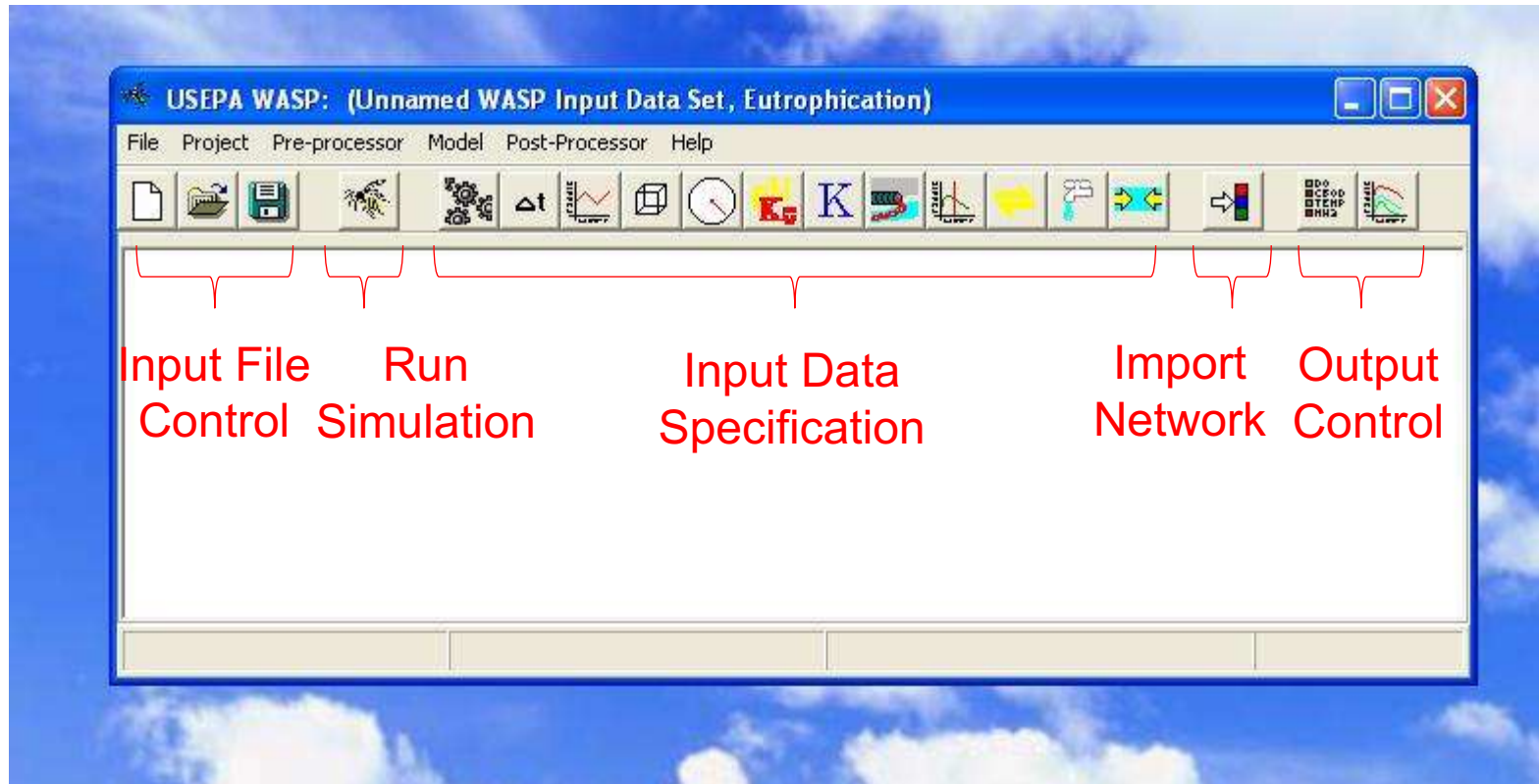


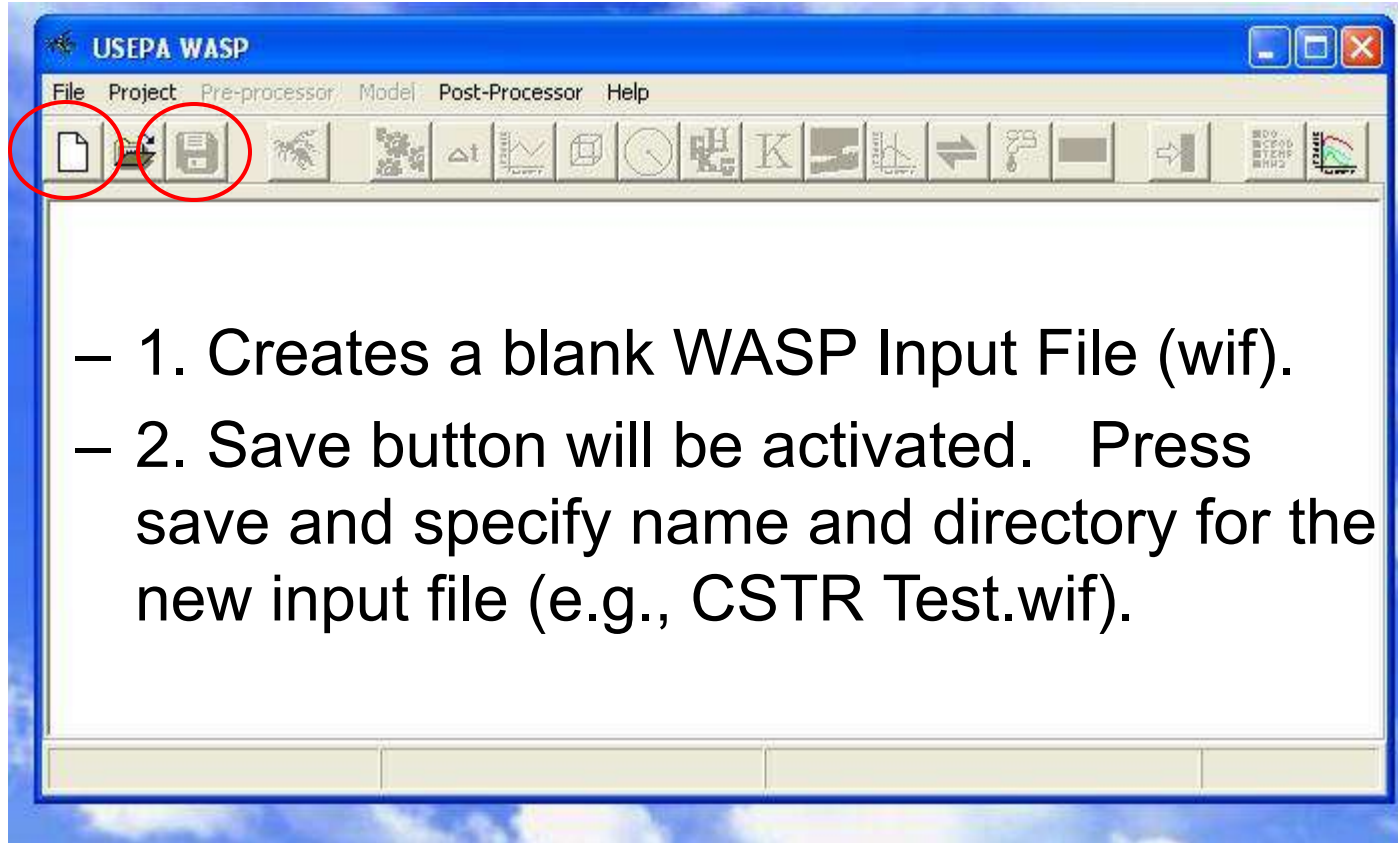
# Introduction to the WASP Interface



# Introduction to WASP Interface

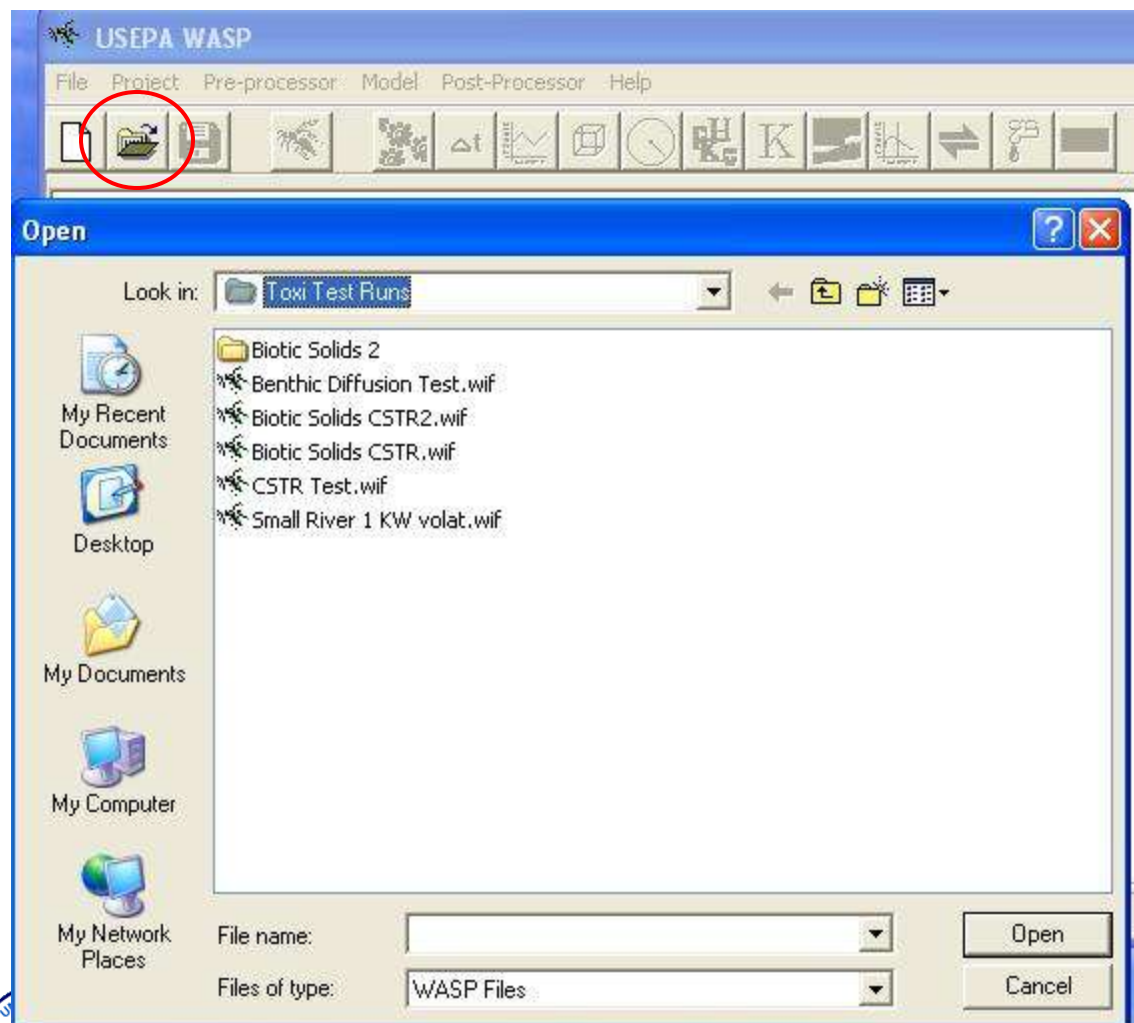


# Create New WASP Input File

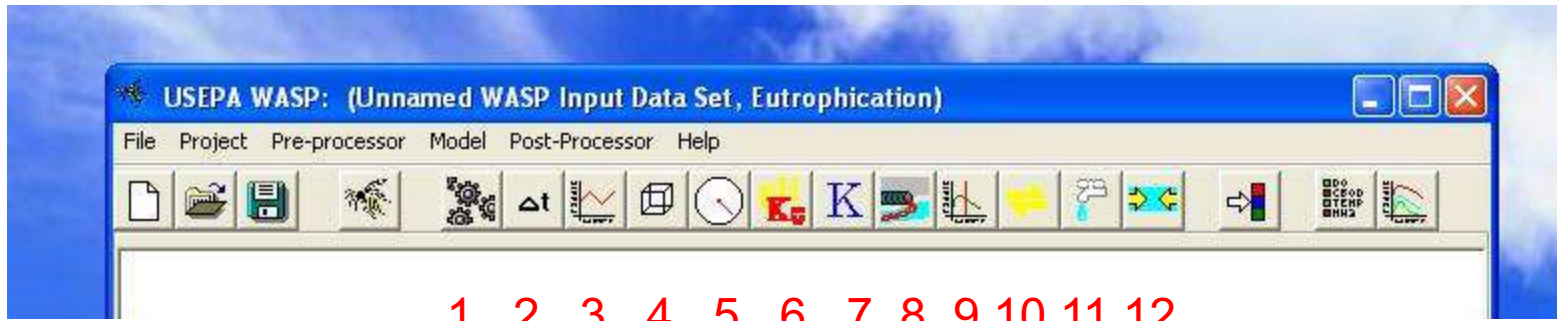


- 1. Creates a blank WASP Input File (wif).
- 2. Save button will be activated. Press save and specify name and directory for the new input file (e.g., CSTR Test.wif).

# Open Existing WASP Input File



# WASP Input Data Categories



1 2 3 4 5 6 7 8 9 10 11 12

- 
- 
- 
- 
- 
- 



# Simulation Control

USEPA WASP: (Unnamed WASP Input Data Set, Eutrophication)

File Project Pre-processor Model Post-Processor Help

Parameters

Description: CSTR Test  
Comments: Simple Class Example

Model Type: Eutrophication (dropdown menu open showing: Eutrophication, Simple Toxicant, Non-Ionizing Toxicant, Organic Toxicants, Mercury, Heat, Test (Do Not Use))

Restart Option:  
 No Restart File  
 Create Restart File  
Load restart file now

Bed Volumes:  
 Static  
 Dynamic  
Bed Compaction Time Step: 0.00

Time Step:  
 Wasp Calculated  
 User Defined

Solution Options:  
 Negative Solution Allowed

Hydrodynamics:  
 Net Flows  
 Gross Flows  
 1-D Network Kinematic wave  
 Hydrodynamic Linkage  
Hydrodynamic Linkage File: [Browse]

Hydro Skip Date: 12/30/1899  
Hydro Skip Time: 15:58

Solution Technique: Euler

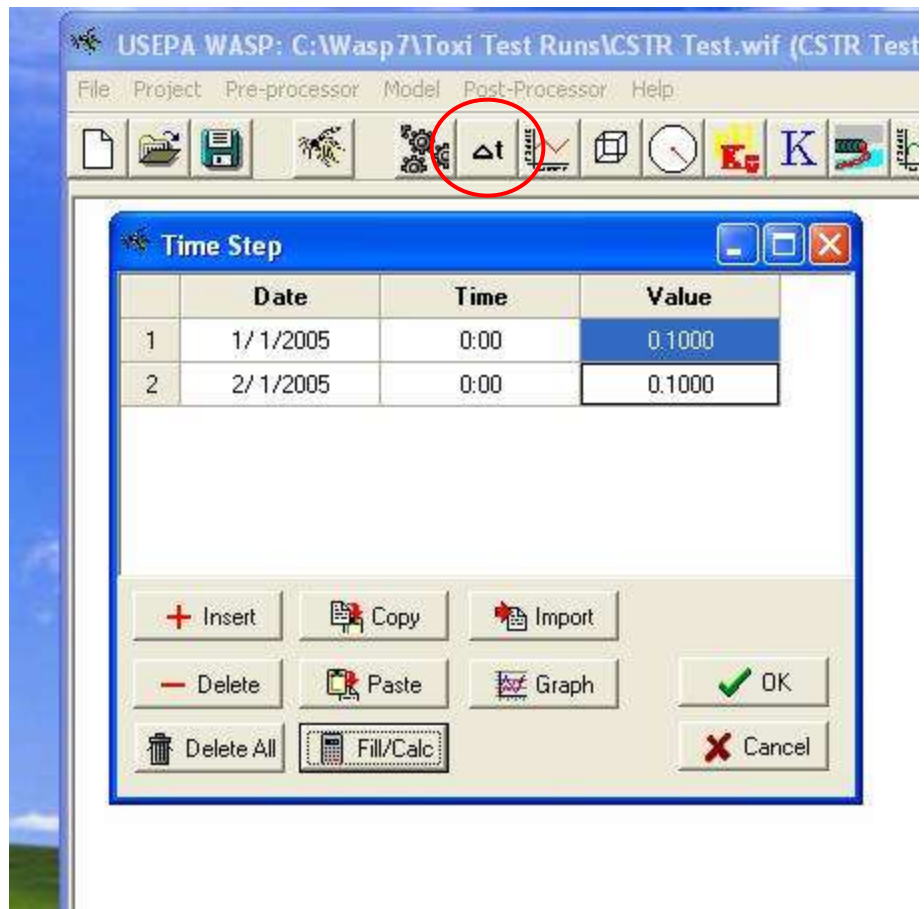
Time Range:  
Start Date: 1/1/2005  
Start Time: 0:00  
End Date: [ ]  
End Time: [ ]

Non Point Source File:  
 Use NPS file  
NPS File Name: [Browse]

OK Cancel



# Time Step



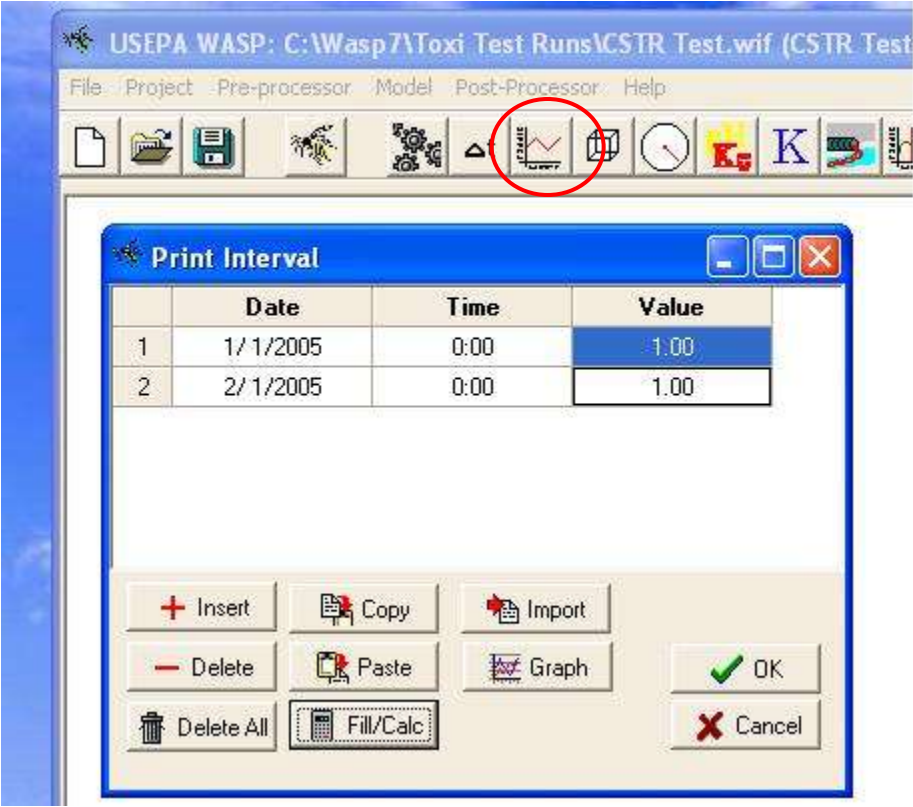
+

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# Print Interval



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# Segment Properties - Geometry

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

**Segments**

Segments Parameters Initial Concentrations Fraction Dissolved

Segment	Description	Volume	Velocity Multiplier	Velocity Exponent	Depth Multiplier	Depth Exponent	Segment Type	Bottom Segment	Length	Width	Slope	Bottom Roughness
1	Wasp Segment	1E+4	0.0000	0.0000	1.0000	0.0000	Surface Water	None	0.0000	0.0000	0.0000	0.0000

Volume Scale Factor: 1.0000000  
Volume Conversion Factor: 1.0000000

Fill/Calc Copy Paste

Insert Delete OK Cancel

+

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# Segment Properties - Parameters

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

Segments

Segments Parameters Initial Concentrations Fraction Dissolved

Segment	Dissolved Organic Carbon	Partition Coefficient to Silt	Partition Coefficient to Sand	Partition Coefficient to Organic	Decay Rate Constant (per day)
1	0	0	0	0	0

Fill/Calc Copy Paste

+ Insert - Delete OK Cancel

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# Segment Properties – Initial Concentrations

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

Initial Concentrations

Segment	Toxicant (mg/L)	Silts and Fines (mg/L)	Sand (mg/L)	Organic Solids (mg/L)
1	1	10	0	0

Fill/Calc Copy Paste

+ Insert - Delete OK Cancel



# Segment Properties – Fraction Dissolved

The screenshot shows the USEPA WASP software interface. The main window title is "USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)". The menu bar includes File, Project, Pre-processor, Model, Post-Processor, and Help. The toolbar contains various icons, with a cube icon circled in red. Below the toolbar is a "Segments" dialog box with four tabs: Segments, Parameters, Initial Concentrations, and Fraction Dissolved. The "Fraction Dissolved" tab is selected and circled in red. The dialog box contains a table with the following data:

Segment	Toxicant (mg/L)	Silts and Fines (mg/L)	Sand (mg/L)	Organic Solids (mg/L)
1	1.0000	0.0000	0.0000	0.0000

Below the table are buttons for "Fill/Calc", "Copy", and "Paste". At the bottom of the dialog box are buttons for "+ Insert", "- Delete", "OK", and "Cancel".



# Systems

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

	System	Option	Particulate Transport Field	Mass Balance	Dispersion Bypass	Flow Bypass	Density	Maximum Concentration	Boundary Scale Factor	Boundary Conversion Factor	Loading Scale Factor	Loading Conversion Factor
1	Toxicant (mg/L)	Simulated	Solids 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.0000	100.0000	1.0000	1.0000	1.0000	1.0000
2	Silts and Fines (mg/L)	Simulated	Solids 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2.6500	2000000.000	1.0000	1.0000	1.0000	1.0000
3	Sand (mg/L)	Bypassed	Solids 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2.6500	2000000.000	1.0000	1.0000	1.0000	1.0000
4	Organic Solids (mg/L)	Bypass	Solids 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2.6500	2000000.000	1.0000	1.0000	1.0000	1.0000



# Parameters – Switch

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

**Parameter data**

	Parameter	Used	Scale Factor
1	Dissolved Organic Carbon (mg/L)	<input type="checkbox"/>	1.0000
2	Partition Coefficient to Silts and Fines (L/kg)	<input checked="" type="checkbox"/>	1.0000
3	Partition Coefficient to Sand (L/kg)	<input type="checkbox"/>	1.0000
4	Partition Coefficient to Organic Solids (L/kg)	<input type="checkbox"/>	1.0000
5	Decay Rate Constant (per day)	<input type="checkbox"/>	1.0000

Copy Paste Fill/Calc OK Cancel



# Constants



**Constants Data**

Constant Group: Toxicant

		Used	Value	Minimum	Maximum
1	Log10 of Partition Coefficient to DOC (L/kg)	<input type="checkbox"/>	0	0.0000	7.0000
2	Partition Coefficient to Silts and Fines (L/kg)	<input checked="" type="checkbox"/>	1E+5	0.0000	0000000.0000
3	Partition Coefficient to Sands (L/kg)	<input type="checkbox"/>	0	0.0000	100000.0000
4	Partition Coefficient to Organic Solids (L/kg)	<input type="checkbox"/>	0	0.0000	0000000.0000
5	Volatilization loss rate constant, 1/day	<input type="checkbox"/>	0	0.0000	0.0000
6	Water column decay rate constant, 1/day	<input checked="" type="checkbox"/>	1E-1	0.0000	0.0000
7	Benthic decay rate constant, 1/day	<input type="checkbox"/>	0	0.0000	0.0000

Buttons: Copy, Paste, Fill/Calc, OK, Cancel



# Direct Loads

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

**Loads**

Loads | Scale and Conversion Factors

- Loads
  - Toxicant (mg/L) Add/Remove Loads
  - Silts and Fines Add All Loads
  - Sand (mg/L) Delete All Loads
  - Organic Solids

Time functions for segment 1 (Wasp Segment), Toxicant (mg/L)

Date	Time	Value
------	------	-------

+ Insert   - Delete   Delete All   Graph

Copy   Paste   Fill/Calc   Import

OK   Cancel

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# Direct Loads, continued

EPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

Object: Pre-processor Model Post-Processor Help

**Loads**

Loads | Scale and Conversion Factors

- Loads
  - Toxicant (mg/L)
    - Wasp Segment
  - Silts and Fines (mg/L)
  - Sand (mg/L)
  - Organic Solids (mg/L)

Note: variables with concentrations in mg/L have loading values in kg/day

Time functions for segment 1 (Wasp Segment), Toxicant (mg/L)

Date	Time	Value
1/1/2005	0:00	0
2/1/2005	0:00	0


Buttons: + Insert, - Delete, Delete All, Graph, Copy, Paste, Fill/Calc, Import, OK, Cancel



# Kinetic Time Functions

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Sim

File Project Pre-processor Model Post-Processor Help



**Time Functions**

	Time Function	Used
▶	Biotic Solids Production Time Function Multiplier	<input type="checkbox"/>

Time/value pairs for Biotic Solids Production Time Function Multiplier

	Date	Time	Value
1	1/1/2005	0:00	0
2	2/1/2005	0:00	0

+ Insert Copy Import

- Delete Paste Graph

Delete All Fill/Calc

+


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# Dispersive Exchanges

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help



### Exchanges

Exchange Fields			
Field	Used	Scale	Conversion
Surface Water	<input type="checkbox"/>	1.0000000	1.0000000
Pore Water	<input checked="" type="checkbox"/>	1.0000000	0.0001000

Pore Water functions	
Function	
▶	Benthic Exchange


Segment pairs for Pore Water, Benthic Exchange			
Segment one	Segment two	Area	Distance
▶ Boundary	1: Wasp Seg1	10000.00000	0.1000000

Time/value pairs for Pore Water, Benthic Exchange		
Date	Time	Value
1/ 1/2005	0:00	1E-5
▶ 2/ 1/2005	0:00	1E-5

# Dispersive Exchanges

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help



### Exchanges

Exchange Fields			
Field	Used	Scale	Conversion
Surface Water	<input type="checkbox"/>	1.0000000	1.0000000
Pore Water	<input checked="" type="checkbox"/>	1.0000000	1.0000000

Pore Water functions	
Function	
▶	Exchange Function

Segment pairs for Pore Water, Exchange Function			
Segment one	Segment two	Area	Distance
▶			


Time/value pairs for Pore Water, Exchange Function		
Date	Time	Value
▶ 1/1/2005	0:00	0
2/1/2005	0:00	0

+

# Dispersive Exchanges - continued

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help



### Exchanges

Exchange Fields			
Field	Used	Scale	Conversion
Surface Water	<input type="checkbox"/>	1.0000000	1.0000000
▶ Pore Water	<input checked="" type="checkbox"/>	1.0000000	0.0001000

Pore Water functions	
Function	
▶	Benthic Exchange

Segment pairs for Pore Water, Benthic Exchange			
Segment one	Segment two	Area	Distance
▶ Boundary	1: Wasp Seg	10000.00000	0.10000000
	1: Wasp Segme		
	Boundary		

Time/value pairs for Pore Water, Benthic Exchange		
Date	Time	Value
1/ 1/2005	0:00	1E-5
▶ 2/ 1/2005	0:00	1E-5


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# Dispersive Exchanges continued

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help



### Exchanges

Exchange Fields				
Field	Used	Scale	Conversion	
Surface Water	<input type="checkbox"/>	1.0000000	1.0000000	
▶ Pore Water	<input checked="" type="checkbox"/>	1.0000000	0.0001000	

Pore Water functions	
Function	
▶	Benthic Exchange

Segment pairs for Pore Water, Benthic Exchange				
Segment one	Segment two	Area	Distance	
▶ Boundary	1: Wasp Seg1	10000.00000	0.1000000	

Time/value pairs for Pore Water, Benthic Exchange			
Date	Time	Value	
1/ 1/2005	0:00	1E-5	
▶ 2/ 1/2005	0:00	1E-5	

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# Advective Flows

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

### Flows

Field	Used	Scale	Conversion
Surface Water	<input checked="" type="checkbox"/>	1.0000000	1.0000000
Pore Water	<input type="checkbox"/>	1.0000000	1.0000000
Solids 1	<input type="checkbox"/>	1.0000000	1.0000000
Solids 2	<input type="checkbox"/>	1.0000000	1.0000000
Solids 3	<input type="checkbox"/>	1.0000000	1.0000000
Evaporation/Precipitation	<input type="checkbox"/>	1.0000000	1.0000000

Function
Flow Function

From	To	Frac. of flow

Date	Time	Value
1/1/2005	0:00	0
2/1/2005	0:00	0

Buttons: + Insert, - Delete, Delete All, Graph, Copy, Paste, Fill/Calc, Import, OK



# Advective Flows - continued

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

**Flows**

Field	Used	Scale	Conversion
Surface Water	<input checked="" type="checkbox"/>	1.0000000	1.0000000
Pore Water	<input type="checkbox"/>	1.0000000	1.0000000
Solids 1	<input type="checkbox"/>	1.0000000	1.0000000
Solids 2	<input type="checkbox"/>	1.0000000	1.0000000
Solids 3	<input type="checkbox"/>	1.0000000	1.0000000
Evaporation/Precipitation	<input type="checkbox"/>	1.0000000	1.0000000

Surface Water functions

Function

CSTR Throughflow

Segment pairs for Surface Water, CSTR Throughflow

From	To	Frac. of flo
Boundary	1: Wasp Segmen	1.0000000
1: Wasp Segmen	Boundary	1.0000000

Time/value pairs for Surface Water, CSTR Throughflow

Date	Time	Value
1/ 1/2005	0:00	0
2/ 1/2005	0:00	0

Buttons: +, -, Graph, OK, Copy, Paste, Fill/Calc, Import, Delete, Delete All

+

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# Advective Flows - continued

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

### Flows

Field	Used	Scale	Conversion
Surface Water	<input checked="" type="checkbox"/>	1.0000000	0.0000116
Pore Water	<input type="checkbox"/>	1.0000000	1.0000000
Solids 1	<input type="checkbox"/>	1.0000000	1.0000000
Solids 2	<input type="checkbox"/>	1.0000000	1.0000000
Solids 3	<input type="checkbox"/>	1.0000000	1.0000000
Evaporation/Precipitati	<input type="checkbox"/>	1.0000000	1.0000000

Function
CSTR Throughflow

From	To	Frac. of flo
Boundary	1: Wasp Segm	1.0000000
1: Wasp Segmer	Boundary	1.0000000

Date	Time	Value
1/1/2005	0:00	1E+3
2/1/2005	0:00	1E+3

+

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# Boundaries

JSEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

Project Pre-processor Model Post-Processor Help

**Boundaries**

Boundaries | Scale and Conversion Factors

- Boundaries
  - Toxicant (mg/L)
    - Wasp Segment
  - Silts and Fines (mg/L)
  - Sand (mg/L)
  - Organic Solids (mg/L)

Time functions for segment 1 (Wasp Segment), Toxicant (mg/L)

	Date	Time	Value
	1/1/2005	0:00	1E-2
▶	2/1/2005	0:00	1E-2

+ Insert - Delete Delete all Graph  
Copy Paste Fill/Calc Import

OK Cancel



# WASP Output Variable Selection

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

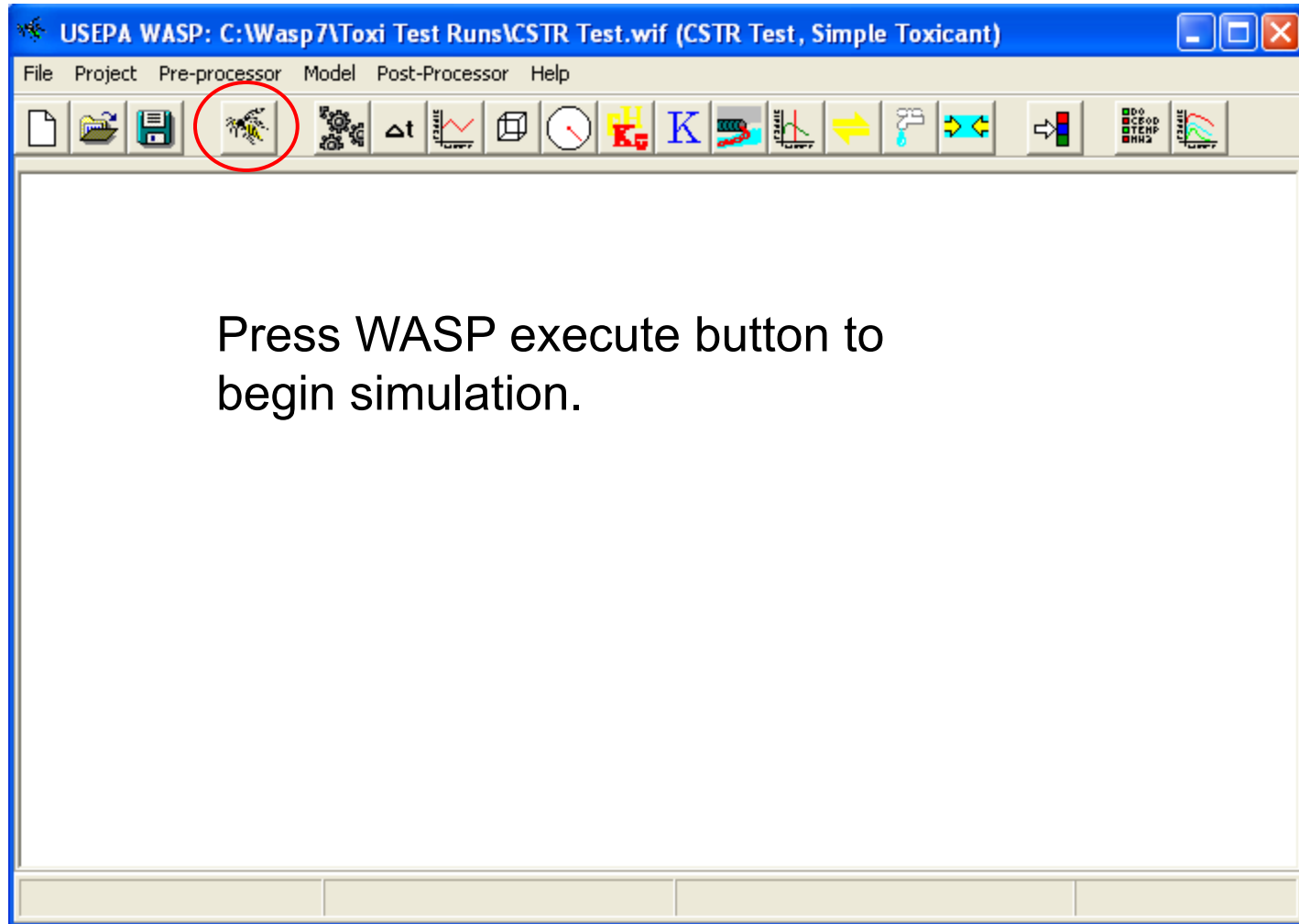
**Output Control**

	Description	Units	Output	CSV
1	Total Solids	mg/L	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	Silts and Fines	mg/L	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Sand	mg/L	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Organic Solids	mg/L	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Segment Temperature	°C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Velocity	m/sec	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Depth	m	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Advective Flow	m3/sec	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	Total Concentration	ug/L	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10	Dissolved Concentration	ug/L	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11	DOC Sorbed Concentration	ug/L	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12	Total Sorbed Concentration	ug/L	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13	Total Sorbed Concentration (solids)	ug/kg	<input checked="" type="checkbox"/>	<input type="checkbox"/>
14	Maximum DT	days	<input checked="" type="checkbox"/>	<input type="checkbox"/>
15	Time Step	days	<input checked="" type="checkbox"/>	<input type="checkbox"/>

OK Cancel



# Execute Model Simulation -1



# Execute Model Simulation - 2

USEPA WASP: C:\Wasp7\Toxi Test Runs\CSTR Test.wif (CSTR Test, Simple Toxicant)

File Project Pre-processor Model Post-Processor Help

	Chemical	Chemical	Chemical	Solids 1	Solids 2	Solids 3	Total Soli	Flow	Volume
1	95.425156	0.000000	0.000000	3.014666	0.000000	0.000000	3.014666	0.011574	10000.0000

US EPA -- WASP Version 7.0  
Organic Chemical Model Last Revised: 7/14/2004 2:52PM

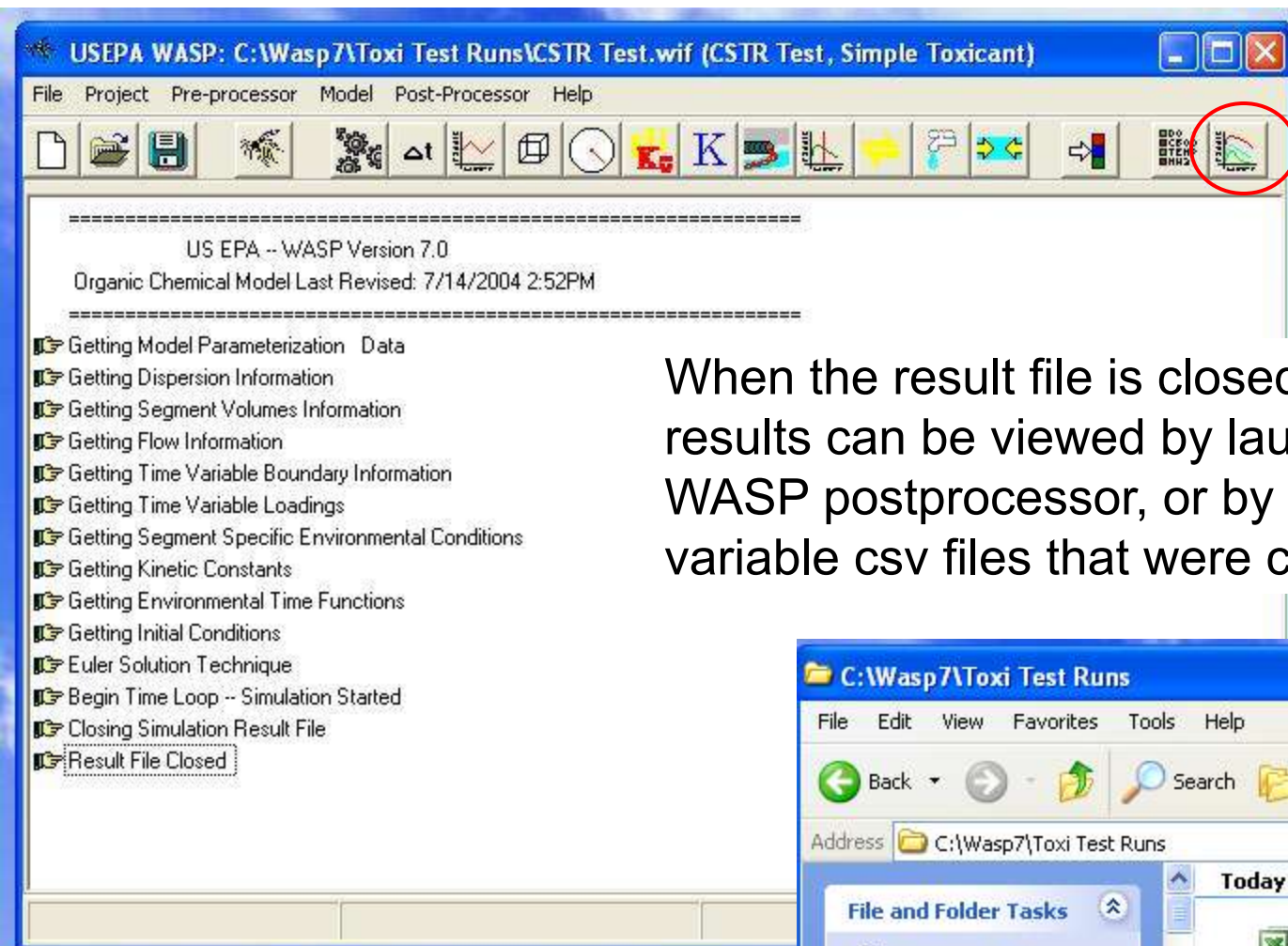
- Getting Model Parameterization Data
- Getting Dispersion Information
- Getting Segment Volumes Information
- Getting Flow Information
- Getting Time Variable Boundary Information
- Getting Time Variable Loadings
- Getting Segment Specific Environmental Conditions
- Getting Kinetic Constants
- Getting Environmental Time Functions
- Getting Initial Conditions
- Euler Solution Technique
- Begin Time Loop -- Simulation Started

Stop  Turbo Simulation Time: 1/13/2005 0:00:01 Time remaining: 0:00:01

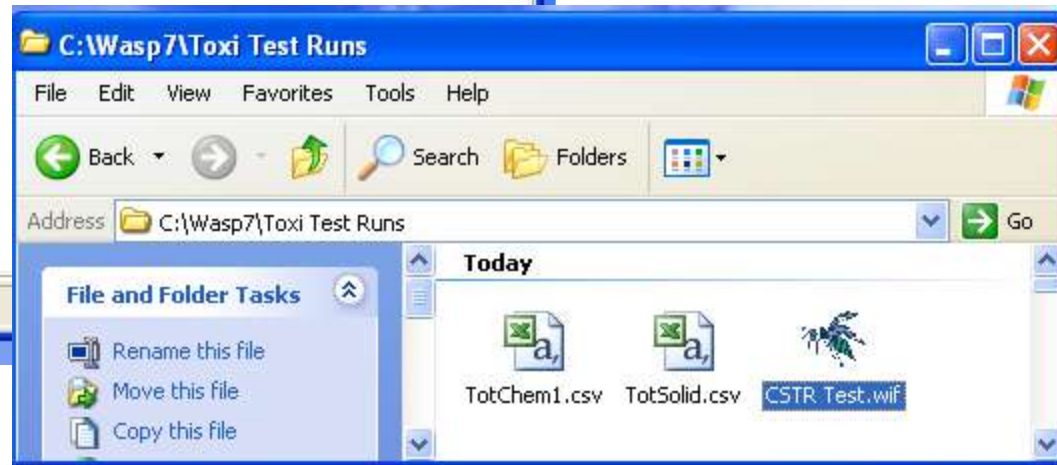
A table of calculated concentrations will be displayed throughout the simulation. Status and error messages will be displayed. Progress through the simulation is summarized along the bottom bar. A control slide can be used to speed up, slow down, or freeze the simulation. The simulation can be aborted by pressing the stop button (circled above).



# Execute Model Simulation - 3



When the result file is closed, simulated results can be viewed by launching the Wasp postprocessor, or by opening the variable csv files that were created.



# WASP Output csv file

Time (days)	Output Variable: Tot Conc ug/L
0	1000
1	817.9874
2	669.2699
3.1	536.9018
4.1	439.6025
5.1	360.1018
6.1	295.144
7.1	242.0688
8.1	198.7025
9.1	163.269
10	136.9565

Time (days)	Output Variable: Tot Conc ug/L
0	1000
1	817.9874
2	669.2699
3.1	536.9018
4.1	439.6025
5.1	360.1018
6.1	295.144
7.1	242.0688
8.1	198.7025
9.1	163.269
10	136.9565
11	112.818
12	93.0952
13	76.9802
14	63.813
15	53.0545
16	44.2641
17	37.0816
18	31.213
19	26.4179
20	22.5
21	19.2988
22	16.6831
23	14.546
24	12.7998
25	11.373
26	10.2072
27	9.2546
28	8.4764
29	7.8404
30	7.3208
31.1501	6.8963

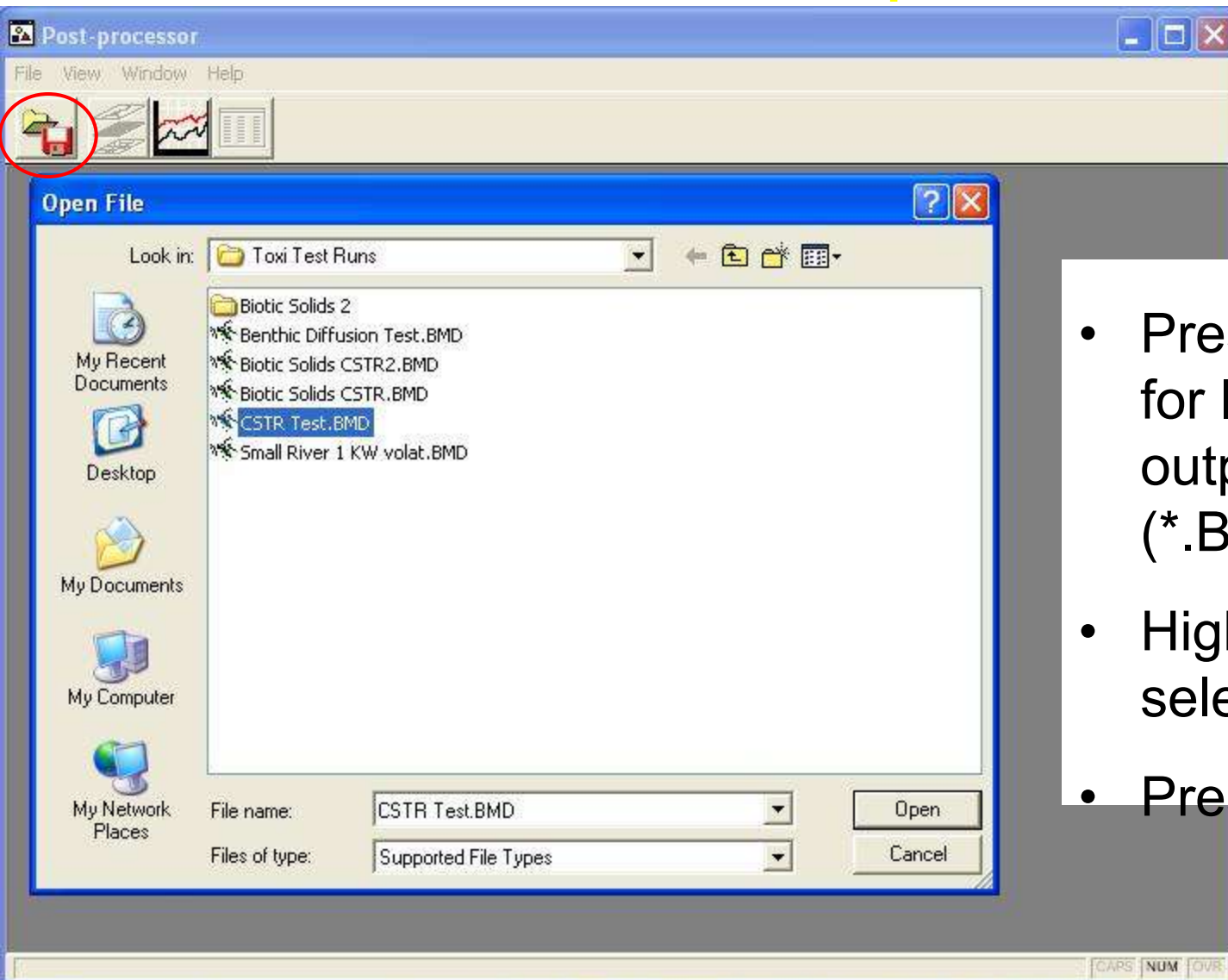
Time,  
days

Output variable by segment in columns



# WASP Postprocessor

## Select Output File

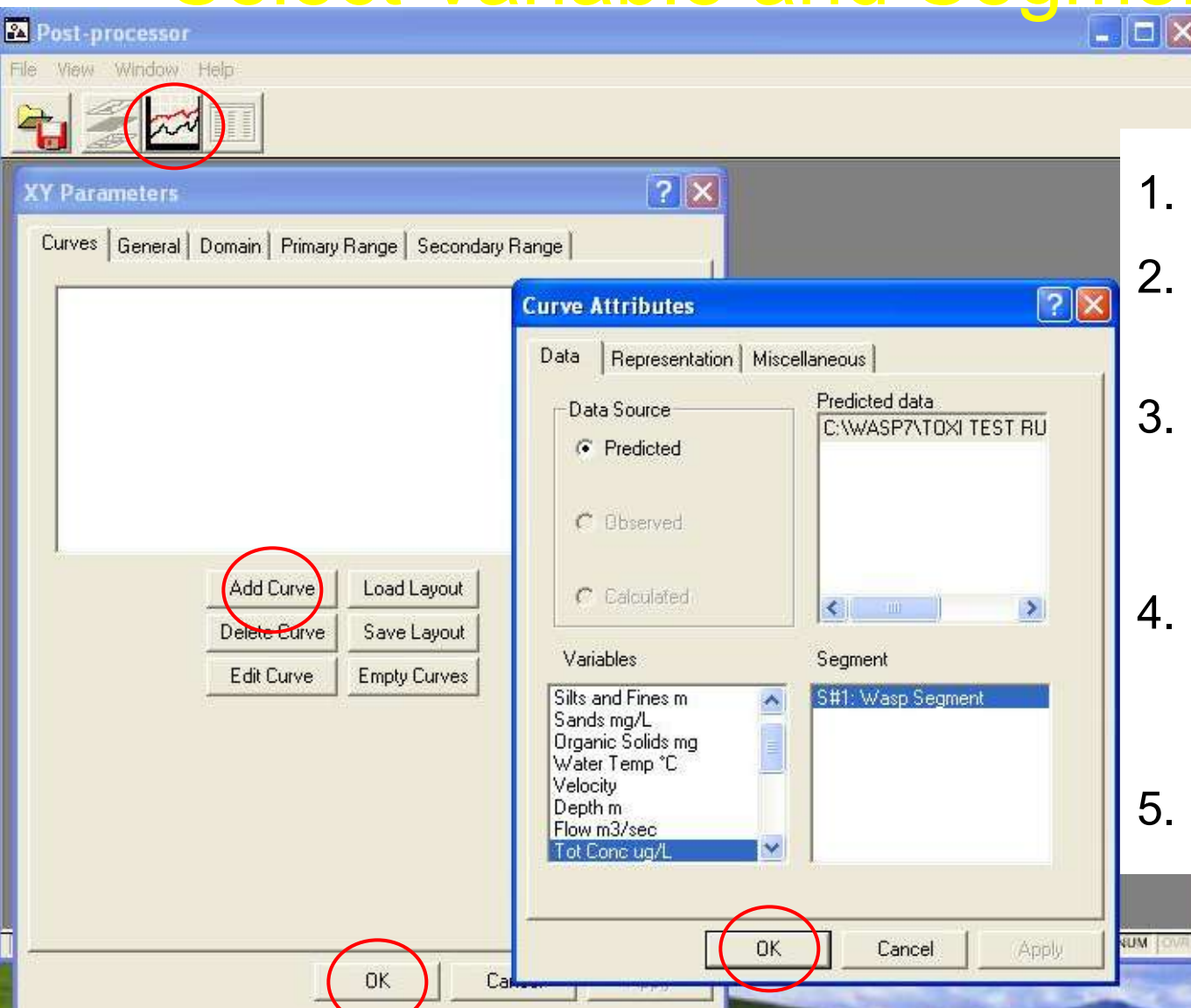


- Press File Open for list of WASP output files (\*.BMD)
- Highlight and select output file
- Press Open



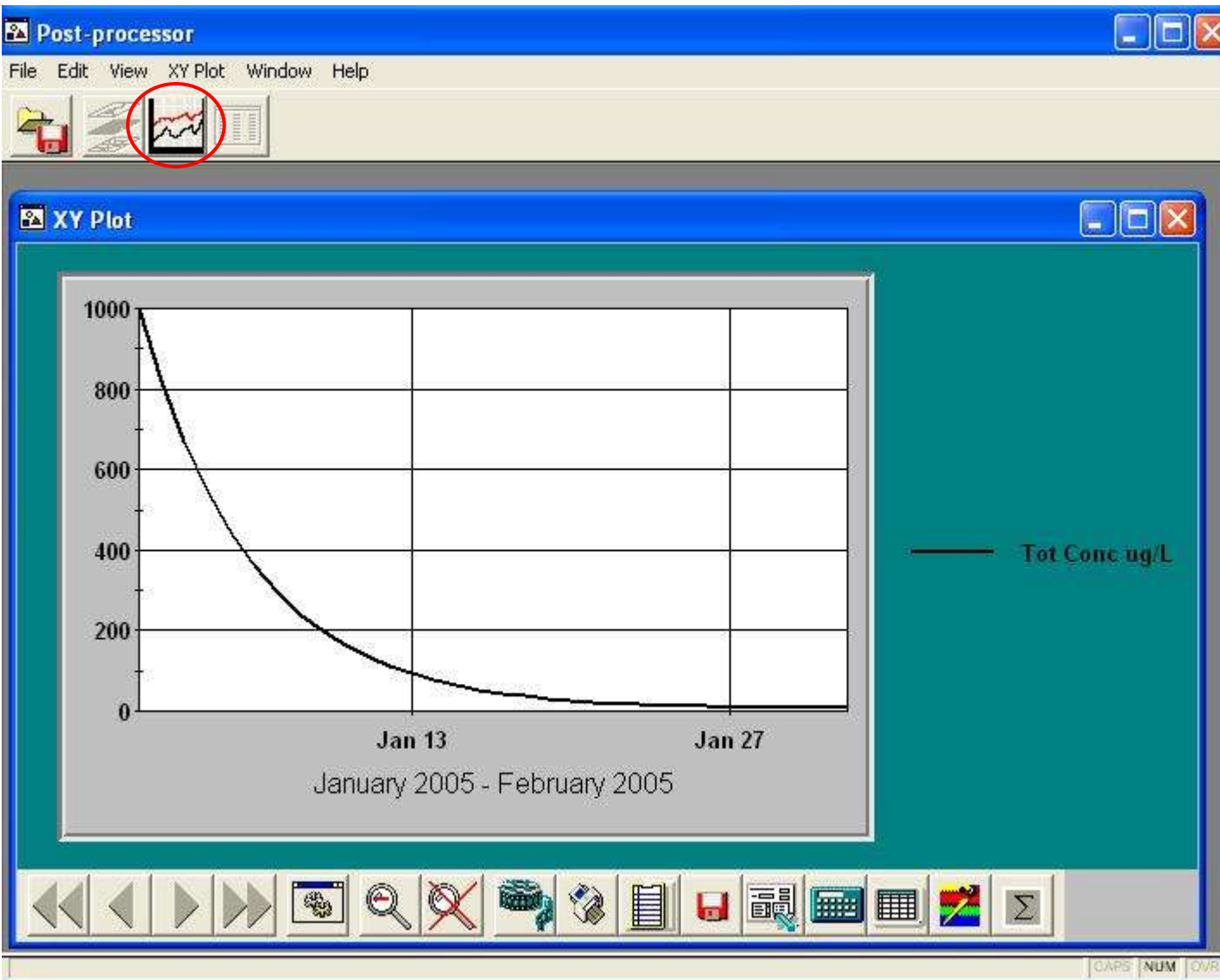
# WASP Postprocessor

## Select Variable and Segment to Plot



1. Press X-Y Plot button
2. Press Add Curve button
3. Highlight and select variable and segment and press OK button
4. Repeat 2 and 3 for additional variables & segments on graph
5. Press OK button to view graph

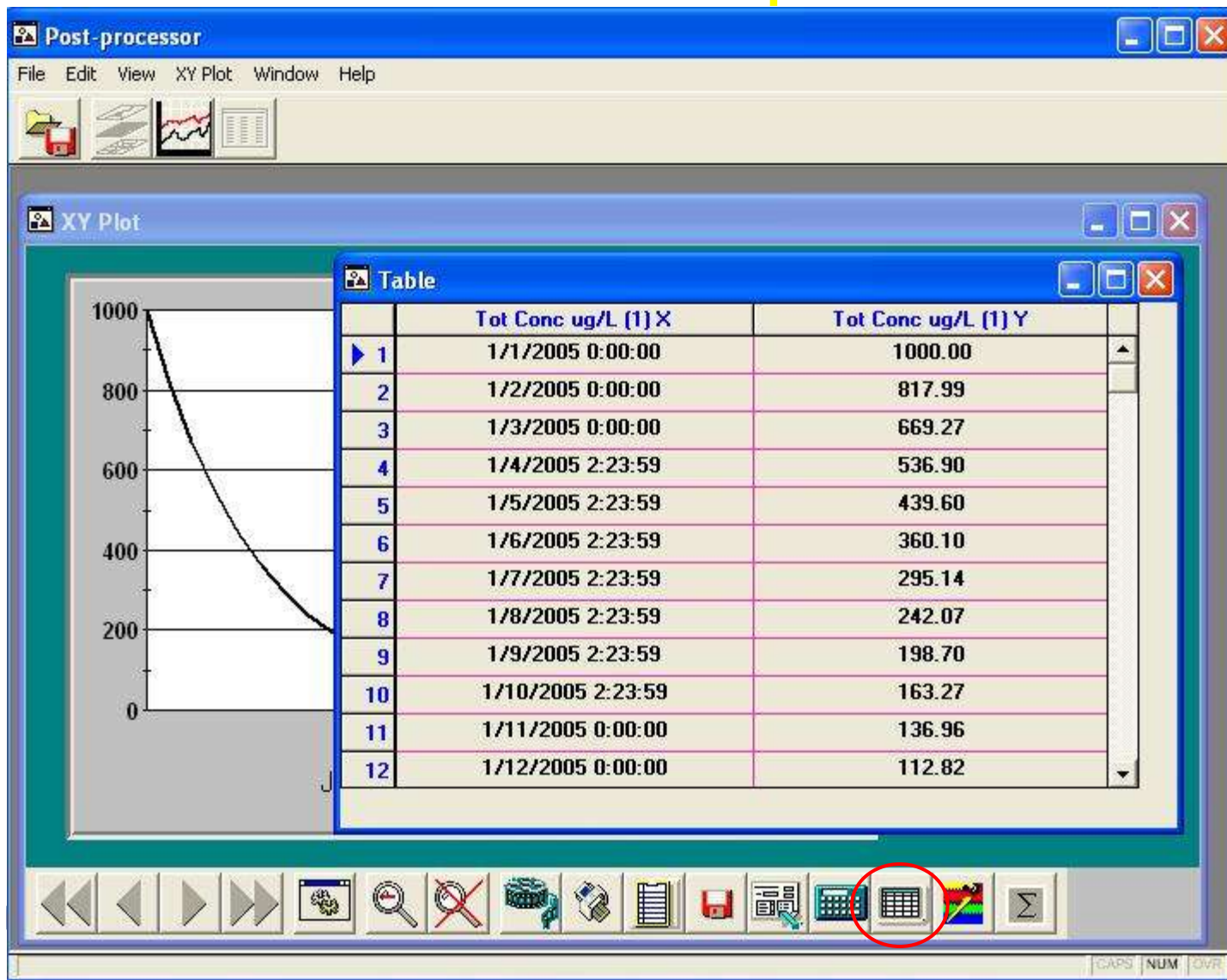
# WASP Postprocessor Example Graph



- Press Add Curve button to create more graphs

# WASP Postprocessor

## Example Table



- Press Tabular Results button to display table of results