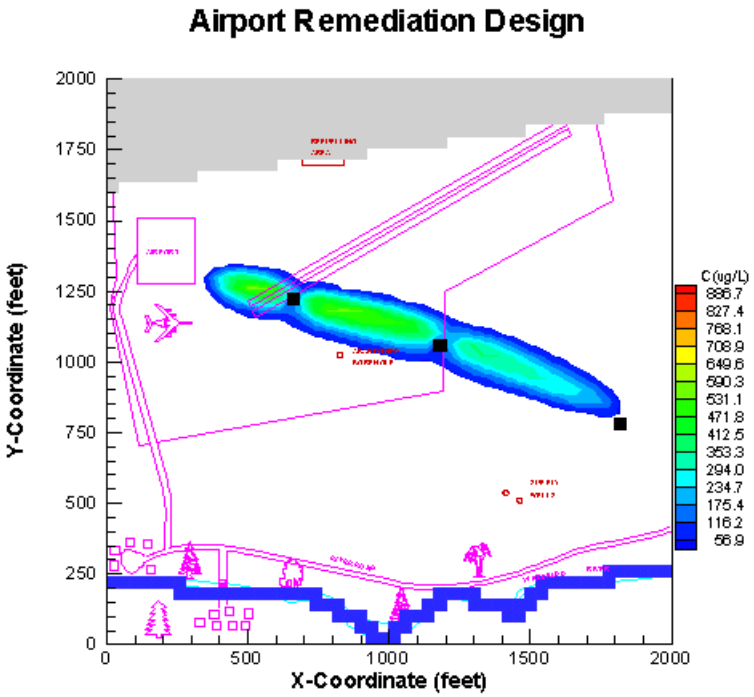
☞ Contour tab/Cont. Show

Mesh | Contour | Vector | Scatter | Shade | Boundary | IJK

Zone Num	Zone Name	Zone Grp	Zone Show	Cont Show	Cont Plottype	Cont Color	Line Pttrn	Pttrn Lngth	Line Thck	Flood Trans
1	T = 0 days	1	Yes	Yes	Flood	Red	Solid	2.0%	0.10%	Solid
2	T = 1000 days	1	No	Yes	Flood	Green	Solid	2.0%	0.10%	Solid
3	T = 2000 days	1	No	Yes	Flood	Blue	Solid	2.0%	0.10%	Solid
4	T = 3000 days	1	No	Yes	Flood	Cyan	Solid	2.0%	0.10%	Solid
5	T = 4000 days	1	No	Yes	Flood	Yellow	Solid	2.0%	0.10%	Solid
6	T = 5000 days	1	No	Yes	Flood	Purple	Solid	2.0%	0.10%	Solid
7	T = 6000 days	1	No	Yes	Flood	Red	Solid	2.0%	0.10%	Solid
8	T = 7000 days	1	No	Yes	Flood	Green	Solid	2.0%	0.10%	Solid

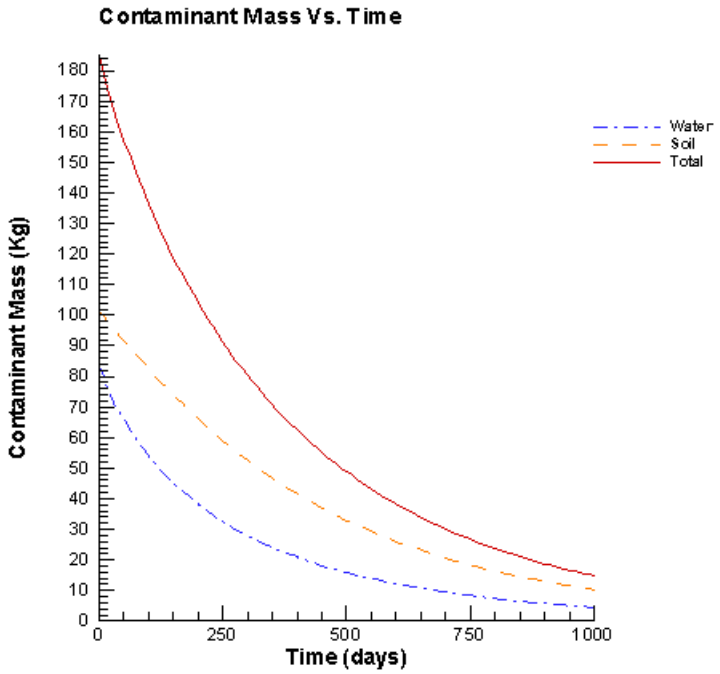
Note that you must activate the zone of interest

Results at Time 100 days



☞ File/Exit ***to return to RBCA Tier 2 Analyzer***
☞ Plot Mass Results
☞ Total Mass in the Aquifer

Mass in the Aquifer After 1000 days



☞ File/Exit ***to return to RBCA Tier 2 Analyzer***