Users Guide

Waterways Analysis Model
Batch Processing Program

May 2007

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Acronyms

CXIN – Center of Expertise for Inland Navigation

GUI – Graphical User Interface

IWR – US Army Corps of Engineers Institute for Water Resources

NETS – Navigation Economic Technologies program

WAM – Waterways Analysis Model

WAMBPP – Waterways Analysis Model Batch Processing Program

Introduction

The WAMBPP was developed to make the setup, execution, and review of shallow draft WAM runs as efficient as possible for the user. The WAMBPP provides a point-and-click GUI which allows a user to create WAMBPP projects, add alternatives to the project, and closure sets to each alternative. It allows the user to set run parameters, select input files, specify chamber closure durations, and execute the WAM using the GUI. The WAMBPP was developed by the US Army Corps of Engineers, Institute for Water Resources, as part of the NETS program.

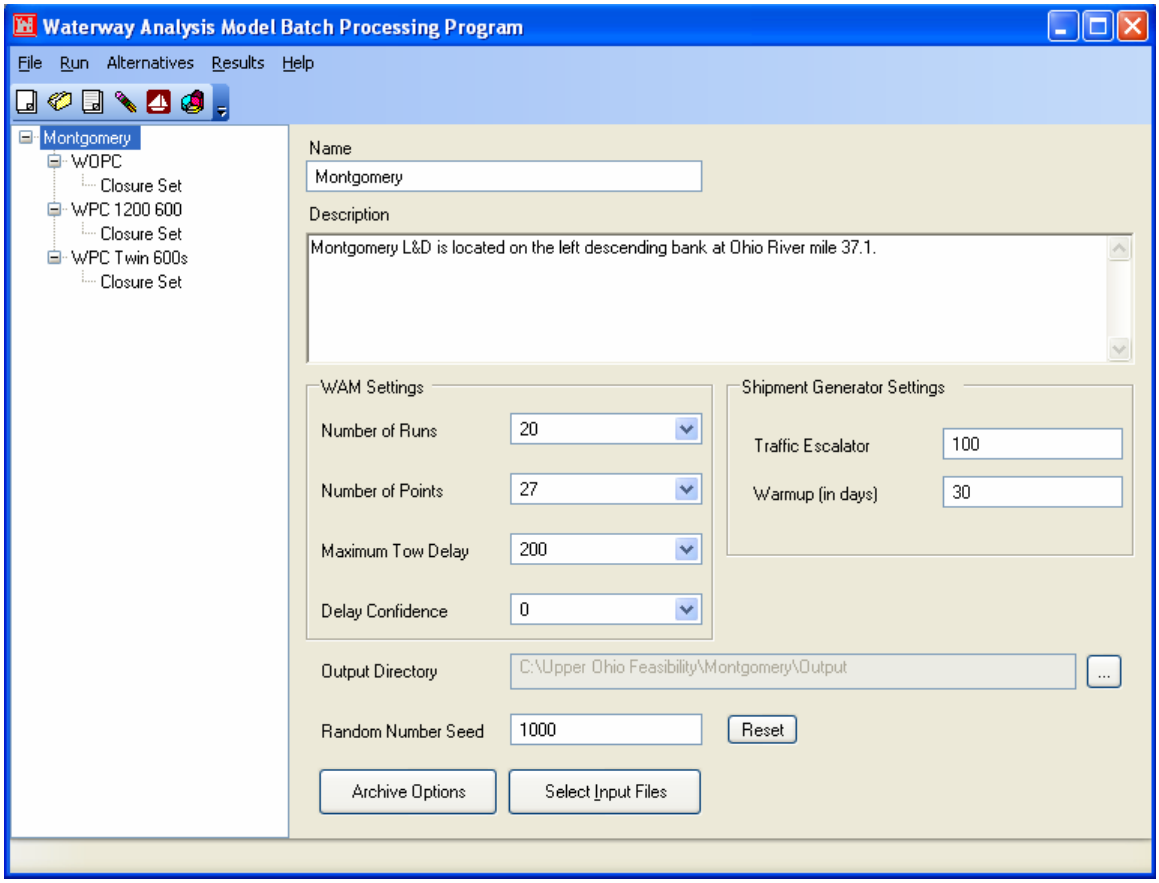
The WAMBPP is designed to be installed and operated in a Microsoft ® Windows environment. WAM run output is read by the WAMBPP and stored in Microsoft ® Access database tables.

This User's Guide assumes the user is familiar with the requirements of the shallow draft version of WAM. A WAM User's Manual and Model Documentation are available from the CXIN in Huntington West Virginia.

GUI Overview

Figure 1 below shows a screen shot of a typical WAMBPP project. The GUI displays a Menu Bar and Tool Bar in the top left hand corner of the window. These items operate like other Windows based menu and tool bars. Two panes are shown below the Tool Bar. The left pane contains a tree structure similar to the file tree structure found in applications such as Windows Explorer. The right side pane offers the user various options for setting run parameters. The options vary depending on which level of "tree" is selected in the left side pane. Detailed explanations of all these features will be presented in this document.

Figure 1
Screen Shot of Typical WAMBPP Project



Application Setup

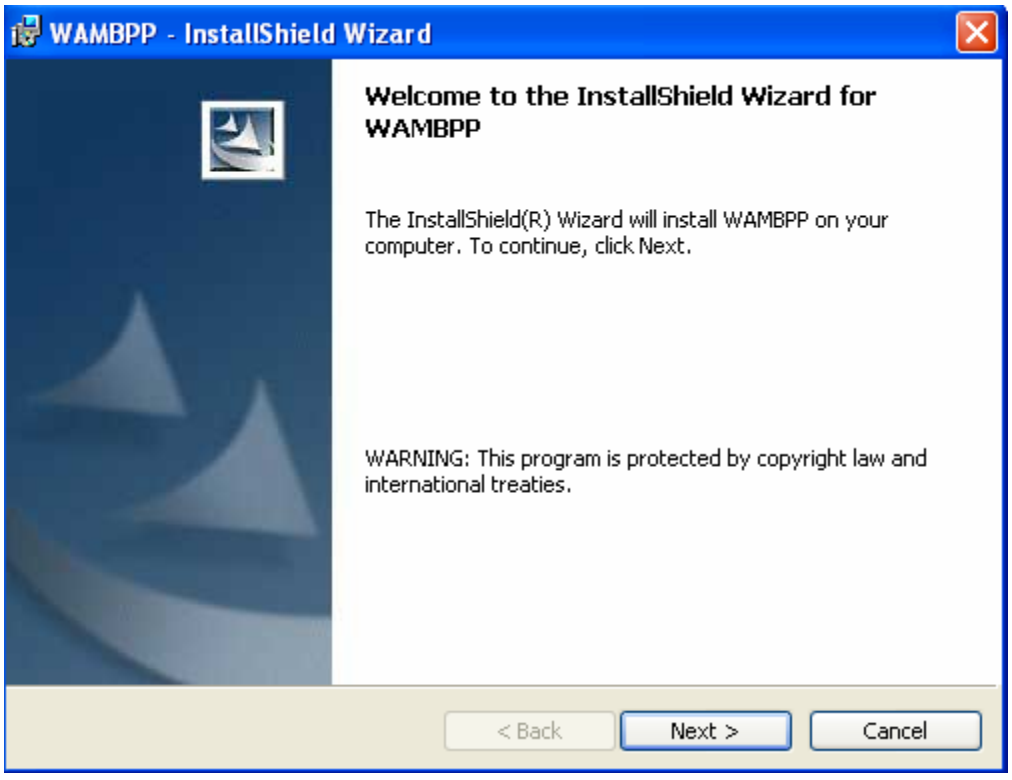
The WAMBPP is setup on a personal computer in the same manner as any other application. The user should insure they have the most up-to-date version of the WAMBPP setup program from the NETS toolbox.

Please note that in order to install an application the user must have Administrative privileges on the machine. Since most Corps users do not have administrative privileges, most users will need to have an administrator perform the setup procedure.

Also note that if a newer version of the WAMBPP is being installed on a machine that currently has WAMBPP installed, the current version should be uninstalled before proceeding with the new install. This is done via Start-Control Panel-Add Remove Programs.

After launching the setup executable file, the Install Shield Wizard will prepare the installation files and present the user with the window shown in **Figure 2.**

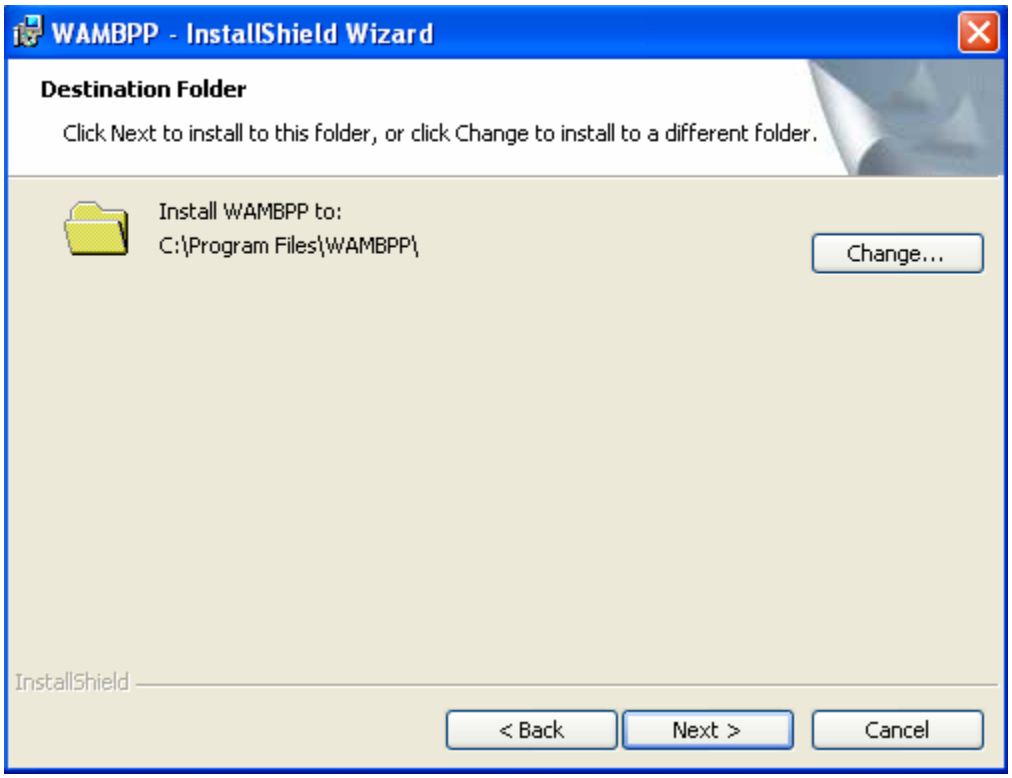
Figure 2
First Install Window



If the user presses the *Next* button, they will be presented with the window shown in **Figure 3.** This window offers the option to install the application in the default folder, or

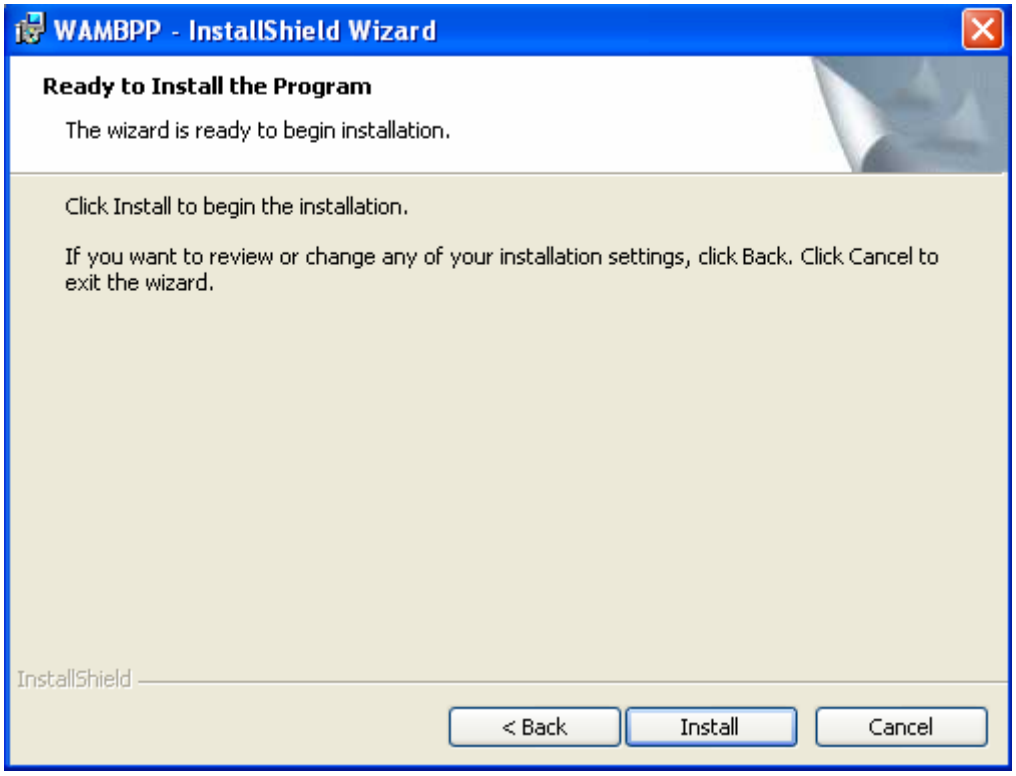
folder of the installer's choosing. In most cases the user should simply accept the default folder location by clicking the *Next* button.

Figure 3
Select Destination Folder



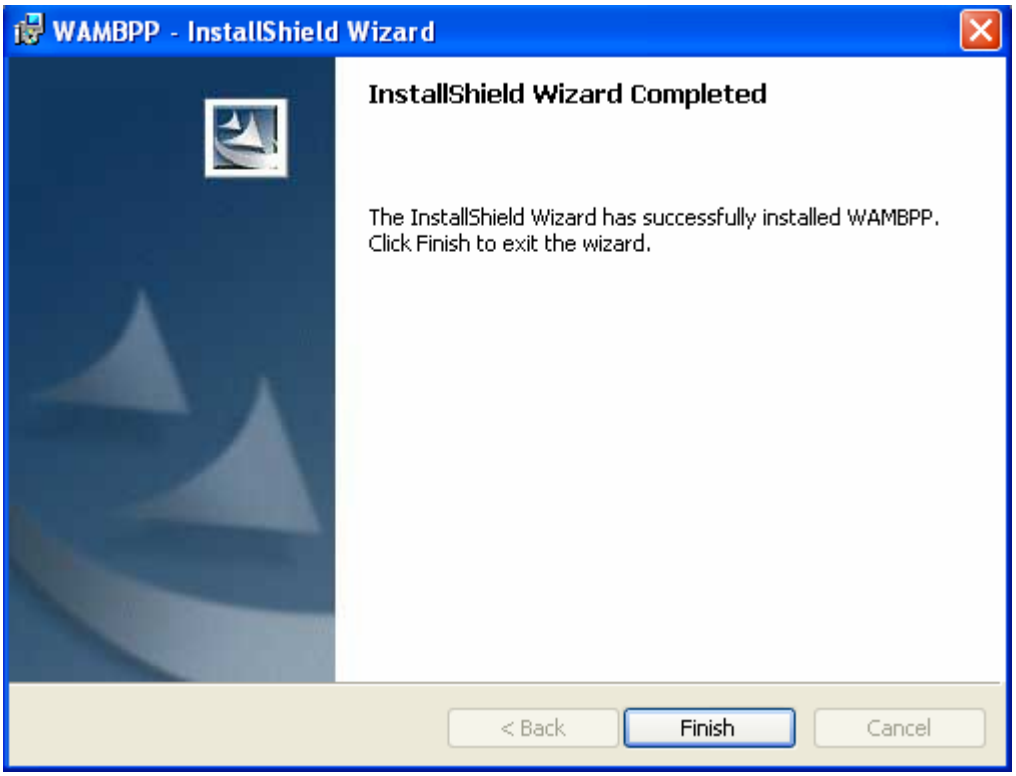
If the user clicked the *Next* button, the setup procedure will present them with a screen shown in **Figure 4.** Pressing the *Install* button installs the WAMBPP in the destination folder.

Figure 4
Ready to Install



After the user presses the *Install* button, the InstallShield Wizard will go through the process of installing the WAMBPP. This may take several minutes. When the installation is complete, the user will be presented with the final installation window shown in **Figure 5.**

Figure 5
Final Install Window



After the *Finish* button is pressed, the WAMBPP is installed and ready to use. The user can launch the WAMBPP application by clicking Start-All Programs-WAMBPP.

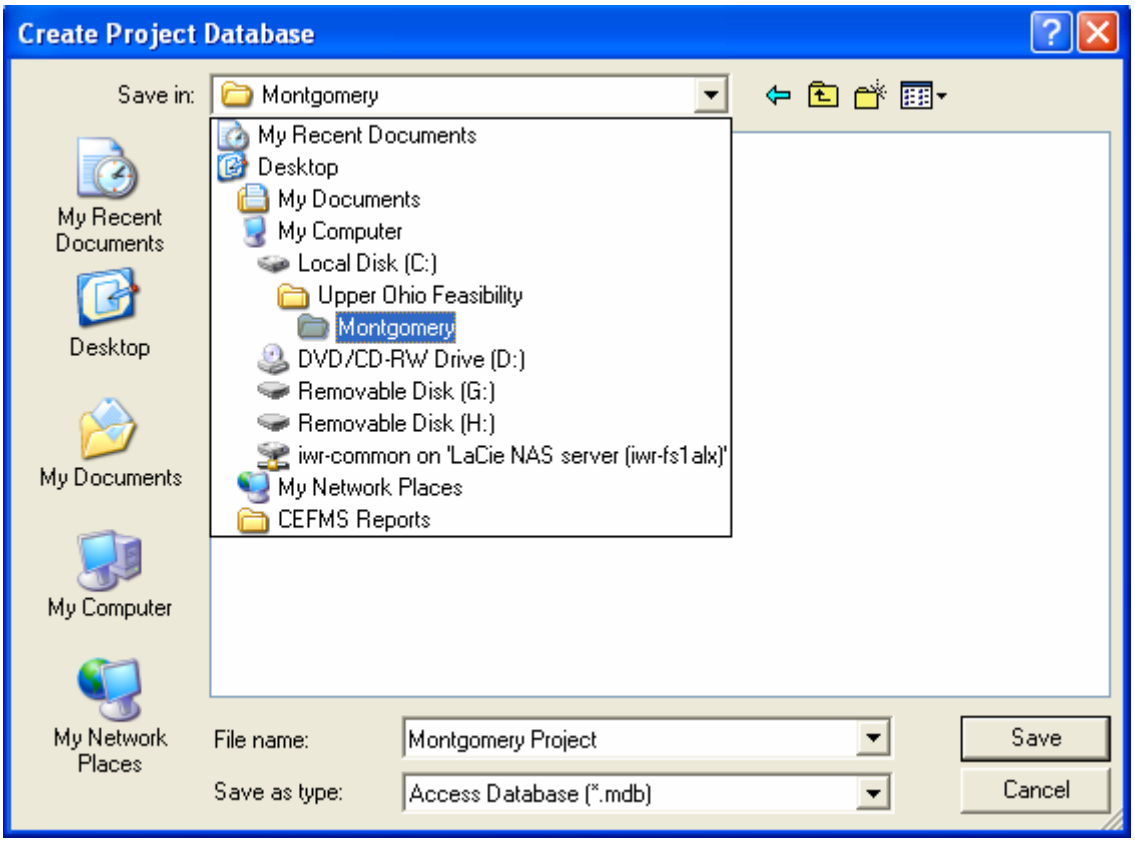
Project Setup

The process of using the WAMBPP begins by setting up a new WAMBPP project. In most cases a WAMBPP project is analogous to a physical lock project. That is, all capacity analysis for a physical lock project can be conducted through the use of one WAMBPP project. This will become clearer as a project is setup and alternatives are added.

A user can set up a new WAMBPP project in one of two ways. They can select File-New Project from the Menu Bar or they can select the New Project icon on the Tool Bar. Note that a user can obtain "tool tips" by resting their mouse pointer on any of the Tool Bar icons.

When a user selects New Project they are prompted to select the location and enter a filename for the new WAMBPP Project database. An example Create Project Database dialog box is shown as **Figure 6.**

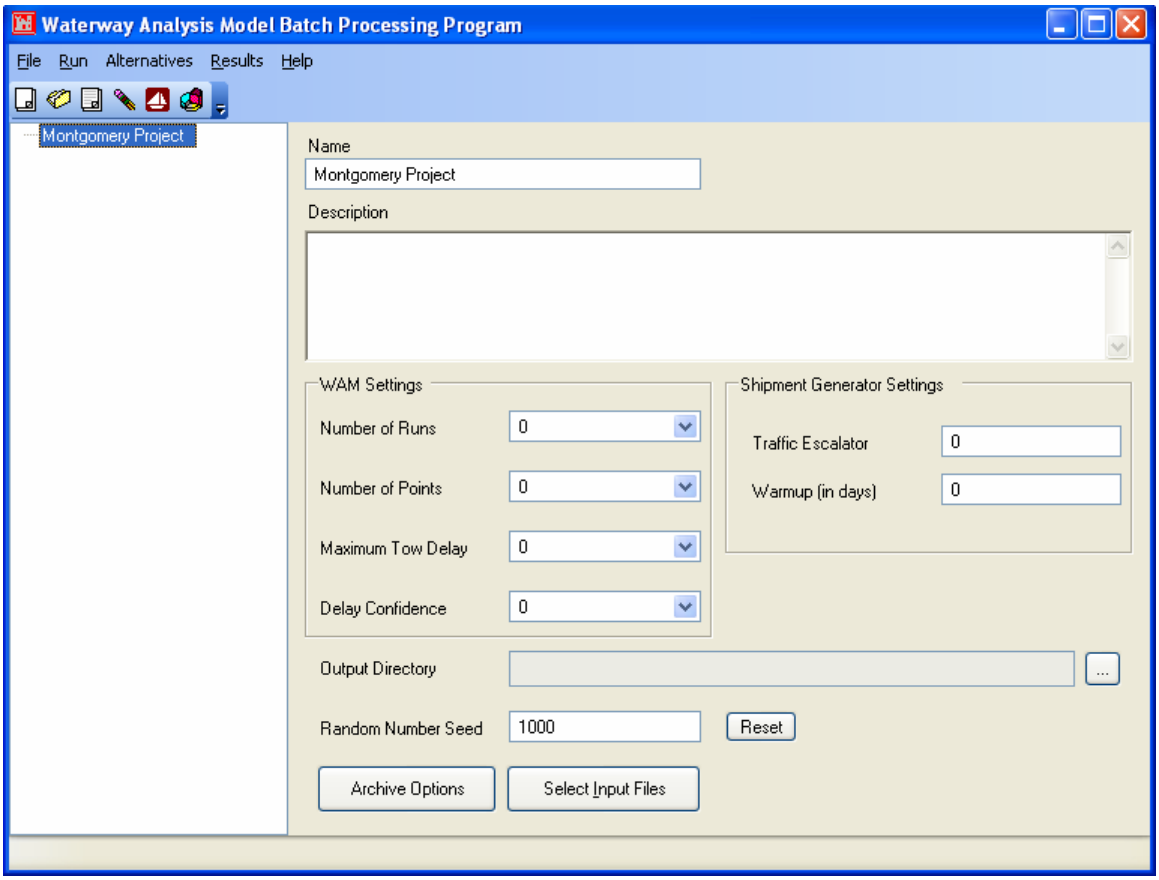
Figure 6
Create Project Database Dialog Box



The Create Project Database dialog box is a standard Microsoft dialog box similar to those found in any Microsoft Office application. At this point, the user may select an existing folder or create a new folder in the location of their choosing. They must enter a name for the WAMBPP project database. In this case a file named Montgomery Project.mdb will be created in the C:\Upper Ohio Feasibility\Montgomery folder.

When the *Save* button is clicked, a new project database is created and the user is presented with the window shown in **Figure 7.**

Figure 7
New Project Window



At this point, the right side pane of the project window presents several text boxes and dropdown boxes which must be filled in. There are also two command buttons which pop up additional windows containing additional items which must be filled in. The remainder of this section describes each item which should be entered.

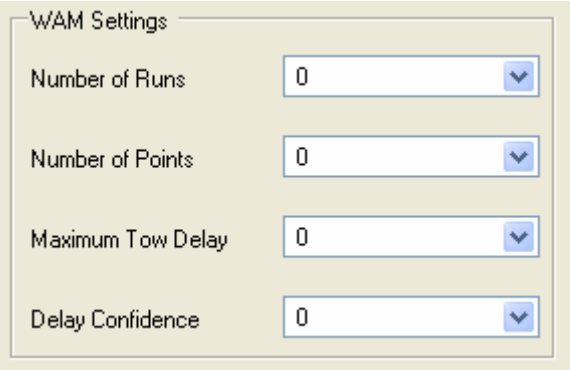
Name

When a new project is created, the *Name* text box is automatically populated with the project database filename. This text box can be modified if the user so chooses.

Description

The *Description* text box is intended as an area where a user may enter additional information of their choosing. It is not necessary to enter information in this text box.

WAM Settings Frame



Number of Runs

The *Number of Runs* dropdown box allows the user to select a value between 1 and 50 or enter a user specified number greater than 50. The *Number of Runs* represents the number of WAM runs that will be made at each escalation factor. If "1" is selected in the *Number of Points* dropdown box, the WAMBPP will make the specified *Number of Runs* at the escalation factor shown in the *Traffic Escalator* text box in the *Shipment Generator Settings* frame. If "27" is selected in the *Number of Points* dropdown box, the WAMBPP will make *Number of Runs* WAM runs at 27 different *Traffic Escalator* numbers. See *Number of Points* and *Traffic Escalator* sections for a description of these items.

Number of Points

The *Number of Points* dropdown box allows a user to select a value of either 1 or 27. If a user is interested in making WAM runs at only one *Traffic Escalator*, they would select "1" as the *Number of Points* and enter the desired *Traffic Escalator*. This is a useful option when a user is trying to calibrate a shipment list, or when the user is interested in knowing the processing time and delay at a *Traffic Escalator* which is different than the **Base Year** traffic level. If a user selects 27 points, the WAMBPP will create a WAM **Capacity Curve** consisting of runs at 27 different traffic escalation values. These 27 traffic escalation values are determined automatically by the WAMBPP.

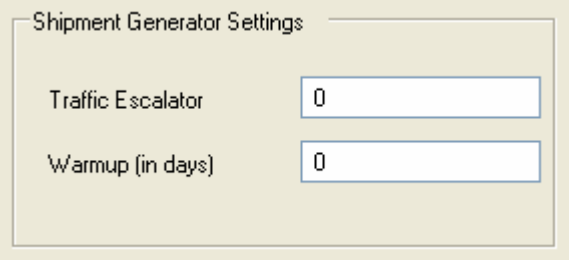
Maximum Tow Delay

The *Maximum Tow Delay* box allows a user to specify the delay value sought by the WAMBPP while it is in **Exploration Mode**. This value is used only when a user specifies 27 in the *Number of Points* dropdown box. Experience has shown that 200 is a good value to use if a user wants to create a capacity curve which extends over the full range of a lock's capabilities.

Delay Confidence

This value is not used by the WAMBPP and will be removed in future versions.

Shipment Generator Settings Frame



Traffic Escalator

The value entered in this text box determines the level of traffic generated by the shipment list generator. This value is used in two different ways by the WAMBPP depending upon the selection made in the *Number of Points* dropdown box. If 1 point is selected by the user, the WAMBPP will make the specified *Number of Runs* at the specified *Traffic Escalator*. If 27 points are specified by the user, the WAMBPP will begin the Exploration Mode with the value specified in this text box.

The value entered in this box represents the percent of **Base Year** traffic that will be generated by the shipment list generated. That is, if a value of 100 is entered, the shipment list generator will generate a traffic level that is approximately equal to the base year traffic level. If a value of 200 is entered, the generated shipment list will contain twice the traffic of the base year. If a value of 50 is entered, the generated shipment list will contain one-half as much traffic as the base year. Note that decimal values are accepted as valid Traffic Escalator values.

Warmup(in days)

The value entered in this text box determines the number of simulated days each WAM run is "warmed up" before it starts to accumulate statistics. The warmup period can be considered the period of time it takes to get the model to a "steady state" condition. The optimum warmup time can be identified by making runs with various warmup periods. At some point an increase in warmup period will result in negligible changes in delay. At that point, the user has found the optimum warmup period.

Output Directory

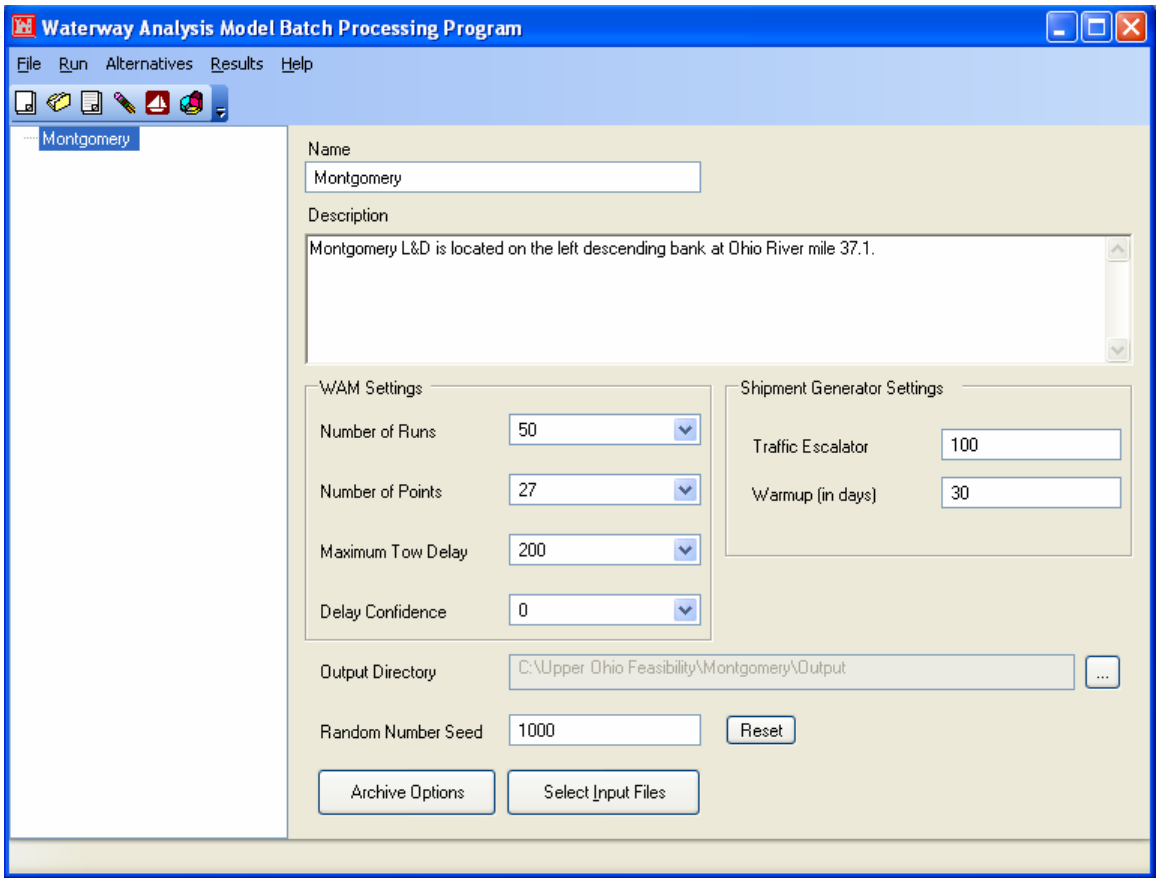
This tool enables the user to specify the folder where the WAMBPP output database will reside. Clicking the  button brings up a standard dialog box which allows a user to select or create a folder of their choice. Once selected, the full path of the folder will be shown in the text box.

Random Number Seed

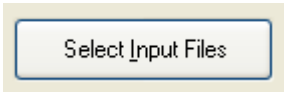
The *Random Number Seed* text box enables a user to manually enter the random number seed used for the first run executed by the WAMBPP. After the first run, the WAMBPP automatically increments the random number seed every time a new run is made. Random number seeds are used in several places within the WAM run process including the shipment list generator, the qlimit program, and the WAM model itself. The *Reset* button enables the user to reset the random number seed back to 1000 with one click.

Figure 8 shows the initial project window filled in with typical entries.

Figure 8
Project Window with Entries

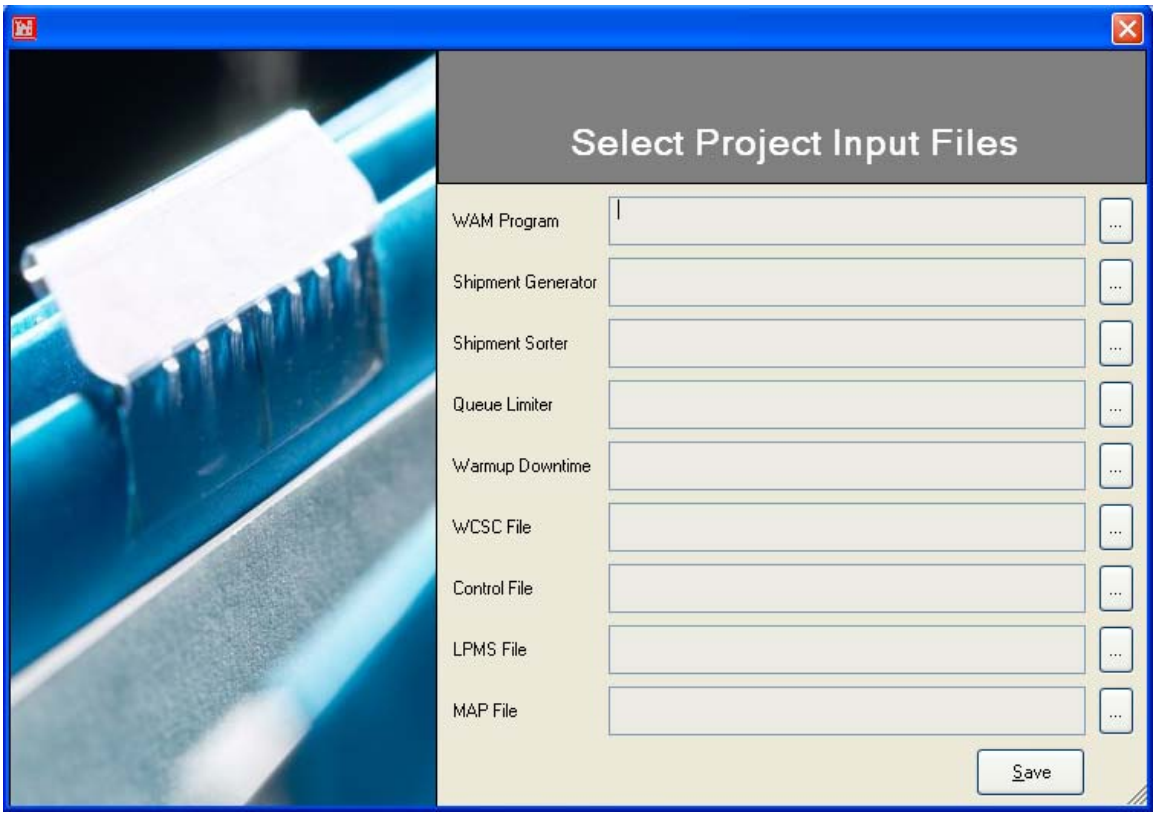


Select Input Files Button



The user must click on the *Select Input Files* button to specify several files required by WAM. When clicked, a new window appears which looks like **Figure 9.**

Figure 9
Select Input Files Screen



The *Select Project Input Files* window allows a user to find and select the program files and other project input files which will be used for all runs made by this project.

The *WAM Program*, *Shipment Generator*, *Shipment Sorter*, *Queue Limiter*, and *Warmup Downtime* options allow the user to select the executable files necessary to make WAM runs. The most up-to-date versions of these programs are available from the CXIN in Huntington West Virginia.

The *WCSC File*, *LPMS File*, and *MAP File* are project specific files used by the shipment list generator. The CXIN has the most up-to-date versions of these files for projects on the Ohio River. If a user is going to use WAMBPP for non-Ohio River projects, they will have to create these files. It is recommended that they contact the CXIN for assistance in preparing these files.

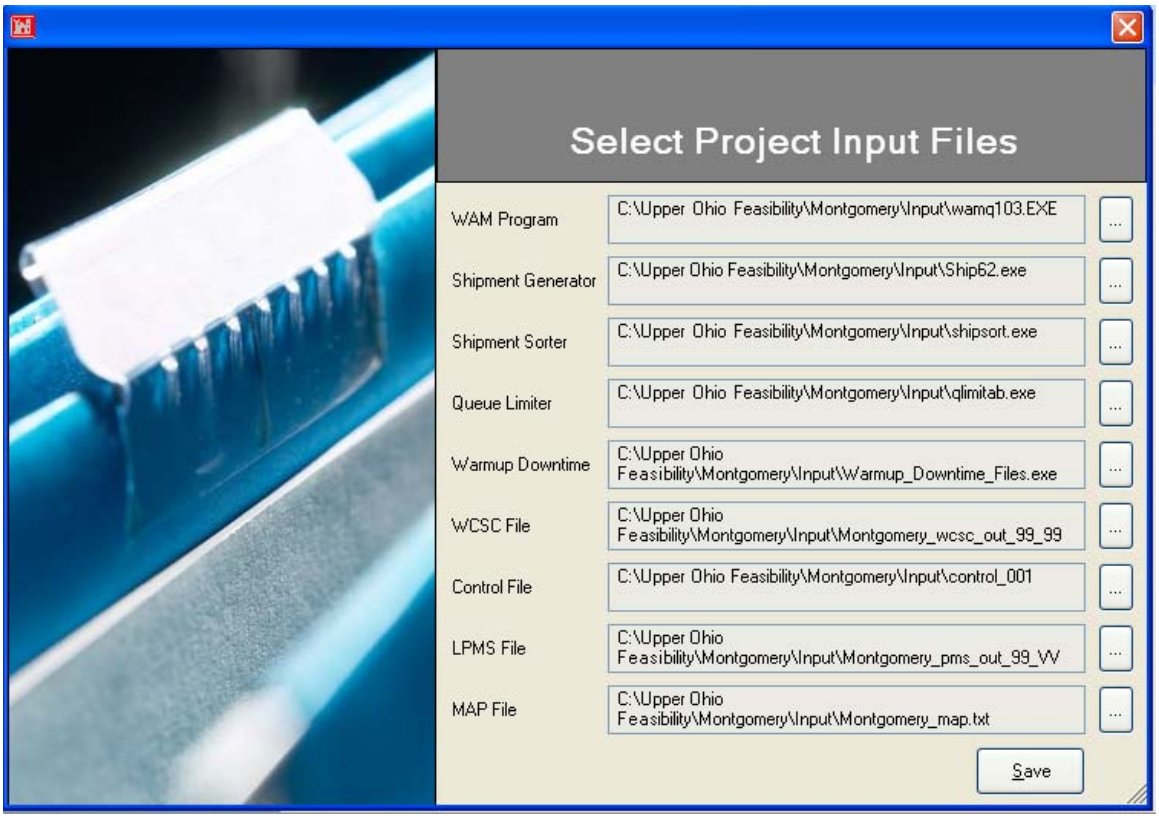
The *Control File* is used by WAM to control things such as the initial random number seed, and run duration in simulated days.

In addition to the files shown above, one other file is required. It is a WCSC related file which has the same file name as the *WCSC File* except it has a ".lst" file extension. This file is required and must be in the same folder as the *WCSC File*.

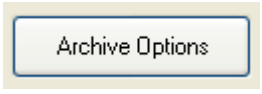
It is important to note the *Save* button at the bottom of the screen. After all the items are selected, the user must click the *Save* button to save these values to the project database.

Figure 10 shows a Select Project Input Files window with all entries filled in.

Figure 10
Input Files Window With Entries



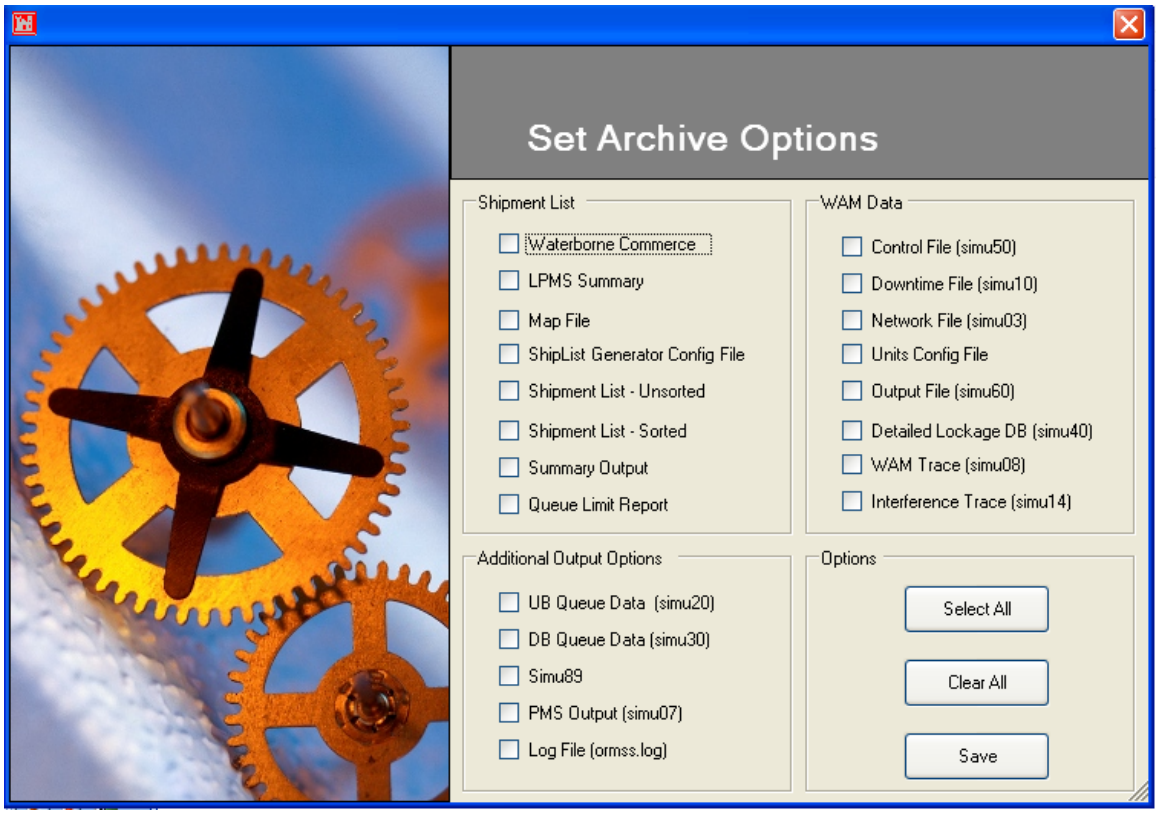
Archive Options Button



The *Archive Options* button allows a user to force the WAMBPP to save the actual WAM text files used for every WAM run. Under normal conditions, users will not want to save these files because there are many different files which could be saved, and the WAMBPP will save the files for every run.

If a user chooses to click the Archive Options button they will see a window that looks like **Figure 11.**

Figure 11
Set Archive Options Window



Clicking any of the check boxes and then clicking *Save* forces the WAMBPP to save a copy of the selected file(s).

This is the end of the Project Setup section.

Alternative Setup

Alternatives are analogous to project alternatives discussed in the Corps ER 1105-2-100. For capacity analysis purposes, the existing condition would be an alternative, as would an improvement project such as extending an existing 600’ long chamber to 1200’ long.

Alternatives can be added to a project by clicking *Alternative – Add New Alternative* on the Menu Bar, or clicking the  button. When the user adds a new alternative, they are prompted for an alternative name. **Figure 12** shows the Montgomery project with a new alternative, named WOPC.

Figure 12
Project With New Alternative

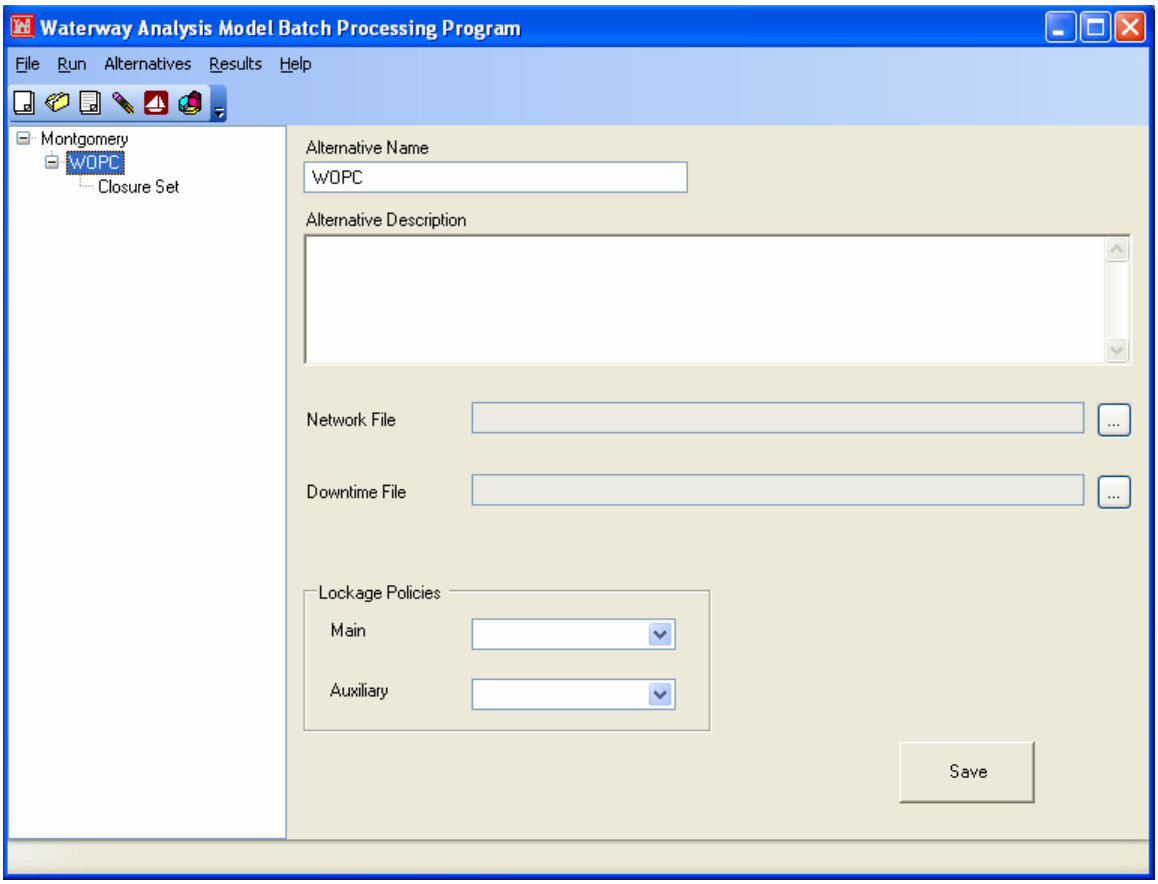
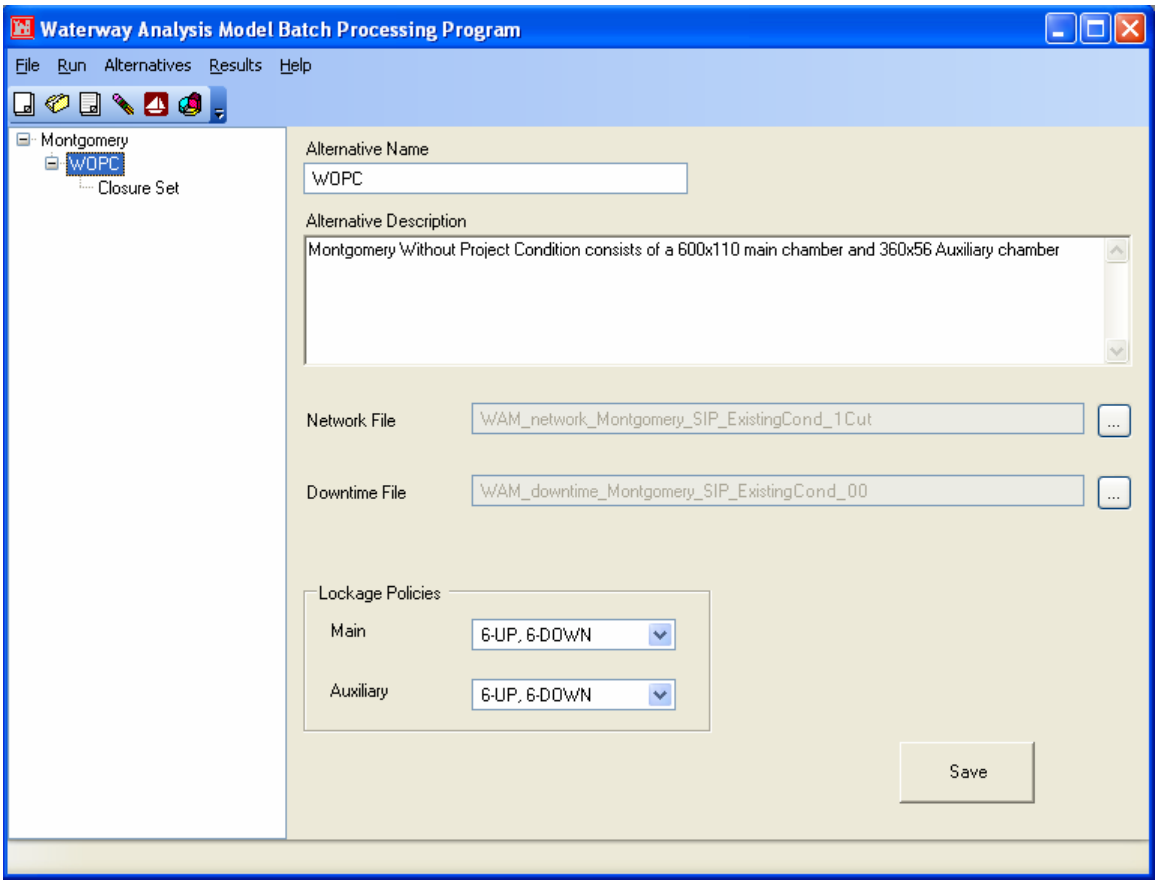


Figure 12 above show the Montgomery project immediately after the WOPC alternative was added. One can see there are far fewer parameters associated with defining an Alternative than there were with defining a Project. The GUI offers the user an opportunity to enter an *Alternative Description*, but the description is optional. It is mandatory however that the user enter a *Network File* name, *Downtime File* name, and *Lockage Policies* for the *Main* and *Auxiliary* chambers. The *Network File* and *Downtime File*s are selected in a similar manner as the Project Files. Lockage Policies are selected from the dropdown boxes offered by the GUI. Please note that the user must click the *Save* button after the files and policies are selected.

Figure 13 shows an Alternative window with typical entries.

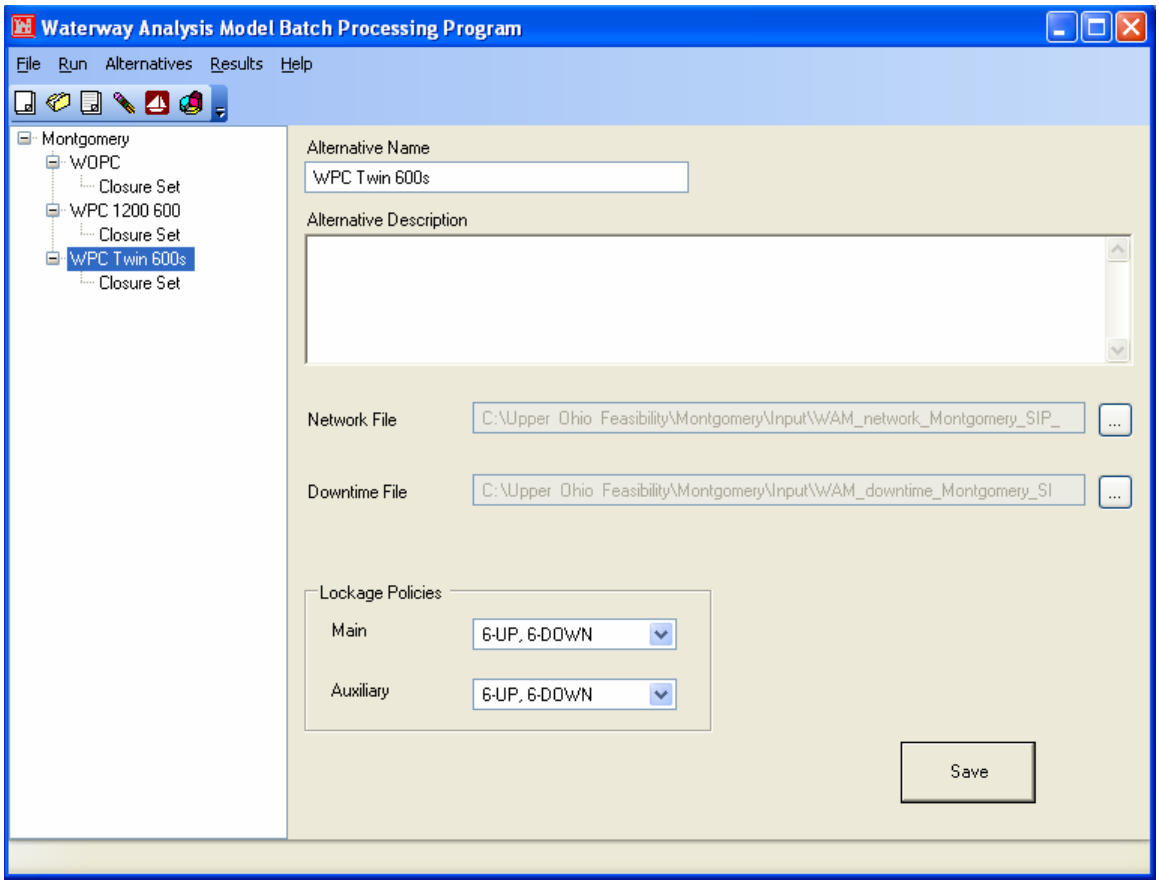
Figure 13
Alternative Window with Entries



At this point, it is worth making a few observations which may prove helpful to the user. An alternative is defined by only four items, the network and downtime files and the chamber service policies. If a user decides to compare the impact of using different lockage policies, they could easily define several alternatives which are identical except for the lockage policies. Likewise, if a user wanted to determine the impact of using helper boats, they could create a network file that reflects the processing time impact of using helper boats, and then create an alternative that uses the helper boat network. A project can have an unlimited number of alternatives. It should be noted however, that the user must give each alternative a different name so they can be distinguished from each other when output data is analyzed.

Figure 14 shows the Montgomery project with three alternatives. In this case, the network and downtimes files are different for each alternative.

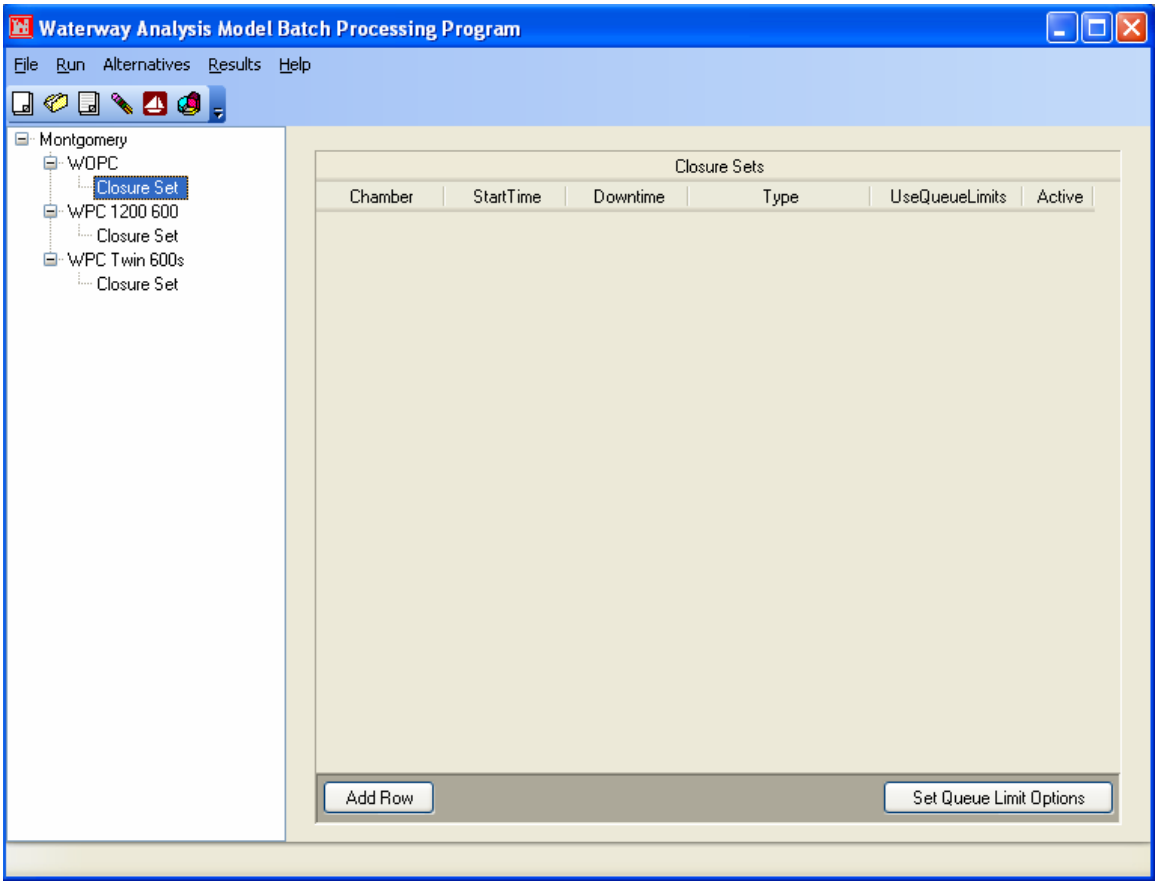
Figure 14
Project With Three Alternatives



Closure Set Setup

An astute observer will notice there is a *Closure Set* branch associated with each alternative shown in **Figure 14**. When a user clicks on one of the *Closure Sets* they will see a screen that looks like **Figure 15**. It should be noted that closure sets are optional. A user may choose to run the WAMBPP without creating closure sets, or they may use closure sets for some alternatives and not with others.

Figure 15
Blank Closure Set Window



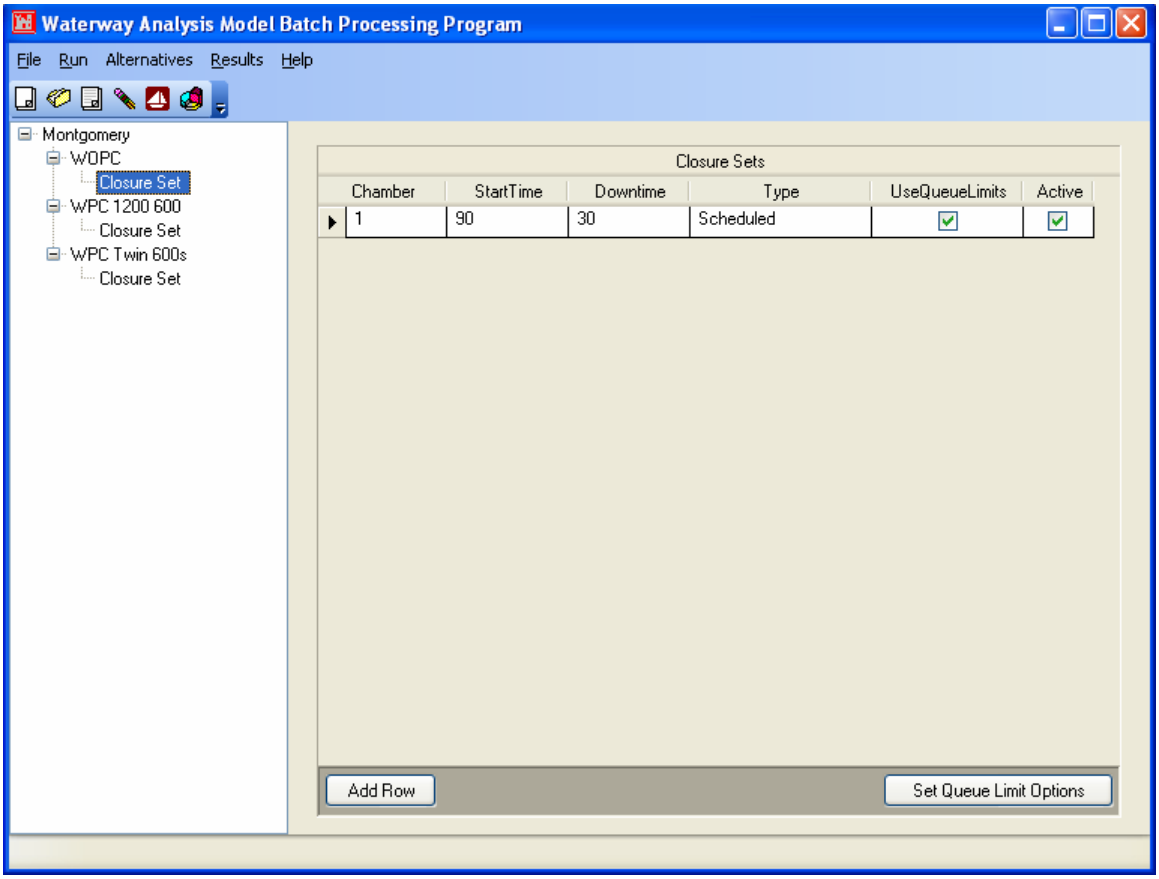
Closure Sets provide the ability to add a user specified closure into the alternative's downtime file. It allows the user to specify whether the closure is scheduled, unscheduled, or a half speed closure event. In addition, the user may also specify whether the WAM modeling process should use the Queue Limiting program, and whether the closure is active or inactive.

This feature was added to the WAMBPP to facilitate the production of curve "families". These families are used by the Ohio River Investment Model as it is modeling major maintenance closures, and component reliability related failures.

In order to define a closure set, the user clicks the *Add Row* button. They are then presented with a cell grid similar to that seen in a spreadsheet application. The user must enter the chamber where the closure will occur, the time in days when the closure will begin, the duration of the closure in days, whether the closure is scheduled, unscheduled or a half speed closure, whether the WAM modeling process should use the queue limiting program, and whether the closure is active or inactive.

Consider the grid shown in **Figure 16**. The closure set shown is associated with the WOPC alternative. It specifies that a closure of chamber 1, the main chamber, will begin on day 90 and last for 30 days. It is a scheduled closure, the queue limiting program will be used, and the closure set is active, which means it will be used when the user launches the WAMBPP application if the user decides to run the WOPC alternative.

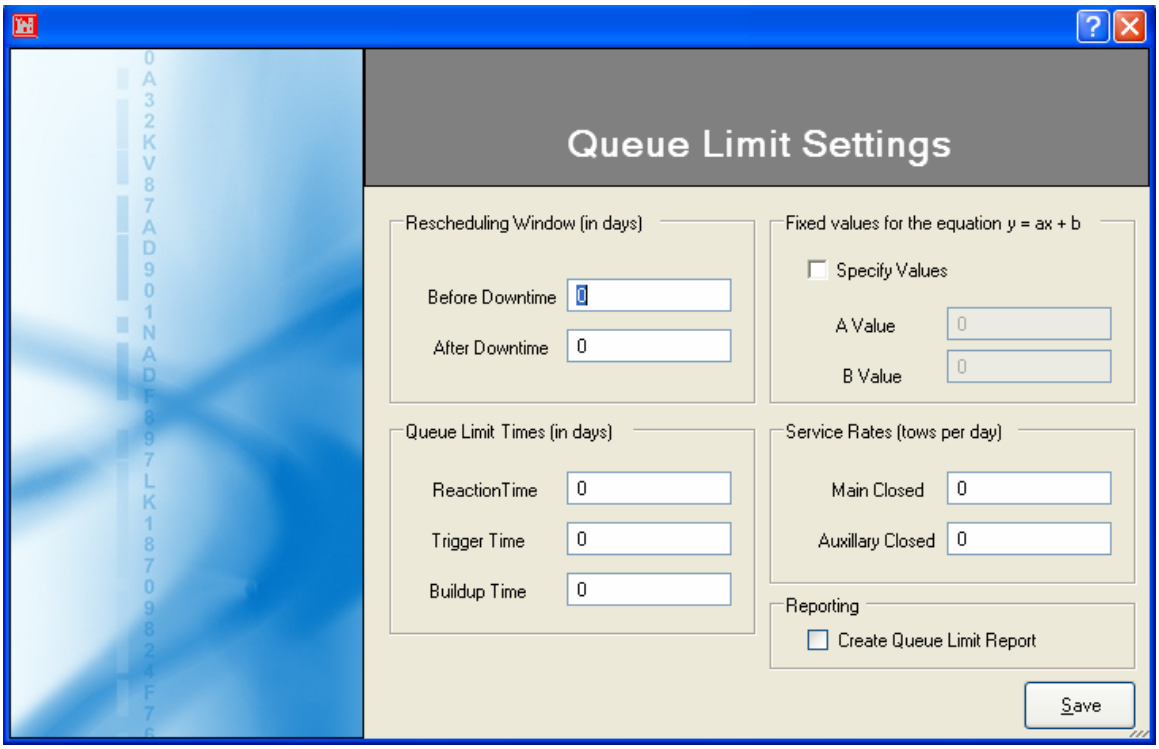
Figure 16
Example Closure Set Grid



Since the *UseQueueLimits* box is checked, the user must click the *Set Queue Limit Options* to specify the queue limit parameters.

When the user clicks the *Set Queue Limit Options* button, they will be presented with a window that looks like **Figure 17**.

Figure 17
Queue Limit Settings Window



It is beyond the scope of this document to explain what the queue limit settings mean, what the queue limit program does, how it works, and how a user develops the parameters shown in **Figure 17**. For additional information about the queue limit program, please contact the CXIN.

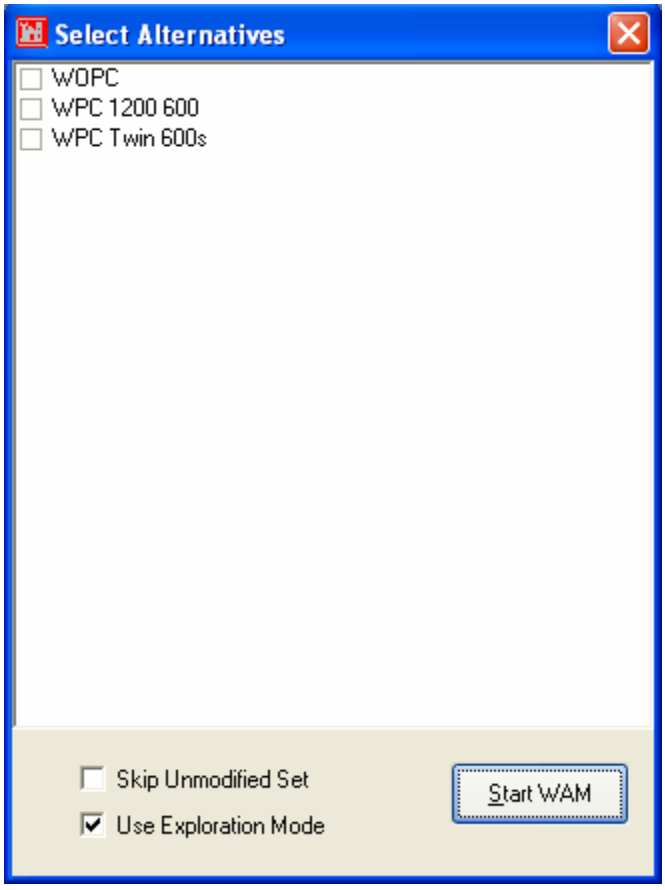
It is important to note that the WAMBPP "carries over" the queue limit settings from one row to another. That is, if the user sets the queue limit parameters on the very first closure set, those settings will be carried over to all closure sets defined later. This feature eliminates the tedious chore of entering the parameters for every closure set.

It is also important to note that the user must press the *Save* button in order to save the parameters.

Run WAM

After a user has set up a project, at least one alternative, and optional active closure sets, it is a simple matter to the start the WAM modeling process. The user can start WAM by clicking Run-Start WAM from the Menu Bar or they may click the  button on the Tool Bar. Upon doing this, the user will be presented with a window that looks like **Figure 18**.

Figure 18
Select Alternatives Window



At this point, the user is able to select the alternative or alternatives they want to run, choose whether they want the WAMBPP to use **Exploration Mode**, and choose whether they want to skip the **Unmodified Set**.

Upon clicking the *Start WAM* button, the user is presented with a WAMBPP progress screen.

If the user chose to run 27 points and the Exploration Mode, they will be presented with a screen that looks like **Figure 19**.

Figure 19
WAM Exploration Mode Screen

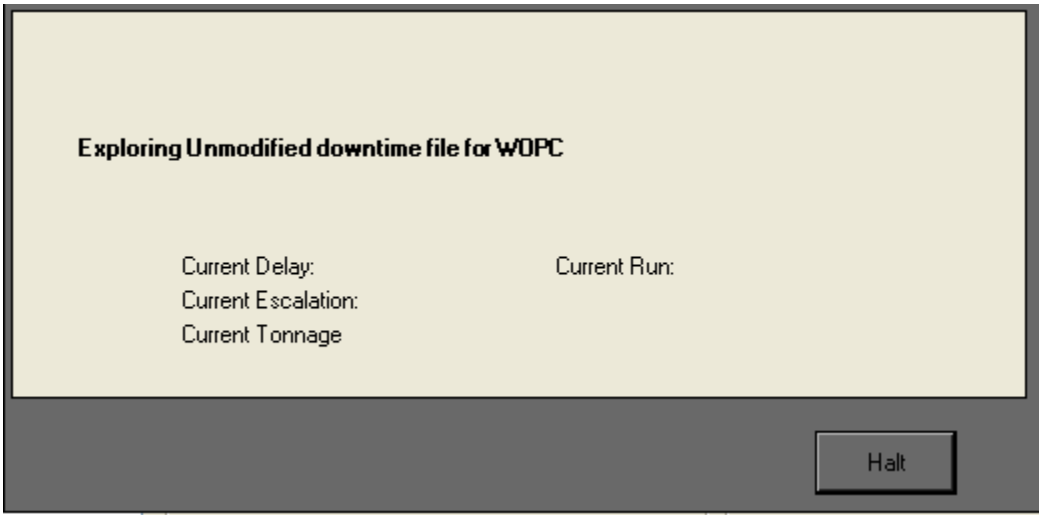
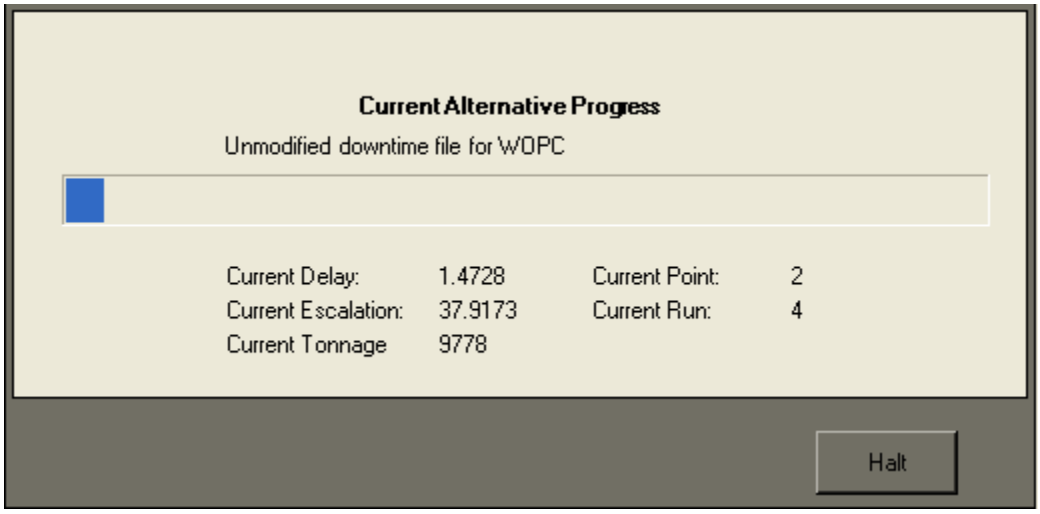


Figure 19 indicates the WAMBPP is in Exploration mode and using the Unmodified downtime file for the WOPC alternative. As runs are made, the *Current Delay*, *Current Escalation*, *Current Tonnage*, and *Current Run* fields are updated.

After the WAMBPP finishes Exploration and switches to Production mode, or if the user initially chose 1 point, they will be presented with a screen that looks like **Figure 20**.

Figure 20
WAMBPP Production Mode Screen

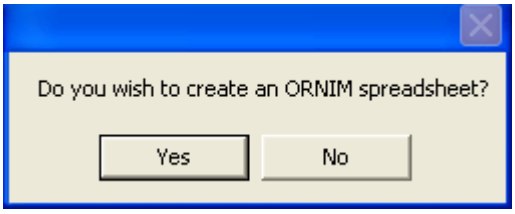


As productions runs are made, the *Current Delay*, *Current Escalation*, *Current Tonnage*, *Current Point*, and *Current Run* fields are updated and the progress bar shows the progress for the current series of runs. The WAMBPP will continue to make runs until

all runs for all points for the indicated alternative and closure set are complete. The WAMBPP will then move to the next active closure set. After all active closure sets are finished for the first alternative, the WAMBPP will move on to the next selected alternative and repeat the process until all selected alternatives and active closure sets are completed.

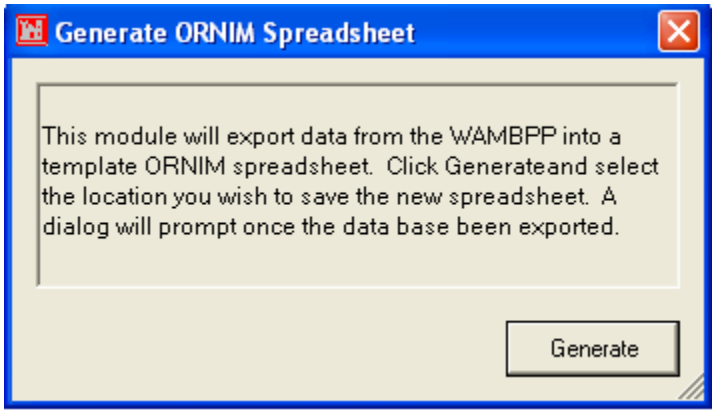
When the WAMBPP finishes execution, a window pops up that looks like **Figure 21**. An ORNIM spreadsheet is used to review the results of WAM runs, and prepare the data for input to the ORNIM model. A full explanation of the ORNIM spreadsheet is beyond the scope of this User's Guide.

Figure 21
Create ORNIM Spreadsheet?



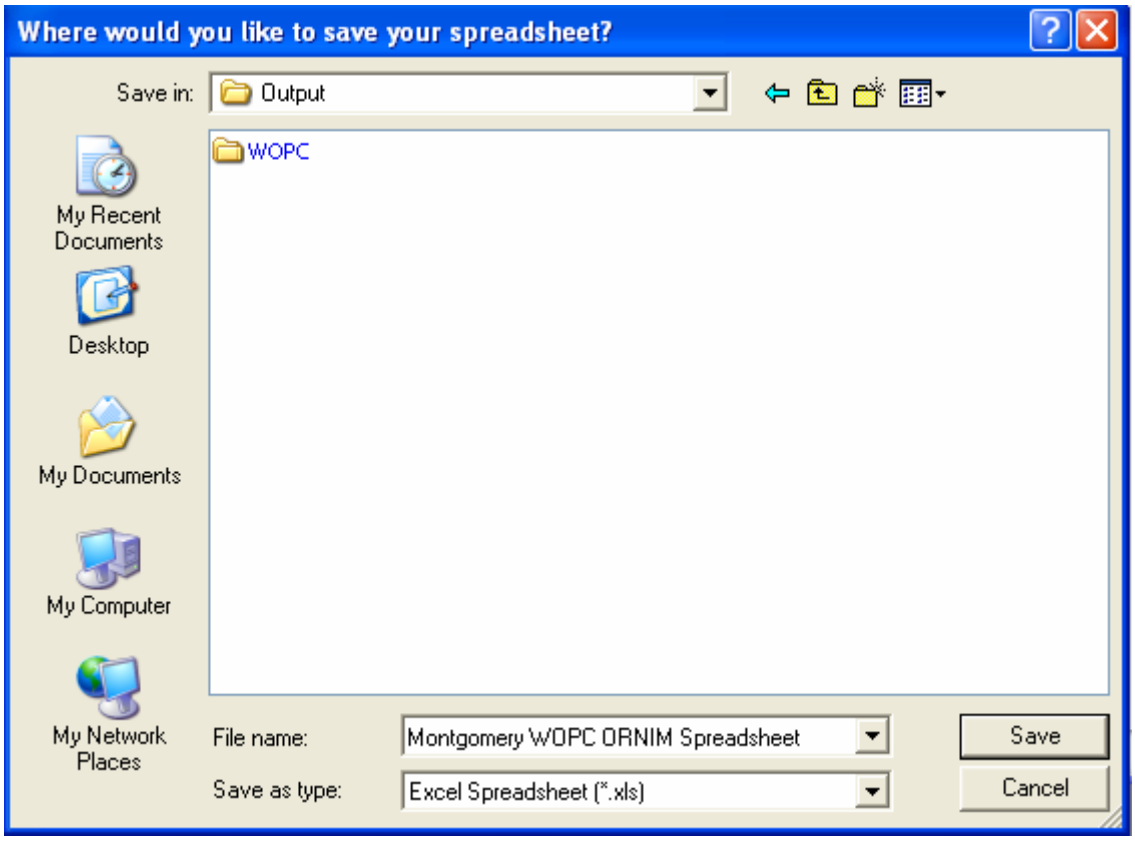
If the user clicks *Yes*, they will see a screen that looks like **Figure 22**.

Figure 22
Generate ORNIM Spreadsheet



When the user clicks the *Generate* button, they will be prompted for the file name and location with a window that looks like **Figure 23**.

Figure 23
ORNIM Filename and Location



The user is able to select the destination folder and enter a file name of their choice. When the user clicks *Save*, the spreadsheet will be created and the user will be notified that the spreadsheet was created.

Output Database

After every WAM run, the WAMBPP opens the main WAM output file, reads various data fields, and saves that data into the WAMBPP output database. The WAMBPP output database resides in the project's **Output Directory**, is in Microsoft® Access format, and contains four tables. If the output database does not exist when the first run is made, the WAMBPP creates the database with four blank tables.

WAMBPP appends various data values read from the WAM output file to the appropriate table. The contents of each table are described in the following sections.

tblExploringData

The tblExploringData table contains information obtained from WAM output files when the WAMBPP is in Exploration Mode. **Figure 24** shows the fields contained in tblExploringData.

Figure 24
tblExploringData Fields

Field Name	Data Type	
ID	AutoNumber	Primary Key
CurrentTime	Date/Time	Date and time run finished
RunID	Text	Run ID for this run
Escalation	Number	Escalation factor used for this run
Seed	Number	Random number seed used for this run
Tonnage	Number	Tonnage processed during this run
Tows	Number	Number of tows processed during this run
TonsPerTow	Number	Tonnage divided by number of tows
Delay	Number	Average tow delay during this run
ProcessTime	Number	Average tow processing time during this run

ID

As indicated in **Figure 24**, the ID field is an AutoNumber field that identifies the record. Every time a new record is created, it is given a unique number. This field can be used to distinguish among runs which have the same RunID. That is, a user can create a query which limits the results to those whose ID is greater than one number and less than another.

CurrentTime

This field indicates the time the run finished. It is another field which can be used to distinguish among sets of runs having the same RunID.

RunID

The RunID field identifies the conditions of the run. It identifies:

- the Project
- the Alternative
- the service policy of the main chamber
- the service policy of the auxiliary chamber
- whether a closure is scheduled, unscheduled, or half-speed
- whether the queue limiting program was used
- the chamber where the closure occurred (1 for main, 2 for auxiliary)
- and the duration of the closure in days

For example, this RunId “Montgomery_WOPC_66_S_Y_1_30” identifies the run as applies to:

- the Montgomery project
- the WOPC alternative
- 6-Up 6-Down was the service policy in the main chamber
- 6-Up 6-Down was the service policy in the auxiliary chamber
- a scheduled closure was added to the unmodified closure set
- the queue limiting program was used
- the scheduled closure occurred in chamber 1
- and the closure duration was 30 days

It should be noted that the chamber and closure duration fields are set to zero for the unmodified closure set run. The same conditions as above for the unmodified closure set run looks like “Montgomery_WOPC_66_U_N_0_0”.

Escalation

The Escalation field shows the Traffic Escalator used during the run.

Seed

The Seed field identifies the initial random number seed used for the run.

Tonnage

The Tonnage field contains the amount of tonnage processed through the lock, shown in kilotons, during the run. WAM reports tonnage that has processed, so if there is a tow being processed at the end of the run, the tonnage is not reported. Likewise, the tonnage waiting in queue is also not reported.

Tows

The Tows field contains the number of tows that were processed during the run. Like Tonnage, WAM reports the number of tows that have completed processing. It does not include tows that are being processed or are in queue.

TonsPerTow

This field is simply Tonnage divided by Tows. It is calculated and stored because it is a very important statistic to an analyst who is trying to "calibrate' a shipment list.

Delay

This field shows the average tow delay during this run. It is reported in hours per tow.

ProcessTime

This field contains the average tow processing time for tows processed during this run. This statistic is reported in hours per tow.

Example Exploring Output

Figure 25 shows records from tblExploringData for the Montgomery WOPC alternative using the Unmodified closure set. In this case, the user specified a Maximum Tow Delay of 200 hours.

Figure 25
Example Exploring Output

ID	CurrentTime	RunID	Escalation	Seed	Tonnage	Tows	TonsPerTow	Delay	ProcessTime
1	4/24/2007 11:01:48 AM	Montgomery_WOPC_66_U_N_0_0	100.000	1000	26414	4499	5871.1	1.2	1.2
2	4/24/2007 11:01:57 AM	Montgomery_WOPC_66_U_N_0_0	166.474	1001	43832	7396	5926.4	15.6	1.2
3	4/24/2007 11:02:09 AM	Montgomery_WOPC_66_U_N_0_0	179.306	1002	47084	8105	5809.3	73.7	1.1
4	4/24/2007 11:02:23 AM	Montgomery_WOPC_66_U_N_0_0	183.974	1003	47089	8052	5848.1	151.6	1.1
5	4/24/2007 11:02:38 AM	Montgomery_WOPC_66_U_N_0_0	188.023	1004	47441	8185	5796.1	191.9	1.1
6	4/24/2007 11:02:57 AM	Montgomery_WOPC_66_U_N_0_0	191.783	1005	47111	8043	5857.4	286.4	1.2
7	4/24/2007 11:03:19 AM	Montgomery_WOPC_66_U_N_0_0	190.824	1006	47214	8197	5759.9	285.7	1.1
8	4/24/2007 11:03:36 AM	Montgomery_WOPC_66_U_N_0_0	189.870	1007	46933	8126	5775.7	238.9	1.1
9	4/24/2007 11:03:53 AM	Montgomery_WOPC_66_U_N_0_0	189.870	1008	46858	8131	5762.9	224.3	1.1
10	4/24/2007 11:04:11 AM	Montgomery_WOPC_66_U_N_0_0	189.870	1009	47165	8078	5838.7	245.0	1.2
11	4/24/2007 11:04:37 AM	Montgomery_WOPC_66_U_N_0_0	189.870	1010	47123	8084	5829.2	227.5	1.2
12	4/24/2007 11:04:55 AM	Montgomery_WOPC_66_U_N_0_0	189.870	1011	46677	8067	5786.2	238.1	1.1

Note how WAMBPP began with an escalation of 100, which produced a transit time much less than 200. The WAMBPP went through a process of raising the escalation and making runs until transit time exceeded 200. It then reduced the escalation slightly until it found an escalation that resulted in a transit time between 200 and 250 hours. It made 5 runs at that escalation to insure the proper escalation value was found. After the five runs at an escalation of 189.870, the WAMBPP switched into Production mode.

tblSummaryData

The tblSummaryData table contains information obtained from WAM output files when the WAMBPP is in Production Mode. **Figure 26** shows the fields contained in tblSummaryData.

Figure 26
tblSummaryData Fields

Field Name	Data Type	
ID	AutoNumber	Primary Key
CurrentTime	Date/Time	Date and time run finished
RunID	Text	Run ID for this run
RunSet	Number	Run number for this escalation
Escalation	Number	Escalation factor used for this run
Seed	Number	Random number seed used for this run
Tonnage	Number	Tonnage processed during this run
Tows	Number	Number of tows processed during this run
TonsPerTow	Number	Tonnage divided by number of tows
Delay	Number	Average tow delay during this run
ProcessTime	Number	Average tow processing time during this run
AlternativeID	Number	Foreign key to alternative, used by WAMBPP
ClosureSetID	Number	Foreign key to closure set, used by WAMBPP

Most of the fields are in tblSummaryData are the same as those in tblExploringData. The field descriptions will be repeated here for the user's convenience.

ID

As indicated in **Figure 26**, the ID field is an AutoNumber field that identifies the record. Every time a new record is created, it is given a unique number. This field can be used to distinguish among runs which have the same RunID. That is, a user can create a query which limits the results to those whose ID is greater than one number and less than another.

CurrentTime

This field indicates the date and time the run finished. It is another field which can be used to distinguish among sets of runs having the same RunID.

RunID

The RunID field identifies the conditions of the run. It identifies:

- the Project
- the Alternative
- the service policy of the main chamber
- the service policy of the auxiliary chamber

- whether a closure is scheduled, unscheduled, or half-speed
- whether the queue limiting program was used
- the chamber where the closure occurred (1 for main, 2 for auxiliary)
- and the duration of the closure in days

For example, this RunId “Montgomery_WOPC_66_S_Y_1_30” identifies the run as being for:

- the Montgomery project
- the WOPC alternative
- 6-Up 6-Down was the service policy in the main chamber
- 6-Up 6-Down was the service policy in the auxiliary chamber
- a scheduled closure was added to the unmodified closure set
- the queue limiting program was used
- the scheduled closure occurred in chamber 1, the main
- and the closure duration was 30 days

It should be noted that the chamber and closure duration fields are set to zero for the unmodified closure set run. The same conditions as above for the unmodified closure set run looks like “Montgomery_WOPC_66_U_N_0_0”.

RunSet

This field does not appear in tblExploringData. It identifies the run number for a given escalation. This field identifies at a glance whether all runs were completed for a given escalation.

Escalation

The Escalation field shows the Traffic Escalator used during the run.

Seed

The Seed field identifies the random number seed used during the run.

Tonnage

The Tonnage field contains the amount of tonnage processed through the lock, shown in kilotons. WAM reports tonnage that has processed, so if there is a tow being processed at the end of the run, the tonnage is not reported. Likewise, the tonnage waiting in queue is also not reported.

Tows

The Tows field contains the number of tows that were processed through the lock during the run. Like Tonnage, WAM reports the number of tows that have completed processing. It does not include tows that are being processed or are in queue.

TonsPerTow

This field is simply Tonnage divided by Tows. It is calculated and stored because it is a very important statistic to an analyst who is trying to "calibrate' a shipment list.

Delay

This field shows the average tow delay during this run. It is reported in hours per tow.

ProcessTime

This field contains the average tow processing time for tows processed during this run. This statistic is reported in hours per tow.

AlternativeID

This field does not appear in tblExploringData, is used by the WAMBPP, and is not important to the end user.

ClosureSetID

This field does not appear in tblExploringData, is used by the WAMBPP, and is not important to the end user.

Example Production Output

Figure 25 shows example records from tblExploringData for the Montgomery WOPC alternative using the unmodified closure set. Figure 27 shows records from tblSummaryData. These records were created after the model switched from Exploration to Production modes. This can be verified by comparing the CurrentTime of the last run in **Figure 25** with that of the first run in **Figure 27**.

Figure 27
Example Production Output

ID	CurrentTime	RunID	RunSet	Escalation	Seed	Tonnage	Tows	TonsPerTow	Delay	ProcessTime
1	4/24/2007 11:04:58 AM	Montgomery_WOPC_66_U_N_0_0	1	18.99	1012	4750	803	5915	0.1	1.22
2	4/24/2007 11:05:05 AM	Montgomery_WOPC_66_U_N_0_0	2	18.99	1013	4728	831	5690	0.1	1.18
3	4/24/2007 11:05:12 AM	Montgomery_WOPC_66_U_N_0_0	3	18.99	1014	4782	830	5761	0.1	1.18
4	4/24/2007 11:05:19 AM	Montgomery_WOPC_66_U_N_0_0	4	18.99	1015	4694	789	5949	0.1	1.24
5	4/24/2007 11:05:27 AM	Montgomery_WOPC_66_U_N_0_0	5	18.99	1016	4718	803	5875	0.1	1.19
6	4/24/2007 11:05:34 AM	Montgomery_WOPC_66_U_N_0_0	6	18.99	1017	4751	820	5794	0.1	1.20
7	4/24/2007 11:05:41 AM	Montgomery_WOPC_66_U_N_0_0	7	18.99	1018	4698	803	5851	0.1	1.17
8	4/24/2007 11:05:49 AM	Montgomery_WOPC_66_U_N_0_0	8	18.99	1019	4747	803	5912	0.1	1.21
9	4/24/2007 11:05:57 AM	Montgomery_WOPC_66_U_N_0_0	9	18.99	1020	4735	817	5796	0.1	1.18
10	4/24/2007 11:06:04 AM	Montgomery_WOPC_66_U_N_0_0	10	18.99	1021	4741	817	5803	0.1	1.19
11	4/24/2007 11:06:12 AM	Montgomery_WOPC_66_U_N_0_0	11	18.99	1022	4778	810	5899	0.1	1.22
12	4/24/2007 11:06:19 AM	Montgomery_WOPC_66_U_N_0_0	12	18.99	1023	4707	792	5943	0.1	1.23
13	4/24/2007 11:06:26 AM	Montgomery_WOPC_66_U_N_0_0	13	18.99	1024	4659	786	5927	0.1	1.19
14	4/24/2007 11:06:33 AM	Montgomery_WOPC_66_U_N_0_0	14	18.99	1025	4695	796	5898	0.1	1.24
15	4/24/2007 11:06:41 AM	Montgomery_WOPC_66_U_N_0_0	15	18.99	1026	4696	808	5812	0.1	1.18
16	4/24/2007 11:06:48 AM	Montgomery_WOPC_66_U_N_0_0	16	18.99	1027	4708	806	5841	0.1	1.22
17	4/24/2007 11:06:55 AM	Montgomery_WOPC_66_U_N_0_0	17	18.99	1028	4714	823	5728	0.1	1.18
18	4/24/2007 11:07:02 AM	Montgomery_WOPC_66_U_N_0_0	18	18.99	1029	4746	837	5670	0.1	1.18
19	4/24/2007 11:07:10 AM	Montgomery_WOPC_66_U_N_0_0	19	18.99	1030	4696	816	5755	0.2	1.16
20	4/24/2007 11:07:17 AM	Montgomery_WOPC_66_U_N_0_0	20	18.99	1031	4714	807	5841	0.1	1.19
21	4/24/2007 11:07:26 AM	Montgomery_WOPC_66_U_N_0_0	1	37.97	1032	9737	1682	5789	0.2	1.19
22	4/24/2007 11:07:34 AM	Montgomery_WOPC_66_U_N_0_0	2	37.97	1033	9711	1663	5839	0.3	1.20
23	4/24/2007 11:07:42 AM	Montgomery_WOPC_66_U_N_0_0	3	37.97	1034	9719	1674	5806	0.2	1.18
24	4/24/2007 11:07:49 AM	Montgomery_WOPC_66_U_N_0_0	4	37.97	1035	9747	1680	5802	0.2	1.19
25	4/24/2007 11:07:56 AM	Montgomery_WOPC_66_U_N_0_0	5	37.97	1036	9714	1638	5930	0.2	1.19
26	4/24/2007 11:08:04 AM	Montgomery_WOPC_66_U_N_0_0	6	37.97	1037	9722	1664	5843	0.2	1.20
27	4/24/2007 11:08:11 AM	Montgomery_WOPC_66_U_N_0_0	7	37.97	1038	9708	1649	5887	0.2	1.19

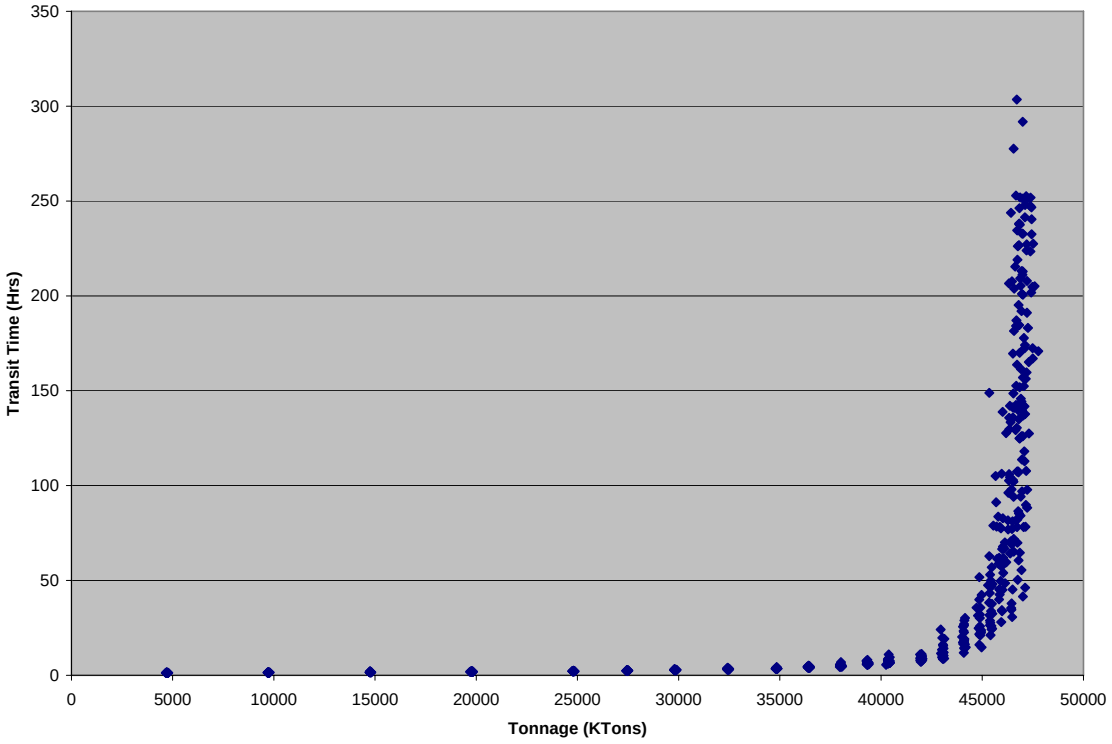
Figure 27 above shows the WAMBPP made 20 runs at an escalation value of 18.99. It then switched to an escalation of to 37.97 and started making more runs. This process of making the user specified number of runs, increasing the escalation, then making the user specified runs at that escalation, continues until runs are made for all 27 escalation values.

It should be noted that the lines shown in **Figure 27** are only a small portion of all the runs made for this RunID. It would take 540 lines to show all the runs (20 runs per point multiplied by 27 points).

Capacity Curve Creation from tblSummaryData

The tblSummaryData table serves as the data source for creation of all **Capacity Curves**. These capacity curves are used by the Ohio River Navigation Investment Model. **Figure 28** is a chart showing the tonnage vs transit time points generated by the WAMBPP for the Montgomery_WOPC_66_U_N_0_0 condition.

Figure 28
Chart of all Montgomery_WOPC_66_U_N_0_0 Runs



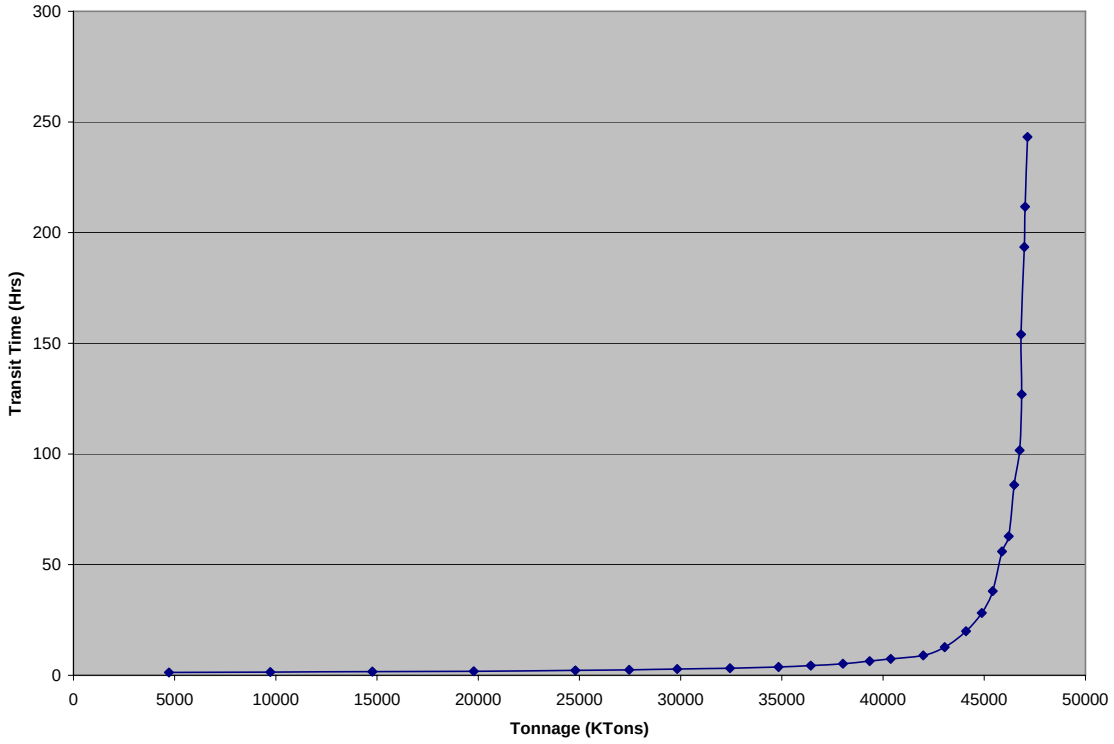
The ORNIM model is not designed to use the "cloud" of points shown in **Figure 28** so a query is created which groups the runs by RunID and Escalation and calculates the average tonnage and transit time for each group.

The SQL for the query looks like:

```
SELECT tblSummaryData.RunID, tblSummaryData.Escalation,
Avg(tblSummaryData.Tonnage) AS AvgOfTonnage,
Avg([Delay]+[Processtime]) AS [Transit Time]
FROM tblSummaryData
GROUP BY tblSummaryData.RunID, tblSummaryData.Escalation
HAVING (((tblSummaryData.RunID) Like "*WOPC*_0_0"))
ORDER BY tblSummaryData.Escalation;
```

The charted results of this query are shown in **Figure 29**.

Figure 29
Capacity Curve, Montgomery_WOPC_66_U_N_0_0



tblDetailedData

The WAMBPP creates another Output database table named *tblDetailedData*. This table is populated when the WAMBPP is in Production Mode and, like *tblSummaryData*, contains data taken from the main WAM output file. The *tblDetailedData*, however contains a much more detailed account of what transpired during each WAM run. Over 100 fields of information are included in *tblDetailedData*.

Table 1 shows the types of statistics contained in *tblDetailedData*, but there are actually four times as many fields in *tblDetailedData* as the number of statistics shown in **Table 1** because *tblDetailedData* contains four fields for each statistic. For example, **Table 1** shows a Tons statistic. *tblDetailedData* contains a Tons field for the entire lock and Tons fields for Chamber 1, Chamber 2, and Chamber 3. This is the case for all other statistics shown in **Table 1**. A user does not have to use *tblDetailedData* to create Tonnage - Transit Time curves, so it is not a table that will be used regularly. tblDetailedData is useful for model validation purposes, during the shipment list calibration process, and other purposes when the analyst needs to get into the detailed operation of WAM.

Table 1
tblDetailedData Fields

Field Name	Field Description
Tons	Tonnage Processed
Tows	# Tows Processed
LBrgs	# Loaded Barges Processed
Ebrgs	# Empty Barges Processed
Recs	# Recreational Craft Processed
Ltbts	# Light Boats Processed
TowPrTm	Avg Processing Time for Tows
TotalUtil	Total Percent of Time Facility is Busy
LkgUtil	Percent of Time Spent Locking Vessels
IntUtil	Percent of Time Spent Waiting for Interference
W4TUtil	Percent of Time Spent Waiting for Chamber to Turnback
ChamTBUtil	Percent of Time Spent Turning the Chamber Back
UnavailUtil	Percent of Time Chamber is Unavailable
NumUnAvail	# Closure Events
DurUnAvail	Duration of Closure Events
AppAppInt	# Tows Impacted by Approach Area Interference While Tow is Approaching
GateAppInt	# Tows Impacted by Gate Area Interference While Tow is Approaching
ChamInt	# Tows Impacted by Chambering Interference
ChamTBInt	# Tows Impacted by Chambering Turnback Interference
AppExInt	# Tows Impacted by Approach Area Interference While a Tow is Exiting
GateExInt	# Tows Impacted by Gate Area Interference While a Tow is Exiting
AppAppIntTm	Avg Time of Approach Area Interference Occuring While a Tow is Approaching
GateAppIntTm	Avg Time of Gate Area Interference Occuring While a Tow is Approaching
ChamIntTm	Avg Time of Chambering Interference
ChamTBIntTm	Avg Time of Chamber Turnback Interference
AppExIntTm	Avg Time of Approach Area Interference Occurring While a Tow is Exiting
GateExIntTm	Avg Time of Gate Area Interference Occurring While a Tow is Exiting
AppWOIntTm	Avg Approach Time Without Interference
AppWIntTm	Avg Approach Time With Interference
ChamWOIntTm	Avg Chambering Time Without Interference
ChamWIntTm	Avg Chambering Time With Interference
ChamTBWOIntTm	Avg Chamber Turnback Time Without Interference
ChamTBWIntTm	Avg Chamber Turnback Time With Interference
ExitWOIntTm	Avg Exit Time Without Interference
ExitWIntTm	Avg Exit Time With Interference

tblUncrossedData

This table is not used.

Definitions

Base Year – The historic year which serves as the basis from which shipment generator files are created. For example, if the base year is 2005, then the WAM shipment list LPMS and WCSC input files were created using 2005 LPMS and WCSC data. In this case the shipment list will reflect the seasonal shipping patterns, tow size configuration, loading per barge, and percent barges empty found in the year 2005.

Capacity Curve – A series of piecewise linear lines between points which define the tonnage processed versus expected transit time over the full range of tonnages which a project is capable of processing in a year. Each point on the curve is the average of many WAM runs made at the same traffic escalation values. By intelligently selecting many different escalation values, and making many runs at each of these escalations, a series of points is developed by the WAMBPP.

Closure Set – A user specified closure that is inserted into the **Unmodified Set**. Users specify closure sets by specifying a closure duration (days), the chamber affected by the closure, when the closure begins, whether the closure is scheduled, unscheduled, or half-speed, and whether the WAMBPP should use the queue limiting program.

Delay Time – The time a tow spends waiting to start the lockage process. Delay time starts when a tow arrives at a lock and ends when it starts its lockage. Delay time does not include the time required to actually process the tow through the lock.

Exploration Mode – One of the two operational modes of the WAMBPP. The other is Production Mode. When the WAMBPP is in Exploration mode, it varies the traffic escalation value used by the shipment list generator. The traffic escalation value determines the level or amount of traffic generated by the shipment list generator. As the escalation value increases, traffic levels and delays increase. As the escalation value decreases, traffic levels and delays decrease. While in Exploration mode, WAMBPP automatically adjusts the escalation factor until the average **Transit Time** produced by five WAM runs is at least as large as the *Maximum Tow Delay* but no larger than 125% of the *Maximum Tow Delay*. Once the Exploration Mode has found the traffic escalation value that produces the maximum tow delay, WAMBPP switches to Production Mode.

Processing Time – The amount of time required for a tow to actually process through a lock. The process begins when the tow starts it lockage and ends when a tow ends it lockage. Processing Time does not include any time spent waiting to start processing.

Production Mode - One of the two operational modes of the WAMBPP. The other is Exploration Mode. Production mode operation depends on the contents of the "*Number of Points*" dropdown box. If the user selected 1 point, the WAMBPP will make the specified "*Number of Runs*" WAM runs at the specified "*Traffic Escalator*". If the user specified 27 points, the WAMBPP will make the specified "*Number of Runs*" at 27 different traffic escalation factors, which are based on the traffic escalator that caused the WAMBPP to switch from Exploration to Production mode.

Transit Time – The sum of tow **Processing Time** and tow **Delay Time**.

Unmodified Set – The downtime file specified by a user when an Alternative is created. Closure sets modify this downtime file.