ICP Design Document

Task 5-0016-2

Interactive Calibration Program (ICP) Design and Development

submitted to

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1.0 INTRODUCTION

The National Weather Service (NWS) is working to improve and expand its hydrologic prediction services across the country pursuant to the Advanced Hydrologic Prediction Services (AHPS) program. In support of these efforts, Riverside Technology, inc. (RTi) is designing and developing a replacement for the current Interactive Calibration Program (ICP). This effort is focusing on migrating the software from C/Motif to Java, maintaining the same functionality, but correcting usability issues. The software will also be more maintainable and facilitate the implementation of new enhancements. No new functionality is planned under the current scope of the project.

1.1 Document Scope and Purpose

The purpose of this document is to communicate at a high level the various aspects of the design of the replacement ICP. Refinement of the design will be performed in the appropriate iteration.

The Design Document describes the system architecture upon which the product will be based. Strategies are identified for logging, troubleshooting, and messaging.

Components are identified that will be employed by the product as well as interfaces needed to external software packages.

The initial screen shots for the replacement ICP Graphical User Interface are presented.

1.2 Intended Audiences

This major portion of this document is directed toward knowledgeable software engineers with some understanding of the current ICP product. The Presentation Layer will be of more interest to potential users of the software.

1.3 References

Hillel Sukenik, 1.2-UNIX-ICP Interactive Calibration Program (ICP) - Setup Information Hydrologic Research Laboratory

http://www.nws.noaa.gov/oh/hrl/nwsrfs/users_manual/part1/_pdf/12unix_icp.pdf

Riverside Technology, inc. 2006. "Concept of Operations and Requirements ICP Redevelopment", Riverside Technology, inc.

Riverside Technology, inc. 2006. "ICP User Interface Kickoff Call User Interface Topics", Riverside Technology, inc.

National Weather Service Office of Hydrologic Development, NWSRFS User Manual Documentation http://www.nws.noaa.gov/oh/hrl/nwsrfs/users_manual/htm/xrfsdocpdf.php

2.0 THE REPLACEMENT ICP DESIGN

2.1 Overview

An overview of the replacement ICP is presented in the following sections. The goals of the design and constraints are discussed, followed by topics that have a system wide scope. Finally, the Business Layer design is presented. User Interface prototypes are presented in ***Appendix A***.

2.2 Goals

The goals of this project are to re-implement ICP to improve usability and maintainability while retaining the original functionality.

OHD classes for data access will be examined for reuse in ICP.

Open source software is to be employed where feasible.

2.3 Constraints

- Retain Functionality
- Maintainability by OHD
- Single and Multiple Monitors to be supported
- Ant 1.6.2
- ChartDirector 4.1
- Eclipse 3.2 (Used during development)
- Java Version 5.0
- JUnit 3.81 (Used during development)
- Linux Version rhel4u2 (2.6x)
- Hardware Dual processor 2.4 to 2.8 FHz/2MB CPUs
- Subclipse 1.0.3 (Used during development)

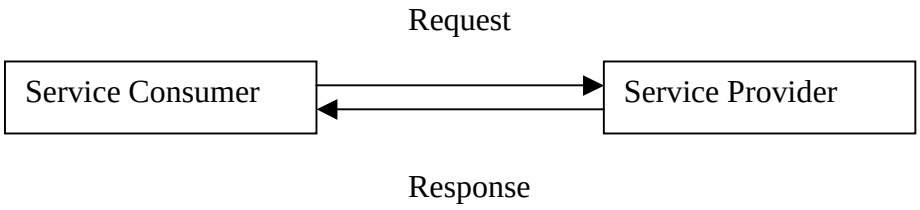
2.4 System Architecture

The high-level system design takes into account the following considerations:

- Design for an eventual migration in the future to a Services Oriented Architecture (SOA)
- Observes the Layer architectural pattern (i.e. separation of Presentation layer, Business layer, Data access layer).
- Observes the Partitions pattern (i.e., separation of concerns between domain dependent and domain independent components).

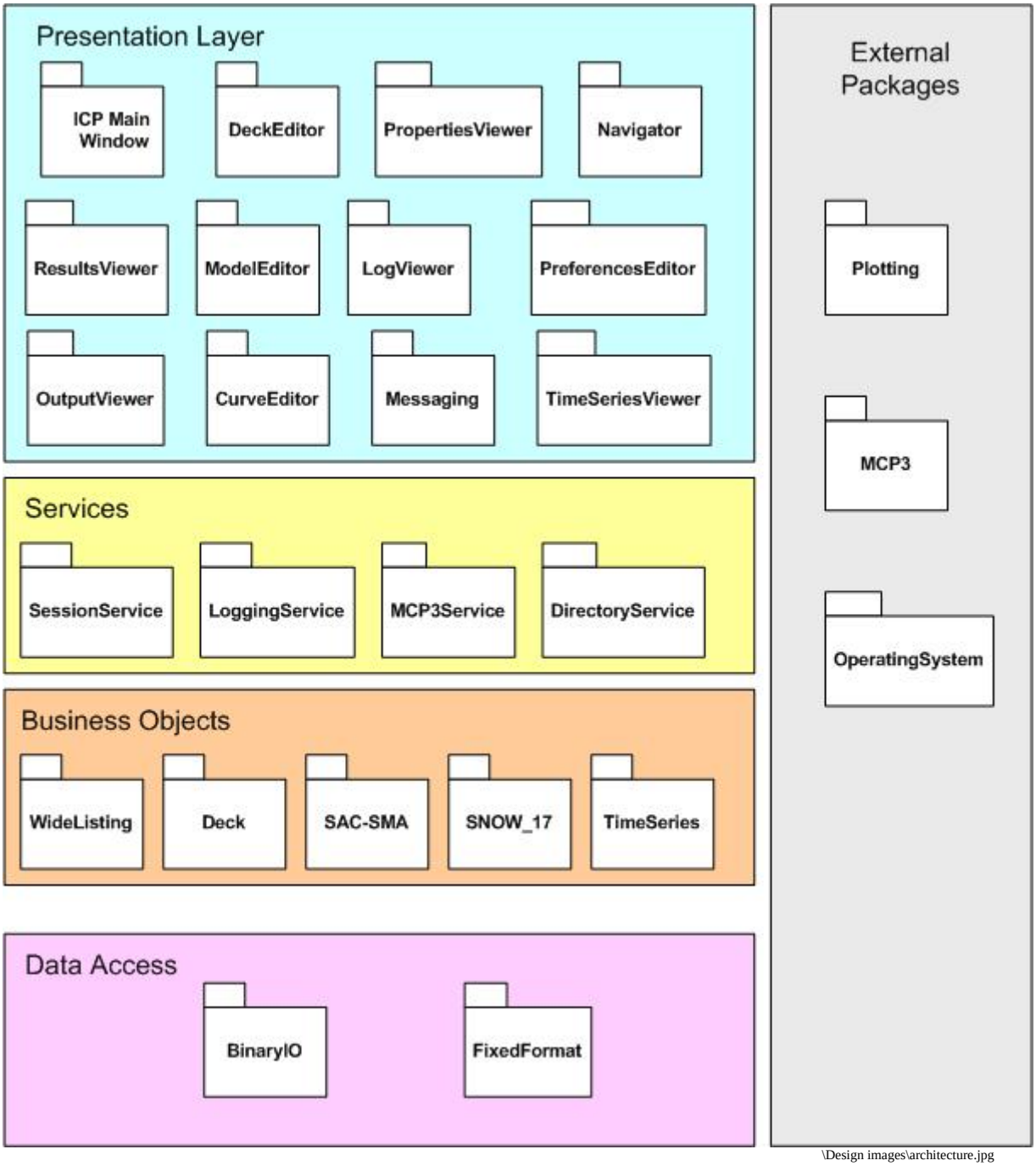
Services Architecture

A service is a function that is well-defined, self contained, and does not depend on the context or state of other services



The following package diagram illustrates the architectural layers adopted for ICP design.

Although classes in higher levels may be dependent on (have knowledge of) classes in lower levels, the opposite relationship is to be avoided.



\Design images\architecture.jpg

Figure 2-1. Candidate System Architecture

2.4.1 Package Naming Conventions

OHD has requested that package naming begin with "ohd.hseb.icp" or "ohd.hseb.rfc.icp" and that additional levels be kept to a minimum.

The prefix "ohd.hseb.icp" will be adopted. Sub-package naming conventions will follow the guidelines established by Sun. See http://java.sun.com/docs/codeconv/html/CodeConventions.doc8.html.

2.4.2 Error, Warning, Information Strategy

The strategy for displaying Error/Warning messages is to minimize the interference with the user. The more severe the problem encountered, the more visible the message will be.

A common terminology must be established in order to discuss the message handling strategy, and is presented below.

2.4.2.1 Terminology

Error. Problems encountered during execution that prohibits further execution of the software until corrected. They may be programming errors or user data errors.

Programming Error. Result of a divide by zero, array index out of range, or an exception thrown without ever being handled.

User Data Error. Data undefined or incomplete, data out of range, or data invalid.

User Correctable Error. An error that can be eliminated by user intervention.

Exception. An abnormal condition that must be handled correctly in order to prevent a program from terminating.

Warning. Problems that do not prohibit continued execution, but may cause a variance in results.

Failure. Failures are a variance from an expected result that is reported to the user. Not to be confused with an error. (Current functionality does not recognize this classification)

2.4.2.2 User Notification

ICP will display the following types of messages as detailed below.

Message Type	User Notification
Error	Displayed in a dialog, which when acknowledged leads to application termination.
Warnings	Displayed in the status line.
Informational	Displayed in the status line.

Format

<MessageType> <Message Text> <Suggestions>

Example

Error: FileNotFound. The file <filename> could not be found.
File: <filename>

Path: <path>
- Check that the file exists and that permissions exist to access the file.

Error, Warning, and Informational messages are to contain text describing what went wrong and possible actions on the part of the user to rectify the problem.

The text of the message is to be kept in external files (resource bundles). This leaves open the possibility of internationalization/localization as a future enhancement.

Any runtime exceptions resulting from programming errors that are thrown by ICP are to be caught, and an appropriate message displayed.

User data validation will only be implemented to the same level as in the current ICP. It is envisioned that additional enhancements could be implemented to detect and warn when incorrect data is entered in text fields.

Error, Warning, and Informational messages will be logged.

2.4.3 Debugging/Troubleshooting Strategy

Debugging/Troubleshooting will make use of logging features (see below) to record pertinent information.

- All Error, Warning and Informational messages are to be logged.
- All exceptions are to be logged.

In addition logging levels will be optionally used to log:

- Method enter/exit
- All Actions
- Timing

Normal ICP execution will not include these in the log.

2.4.4 Logging Strategy

The java.util.logging package will be used to for ICP logging.

The logging file(s) will be located in the directory designated by the apps default token mcp3_icp_iface.

ToDo: Check whether ICP has write permissions, and that log files persist after the session ends.

Refer to the java.util.logging javadocs for information on the logging package.

The log file will contain a header consisting of:

- ICP version
- Date/time stamp
- User
- Selected environment variables and their values
- Selected apps_defaults tokens and their values

In addition, entries will be made for the following events as they occur:

- Files accessed
- Error messages
- Warning messages
- Troubleshooting messages

2.5 Presentation Layer

See ***Appendix A*** for the proposed ICP replacement GUI.

2.6 Business Layer

An overview of the business layer may be seen in ***Figure 2-1. Candidate System Architecture***. More refinement may be seen in ***Figure 2-2. Class Diagram of Key ICP Classes***, ***Section 2.7***, although the business classes are not called out. The business layer will be refined as appropriate during iterations of development.

2.6.1 Environment

ICP runs in the NWSRFS software environment. It uses values specified as apps_defaults tokens and environment variables for configuration. ***Appendix B*** provides details abut the MCP3 environment, which impacts ICP.

2.6.1.1 Application Defaults

See ***Section B.1.2***.

ToDo: Look at RTi's NWSRFS_Util.get_apps_defaults(String s) and OHD's MiscTools.getAppDefaults () methods for an implementation.

2.6.1.2 Environment Variables

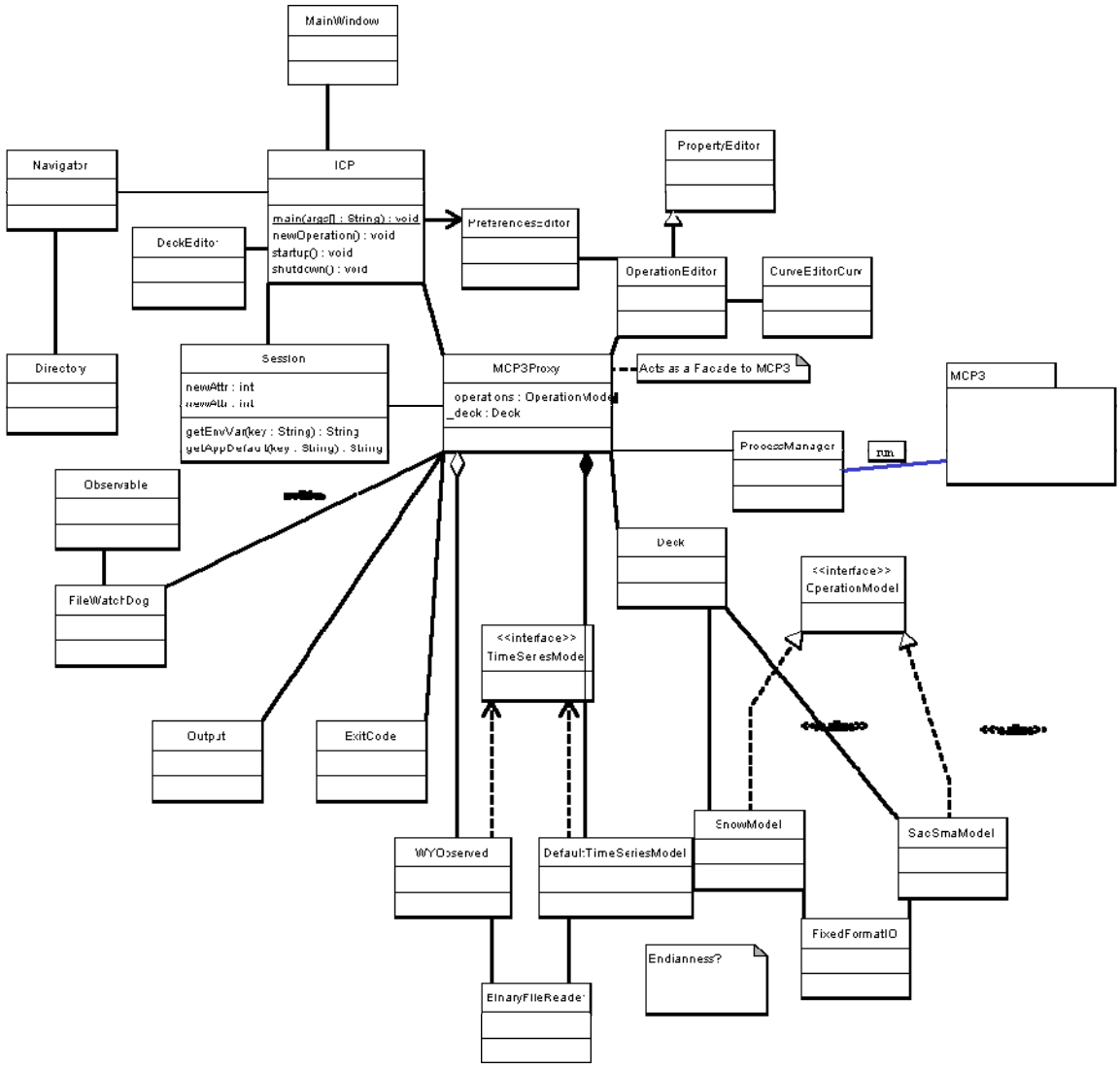
See ***Section B.1.1***

2.6.1.3 File System

See ***Section B.4.3***

2.7 Class Diagram

The following class diagram provides an overview of class relationships.



\Design images\Class Diagram1.png

Figure 2-2. Class Diagram of Key ICP Classes

The class ICP will contain "main" and will initialize the ICP GUI.

Class ICP will initiate communication with the business/services layer to ascertain apps_defaults tokens and environment. Thereafter GUI interactions will control further processing.

Additional GUI components (DeckEditor, OperationEditor, etc.) will be lazily initialized upon demand.

The façade pattern will be used to present a high level interface to the presentation layer embodied by the class MCP3Proxy. MCP3Proxy acts as a substitute (proxy) for MCP3, which is an external process and cannot be interacted with at a method level.

Interfaces (TimeSeriesModel, OperationModel) will be used to abstract time series and operation model parameter communications between the business classes & the GUI.

The Observer/Observable pattern will be used to communicate changes from the business layer upward to the presentation layer.

The data access classes (BinaryFileReader, FixedFormatIO) isolate system dependent code to the data access layer.

The class diagram presented above should be thought of more as a logical diagram. Actual class names are likely to change. OHD code reuse is to be taken into consideration.

2.7.1 OHD Code reuse

Several OHD classes appear to be of interest for reuse. The following table summarizes the classes.

Appropriate code will be utilized by referencing an OHD jar file at run time.

Table 2-1 Candidate OHD Code for ICP

Class	Description
ohd.hseb.rfc.util.data.DataPoint	Simple x, y datapoint class.
ohd.hseb.rfc.util.data.DataTable	A general class that could be used for the data model for properties or other data.
ohd.hseb.rfc.util.data.DataSet	Data model for time series, with an array of Julian hour and data values.
ohd.hseb.rfc.util.data.DatacardData	Class to read/write DataCard time series files
ohd.hseb.rfc.util.data.ESPData	Class to read the ESP (Ensemble Streamflow Prediction) binary file - not directly useful to ICP but provides an example of reading binary files
ohd.hseb.rfc.util.data.FileData	Read/write tables of data.
ohd.hseb.rfc.util.data.PlotData	Appears to be utility/wrapper code for use with ChartDirector.
ohd.hseb.rfc.util.data.TableModelData	Appears to be an interface to support JTable.
ohd.hseb.rfc.util.misc.HCalendar	HCalendar and some others might have some value to process date/times.
ohd.hseb.rfc.util.misc.SystemSettings	May have some value to persist settings.
ohd.hseb.rfc.util.misc.MiscTools	Includes getAppsDefaults() method
ohd.hseb.rfc.util.misc.Messenger	Class for logging/messages, using a design from APEX C++ code
ohd.hseb.rfc.util.misc.HBinaryInputStream	Could be used to read the MCP3 binary files.

2.8 ICP Execution

ICP will be launched by a shell script “icpnew” during transition to allow using the replacement ICP parallel to the existing software. The script will call JRE (version 1.5.0) to run the main method in ICP.

The “icpnew” script, jar files, and JRE will be located in standard NWSRFS locations.

APPENDIX A: GUI DESIGN

A.1. Introduction

This appendix provides a design for the replacement ICP Graphical User Interface (GUI).

Important GUI elements have been prototyped in Java and screenshots captured for this document. This effort also facilitated evaluation of Java components to be used during development.

It is important to note that GUIs typically evolve during development as usability issues and user feedback are incorporated. This document captures the initial design; however, it is expected that the design will be refined.

The vocabulary of GUIs may not be familiar to all who read this document; therefore the following glossary is provided to facilitate review:

A.1.1 Glossary

Checkbox. A control, consisting of a graphic and associated text, which a user clicks to turn an option on or off.

Dialog. A secondary window displayed by an application, usually to gather information from users

Modal dialog. A dialog that prevents users from interacting with other windows of an application until the dialog is closed.

Non-modal dialog. A dialog that allows users to interact with other windows of an application without being closed.

Pane or Panel. An area in a window.

Radio Button. One of a group of items, of which only one can be selected at a time.

Split pane. A container that enables the user to adjust the relative size of two adjacent panes.

Window. A user interface element that contains and organizes the information that users see in an application.

The new ICP design takes into consideration the workflow of a calibration session and mitigating major usability issues in the existing ICP software.

A calibration session consists of:

1. Start ICP.
2. Select watershed (MCP3 deck).
3. Run MCP3.
4. Examine results.
5. Edit model (operation) parameters (if results are unsatisfactory) and save to the MCP3 deck.

Steps 3 through 5 are repeated until the results are satisfactory. Calibration requires repeating these steps many times.

During the session, a user will run MCP3 and view results many times. In order to facilitate this it is important that:

1. Results are easily viewed.
2. Operation parameters are quickly edited.
3. MCP3 can easily be run for the currently selected deck.

These considerations imply that the simulation results of MCP3 runs are by default to be immediately displayed and parameters affecting them can be edited with minimal user interaction.

An evaluation of ICP use indicated that users often review SAC-SMA, SNOW-17, and WY-PLOT graphical output (or a combination thereof), and sometimes review PLOT-TS graphical output.

To accommodate this usage the initial GUI design focuses on a Main Window providing WY-PLOT, SAC-SMA, and SNOW-17 graphical output, with related navigation tools to select results display. The PLOT-TS results, which are viewed less often, are displayed in a separate window.

Non-modal dialogs are employed to facilitate editing Operation parameters. This allows Operation parameter and results windows to remain open, facilitating rapid access.

Three new features are introduced to improve usability:

1. The MCP3 control deck, once selected, remains selected.
2. Option to run MCP3 automatically after Operation parameters are applied.
3. Option to update results automatically after MCP3 runs.

The ***ICP User Interface Kickoff Call User Interface Topics*** document identified major usability issues in the existing ICP in the areas of:

- Main window organization
- Control deck selection
- Updates of MCP3 output displays
- Operation parameter editing

These have been taken into consideration in the new GUI design.

In addition, the GUI design addresses:

- Observing standards
  - Menus
  - Common controls
  - Dialogs (modal, non-modal)
- Ease of use
  - Eliminate the need to repeatedly reselect the MCP3 control deck
  - Place oft used functionality to be easily accessible

- Avoid "find the window" syndrome (where a window becomes hidden behind other windows and the user is forced to search for it)

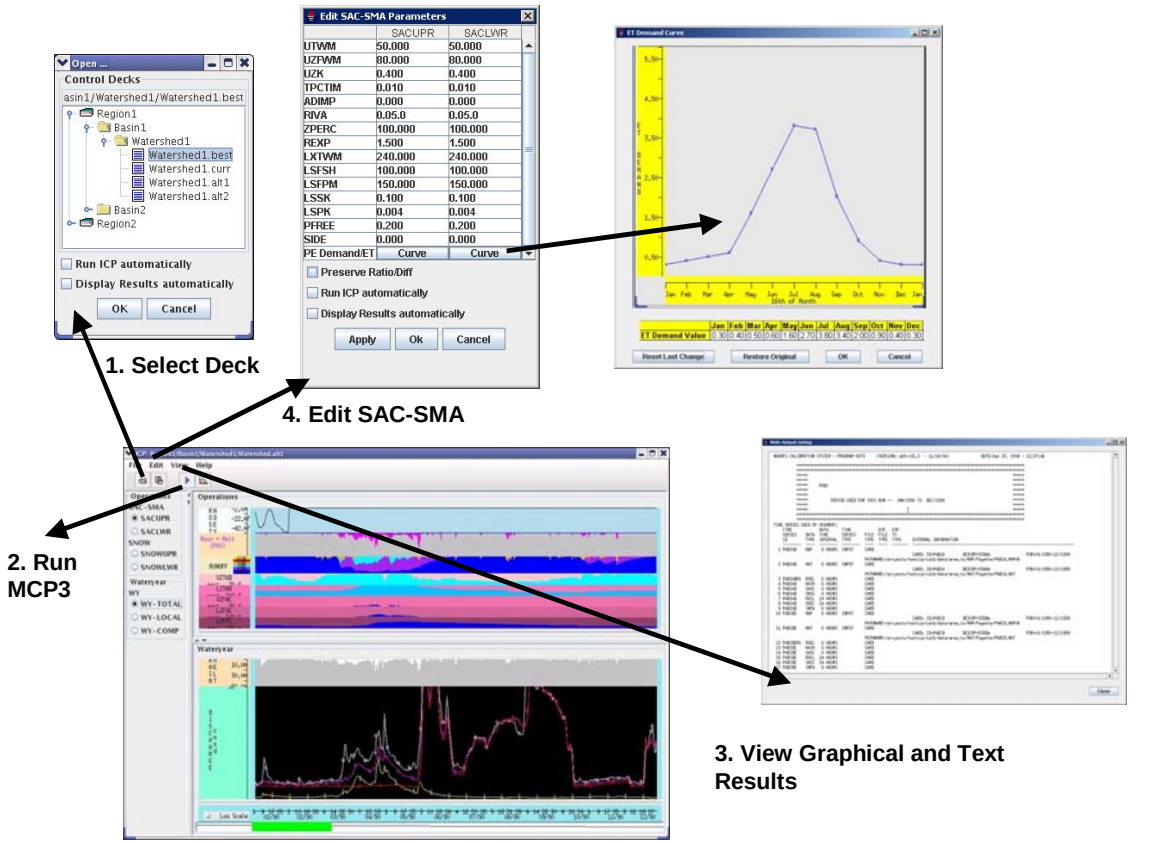
Many users use multiple monitors (often 3) to run ICP; therefore, using tabbed panes and other mechanisms to conserve screen real estate have not been employed. It was felt that the primary goal of increasing user productivity was more important than screen real estate conservation.

The major visible changes in the ICP GUI are to reduce the number of windows and increase usability. Much of the GUI will appear familiar to those who have used ICP and therefore minimal retraining is anticipated.

The following sections introduce the major GUI elements.

A.2. Overview of ICP GUI

The figure below shows some of the more important ICP windows and their relationships.



UI_Design_Images\Overview of ICP GUI.png

Figure A. 1. Overview of ICP GUI

A.2.1 Highlights

Figure A. 1 illustrates the main steps performed during calibration.

1. Select a control deck from File->Open
2. Run MCP3 using a tool bar button

3. Review results, either in the results area, Time Series Plot, or MCP3 output
4. Edit operation parameters from Edit-><Operation Name>

A.2.2 ICP General Button Behavior

This section describes the general behavior for buttons used throughout the ICP user interface.

OK: In general, the OK button is used for ICP non-modal dialogs and windows that provide an opportunity for the user to make a selection. When the user clicks OK the dialog is dismissed and the user's selection(s) are applied to the system – either the currently selected deck is selected, or in cases where input deck information has been changed, new information is written to the input deck.

Apply: The Apply button is most often used for ICP non-modal dialogs and windows where the user has an opportunity to change input deck information. When the user clicks Apply the user's selection(s) will be saved to the currently selected input deck and the dialog remains open.

Cancel: The Cancel button is used for ICP modal and non-modal dialogs when the user has an opportunity to make a selection or modify information. When Cancel is clicked none of the user's selections will be applied to the system and the dialog is dismissed. In the case of modifying input deck information, no changes to the deck will be made.

Close: The Close button is used for ICP modal and non-modal dialogs generally only for displaying information to the user. When the user clicks Close the dialog is dismissed.

Undo: The Undo button is used only for the ICP dialogs that display the PE Adjustment, ET-Demand, Unit Hydrograph, or AESC curve information. When the user clicks 'Undo' the most recent change to the plot/table is canceled and the previous values are restored in the plot/table.

Undo All: The Undo All button is also used only for the ICP dialogs that display the PE Adjustment, ET-Demand, Unit Hydrograph, or AESC curve information. When the user clicks Undo All, all changes made to the plot/table since the last OK/Apply are canceled and the original plot/table is restored.

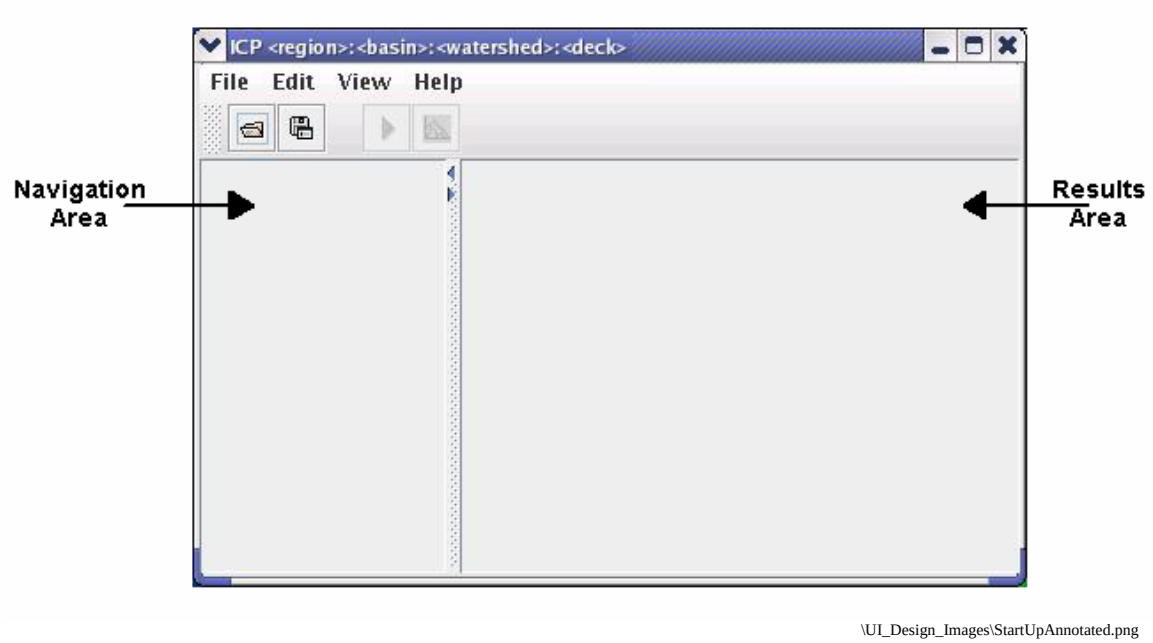
A.3. ICP Main Window

Description: The ICP Main Window is displayed when the ICP program starts.

Invoked From: ICP is started from the Command line

When ICP is initially started, the Navigation Area (left, explained below) and Results Area (right, explained below) are not populated. The Title Bar also is not populated.

The Tool bar buttons for Run MCP3 and Display Time Series are disabled.

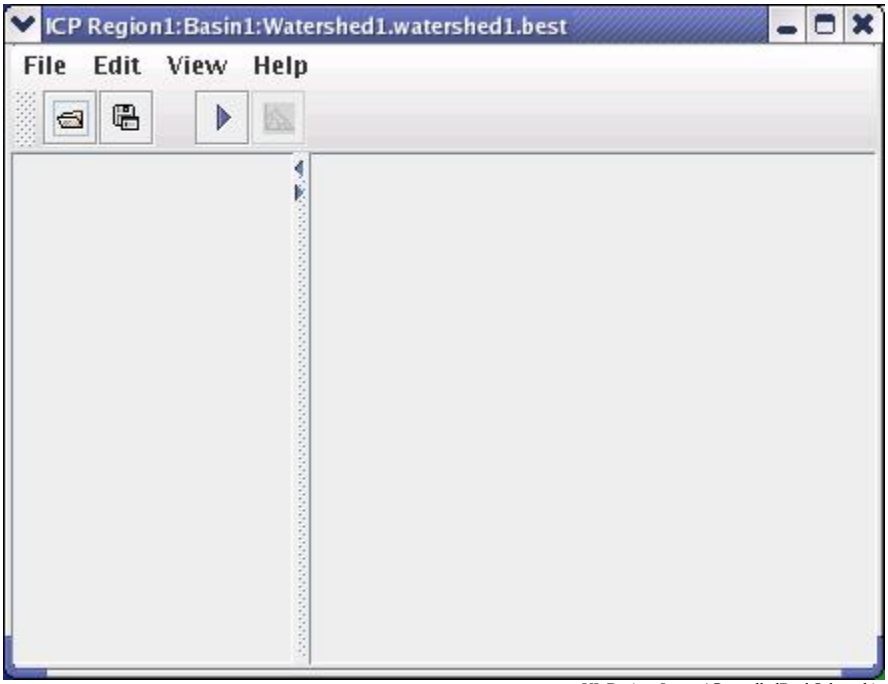


\UI_Design_Images\StartUpAnnotated.png

Figure A. 2. ICP Main Window when First Visible

When a deck has been selected (Open Control Deck UI is described in ***Section A.4***) the ICP Main Window Title Bar updates to show the name of the selected deck.

The tool bar button Run MCP3 is then enabled.



UI_Design_Images\ControlledDeckSelected.jpg

Figure A. 3. ICP Main Window after Control Deck Selected but MCP3 Not Run

The Navigation Area of ICP Main Window lists the SAC-SMA and SNOW-17 model operations and the WY-PLOT operations available for display. For more information see ***Section A.6.1***.

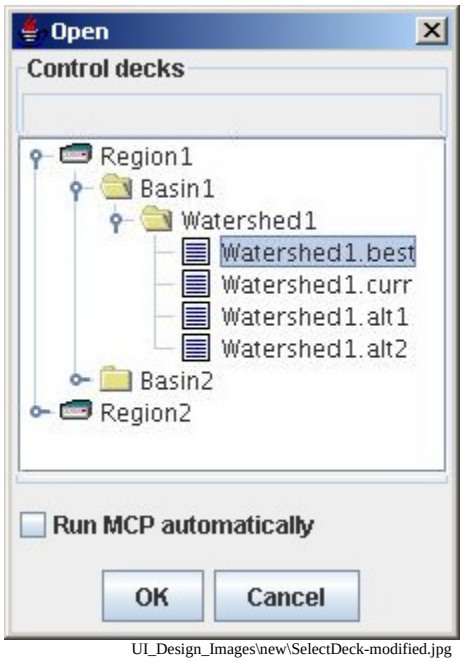
Future Enhancement: It is envisioned that if new operations having graphical output were added they could also be displayed here.

The Results area shows the selected Operations output in graphical form in the corresponding labeled panes.

The behavior of the Results Area is described in more detail in ***Section A.6.2***.

A.4. Open Control Deck Dialog

Description: The Open Control Deck Dialog is a modal dialog that displays the Region/Basin/Watershed/Deck hierarchy and allows users to select a deck, as well as configure MCP3 run and display options.



UI_Design_Images\new\SelectDeck-modified.jpg

Figure A. 4. Open Deck Dialog

- Run ICP Automatically

  When checked, MCP3 will automatically be executed with the selected deck when the following events are detected in ICP

  1. A new Control Deck is selected
  2. Operation parameters are accepted (Ok) or Applied
  3. The Control Deck is saved in the Control Deck Editor

  Otherwise no MCP3 execution will be performed. The user must manually execute MCP3, for example, by using the Run button on the Tool bar.

- Display Results automatically

  When checked, results panes that are open will automatically be updated after MCP3 successfully runs. Otherwise, results panes will not be updated and the user must manually affect an update.

Invoked From:

- File->Open
- Tool bar

A.4.1 Save As Dialog

Description: The Save As Dialog displays a list of control decks to save as another name.

Invoked From: ICP Main Window menu bar File -> Save As…

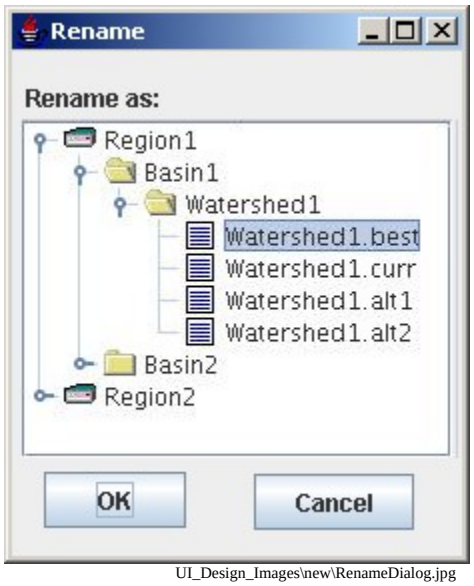
UI_Design_Images\new\SaveAsDialog.jpg

Figure A. 5. Save As Dialog

A.4.2 Rename Dialog

Description: The Rename Dialog displays a list of control decks to re-name.

Invoked From: ICP Main Window menu bar File -> Rename…



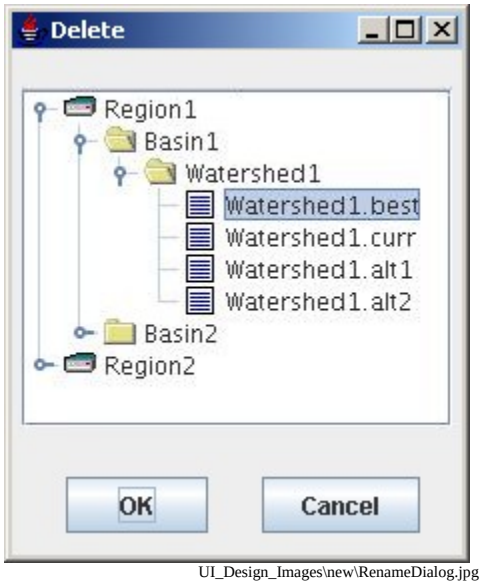
UI_Design_Images\new\RenameDialog.jpg

Figure A. 6. Rename Dialog

A.4.3 Delete Dialog

Description: The Deleted Dialog displays a list of control decks to delete.

Invoked From: ICP Main Window menu bar File -> Delete…



UI_Design_Images\new\RenameDialog.jpg

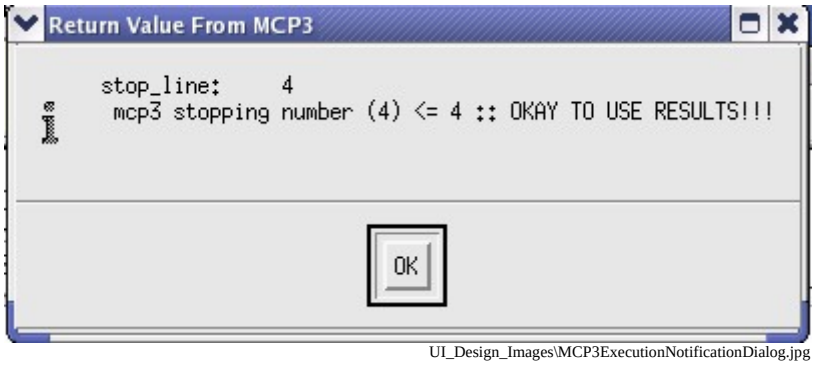
Figure A. 7. Delete Dialog

A.5. MCP3 Execution Notification Dialog

Description: The MCP3 Execution Notification Dialog is a modal dialog that displays the results of executing MCP3 for a selected control deck.

There will be little or no change from how this dialog is at present displayed in ICP.

Invoked From: Tool bar Run MCP3 tool or automatically after other actions.

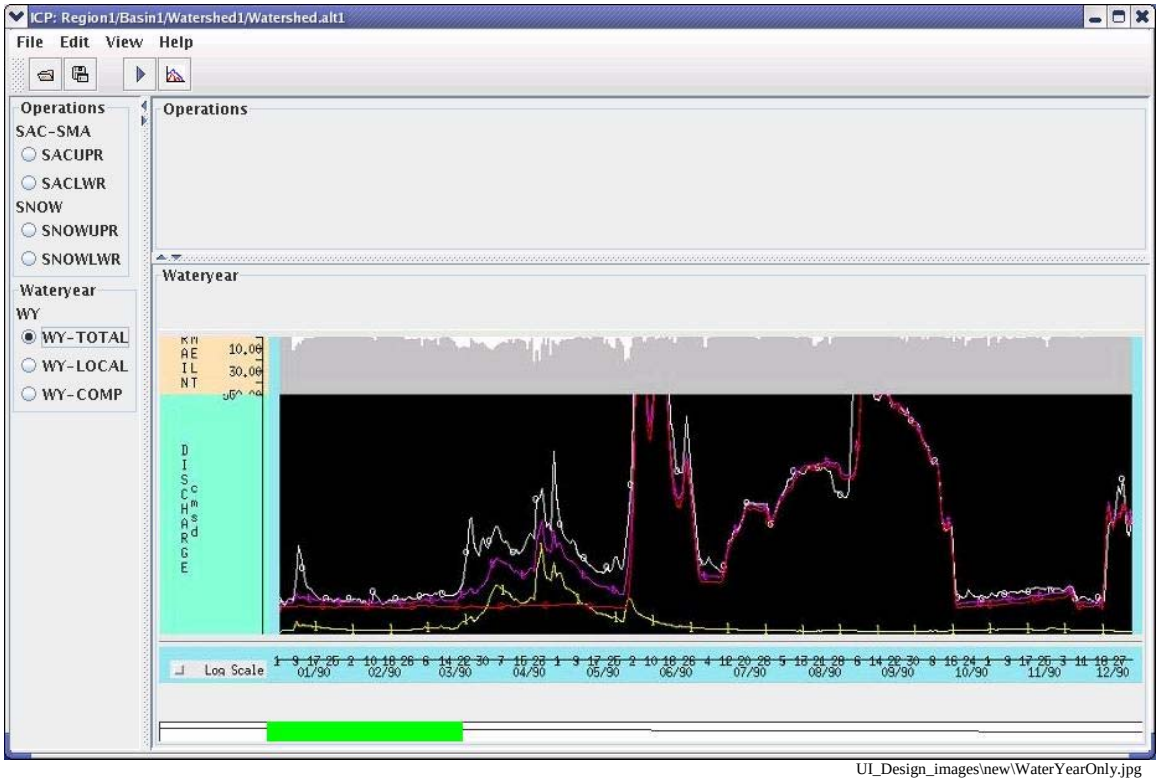


UI_Design_Images\MCP3ExecutionNotificationDialog.jpg

Figure A. 8. MCP3 Execution Notification Dialog

A.6. Main Window Operations and WY-PLOT Displays

The Main Window displays SCA-SMA, SNOW-17, and WY-PLOT graphical output.



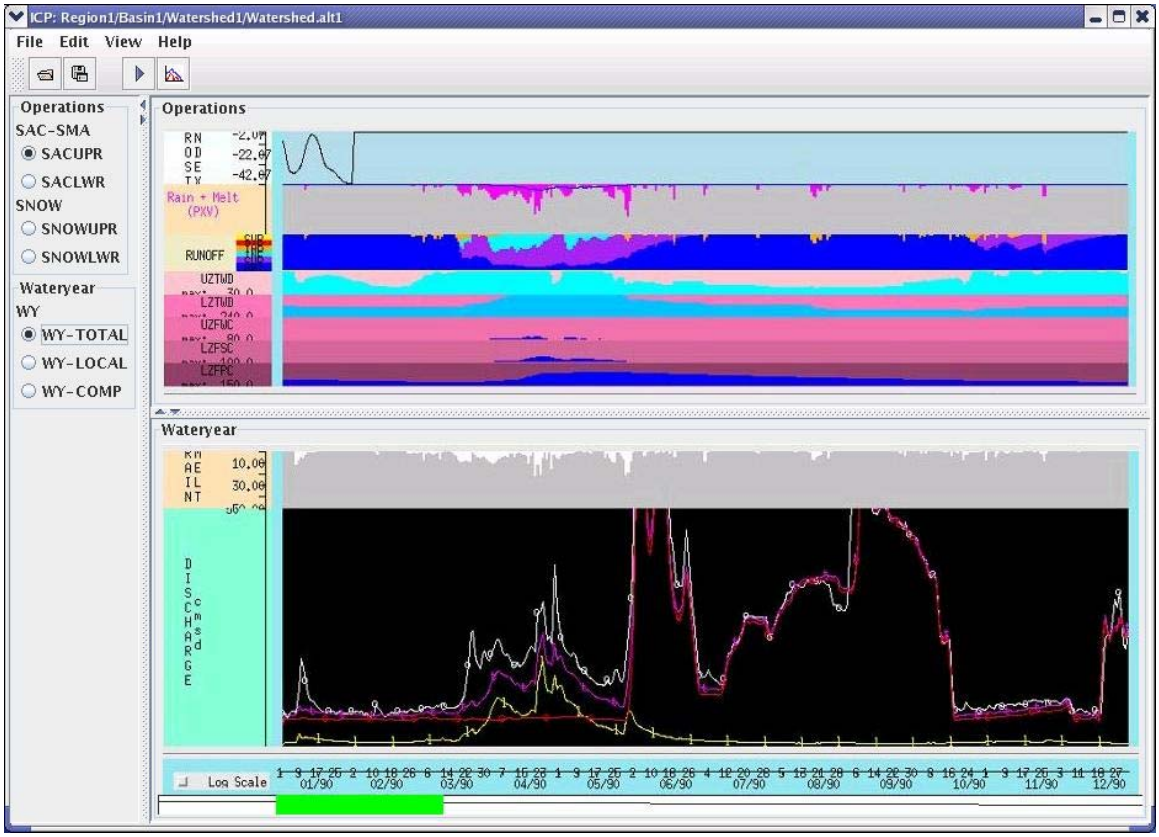
UI_Design_images\new\WaterYearOnly.jpg

Figure A. 9. ICP Main Window – WY-PLOT Displayed in Results Area

Figure A. 10 illustrates how SAC-SMA operation results may be displayed.

The user can quickly change between operations by using the controls in the Navigation area, as well as determining which Operational results are currently displayed.

A single click on the left facing triangle of the Splitter control will maximize the Results area (hiding the Navigation area). It can be restored to its original configuration by a click on the right facing triangle.



UI_Design-Images\new\WaterYearAndSACSMA.jpg

Figure A. 10. WY-PLOT Showing SACUPR SAC-SMA Model Operation

A.6.1 Navigation Area

Description: The Navigation Area lists the SAC-SMA, SNOW-17, and WY-PLOT operations that are defined in the current deck.

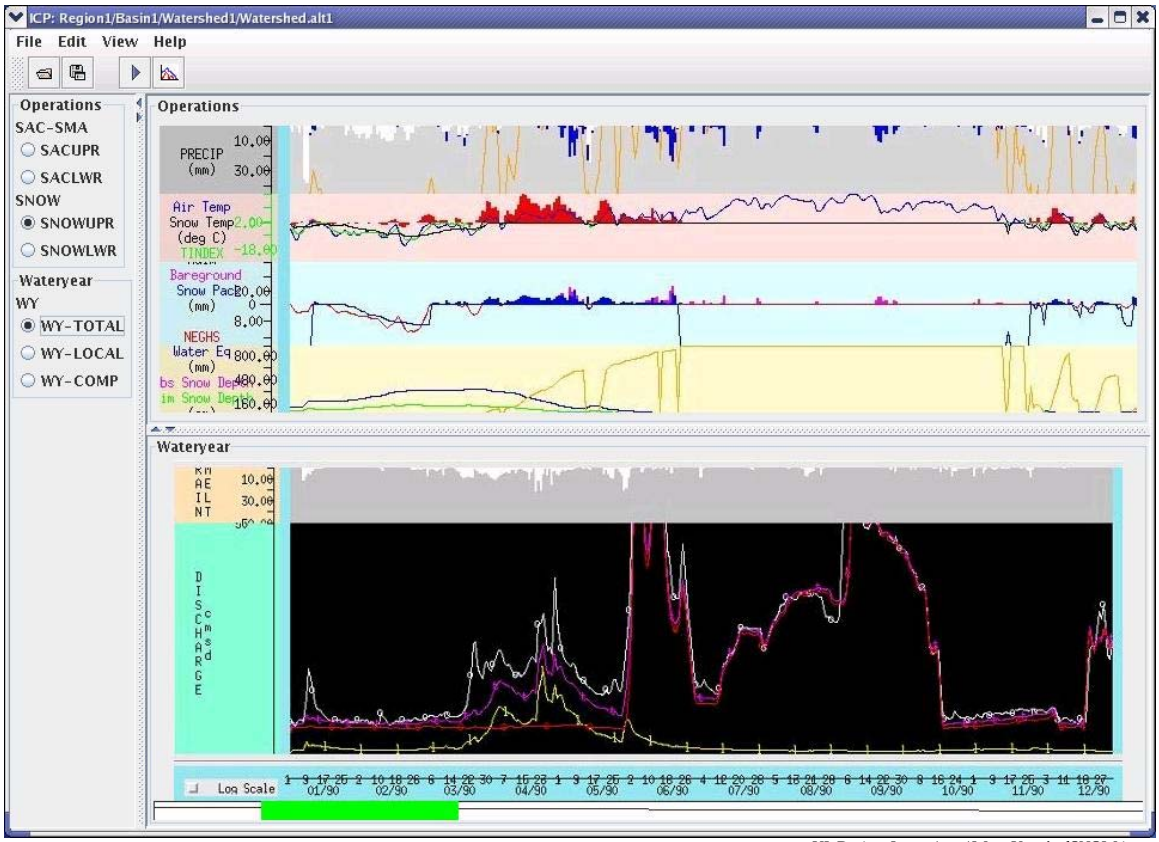
UI_Design_Images\ICPMainFrameNavigationArea.jpg

Figure A. 11. ICP Main Window Navigation Area

The user must click on the radio button next to the name of the SAC-SMA or SNOW-17 operation to see view graphical results in the upper part of the Results Area.

The user must click on the radio button next to the name of the WY-PLOT operation to view a WY-PLOT operation in the lower half of the Results Area. The user may only select one radio button from the "Operations" group and only one radio button from the "Wateryear" group. The Navigation Area is a vertically scrollable panel so that if the list of operations extends beyond the size of the frame the user may still see the whole list.

Figure A. 12 shows that the SNOW-17 SNOWUPR operation has been selected in the Navigation area and the Results area shows the corresponding results in the Operations pane.



UI_Design_Images\new\WaterYearAndSNOW.jpg

Figure A. 12. WY-PLOT Displaying SNOW-17 Model SNOWUPR

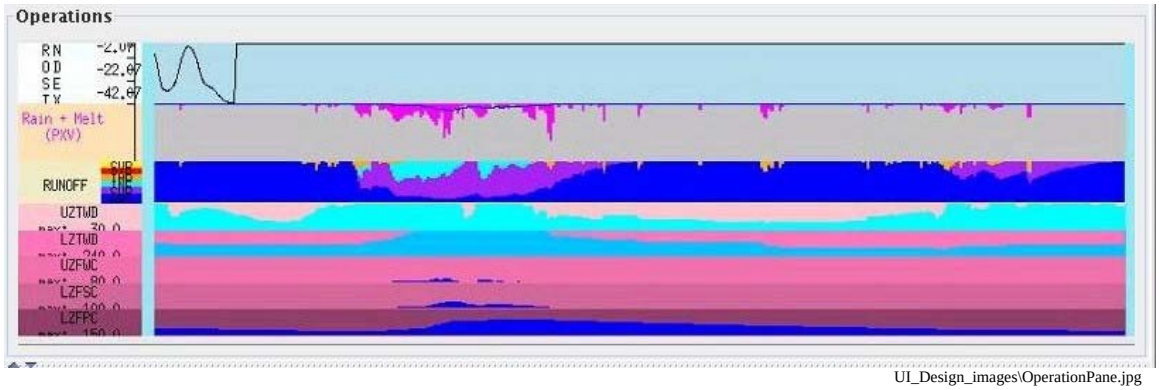
A.6.2 Results Area

Description: The Results Area is a split pane, with the upper half containing the Operation Results Pane and the lower half containing the WY-PLOT Pane.

Operation Results Pane

Description: The Operation Results Pane is located in the upper half of the Results Area. The user's selection from the Operations Group in the Navigation Area is displayed in the Results area.

Each plot of the selected SAC-SMA or SNOW-17 operation is displayed in an individual pane that can be resized vertically.



UI_Design_images\OperationPane.jpg

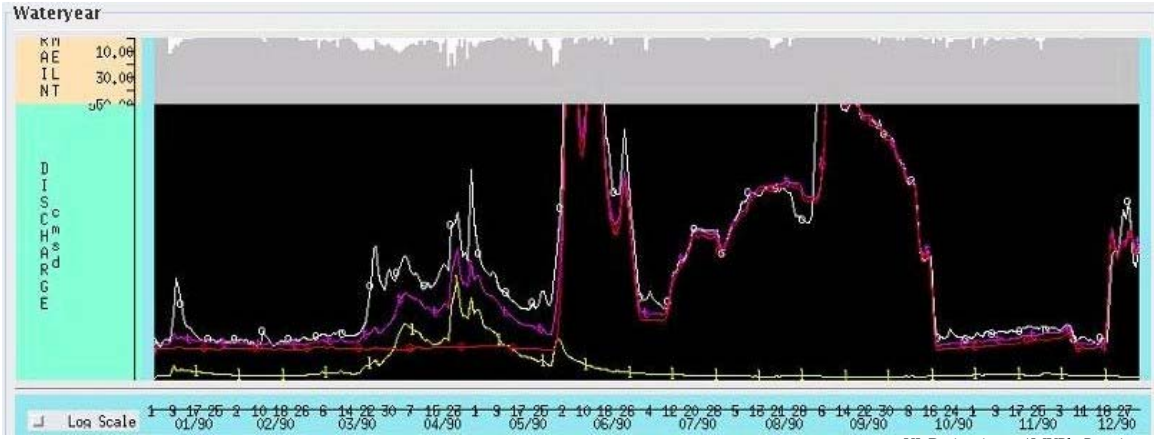
Figure A. 13. Results Area Operation Results Pane

WY-PLOT Pane

Description: The WY-PLOT Pane is located in the lower half of the Results Area and displays the Rain + Melt graph and the Discharge Graph in separate panes.

The user can change the plots displayed in the WY-PLOT Pane by selecting a different radio button from the "Wateryear" radio button group in the Navigation Area.

The Rain + Melt plot pane and the Discharge plot pane can each be vertically resized. The WY-PLOT Pane also utilizes a horizontal scrollbar, and the WY-PLOT Panner, described below.



UI_Design_images\WYPlotPane.jpg

Figure A. 14. WY-PLOT Pane

A.6.3 Results Panner

Description: The Results Panner is positioned directly below the Results Area. The Results Panner displays an overview of the Results Time Series and controls the selection of the Time range of plots displayed in the Results Area.

UI_Design_images\WYPanner.jpg

Figure A. 15. WY- PLOT Panner

The Panner provides the ability to horizontally scroll the time axis by positioning the selection rectangle (the shaded rectangle shown below) with the left mouse button.

It also provides the ability to select the range of the Time axis. This is done by "stretching" the selection rectangle by grabbing either end of the selection rectangle and drawing it out. The cursor will provide feedback by changing to represent the user action.

Future Enhancement: Markers can be displayed on the Panner to indicate points of interest (e.g. periods of greatest calibration error) in the WY-PLOT plot. These points can be clicked on to position the Results plots to show the associated time.

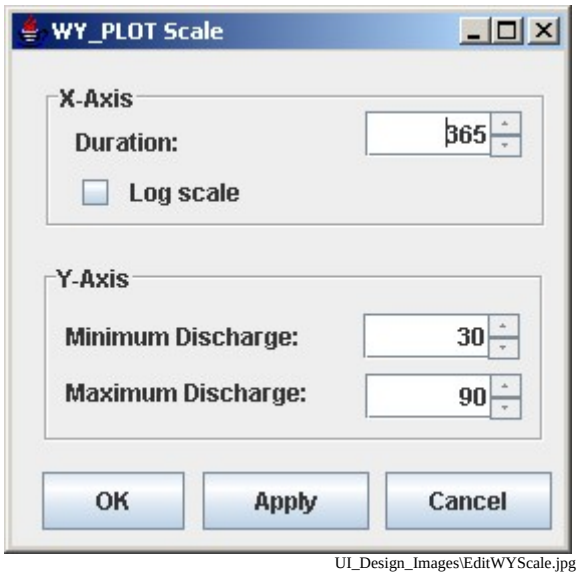
A.6.4 Edit (Results) WY_PLOT Scale Dialog

Description: The Edit WY-PLOT Scale Dialog provides controls to allow the user to change the WY-PLOT X and Y-axis scales.

The dialog is non-modal, allowing the dialog to remain on the screen until the user chooses to dismiss it.

Invoked From:

- ICP Main Window menu bar Edit -> WY-PLOT Scale…
- Right click on the Panner and select WY-PLOT Scale…



UI_Design_Images\EditWYScale.jpg

Figure A. 16. Edit WY-PLOT Scale

A.7. Time Series Plot (PLOT-TS) Window

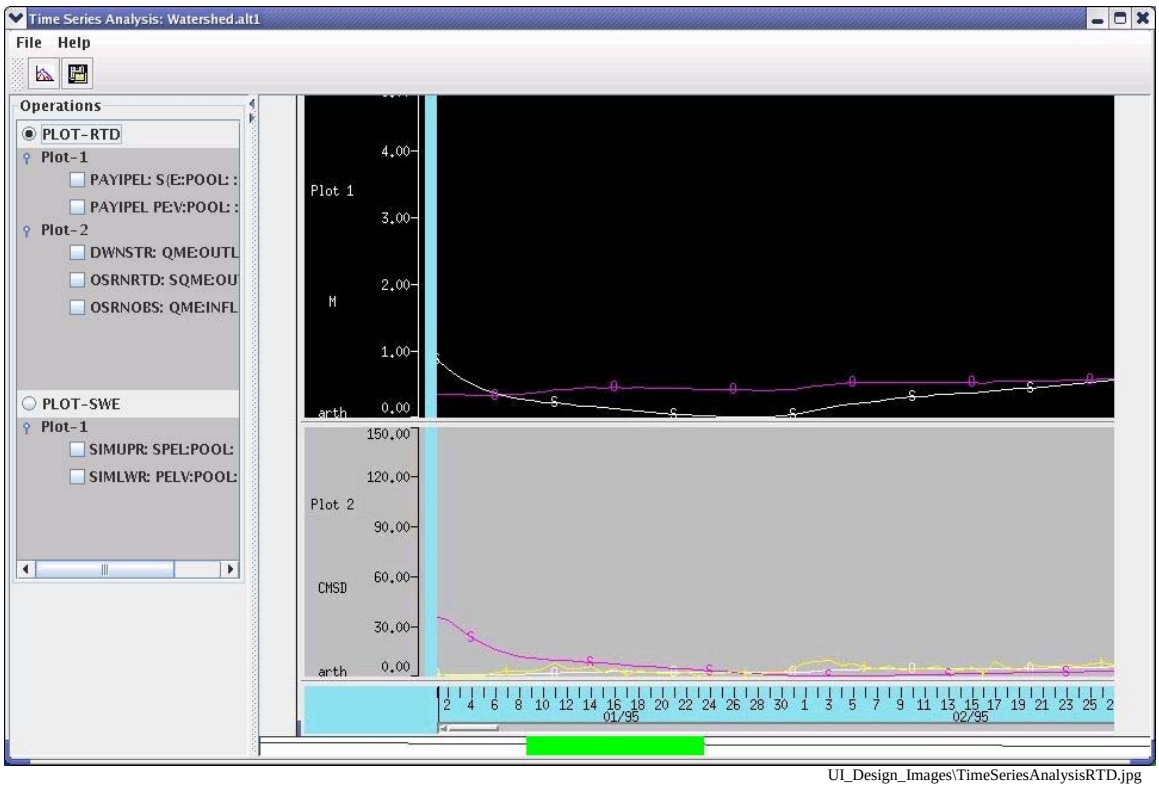
Description: The Time Series Plot Window displays the PLOT-TS Operations graphical output.

The Operations available for display are shown in the Navigation Area.

Selecting a Radio Button causes the selected entry to be displayed in the Results window.

Future Enhancement: Each plot could be individually selected for display.

Invoked From: The Time Series Plot Window can be launched from the ICP Main Window menu bar View -> Time Series Window.



UI_Design_Images\TimeSeriesAnalysisRTD.jpg

Figure A. 17. Time Series Plot Window

A.7.1 Navigation Area

Description: The Time Series Plot Window navigation area displays a list of PLOT-TS Operations for the selected deck.

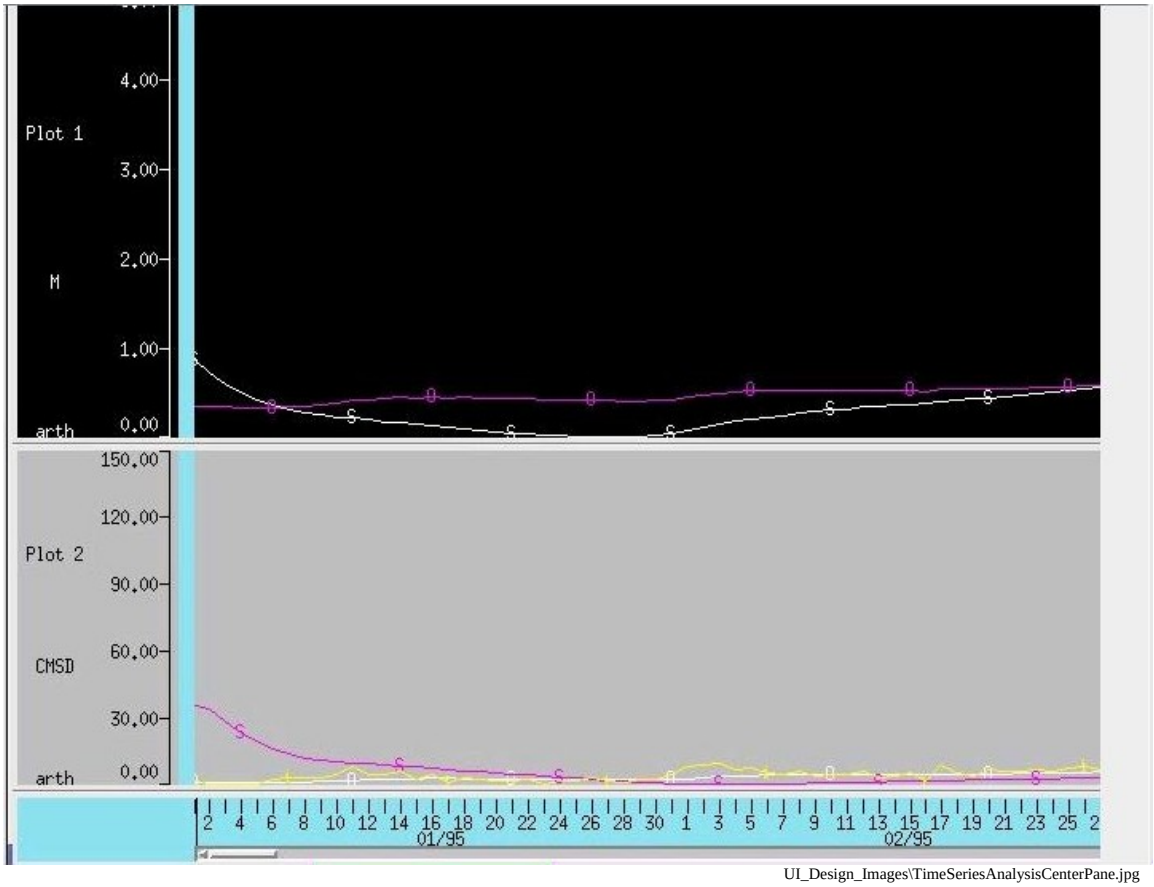
UI_Design_Images\TimeSeriesAnalysisNavigation.jpg

Figure A. 18. Time Series Plot Window Navigation Area

The user may select a PLOT-TS Operation to display in the Time Series Plot Window Results area by choosing the radio button next to the PLOT-TS Operation name. For each PLOT-TS Operation the navigation area also displays the plots defined in the PLOT-TS operation, as well as the legend information for each times series shown in the plot. The Time Series Plot Window Navigation area is horizontally and vertically scrollable.

A.7.2 Results Area

Description: Time Series Plot Window Results area contains the plots for a PLOT-TS operation. Each plot can be vertically resized. The plots share a common X-axis that can be scrolled left or right. The X-axis is identified by the date and Time defined in the PLOT-TS operation.



UI_Design_Images\TimeSeriesAnalysisCenterPane.jpg

Figure A. 19. Time Series Plot Window Results Area

A.7.3 Results Panner

Description: The Time Series Plot Window Panner is positioned directly below the Results Area of the Time Series Window. The Time Series Plot Window Panner displays an overview of the selected PLOT-TS Operation and controls the selection of the Time range of plots displayed in the Results Area.

UI_Design_Images\TimeSeriesAnalysisPanner.jpg

Figure A. 20. Time Series Plot Window Panner

The Panner provides the ability to horizontally scroll the Time axis by positioning the selection rectangle (the shaded rectangle) with the left mouse button.

It also provides the ability to select the range of the Time axis. This is done by "stretching" the selection rectangle by grabbing either end of the selection rectangle and drawing it out. The cursor will provide feed back by changing to represent the user action.

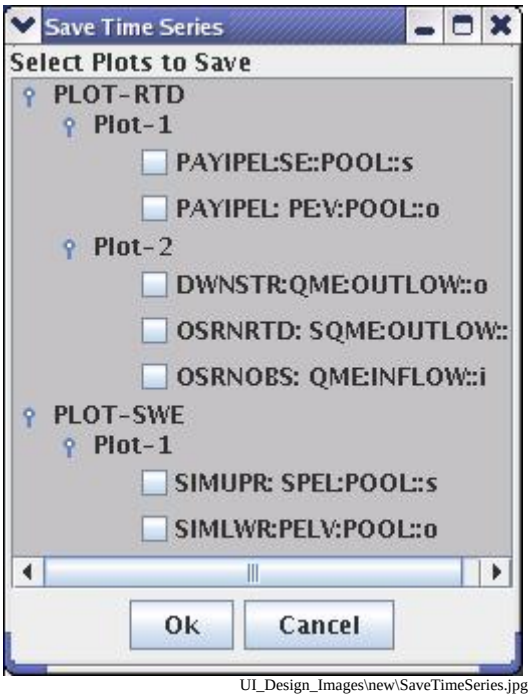
Future Enhancement: Markers can be displayed on the Panner to indicate points of interest. These points can be clicked on to position the Results plots to show the associated Time.

A.7.4 Save Time Series Dialog

Description: Modal dialog that allows user to select a Time Series to save to disk, for later use.

The Time Series that are available for saving are displayed a hierarchical order in a scrollable pane. Selections for saving are made by clicking in the check box next to the Time Series.

Invoked From: Time Series Window menu File -> Save…



UI_Design_Images\new\SaveTimeSeries.jpg

Figure A. 21. Save Time Series Dialog

A.7.5 Display Time Series Dialog

Description: Modal dialog that displays a list of previously saved Time Series that can be displayed on the current Time Series Plot.

Invoked From: Time Series menu File->Open…

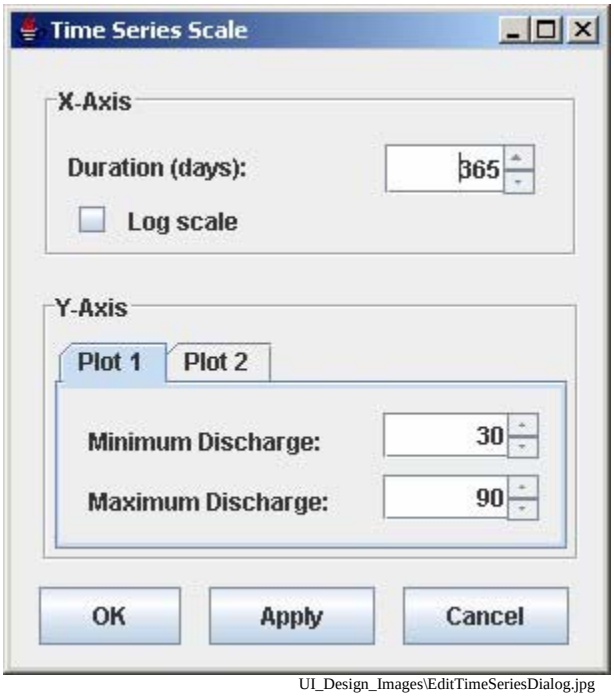
The Open Time Series Dialog is visually very similar to the Save Time Series Dialog

A.7.6 Time Series Plot Scale Dialog

Description: The Time Series Plot Scale Dialog provides controls to allow the user to change the scale for the X and Y-axes for the Time Series.

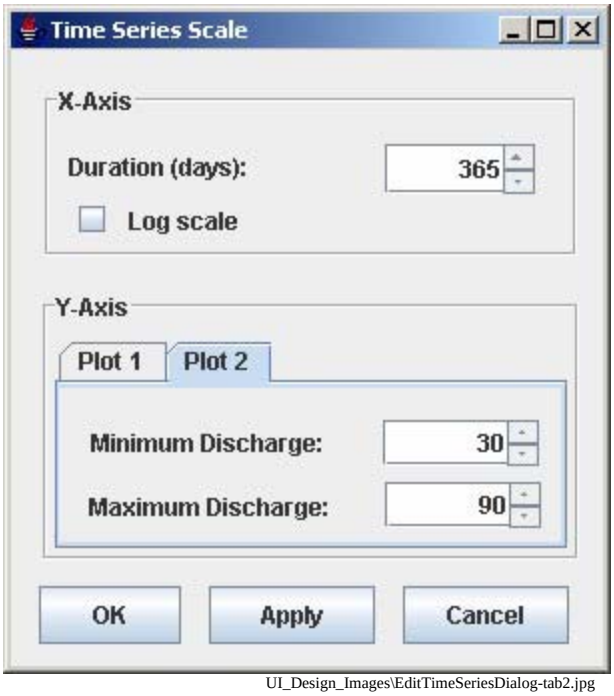
The dialog is non-modal, allowing the dialog to remain open until the user chooses to dismiss it.

Invoked From: Time Series menu Edit -> Time Series Scale…



UI_Design_Images\EditTimeSeriesDialog.jpg

Figure A. 22. Time Series Plot Scale Dialog



UI_Design_Images\EditTimeSeriesDialog-tab2.jpg

Figure A. 23. Time Series Plot Dialog Showing Y-Axis Plot-2 Tab

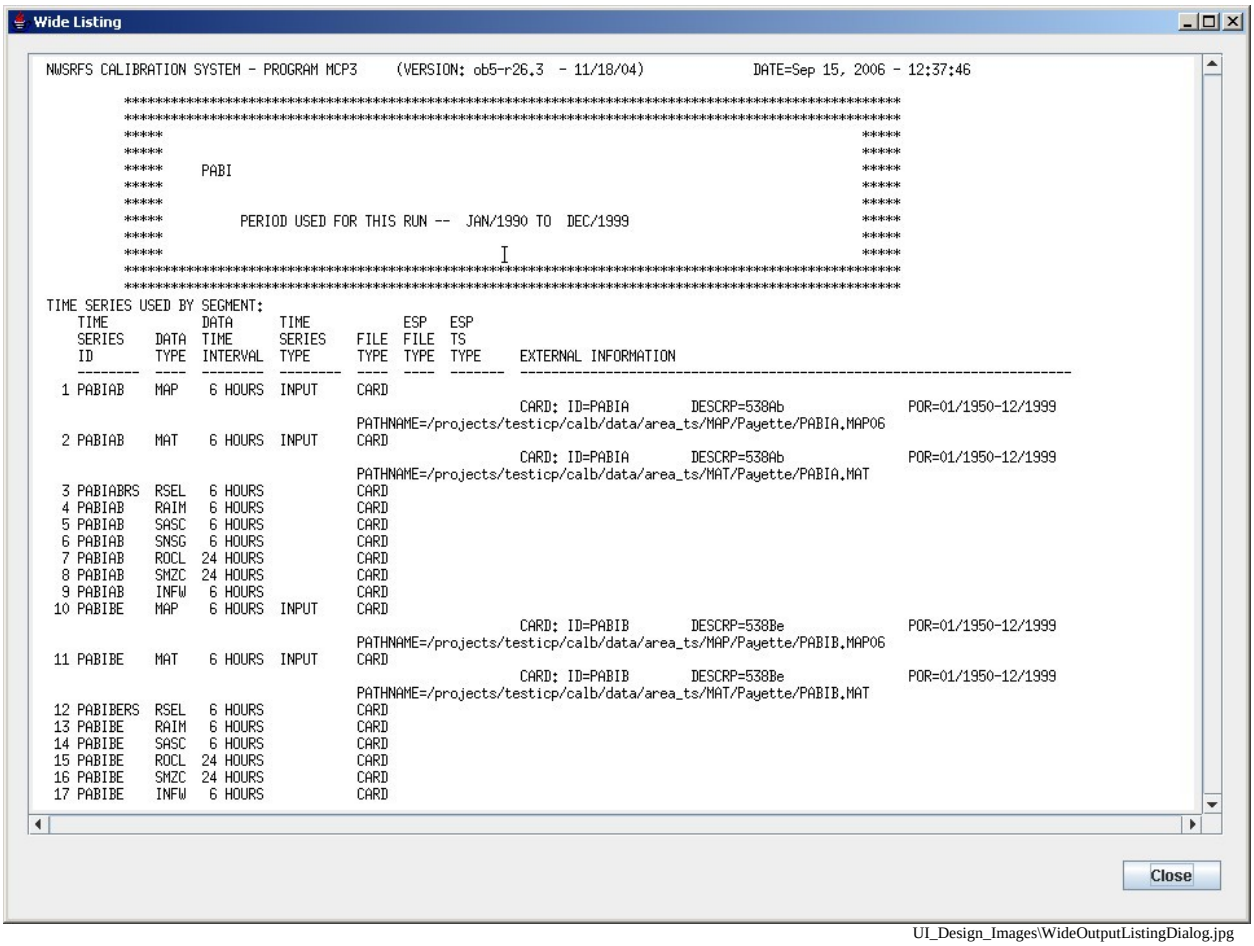
A.8. Wide Listing Dialog

Description: The Wide Listing Dialog displays the text output of the MCP3 execution.

The text may be scrolled.

Future enhancement: Provide a way to position to oft visited sections of the output (e.g. statistics).

Invoked From: ICP Main Window menu bar View -> Wide Listing



UI_Design_Images\WideOutputListingDialog.jpg

Figure A. 24. Wide Listing Dialog

A.9. SAC-SMA Parameter Dialog

Description: The SAC-SMA Parameter Dialog displays the SAC-SMA parameters for editing.

An editable text field is displayed for each parameter.

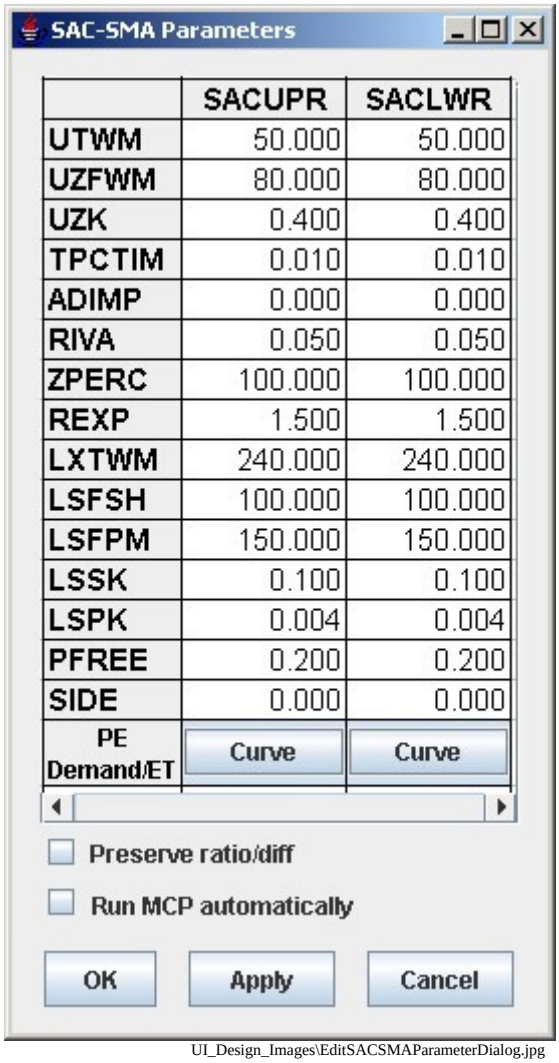
Multi-valued parameters (PE Demand/ET) are edited using a specialized editor reached by clicking on the "Curve" button.

Preserve Ratio/Diff toggles whether ratios or differences are maintained: If there is more than one operation, the consistency among the values of a given parameter is maintained. Some parameters are maintained by increment (i.e., if x is added/subtracted from the value in one operation it is added to/subtracted from to same value in the other operations). Other parameters are not adjusted.

The user may change options for Running ICP and Displaying Results automatically before clicking on the Apply or OK buttons.

The Apply button can be used if the changes are to be saved, but the dialog is to remain open.

Invoked From: ICP Main Window menu bar Edit -> SAC-SMA Parameters



UI_Design_Images\EditSACSMAParameterDialog.jpg

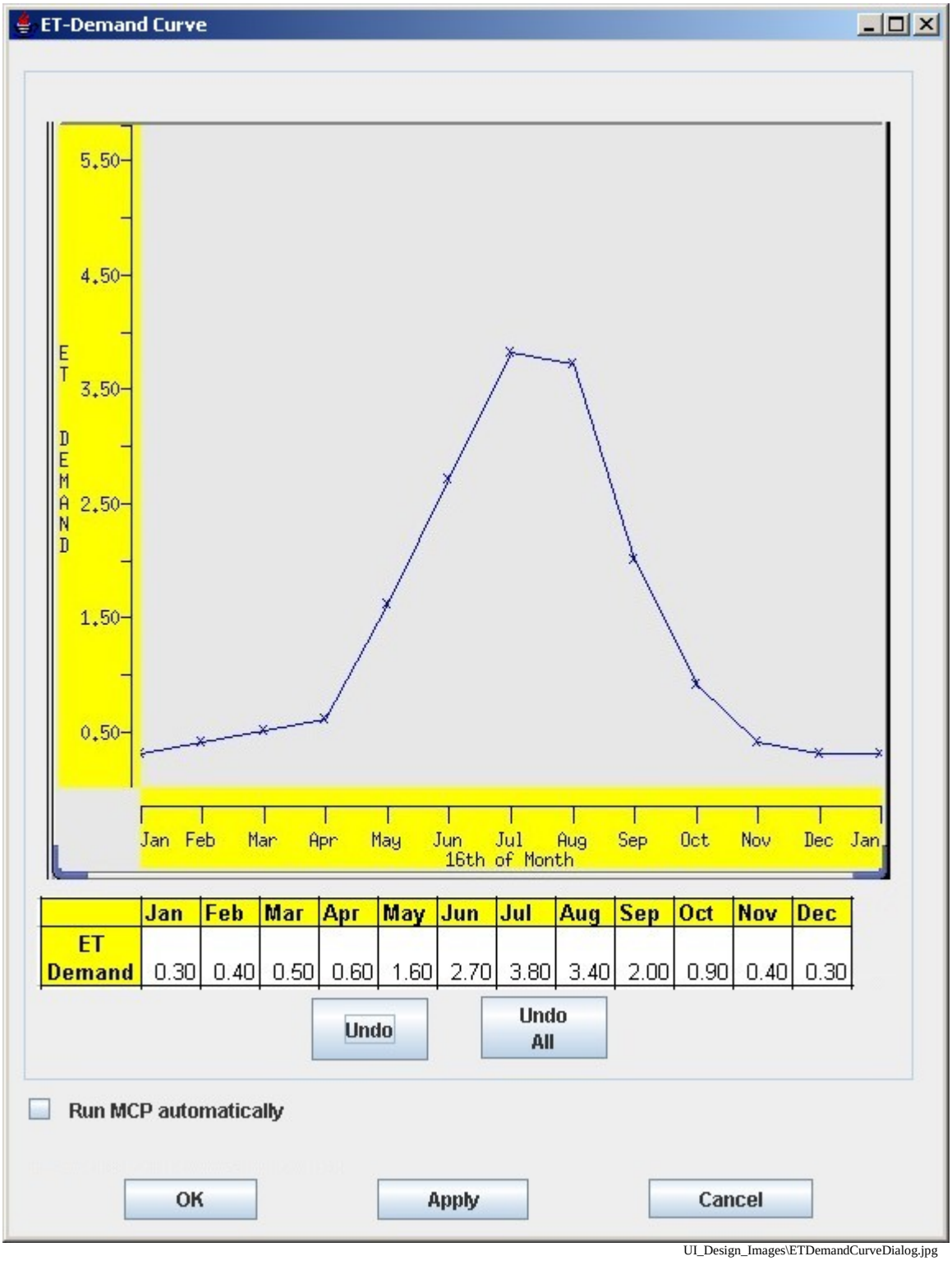
Figure A. 25. SAC-SMA Parameters Dialog

A.9.1 ET-Demand Curve Dialog

Description: The ET-Demand Curve displays the ET-Demand curve information in a graphical and tabular format.

Curve values can be changed either by editing parameters in the table or by dragging points on the plot.

Invoked From: The Curve button in the SAC-SMA Parameter Dialog if ET-Demand information is present in the deck.



UI_Design_Images\ETDemandCurveDialog.jpg

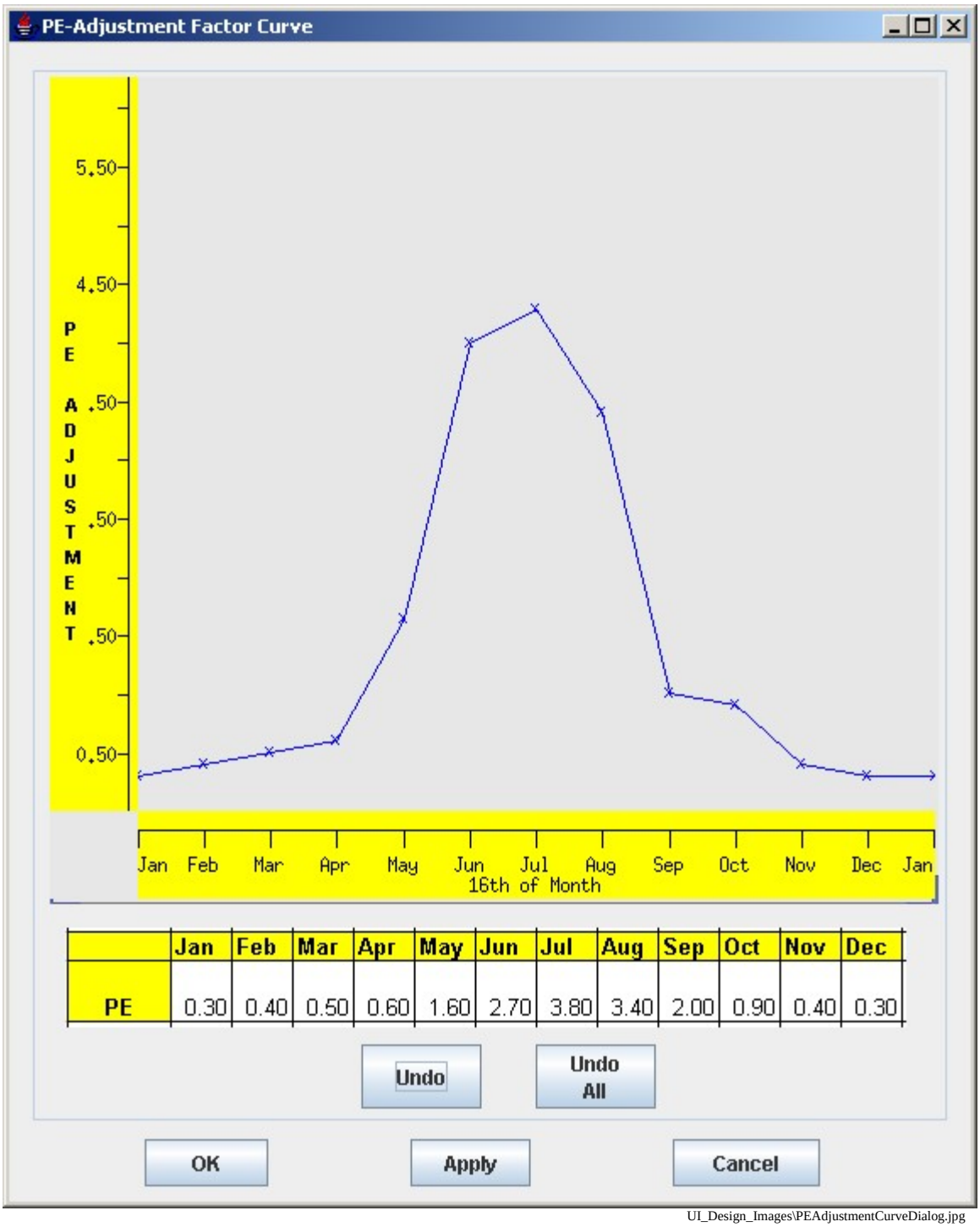
Figure A. 26. ET-Demand Curve Dialog

A.9.2 PE-Adjustment Factor Curve Dialog

Description: The PE-Adjustment Factor Curve displays the PE-Adjustment curve information in a graphical and tabular format.

Curve values can be changed either by editing parameters in the table or by dragging points on the plot.

Invoked From: The Curve button in the SAC-SMA Parameter Dialog if ET-Demand information is present in the deck.



UI_Design_Images\PEAdjustmentCurveDialog.jpg

Figure A. 27. PE Adjustment Factor Curve Dialog

A.10. SNOW-17 Parameters Dialog

Description: The SNOW-17 Parameter Dialog displays the SNOW-17 parameters for editing.

An editable text field is displayed for each parameter.

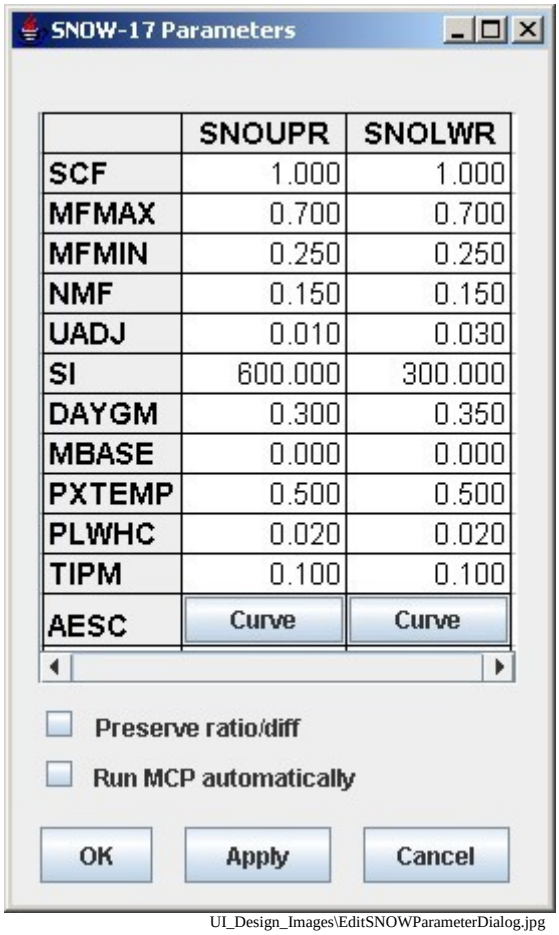
Multi-valued parameters (AESC) are edited using a specialized editor reached by clicking on the "Curve" button.

Preserve Ratio/Diff toggles whether ratios or differences are maintained: If there is more than one operation the consistency among the values of a given parameter is maintained. Some parameters are maintained by increment (i.e., if x is added/subtracted from the value in one operation it is added to/subtracted from to same value in the other operations). Other parameters are not adjusted.

The user may change options for Running ICP and Displaying Results automatically before clicking on the Apply or OK buttons.

The Apply button can be used if the changes are to be saved, but the dialog is to remain open. Note that the Apply button is missing in the following figure.

Invoked From: ICP Main Window menu bar Edit -> SNOW-17 Parameters…



UI_Design_Images\EditSNOWParameterDialog.jpg

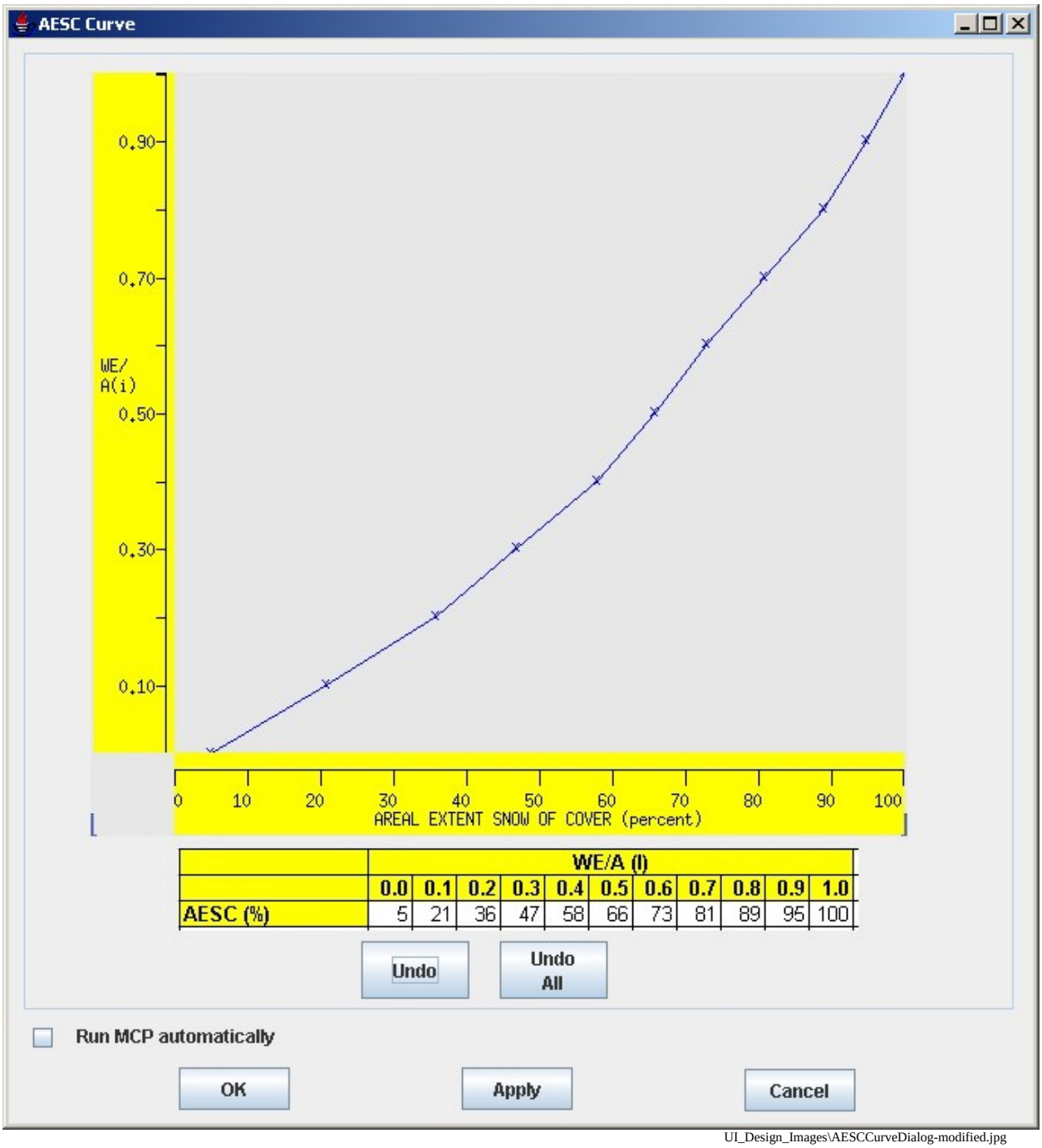
Figure A. 28. SNOW-17 Parameters Dialog

A.10.1 AESC Curve Dialog

Description: The AESC Curve Dialog displays the AESC curve in a graphical and tabular format. It will be similar to the ET-Demand Curve/PE

Curve values can be changed either by editing parameters in the table or by dragging points on the plot.

Invoked From: The Curve button in the SNOW-17 Parameter Dialog.



UI_Design_Images\AESCCurveDialog-modified.jpg

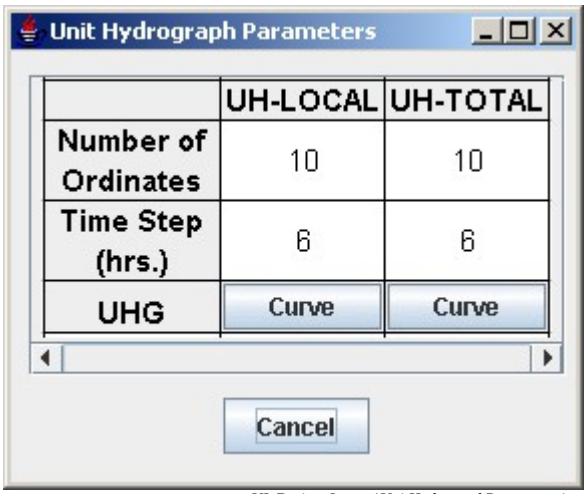
Figure A. 29. SNOW-17 Parameters Dialog

A.11. Unit Hydrograph Dialog

Description: The Unit Hydrograph Dialog displays the Unit Hydrograph parameters in a table. For each Unit Hydrograph operation defined in the input deck a button will exist for the user to display the unit hydrograph curve dialog.

The user may not edit the values in the table.

Invoked From: ICP Main Window menu bar Edit → Unit Hydrograph…



UI_Design_Images\UnitHydrographParameters.jpg

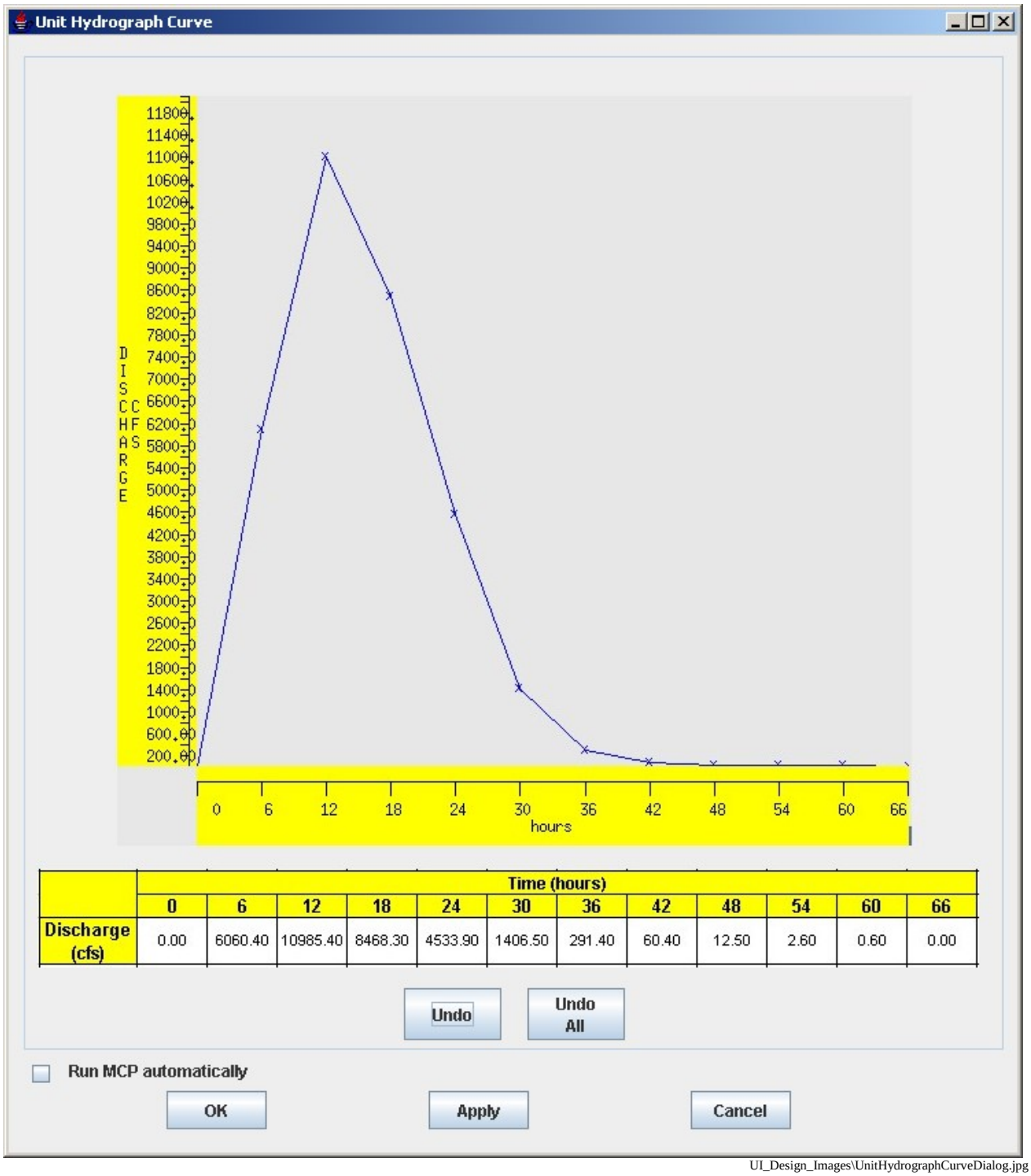
Figure A. 30. Unit Hydrograph Parameters Dialog

A.12. Unit Hydrograph Curve Dialog

Description: The Unit Hydrograph Curve Dialog displays the Unit Hydrograph curve information in a graphical and tabular format. It will be similar to the ET-Demand Curve/PE Adjustment Factor Curve Dialog.

The user can change values by editing parameters in the table or by dragging points in the graph.

Invoked From: Curve button in the Unit Hydrograph Dialog.



UI_Design_Images\UnitHydrographCurveDialog.jpg

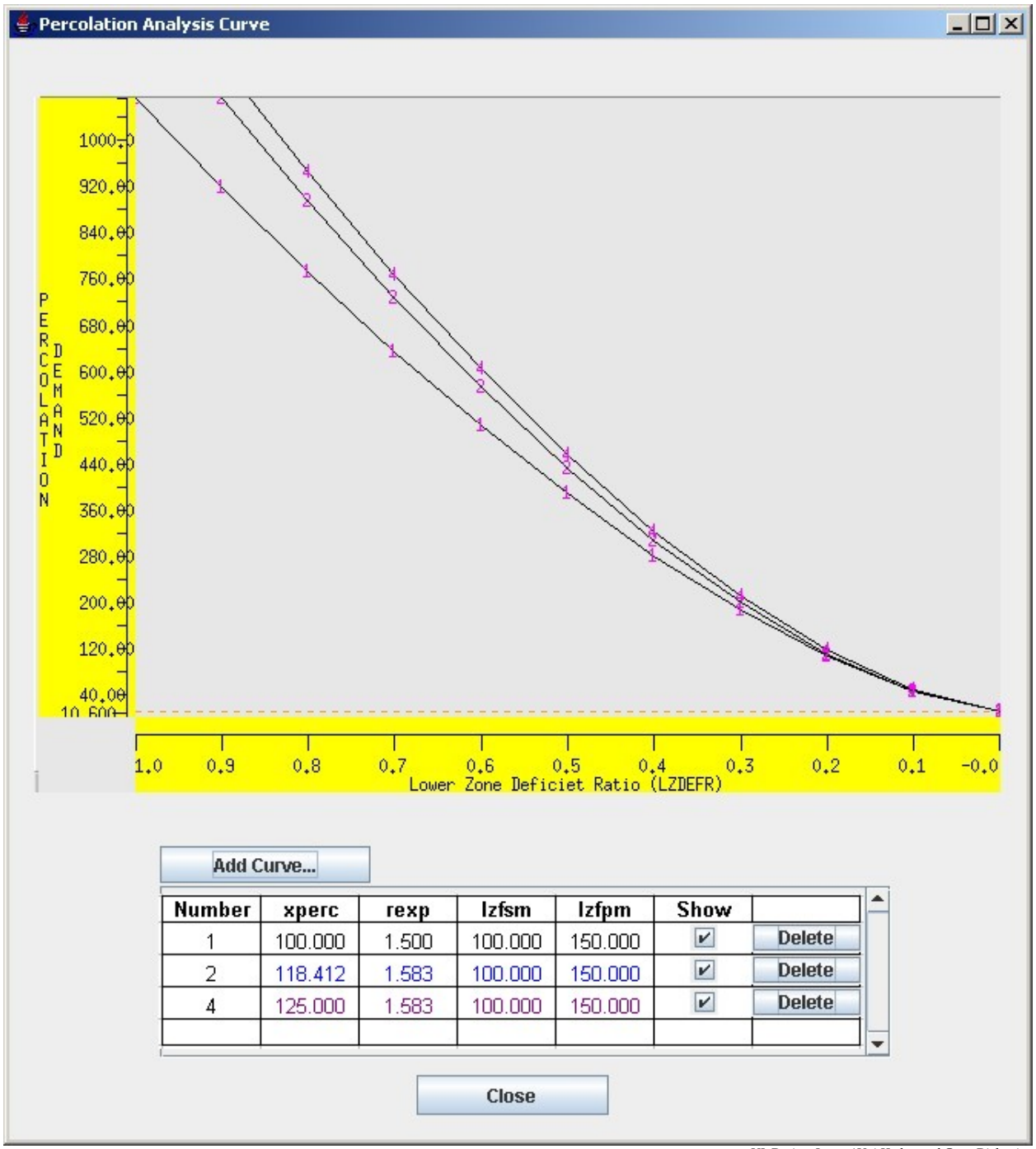
Figure A. 31. Unit Hydrograph Curve Dialog

A.13. Percolation Analysis Dialog

Description: The Percolation Analysis Dialog displays the Percolation Analysis curves in a graphical and tabular format. It will be similar to the ET-Demand Curve/PE Adjustment Factor Curve Dialog.

Curve values can be changed either by editing parameters in the table or by dragging points on the plot.

Invoked From: The ICP Main Window menu bar Edit → Percolation Analysis...



UI_Design_Images\UnitHydrographCurveDialog.jpg

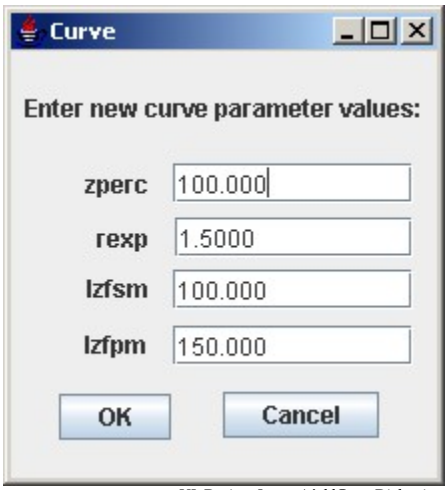
Figure A. 32. Percolation Analysis Curve Dialog

A.13.1 Curve Dialog

Description: The Curve Dialog provides fields for adding a new curve to the Percolation Analysis Curve Dialog.

The dialog is populated with percolation analysis curve values in the input deck that the user can modify.

Invoked From: The Add Curve button in the Percolation Analysis Curve Dialog.



UI_Design_Images\AddCurveDialog.jpg

Figure A. 33. Add Curve Dialog

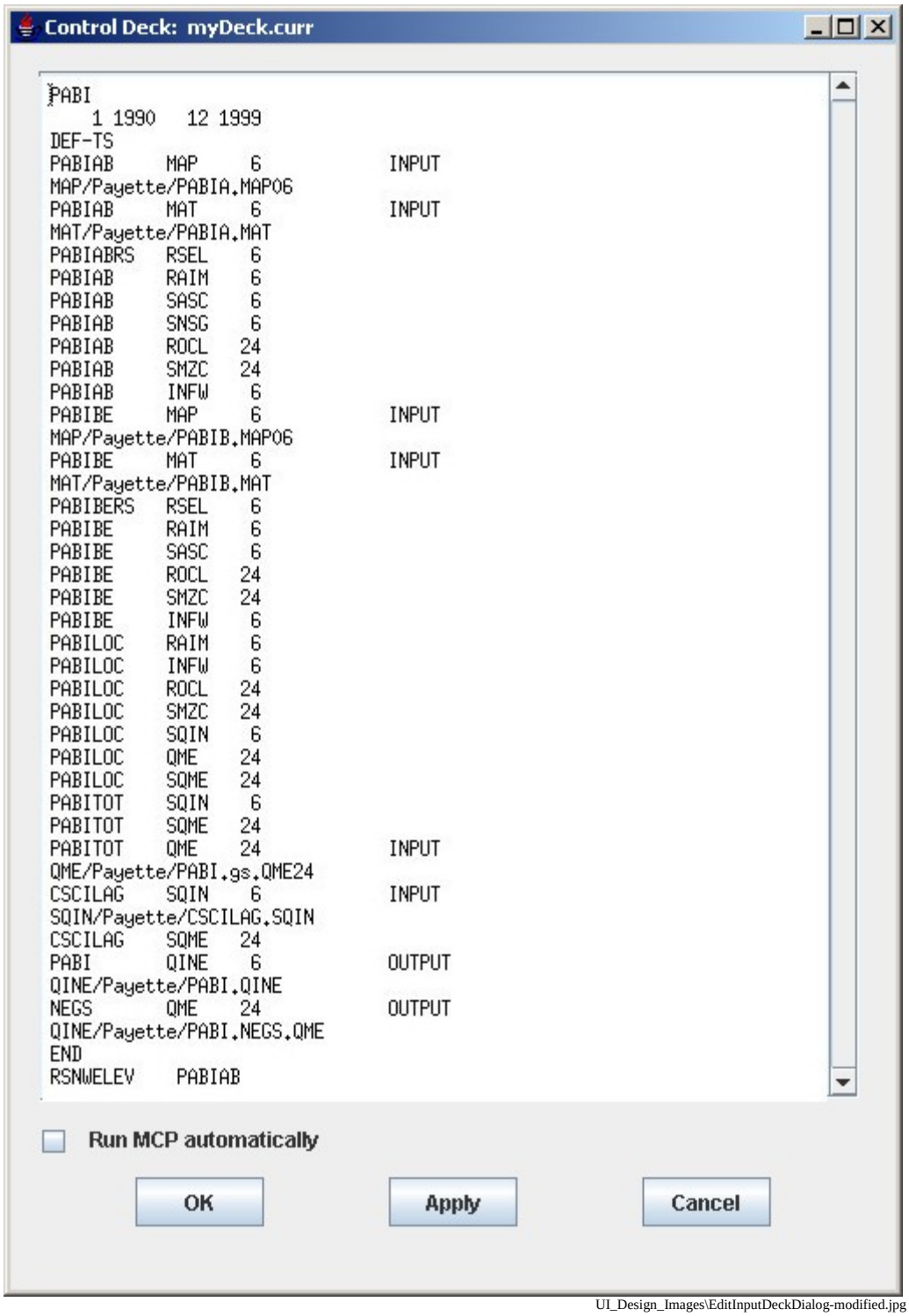
A.14. Control Deck Dialog

Description: The Control Deck Dialog displays the current control deck for editing. This may be necessary for Model parameters that ICP does not support.

Editing operations supported are those of the Swing JTextComponent, similar to Notepad and other simple editors.

ICP will internally ensure that parameter edits are applied to the control deck before the Deck is edited. If necessary the user will be prompted to apply or discard changes prior to editing.

Invoked from: The ICP Main Window menu bar Edit → Control Deck…



UI_Design_Images\EditInputDeckDialog-modified.jpg

Figure A. 34. Control Deck Dialog

A.15. ICP Functional Requirements and UI Design During Cross Reference Table

The following table of functional requirements appears in the "Concept of Operations and Requirements ICP Redevelopment" Version 4.2 document, Appendix C. For each requirement, the UI Design Document section name and number containing more information about the design for the requirement is listed. The shading in the table groups requirements according to functional areas.

Table A. 1. ICP Functional Requirements and Corresponding UI Design Section

ID	Title	Description	Design Document Section
ICP FR-1.0C	Application Environment	The ICP operating environment shall be set using the operating system environment or configuration files. This shall include directory locations and the path to the MCP3 executable program.	No UI design necessary for this requirement.
ICP FR-2.0C	Execution Path	The ICP execution path shall be set through the user's environment.	No UI design necessary for this requirement.
ICP FR-3.0C	GUI Start	The Graphical User Interface shall start when the user invokes a command from the OS.	A.3 ICP Main Window
ICP FR-4.0C	MCP3 Deck Selection	The ICP shall select an initial MCP3 deck through GUI menu and window components.	A.4 Open Control Deck Dialog
ICP FR-4.1C	Directory Creation and Deletion	ICP shall create or delete directories through GUI components during deck selection. The application environment shall indicate the base directory locations.	A.4.3 Delete Dialog
ICP FR-4.2C	Copies Chosen Deck to Local Directory	ICP shall work with a copy of the chosen MCP3 deck in the user's defined work directory. The work directory shall be defined in the application environment.	No UI design necessary for this requirement.
ICP FR-4.3C	Re-naming Chosen MCP3 Deck	ICP shall be able to re-name the chosen MCP3 deck in the work directory. The user through GUI components shall choose the new name.	A.4.1 Save As Dialog
ICP FR-5.0C	Executes MCP3	ICP shall execute MCP3 using the specified deck in the work directory. The user through GUI components shall invoke MCP3.	A.3 ICP Main Window
ICP FR-5.1C	MCP3 Output	The ICP shall place MCP3 output in a user specified directory.	No UI design necessary for this requirement.
ICP FR-5.2C	MCP3 Notification	The ICP shall use GUI components to open a notification window of the completion and status of MCP3.	A.5 MCP3 Execution Notification Dialog
ICP FR-5.3C	Viewing MCP3 Output	The ICP shall use GUI components to open a window for viewing the text MCP3 output. These components shall have resizing and scrolling capabilities.	A.8 Wide Listing Dialog
ICP FR-6.0C	Editing the Chosen MCP3 Input Deck	The user shall be able to edit the chosen MCP3 input deck by using standard GUI components.	A.14 Control Deck Dialog

ID	Title	Description	Design Document Section
ICP FR-6.1C	Making and Saving SAC-SMA Parameter Changes	The ICP shall use GUI components to edit SAC-SMA parameters in the chosen MCP3 deck. These parameters include UZK, PCTIM, ADIMP, RIVA, ZPERC, REXP, LZFPM, LZFSM, LZSK, LZPK, PFREE, and SIDE. The user can preserve the ratio/difference for specified parameters in any SAC-SMA model in a basin listed in the input deck.	A.9 SAC-SMA Parameter Dialog
ICP FR-6.1.1C	Editing ET-Demand Curves or PE Adjustment Factors	The ICP shall use GUI or plotting components to add or edit the monthly ET-Demand curve or the monthly PE adjustment factors.	A.9.1 ET-Demand Curve Dialog and A.9.2 PE-Adjustment Curve Dialog
ICP FR-6.2C	Making and Saving SNOW-17 Parameter Changes	The ICP shall use GUI components to edit SNOW-17 parameters in the chosen MCP3 deck. These parameters include SCF, MFMAX, MFMIN, NMF, UADJ, SI, DAYGM, MBASE, PXTEMP, PLWHC, and TIPM. The user can preserve the ratio/difference for selected parameters across multiple models in an input file for a basin.	A.10 SNOW-17 Parameter Dialog
ICP FR-6.2.1C	Editing AESC Curve	The ICP shall use GUI or plotting components to edit the nine monthly AESC curve values.	A.10.1 AESC Curve Dialog
ICP FR-6.3C	Editing the Unit Hydrograph Ordinates	The ICP shall use GUI or plotting components to add or edit Unit Hydrograph Ordinate values. The area under the curve represented by the UHG ordinates will be preserved as any editing is performed.	A.12 Unit Hydrograph Dialog Curve
ICP FR-7.0C	WY-PLOT Operation Display	The ICP shall use standard GUI and plotting components for creating the graphical plot of the WY-PLOT operation display.	A.3 ICP Main Window
ICP FR-7.1C	WY-PLOT Operation Display Data	The user shall be able to graphically display an instance of each of the SNOW-17, SAC-SMA, and WY-PLOT operations and have the ability to toggle through these multiple instances to display any model or operation result.	A.3 ICP Main Window
ICP FR-7.1.1C	WY-PLOT Operation Display Vertical Resize	The ICP shall use plotting components to allow the user to resize in the vertical direction each of the sections of the WY-PLOT operation display.	A.3 ICP Main Window
ICP FR-7.1.2C	WY-PLOT Operation Display Date-Time Axis	The ICP shall define the X-axis of the WY-PLOT operation display to be the date-Time axis.	A.3 ICP Main Window
ICP FR-7.1.3C	WY-PLOT Operation Display Legend	The ICP shall use GUI and plotting components to display a color-coded legend of the WY-PLOT operation display.	A.3 ICP Main Window
ICP FR-7.1.4C	WY-PLOT Operation Display Time Series View	The user shall be able to toggle between arithmetic and log scale on the Y-axis.	A.6.4 WY-PLOT (Results) Scale Dialog

ID	Title	Description	Design Document Section
ICP FR-7.1.5C	WY-PLOT Operation Display Data Value	The ICP shall use GUI and plotting components to display a view of chosen date-Time and Time series value in the WY-PLOT operation display. The user shall be able to 'click' in the WY-PLOT near the Time series to determine the date/hour and value of the Time series.	A.6.2 Results Area
ICP FR-7.1.6C	WY-PLOT Operation Display Hydrograph Scrolling	The ICP shall use plotting components to allow the user to scroll through the hydrograph. The user shall be able to do this either continuously with a scrollbar or by selected date-Time intervals.	A.3 ICP Main Window
ICP FR-7.1.7C	WY-PLOT Operation Display SAC-SMA Data Axis	The ICP shall define the Y-axis of the WY-PLOT operation display to be the data axis in units determined by the units of the Time series.	A.3 ICP Main Window
ICP FR-7.1.8C	WY-PLOT Operation Display SAC-SMA Zone Contents	The ICP shall plot UZTW and LZTW as deficits and UZFW, LZFSW, and LZFPW as contents in the WY-PLOT SAC-SMA operation display.	A.3 ICP Main Window
ICP FR-7.1.9C	WY-PLOT Operation Display SAC-SMA Runoff	The ICP shall plot the percent of total runoff from each of the six runoff components: surface, direct, impervious, interflow, supplemental base flow, and primary base flow. The ICP shall also show rain plus melt and total runoff.	A.3 ICP Main Window
ICP FR-7.1.10C	WY-PLOT Operation Display SNOW-17 Plots	The ICP shall plot the following values in the WY-PLOT SNOW-17 operation display: rain/snow elevation, type of precipitation, energy exchange, air temperature, TINDEX, snow temperature, liquid water fraction, rain plus melt and negative heat storage, rain on bare ground, rain plus melt on snow covered area, area extent of snow cover, water equivalent of snow pack, and observed and simulated snow depth.	A.3 ICP Main Window
ICP FR-7.2C	WY-PLOT Time Series Locator	The ICP shall use plotting components to display a small Time series plot of the entire WY-PLOT Time series. This plot shall be used to locate and scroll to specific events in the Time series.	A.6.3 Results Panner
ICP FR-7.3C	WY-PLOT Time Series Date Range	The ICP shall use GUI and plotting components to allow the user to change the range of allowed date values in the X-direction. The default values shall be obtained from the chosen MCP3 deck.	A.6.4 WY-PLOT (Results) Scale Dialog
ICP FR-7.4C	WY-PLOT Time Series Data Range	The ICP shall use GUI and plotting components to allow the user to change the range of allowed data values in the Y-direction. The default values shall be obtained from the chosen MCP3 deck	A.6.4 WY-PLOT (Results) Scale Dialog

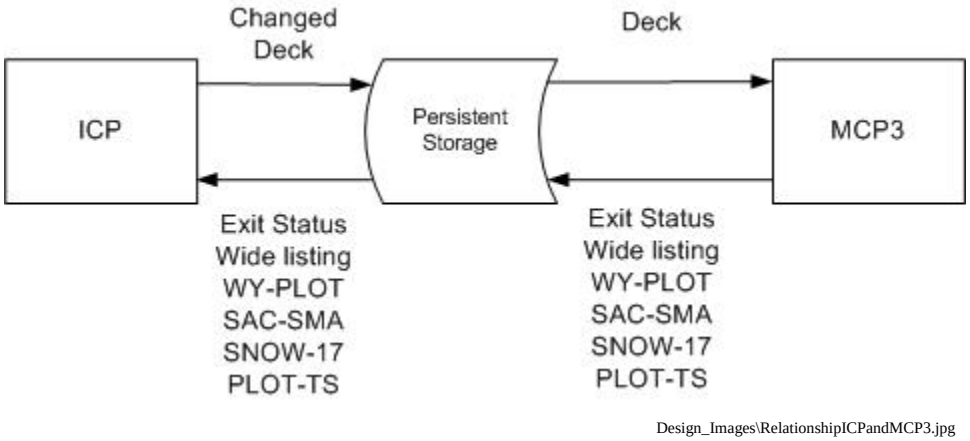
ID	Title	Description	Design Document Section
ICP FR-7.5C	Saving WY-PLOT Time Series	The ICP shall be able to save current SQME Time series for use on subsequent WY-PLOT displays. The ICP shall use GUI components to select a location to save the Time series.	A.3 ICP Main Window
ICP FR-7.6C	Using saved WY-PLOT Time Series	The ICP shall use GUI and plotting components to display saved SQME Time series on the current WY-PLOT.	A.3 ICP Main Window
ICP FR-7.7C	Modifying the SAC-SMA Percolation Demand Curve	The ICP shall use GUI and plotting components to allow the user to modify the percolation demand curve by changing the following parameters: ZPERC, REXP, LZFSM, and LZFPM.	A.13 Percolation Analysis Dialog
ICP FR-8.0C	PLOT-TS Operation Display	The ICP shall use standard GUI and plotting components for creating the graphical plot of the PLOT-TS operation that is defined by the chosen MCP3 deck.	A.7 Time Series Plot Window
ICP FR-8.1C	PLOT-TS Operation Display Data	The user shall be able to graphically display any instance of PLOT-TS information.	A.7 Time Series Plot Window
ICP FR-8.1.1C	PLOT-TS Operation Display Vertical Resize	The ICP shall use plotting components to allow the user to resize in the vertical direction each of the sections of the PLOT-TS operation display.	A.7.2 Time Series Plot Window Results Area
ICP FR-8.1.2C	PLOT-TS Operation Display Date-Time Axis	The ICP shall define the X-axis of the PLOT-TS operation display to be the date-Time axis.	A.7.2 Time Series Window Results Area
ICP FR-8.1.3C	PLOT-TS Operation Display Data Axis	The ICP shall define the units of the Y-axis of the PLOT-TS operation display based upon the units of the Time series type.	A.7.2 Time Series Window Results Area
ICP FR-8.1.4C.	PLOT-TS Operation Display Time Series View	The ICP shall use GUI and plotting components to display a view of chosen date-Time and Time series value in the PLOT-TS operation display. The user can toggle between Log and arithmetic scales in any display pane	A.7.6 Time Series Plot Scale Dialog
ICP FR-8.1.5C	PLOT-TS Operation Display Hydrograph Scrolling	The ICP shall use plotting components to allow the user to scroll through the display. The user shall be able to do this either continuously with a scrollbar or by selected date-Time intervals.	A.7.2 Time Series Window Results Area
ICP FR-8.2C	PLOT-TS Operation Display Legend	The ICP shall use GUI and plotting components to display a color-coded legend of the PLOT-TS operation display.	A.7.1 Time Series Window Navigation Area
ICP FR-8.3C	PLOT-TS Time Series Locator	The ICP shall use plotting components to display a small Time series plot of the entire PLOT-TS Time series. This plot shall be used to locate and scroll to specific events in the Time series	A.7.3 Time Series Window Panner
ICP FR-8.4C	PLOT-TS Time Series Date Range	The ICP shall use GUI and plotting components to allow the user to change the range of allowed date values in the X-direction. The default values shall be obtained from the chosen MCP3 deck.	A.7.6 Time Series Scale Dialog

ID	Title	Description	Design Document Section
ICP FR-8.5C	PLOT-TS Time Series Data Range	The ICP shall use GUI and plotting components to allow the user to change the range of allowed data values in the Y-direction. The default values shall be obtained from the chosen MCP3 deck.	A.7.6 Time Series Scale Dialog
ICP FR-8.6C	Saving PLOT-TS Time Series	The ICP shall be able to save current PLOT-TS Time series for use on subsequent PLOT-TS displays. The ICP shall use GUI components to select a location to save the Time series.	A.7 Time Series Window
ICP FR-8.7C	PLOT-TS Time Series Display Data Value	The user can 'click' in any display pane near a plotted Time series to get the day/Time/value of the point in the Time series.	A.7 Time Series Window
ICP FR-8.8C	Using saved PLOT-TS Time Series	The ICP shall use GUI and plotting components to display saved Time series on the current PLOT-TS.	A.7 Time Series Window

APPENDIX B: MCP3 NOTES

This appendix contains notes on MCP3 that will be useful during development.

The figure below shows the relationship between ICP and MCP3.



Design_Images\RelationshipICPandMCP3.jpg

Figure B. 1. Relationship between ICP and MCP3

B.1. MCP3 Environment

MCP3 and ICP run in the NWSRFS software environment. Both use values specified as apps_defaults tokens and environment variables for configuration.

B.1.1 Environment Variables

Apps_defaults (See ***Section B.1.2***) will be taken from the environment if not in the files.

B.1.2 Apps Defaults

The following table shows the apps_defaults tokens relevant to ICP, their default value, and description.

Extracted from I.2-UNIX-ICP-5

Table B. 1. ICP Apps_Defaults Tokens

Token Name	Usual Value	Description
mcp_decks	$(calb_input)/mcp3/decks	ICP - to locate the control decks - this is the branch-root for the control deck storage structure - requires a subdirectory named 'regions'
mcp_dir	$(calb_bin)	ICP - to locate MCP
mcp3_icp_iface	$(HOME)/icp/mcp3_ntrfc	ICP and MCP - directory to exchange data and results
icp_editor	vi | nedit	ICP name of editor program - if not specified an X-Motif Text Widget is currently used
icp_pw	hILLEL	ICP - minimal protection for control deck tree structure maintenance
calb_data_dir	$(calb_input)/mcp3/data	MCP - to locate root of search for input time series
home_files_workstation	wkOBO	ICP - this is the workstation where the user's files physically reside - it is used in ICP to run MCP on the user's home machine because that is where the data interface is located
icp_interface_workstation	present only if different from home_files_workstation	ICP - allows placement of interface on workstation other than home_files_workstation. - use of this token implies maintenance of mcp3_icp_iface token - use of $LOGNAME or $USER or what is used to identify user is indicated in such maintenance (will be removed)

Note: Use get_apps_defaults <token> to determine the current value in environment.

B.1.3 Directory Structure

See MCP3 input and output discussions below.

B.2. MCP3 Execution

B.2.1 Scripts

ICP is located in the directory pointed to by .Apps_defaults token icp_rlse. It expects the scripts to run MCP3 (run_mcp3, run_mcp3_remsh) to be in the same directory.

Script	Description
run_mcp3	Used to run MCP3
run_mcp3_remsh	Used to run MCP3
relabel	Used to rename control decks

B.2.2 Executing MCP from ICP

MCP3 is launched from icp_menu_clbks.c:mcp_RUN_cb() using the system call:

system("rsh <host> cd <>;pwd; ./run_mcp3_remsh

<envvar>
<df_names.mcp_dir>
< in_deck_file>
< out_file>
<err_file>
<df_names.apps_def_tkn>);

B.3. MCP3 Input

B.3.1 Control Decks

The control deck is read into memory in the array cards[] i.e. card[0] holds the first record, card[n] holds the n-1th record.

The current implementation of ICP appears to extract operation parameters from the control deck by looking for keywords that are known to be located on the first record/ first field of the operation data. Then each field is extracted from records by handcrafted code. There appears to be no method to "parse" the data, as there are no field delimiters.

When Operation parameters are changed, they are written back to the card array, then the card array in written out to disk.

Control decks are stored as branches of a directory structure. The root of the directory structure is in the .Apps_defaults token mcp3_decks. The layout of the sub-directory structure is fixed:

$(mcp3_decks)
regions
<region name>
<basin name>
<watershed>
<control deck>.best
<control deck>.curr
<control deck>.prev

Control decks follow the FORTRAN input standards. They are a fixed format, with fields defined by the columns they fall in. Java does not provide by default a package that deals with reading such a format.

OHD has code to read fixed format files.

Logical structure of deck:

<Header>
DEF-TS
Time series definitions
END

[<operation> <operationName>
operation data (has varying length defined by data)]

STOP

<operation> ::= RSNWELEV
SNOW-17*
SAC_SMA*
UNIT-HG*
WY-PLOT
STAT_QME

Any operation can occur multiple times in the control deck.

<To Do find more info on control deck structure>

B.3.2 Time Series Files

It has not yet been verified whether or not ICP accesses Time Series files other than those in the directory defined by the apps_defaults token mcp3_icp_iface.

ICP appears to have enough information to access the observed Wateryear data.

B.4. MCP3 Output

B.4.1 Console Output

The following output is produced when running ICP/MCP3. Different values for environment variables, apps_defaults, user, & control deck will produce different results.

```
in mcp_RUN_cb: mcp  file :
/awips/hydroapps/lx/rfc/nwsrfs/calb/bin/RELEASE
                deck file :
/projects/testicp/calb/input/mcp3/decks/TESTICP/PAYETTE/CONS_
USE/CONS_USE.curr
                out  file :
/home/dre/mcp3_ntrfc/CONS_USE.wide_list.curr
                err  file : /home/dre/mcp3_ntrfc/stop_num.txt
                sufx file : /home/dre/mcp3_ntrfc/icp_sufx.txt
             in_deck file :
/home/dre/mcp3_ntrfc/input_deck.mcp3
   WAITING...
 while MCP3 is WORKING...
/home/dre
/awips/hydroapps/lx/rfc/nwsrfs/icp/scripts
/awips/hydroapps/lx/rfc/nwsrfs/calb/bin/RELEASE

 directory for system files:
/awips/hydroapps/lx/rfc/nwsrfs/sys_files/
 directory for oper files:
/projects/testicp/ofs/files/testicp/fs5files/
 directory for reorder files:
/projects/testicp/ofs/files/ICPO_reor/fs5files/
 directory for mod files:
/projects/testicp/ofs/files/testicp/mods/
 directory for grid files:
/projects/testicp/ofs/files/testicp/griddb/

 Cleaning up ofs temporary files...
/home/dre
 Back From MCP!  HA!
 MCP3 stopping number (4) <= 4 :: OKAY TO USE RESULTS!!!
```

B.4.2 MCP3 Output Files

A directory specified by the apps_defaults token mcp3_icp_iface is used by MCP3 to pass files back to ICP. The following files may be found in the directory after a MCP3 run. Exiting ICP normally will clear the directory of these files. Depending on the control deck some files may not be produced and/or files not listed may be created.

No documentation has been discovered to verify the descriptions. The information will be verified during development.

<controlDeckName> is the name of the watershed.

File Name	Description
<controlDeckName>.icp_crd.bin_data.24.curr	
<controlDeckName>.wide_list.curr	Output from mcp3. This should conform to output created by

File Name	Description
	FORTRAN programs, with a record length of 133 characters, the first being a carriage control character.
icp_crd_out.txt	Appears to be a troubleshooting aid, or to simplify MCP3 to ICP data transfer.
icp_sac_out.txt	Appears to be a troubleshooting aid or to simplify MCP3 to ICP data transfer.
icp_sno17_out.txt	Appears to be a troubleshooting aid or to simplify MCP3 to ICP data transfer.
icp_sufx.txt	Appears to be a troubleshooting aid or to simplify MCP3 to ICP data transfer.
icp_wyp_out.txt	Appears to be a troubleshooting aid or to simplify MCP3 to ICP data transfer.
input_deck.mcp3	Control deck
plotts_scr.txt	Appears to be a troubleshooting aid or to simplify MCP3 to ICP data transfer.
sac1-ple.sac_sma.bin_data.24.curr	WY time series data.
sac2-ple.sac_sma.bin_data.24.curr	WY time series data
sac3-prp.sac_sma.bin_data.24.curr	WY time series data
sac4-ple.sac_sma.bin_data.24.curr	WY time series data
sac5-prp.sac_sma.bin_data.24.curr	WY time series data
sac6-prp.sac_sma.bin_data.24.curr	WY time series data
sac7-prp.sac_sma.bin_data.24.curr	WY time series data
sac_scr.txt	Appears to be a troubleshooting aid or to simplify MCP3 to ICP data transfer.
sn1-plei.snow_17.bin_data.24.curr	WY time series data
sn2-plei.snow_17.bin_data.24.curr	WY time series data
sn3-prpi.snow_17.bin_data.24.curr	WY time series data
sn4-plei.snow_17.bin_data.24.curr	WY time series data
sn5-prpi.snow_17.bin_data.24.curr	WY time series data
sn6-prpi.snow_17.bin_data.24.curr	WY time series data
sn7-prpi.snow_17.bin_data.24.curr	WY time series data
sno17_scr.txt	Appears to be a troubleshooting aid or to simplify MCP3 to ICP data transfer.
stop_num.txt	Contains the “stop” or completion code for mcp3. Platform dependent format. On Linux it appears to contain at least one record, of which the first 3 columns are blank, followed by an integer. The record is displayed in the?? window and different messages are displayed depending on the value of the completion code. 0: Completed with out errors being detected <=4: Okay to Use results >4 Errors detected, but the user should not used the results.
wy1-plei.wy_plot.bin_data.24.curr	WY time series data
wy2-prpi.wy_plot.bin_data.24.curr	WY time series data
wy3-div8.wy_plot.bin_data.24.curr	WY time series data
wy4-div9.wy_plot.bin_data.24.curr	WY time series data
wy5-div1.wy_plot.bin_data.24.curr	WY time series data
wy6-all.wy_plot.bin_data.24.curr	WY time series data
wy7-all.wy_plot.bin_data.24.curr	WY time series data
wy8-loca.wy_plot.bin_data.24.curr	WY time series data
wyp_scr.txt	Appears to be a troubleshooting aid or to simplify MCP3 to ICP data transfer.

B.4.3 File Formats

To Do: Formats will be documented here as they are discovered by code examination