
US EPA Information Collection Rule

User's Guide Treatment Study Database



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1. Table of Contents

1. TABLE OF CONTENTS	1
2. NOMENCLATURE	4
3. INTRODUCTION	5
3.1. WHAT IS THE TREATMENT STUDY DATABASE?	5
3.2. USING THIS USER'S GUIDE	5
3.3. TS DATABASE INSTALLATION	6
3.3.1. Minimum system requirements	6
3.3.2. Installing the TS Database	7
3.3.3. Installing Adobe Acrobat Reader	8
3.4. STARTING THE TS DATABASE APPLICATION	9
3.5. TREATMENT STUDY DOCUMENTATION	10
3.5.1. Viewing the Documentation page and on-line documents	11
3.5.2. Viewing the on-line Help information	11
4. TS DATA LIBRARY	12
4.1. VIEWING THE TS DATA LIBRARY PAGE	12
4.2. CREATING AN INITIAL SEARCH	13
4.2.1. Initial Search based on Primary Criteria only	13
4.2.2. Creating a search based on Optional Criteria	15
4.3. CREATING ADVANCED SEARCHES	16
4.3.1. Viewing the Advanced Search Screen	16
4.3.2. Building an Advanced Search	17
4.3.3. Sorting results	18
4.3.4. Switching from Form View to Datasheet (Spreadsheet Style) View	18
5. GAC TS DATA	19
5.1. VIEWING THE GAC DATA SCREEN	19
5.2. GAC BREAKTHROUGH CALCULATIONS	21
5.2.1. Viewing the Calculate Breakthrough Data screen	21
5.2.2. Generating blended breakthrough water quality data (based on blended runtime)	22
5.2.3. Generating blended breakthrough water quality data (based on blended concentration of a water quality parameter)	22
5.2.4. Generating single contactor breakthrough water quality data	23
5.2.5. Example: generating results for a target water quality parameter	24
5.3. USING THE BREAKTHROUGH CALCULATION RESULTS SCREEN	25
5.3.1. Flag definitions	27
5.3.2. 88888 or 99999 flags	27
5.3.3. Revising the breakthrough calculation criteria	27
5.3.4. Exporting results to Microsoft Excel	28
5.3.5. Building data queries from the results	28
5.4. GAC DATA QUERIES	29
5.4.1. Viewing the Build Data Queries screen	30
5.4.2. Building a query	30
5.4.3. Filtering results	31
5.4.4. Example: building a GAC query	32
6. MEMBRANE TS DATA	34
6.1. VIEWING THE MEMBRANE DATA SCREEN	34
6.2. MEMBRANE BLENDING CALCULATIONS	35

6.2.1.	Viewing the Calculate Blended Water Quality screen	35
6.2.2.	Generating blended water quality data.....	36
6.2.3.	Example: generating results for a target water quality parameter.....	37
6.3.	USING THE BLENDED WATER QUALITY RESULTS	38
6.3.1.	Flag definitions	39
6.3.2.	Revising the blending criteria	40
6.3.3.	Exporting results to Microsoft Excel.....	40
6.3.4.	Building data queries from the results	41
6.4.	MEMBRANE DATA QUERIES	41
6.4.1.	Viewing the Build Data Queries screen	42
6.4.2.	Building a query.....	43
6.4.3.	Filtering results.....	43
6.4.4.	System/Stage designation.....	44
6.4.5.	Example: building a membrane query	46
7.	COMMON TS DATA	48
7.1.	VIEWING THE COMMON TS DATA SCREEN	48
7.2.	GENERAL INFORMATION	49
7.2.1.	Viewing the General Information screen	49
7.2.2.	Building a query.....	50
7.2.3.	Filtering results.....	50
7.3.	QA/QC INFORMATION	51
7.3.1.	Sets	51
7.3.2.	Class Sums	52
7.3.3.	Viewing the QA/QC Information screen	53
7.3.4.	Building a query.....	54
7.3.5.	Filtering results.....	54
7.3.6.	Accessing the QA/QC Report Generator.....	55
7.3.7.	Viewing the Laboratory QA/QC Report.....	56
7.3.8.	Viewing a list of all participating laboratories	56
7.3.9.	Viewing the Field Duplicate Report.....	56
7.4.	PRETREATMENT INFORMATION	57
7.4.1.	Viewing the Pretreatment Information screen	57
7.4.2.	Building a query.....	58
7.4.3.	Filtering results.....	58
7.4.4.	Accessing the Pretreatment Report Generator.....	59
7.4.5.	Viewing the Pretreatment Report.....	60
8.	QUERY RESULTS	61
8.1.	INTRODUCTION	61
8.2.	USING THE QUERY RESULTS SCREEN	62
8.2.1.	Exporting results to Microsoft Excel.....	62
8.2.2.	Viewing the Query Design (for advanced users).....	63
8.2.3.	Saving the Query Results (for advanced users).....	63
8.2.4.	Filtering results (for advanced users).....	64
8.2.5.	Closing the Query Results Screen	64
8.3.	VIEWING PREVIOUSLY SAVED QUERY DATA (FOR ADVANCED USERS)	65
8.3.1.	Viewing saved GAC Query Results	65
8.3.2.	Viewing saved Membrane Query Results	65
8.3.3.	Viewing saved General Information Query Results	66
8.3.4.	Viewing saved QA/QC Query Results	66
8.3.5.	Viewing saved Pretreatment Query Results	67
9.	MAINTENANCE	68
9.1.	DELETING USER CREATED TABLES	68
9.1.1.	Viewing the Maintenance Screen	68

9.1.2. <i>Deleting a user created query or calculation table</i>	69
9.2. COMPACTING THE DATABASE	69
10. APPENDICES	70
10.1. APPENDIX: USING ADOBE ACROBAT READER	71
10.1.1. <i>Navigating through a document</i>	71
10.1.2. <i>Printing a document</i>	71
10.1.3. <i>Returning to the TS Database</i>	71
10.1.4. <i>Exiting Adobe Acrobat Reader</i>	71
10.2. APPENDIX: EXPLANATION OF FLAGS	72
10.2.1. <i>GAC Flags</i>	72
10.2.2. <i>Membrane Flags</i>	80
10.3. APPENDIX: LIST OF PRETREATMENT CODES	82

2. Nomenclature

The following is a list of abbreviations used in this manual and in the Treatment Study Database.

Br	Bromide
DBP	Disinfection Byproduct
GAC	Granular Activated Carbon
HAA6	Sum of 6 Haloacetic Acids
ICR	Information Collection Rule
LMS	Laboratory Matrix Spike
LTSEBST	Long-Term Single Element Bench-Scale Test
MGD	Million Gallons Per Day
MRL	Minimum Reporting Level
PDF	Portable Document Format
PE	Performance Evaluation
PWS	Public Water System
QA	Quality Assurance
QC	Quality Control
RBSMT	Rapid Bench-Scale Membrane Test
RPE	Relative Percent Error
RSSCT	Rapid Small-Scale Column Test
SDS	Simulated Distribution System
SEBST	Single Element Bench-Scale Test
THM4	Sum of 4 Trihalomethanes
TOC	Total Organic Carbon
TOX	Total Organic Halide
TS	Treatment Study
TSID	Treatment Study ID
TSRunID	Treatment study run ID
TSUVA	Total Specific UV absorption (UV divided by TOC)
UV	Ultraviolet absorption at 254 nm
USEPA	United States Environmental Protection Agency

3. Introduction

3.1. What is the Treatment Study Database?

The purpose of this database is to manage the treatment study (TS) data submitted by public water systems (PWSs) required to conduct disinfection byproduct (DBP) precursor removal studies under the Information Collection Rule (ICR). Results from 99 treatment studies, (63 granular activated carbon (GAC) and 36 membrane studies), representing 108 plants, are reported in this database. This relational database is flexible enough to support all anticipated data analysis needs, while also allowing data analysis to be performed in an efficient manner. Users have full access to the capability and functionality of Microsoft Access data query features, in addition to the preprogrammed queries.

3.2. Using This User's Guide

This user's guide will explain how to install, navigate, and use the features of the *TS Database*. The contents of this document are divided into the following chapters:

Chapter 2	Abbreviations – Lists definitions of frequently used abbreviations
Chapter 3	Introduction - Provides a general overview of the database as well as instructions on installing the database, starting the database, accessing on-line documentation, and using the on-line help feature.
Chapter 4	TS Data Library – Provides instructions on using the TS Data Library module
Chapter 5	GAC TS Data – Provides instructions on using the GAC TS Data module
Chapter 6	Membrane TS Data – Provides instructions on using the Membrane TS Data module
Chapter 7	Common TS Data – Provides instructions on using the Common TS Data module
Chapter 8	Query Results – Provides instructions on modifying queries, a task common to the GAC, membrane, and common data modules
Chapter 9	Maintenance – Provides instructions on deleting user-generated tables and compacting the database
Appendices	Using Adobe Acrobat Reader – describes how to use Adobe Acrobat Explanation of Flags – graphically explains the GAC and membrane flags List of Pretreatment Codes – provides explanations of the GAC and membrane pretreatment codes

Although this user's guide provides step-by-step instructions on using this database, it does assume that the user has a general familiarity with the following:

1. Windows 98/2000 concepts, including:
 - Using the keyboard and mouse
 - Starting applications using the Start menu
 - Using Microsoft Explorer to manage files and directories

- Switching between running applications
 - Maximizing, minimizing and closing windows
2. Microsoft Access 97 database concepts, including:
 - Fields, records, tables and queries
 - Different view modes such as form view and datasheet view
 - Entering data in text boxes
 - Using drop-down boxes and option buttons
 - Filtering records
 3. Microsoft Excel 97 spreadsheet concepts, including:
 - Opening, saving, and closing spreadsheets
 4. Adobe Acrobat Reader 4 (for viewing PDF documents) concepts, including:
 - Opening and closing documents
 - Printing a document
 - Navigating through a document

Users for whom the above concepts are new should refer to the documentation that comes with Windows, Microsoft Access, Excel, and/or Adobe Acrobat Reader. Appendix 10.1 of this document provides a brief overview of Adobe Acrobat Reader.

3.3. TS Database Installation

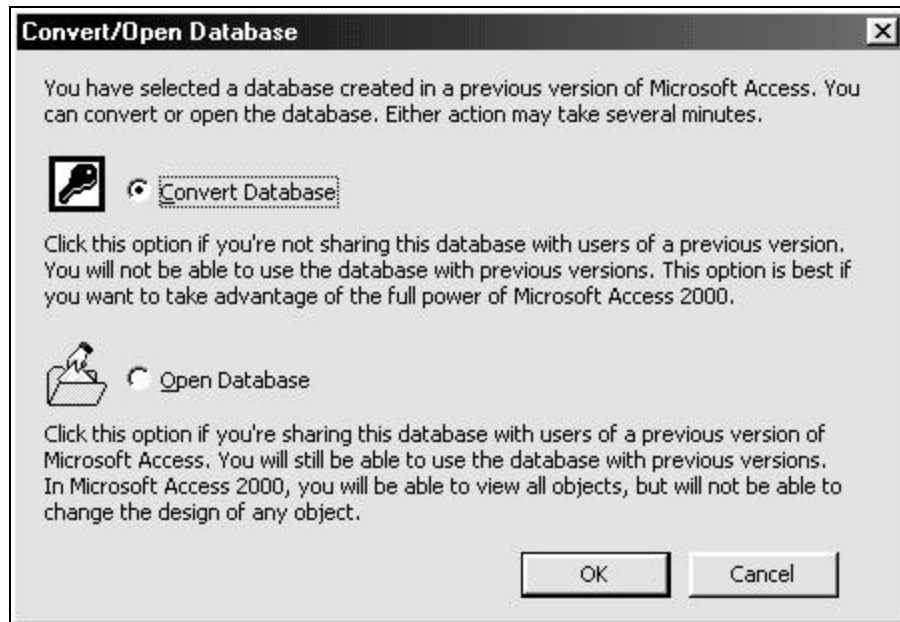
3.3.1. Minimum system requirements

The *TS Database* requires at a minimum the following system configuration:

- IBM-compatible personal computer running Microsoft® Windows 95™ or later
- CD-ROM drive
- 16 MB RAM
- 260 MB available on the hard-disk for full installation, 31 MB available on the hard-disk for compact installation
- Microsoft® Access 97™
- Microsoft® Excel 97™ or later
- Adobe® Acrobat Reader 3.0™ or later

Adobe® Acrobat Reader 4.0™ is recommended for optimum viewing and can be installed from the *TS Database* CD. For instruction on installation of Acrobat 4.0™, see Section 3.3.3.

- ☞ Note for Access 2000™ users. The database was created in the Microsoft® Access 97™ environment and it is recommended that you use the database with Access 97™ when possible. However, you can use the database in Access 2000™. When you open the *TS Database* in Access 2000™ the following window will appear. You can either convert the *TS Database* to Access 2000™, or view it using Access 2000™ without converting it.



- ☞ The first time the *TS Database* is opened in Access 2000™, the following error message may appear: “One of more forms or reports contains an Active-X control that could not be loaded.” This error is inconsequential and the user should click **OK** and continue.

3.3.2. Installing the TS Database

The installation instructions below assume a working knowledge of Microsoft Windows.

1. Insert *TS Database* CD into the CD-ROM drive
2. Choose the **Start, Run** menu option and the Run dialog box will appear.
3. In the Open text box, type **D:\Setup**
 - ☞ If the CD-ROM drive is not assigned to “D”, replace the letter D in the above instruction with the correct letter.
4. The Setup program will guide you through the installation process. Simply follow the on-screen instructions.
5. The Setup program will allow you to select a destination folder for the Treatment Study Database files. The default location is **C:\ICR**. To select another destination folder, click the **Browse** button.
 - ☞ All of the database files must be installed in the same folder for the database and linked files to perform correctly.

6. After selecting the destination folder, the Setup program allows you to select the installation type from the following options:
 - Typical: this option installs all of the software components on your computer (requires 260 MB of hard-disk space). This option is recommended for most users if the required disk space is available.
 - Compact: this option only installs the database (requires 31 MB of hard-disk space). This option is only recommended if you do not have the disk space required for the Typical installation.
 - Custom: this option allows you to choose which software components you wish to install. The components available include the *TS Database*, TS Data Library Files, and Documentation.
7. After selecting the installation type, the Setup program completes the installation.
8. After the database has been installed, you can run the Setup program to perform the following operations:
 - Modify: add or delete program components
 - Repair: reinstall all components that we installed by the previous setup
 - Remove: remove all installed components
9. You can create a desktop icon for the *TS Database* using the following procedure:
 - From the Desktop, open the Programs folder by double-clicking on the folder.
 - Find the *TS Database* icon in this folder.
 - Hold down the **Ctrl** key while selecting the *TS Database* icon. While holding down the **Ctrl** key and the left mouse button, drag the icon onto the desktop and release both buttons.
 - To open the database, simply double-click the desktop icon that you just created.

3.3.3. Installing Adobe Acrobat Reader

Adobe Acrobat Reader 4.0 is included on the *TS Database* CD. Most PCs with Internet access already have Acrobat Reader installed. If Adobe Acrobat Reader 4.0 is installed on your PC, you can proceed to Section 3.4. To install the program, follow the instructions listed below.

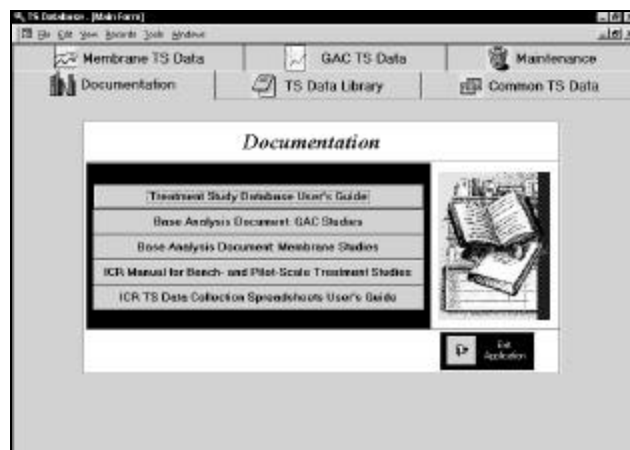
1. Choose the **Start, Run** menu option and the Run dialog box will appear.
2. In the Open text box, type **C:\icr\ar405eng**
 - ☞ If the CD-ROM drive was not installed in **C:\icr**, then enter the correct path name in the command line
3. Follow the instructions on the screen. Additional installation information is available at the Adobe web site, www.adobe.com.


3.4. Starting the TS Database Application

1. Click the **Start** button and choose **Programs, TS Database**.
2. The following Welcome screen will appear.



3. Click the **Enter Database** button to continue. The **Main Form** will appear.



The Main Form has one button. Clicking on this button  will allow the user to exit the database.

The Main Form contains five tabs. Clicking on the tabs will change the current page. Descriptions for each tab are listed below.

Tabs	Description
Documentation	Contains the following documentation in PDF format: <ul style="list-style-type: none"> • <i>Treatment Study Database User's Guide</i> • <i>Base Analysis Document: GAC Studies</i> • <i>Base Analysis Document: Membrane Studies</i> • <i>ICR Manual for Bench- and Pilot-Scale Treatment Studies</i> • <i>ICR TS Data Collection Spreadsheet User's Guide</i>
TS Data Library	Contains general information for each treatment study along with a copy of the final treatment study report in PDF format, original treatment study data collection spreadsheet in Excel format, and a graphical summary document generated by USEPA in PDF format.
GAC TS Data	Performs GAC breakthrough calculations for any or all water quality parameters based on criteria specified by the user. The module has simple and advanced search query capabilities as well as the ability to export data to Excel for further analysis.
Membrane TS Data	Performs membrane blending calculations for any or all water quality parameters based on criteria specified by the user. The module has simple and advanced search query capabilities as well as the ability to export data to Excel for further analysis.
Common TS Data	Provides general information, QA/QC data and pretreatment information for all treatment studies. The module has simple and advanced search query capabilities as well as the ability to export data to Excel for further analysis.
Maintenance	The maintenance module is used to delete user created tables.

3.5. Treatment Study Documentation

The Treatment Study Database includes links to documents that explain how to use the database, how data included in the database was analyzed, how the database was designed, as well as other documents pertinent to the design and operation of the treatment studies. The documents are in PDF format, which can be viewed using Adobe Acrobat. Another source of user support is the on-line help feature that provides definitions for the field names used on the query screens.

3.5.1. Viewing the Documentation page and on-line documents


The Documentation page is the first page that appears after opening the database.

1. If the Documentation page is not visible, click the **Documentation** tab. The Documentation page will then appear.


The following documents are available from the Documentation page:

Document	Description
<i>Treatment Study Database User's Guide</i>	The document you are currently reading.
<i>Base Analysis Document: GAC Studies</i>	Describes the approach and assumptions used during the base analysis of GAC study data.
<i>Base Analysis Document: Membrane Studies</i>	Describes the approach and assumptions used during the base analysis of the membrane study data.
<i>ICR Manual for Bench- and Pilot-Scale Treatment Studies</i>	Describes the technical procedures for conducting GAC and membrane bench-, pilot- and full-scale treatment studies.
<i>ICR TS Data Collection Spreadsheet User's Guide</i>	Describes how the spreadsheets containing the TS data, submitted to the USEPA, were prepared.

2. To view a document, click the button corresponding to the desired document. The document will open up in Adobe Acrobat.

 Please refer to Appendix 10.1 for basic information on using Adobe Acrobat.

3.5.2. Viewing the on-line Help information

The on-line help feature describes the contents of each of the Data Tables included in the *TS Database*. This feature can be accessed from the Data Query Screens through the GAC TS Data, Membrane TS Data and Common TS Data pages, by clicking on the Help Button .

4. TS Data Library

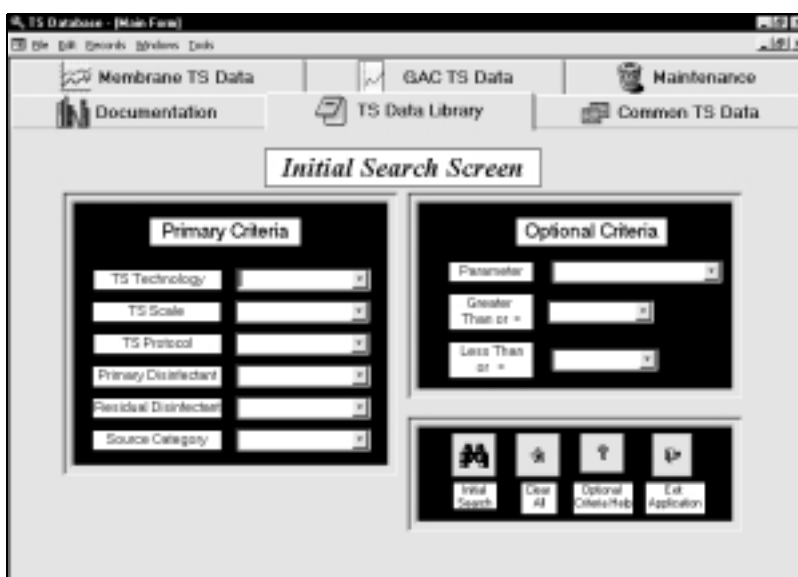
The TS Data Library page is used to:

- Search for specific treatment studies using selected search criteria.
- Provide links to the PDF Summary Reports, the Excel Data Collection Spreadsheets, and the PDF Graphical Summary Files.

Searches can be performed at two levels: initial search and advanced search. During an initial search, general treatment study criteria, such as the type or scale of the study, can be used to filter the studies. Through the advanced search interface, multiple, sophisticated search criteria can be used to refine the search for treatment studies that meet specific criteria.

4.1. Viewing the TS Data Library page

When viewing the **Main Form**, select the **TS Data Library** tab. The TS Data Library page will appear.



The four buttons that appear on the bottom right corner of the screen are described below:

Button	Icon	Action
Initial Search		Generates results based on the selected parameters
Clear All		Clears all filter criteria
Optional Criteria Help		Provides help for entering optional criteria
Exit Application		Exits the database


The TS Data Library page is divided into two frames: Primary Criteria and Optional Criteria. Each frame has a list of search criteria, which are described in the following table:

Frame	Criteria	Description
Primary Criteria	TS Technology	Choose between GAC and membrane, or leave blank for all.
	TS Scale	Choose between Bench-, Pilot-, or Full-Scale, or leave blank for all.
	TS Protocol	For GAC studies, choose between RSSCT, Pilot Columns or Full-Scale Contactors (choice is limited by TS Scale filter, if selected). For membrane studies, choose between RBSMT, SEBST or LTSEBST for bench-scale studies; 2-stage pilot or 3-stage pilot for pilot-scale studies; or 2-stage array or 3-stage array for full-scale studies. Leave blank for all.
	Primary Disinfectant	Choose the primary disinfectant used by the full-scale plant , or leave blank for all.
	Residual Disinfectant	Choose the secondary disinfectant used by the full-scale plant , or leave blank for all.
	Source Category	Choose between surface water (SW) and ground water (GW), or leave blank for all.
Optional Criteria	Parameter	Choose one of several parameters, including the average concentration in the study feed water (for bromide, TOC, UV, or TSUVA), or the total flow or population for the full-scale plant .
	Less than or =	Choose a value for the selected parameter to view all records less than, or equal to, that value. This value can be used in conjunction with a value entered in the “Greater than or =” criteria to create an inclusive or exclusive range.
	Greater than or =	Choose a value for the selected parameter to view all records greater than, or equal to, that value. This value can be used in conjunction with a value entered in the “Less than or =” criteria to create an inclusive or exclusive range.

4.2. Creating an Initial Search

The initial search is used to filter studies that meet user-specified criteria.

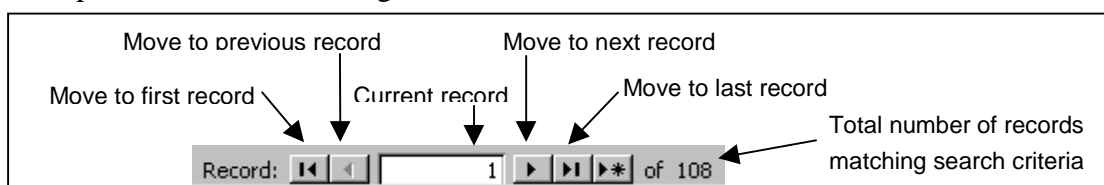
4.2.1. Initial Search based on Primary Criteria only

1. In the **Primary Criteria** frame, move the insertion point to the **TS Technology** field and select a value from the choices listed in the drop-down box.
☞ Leave all criteria blank to view all records.
2. Repeat for each additional field (TS Scale, TS Protocol, Primary Disinfectant, Residual Disinfectant, and Source Category).
☞ Leave criteria blank to view all records.
3. Click the **Initial Search** button  to view the results. The Initial Search Results Screen will appear.

Initial Search Results

TSD	000	Plant Name	Palm Beach County WTP 3	Avg Feed TOC (mg/L)	12.57
TS Test	Membrane	Plant ICR #1	018	Avg Feed Br (mg/L)	213.36
TS Scale	Full-Scale	Plant ICR #2		Avg Feed UV (cm/s)	0.481
TS Protocol	3-Stage Aras	Plant ICR #3		Avg TSS (mg/L)	0.82
Open Excel Data Collection Spreadsheet		Plant Type	MEMBRANE	USEPA Flow Category	2
Open PDF Summary Report		Process Count	Membrane	Plant Rated Flow (MGD)	8
Open PDF Graphical Summary File		Residual Disinfectant	Chloramines	Fc - Total Flow (MGD)	9.3
		PWS Name	Palm Beach County Water Utilities	Fs - GW Flow (MGD)	0
		PWSID #	FL4501047	Fg - GW Flow (MGD)	9.3
		City	West Palm Beach	Fp - Patch Flow (MGD)	0
		State	FL	Pt - Total Population	41,080
		USEPA Region	4	Pg - GW Population	8
		Source Category	GWR	Pg - GW Population	41,080
		Source Type	Aquifer	Pp - Patch Population	8
		Source Name	Biscayne Aquifer		

The results appear one record at a time. To cycle through the records, navigate using the record navigation buttons at the bottom left-side of the screen. Below is a graphical description of the record navigation buttons.



The five buttons that appear on the left side of the screen are described below:

Button	Icon	Action
Open Excel Data Collection Spreadsheet		Opens the data collection spreadsheet submitted by the utility in Excel
Open PDF Summary Report		Opens the final report submitted by the utility in Adobe Acrobat Reader
Open PDF Graphical Summary File		Opens a graphical summary of the spreadsheet data in Adobe Acrobat Reader
Advanced Search		Views a new screen where the user can specify advanced search criteria
Previous Screen		Returns to the previous screen

Each record includes access to three files pertinent to each study:

- **Data Collection Spreadsheet** (Excel format) – spreadsheet submitted by the utility containing the treatment study data. For information on the structure and use of the spreadsheet, please refer to the *ICR TS Data Collection Spreadsheet User's Guide* under the Documentation tab. These spreadsheets can be viewed by clicking on the **Open**



Excel Data Collection Spreadsheet icon. These files are protected but can be printed or copied to a new workbook for further analysis.

- **Summary Report** (PDF format) – summary report submitted by the utility describing the treatment study protocol, materials and methods, data analysis, conclusions and recommendations. This file can be viewed by clicking on the **Open PDF Summary Report** icon.
- **Graphical Summary File** (PDF format) – graphical depiction of the treatment study data prepared by USEPA. This document includes a concise summary of the study design parameters and a statistical and graphical presentation of the study data. This file can be viewed by clicking on the **Open PDF Graphical Summary File** icon.

4. Click the **Previous Screen** button  to return to the Initial Search Screen.

4.2.2 Creating a search based on Optional Criteria


The Optional Criteria frame allows you to select a parameter and specify a range of values to search. For example, the Optional Criteria frame can be used to view only those treatment plants with average feed TOC values between 2.0 and 4.0 mg/L.

1. Click the **Clear All** button  to clear all criteria.
2. In the **Optional Criteria** frame, select an entry from the drop-down box for the **Parameter** field.
3. Chose one of the following options:
 - To view records greater than or equal to a specific value, select a value from the **Greater Than or =** field
 - To view records less than or equal to a specific value, select a value from the **Less Than or =** field
 - To view records between two values A and B ($A < B$), enter the value A in the **Greater Than or =** field, and enter B in the **Less Than or =** field
 - To view records excluding values between A and B ($A < B$), enter the value B in the **Greater Than or =** field, and enter A in the **Less Than or =** field.
4. Click the **Initial Search** button  to view the results. The **Initial Search Results Screen** will appear.
 - ☞ Use the criteria in the Primary Criteria frame in combination with the criteria in the Optional Criteria frame to restrict the search even further.

4.3. Creating Advanced Searches

For more sophisticated queries, the Advanced Search Screen can be used to filter records based on any set of criteria from most of the fields in the TS Library.

4.3.1. Viewing the Advanced Search Screen

When viewing the **Initial Search Results Screen**, click the **Advanced Search** button . The Advanced Search Screen will appear.



Advanced Search Screen

Primary Criteria Choices:

- TS Technology
- TS Scale
- TS Protocol
- Process Control
- Residual Control
- Source Category

Select Filter Criteria:

- Plant Name
- Plant KCR#
- Plant Type
- Plant Name
- PWID#
- City
- State
- USEPA Region
- Source Type
- Source Name




Input Filter Criteria:

- Avg Feed TOC (mg/L)
- Avg Feed In (gpd)
- Avg Feed Out (gpd)
- Avg TSS (mg/L)
- USEPA Flow Category
- Plant Rated Flow (MGD)
- FC - Total Flow (MGD)
- PC - Total Population

Input Criteria for the above fields:
 <#> or <=#> or >#> or >=#> or
 Between # ASD #
 Do not include the comma separator
 in numerical entries.

Buttons: Advanced Search, Clear All, Previous Screen

The three buttons that appear on the bottom left corner of the screen are described below:

Button	Icon	Action
Advanced Search		Generates results based on the selected search parameter value
Clear All		Clears the search criteria
Previous Screen		Returns to the previous screen


The screen is divided into three frames with the following fields:


Frame	Criteria	Description
Primary Criteria Choices		Changes can not be made to the fields in this frame. To make changes to these fields, return to the TS Library's Initial Search Screen.
Select Filter Criteria	Plant Name	Name of the treatment plant
	Plant ICR	Plant ICR number
	Plant Type	Type of treatment plant (CONV, SOFT, etc.)
	PWS Name	Public water system name
	PWSID#	Public water system identification number assigned by the state agency
	City	City where PWS is located
	State	State where PWS is located
	USEPA Region	USEPA region (1-9)
	Source Type	Type of raw water source (aquifer, lake, river)
	Source Name	Name of the water source
Input Filter Criteria	Plant Rated Flow (MGD)	State approved plant capacity
	USEPA Flow Category	USEPA flow category based on the plant's flow rate
	Avg Feed TOC (mg/L)	Average total organic carbon concentration in the treatment study feed water
	Avg Feed Br (µg/L)	Average bromide concentration in the treatment study feed water
	Avg Feed UV (1/cm)	Average ultraviolet absorption at 254 nm in the treatment study feed water
	Avg Feed TSUVA (L/(mg*m))	Average TSUVA concentration in the treatment study feed water
	Fc - Total Flow (MGD)	Average total daily plant flow in 1998 for the full-scale plant
	Pc - Total Population	Total retail population in 1998 for the full-scale plant

4.3.2. Building an Advanced Search

1. In the **Select Filter Criteria** frame (center of the screen), click inside the field to be filtered and select a value from the field's drop-down list.
 - ☞ Be careful when selecting criteria that will result in no records matching the specified criteria. For example, although the database allows you to enter the city of Minneapolis and the state of CA, the Advanced Query Results Screen will not show any matching records.
2. In the **Input Filter Criteria** frame (right side of the screen), type a limit value for each desired parameter. The table below, which uses **Avg Feed TOC** as an example, describes the use of various input criteria.

Input Criteria	Description	Example using Avg Feed TOC	Description of Example
<#	Less than	<4.0	Shows records matching all other criteria and that have Avg Feed TOC less than 4.0 mg/L
<=#	Less than or equal to	<=4.0	Shows records matching all other criteria and that have Avg Feed TOC less than or equal to 4.0 mg/L
>#	Greater than	>4.0	Shows records matching all other criteria and that have Avg Feed TOC greater than 4.0 mg/L
>=#	Greater than or equal to	>=4.0	Shows records matching all other criteria and that have Avg Feed TOC greater than or equal to 4.0 mg/L
Between # AND #	Between two values	Between 2.0 AND 4.0	Shows records matching all other criteria and that have Avg Feed TOC between 2.0 and 4.0 mg/L

- Click the **Advanced Search** button  to view the results. The Advanced Search Results Screen will appear. This screen is similar to the Initial Search Results Screen, but the records have been filtered by the advanced criteria entered by the user.

Click the **Clear All** button  to clear the existing search criteria and start a new search.

4.3.3. Sorting results

When the Advanced Search Results Screen appears, the records can be sorted in ascending or descending order based on any field of choice.

- Move the cursor to the field to be sorted.
- Choose the **Records, Sort** menu option.



Choose either **Sort Ascending** (from 1-1000 or A-Z) or **Sort Descending** (from 1000-1 or Z-A).

-or-

Click the **Sort Ascending** button  or **Sort Descending** button  on the Toolbar.

4.3.4. Switching from Form View to Datasheet (Spreadsheet Style) View

When the Search Results Screen appears, each record occupies the entire screen in what is called Form View. Alternatively, the records can be displayed in the Datasheet View where one record appears per line.

- Click the **Datasheet View** button  on the Toolbar to switch views to spreadsheet-style view.
- To switch back to Form View, click the **Form View** button  on the toolbar.

5. GAC TS Data

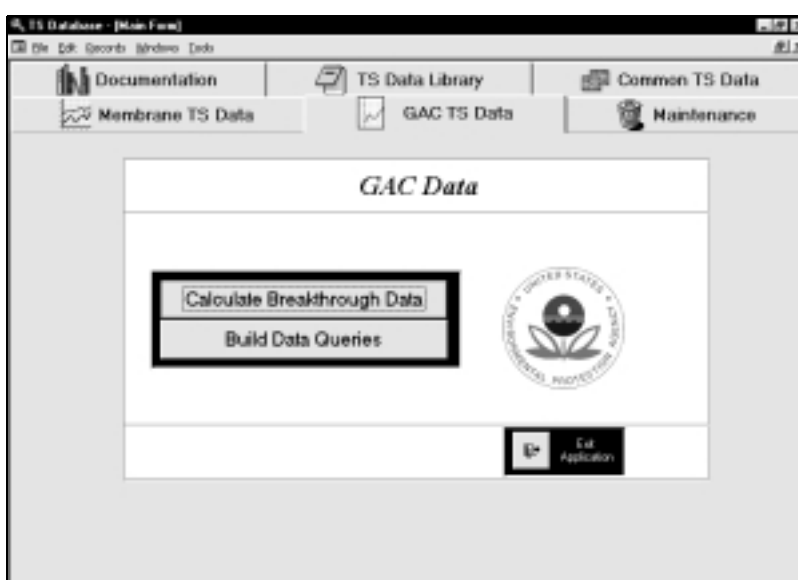
The GAC TS Data module is used to:

- Conduct breakthrough calculations for different water quality criteria defined by the user.
- Build queries linking information from various GAC tables, including breakthrough calculation tables.




All of the results generated in the GAC TS Data module can be saved within this database and can be exported to Microsoft Excel.

5.1. Viewing the GAC Data screen

When viewing the **Main Form**, select the **GAC TS Data** tab. The GAC Data page will appear.



The GAC Data page has the following buttons:

Button	Icon	Action
Calculate Breakthrough Data		Displays the Calculate Breakthrough Data screen used to generate breakthrough data
Build Data Queries		Displays the Build GAC Data Query screen used to link the information from various GAC tables
Exit Application		Exits the database




Listed below are definitions for key terms used throughout the GAC TS Data Chapter.

Term	Definition
Breakthrough	The GAC effluent profile based on measured water quality parameters plotted over runtime.
Blended Contactor	Data representing operation of GAC contactor as one of a series of multiple, parallel contactors with staggered GAC regeneration cycles. Blended contactor run time is the time at which an individual contactor must be taken off-line for regeneration in order to meet a given blended contactor effluent concentration.
Target WQ Parameter	Water quality parameter (such as TOC or HAA6) used to establish a target concentration.
Target Concentration	The target concentration of the target water quality parameter.
Maximum Concentration	The maximum concentration reached by a water quality parameter. Some breakthrough curves peak and then drop off, so the maximum concentration may be reached before the end of the run.
Single Contactor	Data representing the effluent from a single GAC contactor. Single contactor run time is the run time of a single contactor to a given effluent concentration based on operation of only a single contactor.
Treatment Study	A GAC study consisting of either eight column experiments (Bench-scale RSSCTs) or two column experiments (Pilot-scale). Each column is operated at a constant empty-bed contact time (EBCT) between 5 and 25 minutes.
Treatment Study Run	The operation of a single column during a treatment study. Bench-scale studies include eight runs, pilot-scale studies include 2 runs.
Runtime	A point in time during the operation of a GAC contactor, measured in days.
Breakthrough Equation	A logistic function used to model the actual breakthrough curve for a specific parameter during a specific treatment study run.
Scale of Study	Whether the study was conducted at a bench-, pilot- or full-scale level.
Source Category	Whether the source water is a ground water or a surface water.

Based on the selected criteria, the database will generate breakthrough data at a given runtime for the selected water quality parameters for each treatment study run. The database performs the calculations by applying the user-selected target concentration or runtime to breakthrough equations stored in the database. During the GAC study data analysis process, breakthrough equations were defined for every water quality parameter for every treatment study run in the database. This approach provides a flexible method to analyze breakthrough data at any runtime or at any target concentration for any water quality parameter for any treatment plant.



Data can be generated for single contactors or blended contactor simulation. All of the bench- and pilot-scale studies were conducted using single contactors. Single contactor runtime results are calculated from the breakthrough equations stored in the database. Blended contactor runtime results are calculated from the integrated TOC breakthrough equation. For more information on the algorithm used to calculate GAC breakthrough data, refer to the *Base Analysis Document: GAC Studies*.

The three buttons that appear on the right side of the Calculate Breakthrough Data screen are described below:

Button	Icon	Action
Calculate		Generates breakthrough water quality data based on user-defined criteria. ☞ For information on the breakthrough calculation algorithm, please refer to the <i>Base Analysis Document: GAC Studies</i>
Clear All		Clears all selected breakthrough criteria and output parameters.
Previous Screen		Closes the current screen and displays the GAC Data page.


5.2.2. Generating blended breakthrough water quality data (based on blended runtime)




To generate blended breakthrough water quality data based on runtime, enter a blended runtime and the database will calculate the concentrations for all selected water quality parameters at the specified blended runtime.

1. Click the **Clear All** button  to clear any previously selected criteria.
2. In **Field 1** of the **Blended Breakthrough Criteria** frame, enter the **Blended Contactor Runtime** (measured in days).
☞ Once a criterion has been entered in Field 1, criteria can not be entered into Fields 2 or 3.
3. In the **Output WQ Parameters** frame, select the additional water quality parameters for which blended concentrations are desired. **Note:** The Blended Runtime and the Single Contactor Runtime fields are automatically selected.
☞ To select all parameters, click the **Select All Parameters** button at the top of the list.
4. Click the **Calculate** button  to generate the blended data.
5. The results will appear on the Breakthrough Calculation Results screen. For information on using this screen, refer to Section 5.3, Using the Breakthrough Calculation Results Screen.

5.2.3. Generating blended breakthrough water quality data (based on blended concentration of a water quality parameter)



To generate blended breakthrough water quality data based on a blended concentration for a specific water quality parameter, select a water quality parameter and then enter a target blended concentration. The database will calculate the blended runtime to achieve that concentration and the blended concentrations of all selected water quality parameters at that runtime.

1. Click the **Clear All** button  to clear any previously selected criteria.

2. In **Field 2** of the **Blended Breakthrough Criteria** frame, select a **Target WQ Parameter** from the list box by clicking the selected parameter. The parameter will appear in the field to the right of the list.
 -  Once a criterion has been entered in Field 2, criteria can not be entered into Fields 1 or 3.
3. In the **Target Concentration** field, enter a target concentration. **Note:** The concentration entered must be in the units listed to the right of the box.
4. In the **Output WQ Parameters** frame, select the additional water quality parameters for which blended concentrations are desired. **Note:** The Blended Runtime and the Single Contactor Runtime fields and the parameter selected in the Blended Breakthrough Criteria frame are automatically selected.
 -  To select all parameters, click the **Select All Parameters** button at the top of the list.
5. Click the **Calculate** button  to generate the blended data.
6. The results will appear on the Breakthrough Calculation Results screen. For information on using this screen, refer to Section 5.3, Using the Breakthrough Calculation Results Screen.

5.2.4. Generating single contactor breakthrough water quality data

To generate single contactor breakthrough water quality data based on a concentration for a specific water quality parameter, select a water quality parameter and then either enter the target concentration, click the “Select Maximum Concentration” checkbox, or enter a single contactor runtime. The database will calculate the runtime (for a single contactor and blended contactors) corresponding to the specified single contactor breakthrough criteria and the concentrations of all selected water quality parameters.


1. Click the **Clear All** button  to clear any previously selected criteria.
2. In **Field 3** of the **Single Contactor Breakthrough Criteria** frame, select a **Target WQ Parameter** from the list box by double-clicking the selected parameter. The parameter will appear in the field to the right of the list.
 -  Once a criterion has been entered in Field 3, criteria can not be entered into Fields 1 or 2.
3. To view the breakthrough data based on a single contactor concentration, enter a target concentration in the **Target Concentration** field (3a). **Note:** The concentration entered must be in the units listed to the right of the box.

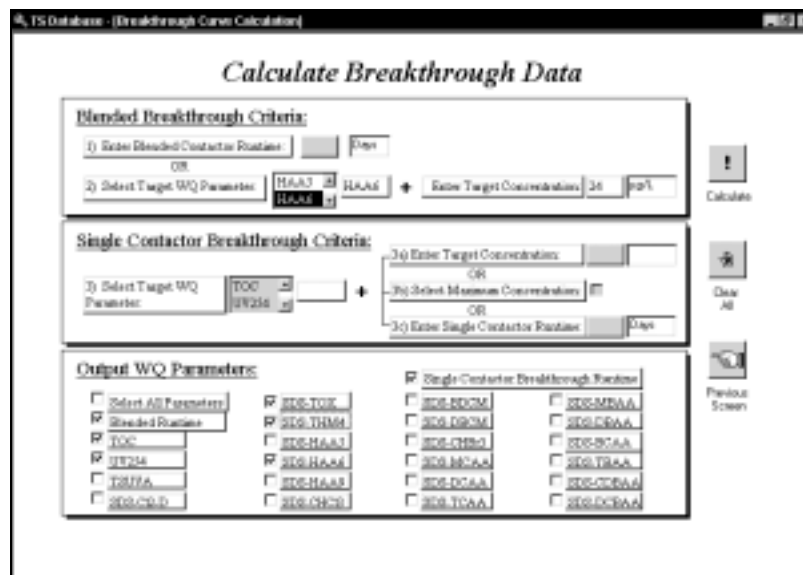
-or-


To view breakthrough data based on the maximum single contactor concentration of the selected water quality parameter observed in the study, check the **Select Maximum Concentration** checkbox (3b).

-or-

July 21, 2000

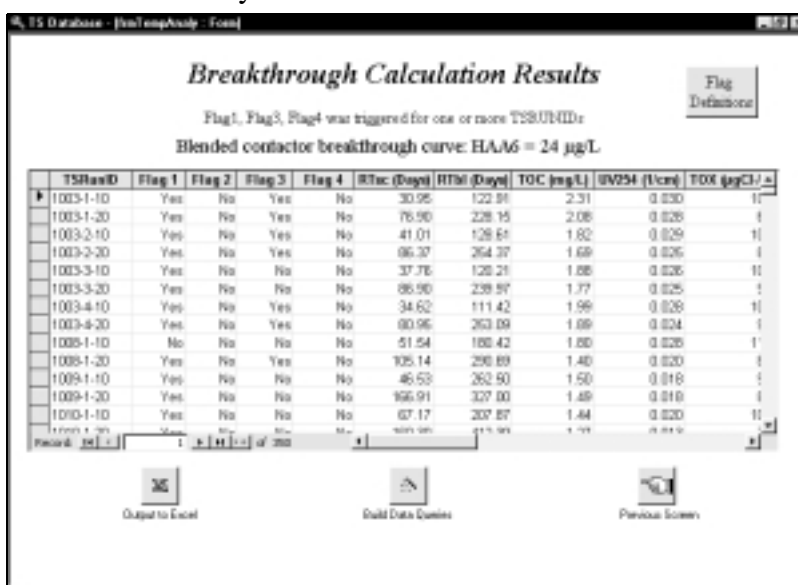
1. Click the **Clear All** button  to clear any previously selected criteria.
2. In **Field 2** of the **Blended Breakthrough Criteria** frame, select **HAA6** as the target water quality parameter.
3. Enter **24** for the target concentration.
4. In the Output WQ Parameters frame, check the **TOC**, **UV254**, **SDS-TOX**, and **SDS-THM4** checkboxes. **Note:** The **Blended Runtime**, **Single Contactor Runtime**, and the **HAA6** parameters are automatically selected.



- Click the **Calculate** button  to generate the results. The results will appear on the Breakthrough Calculation Results screen. For information on using this screen, refer to the following section on Using the Breakthrough Calculation Results Screen.





5.3. Using the Breakthrough Calculation Results Screen

The Breakthrough Calculation Results screen displays the water quality parameter results at a given runtime for all treatment study runs.



TSSUMID	Flag 1	Flag 2	Flag 3	Flag 4	RTIn (Days)	RTOut (Days)	TOC (mg/L)	UV254 (U/cm)	TOX (µgCl ₂ /L)
1003-1-10	Yes	No	Yes	No	30.95	122.51	2.31	0.030	11
1003-1-20	Yes	No	Yes	No	76.90	228.15	2.08	0.028	1
1003-2-10	Yes	No	Yes	No	41.01	128.61	1.82	0.029	11
1003-2-20	Yes	No	Yes	No	86.37	264.37	1.68	0.026	1
1003-3-10	Yes	No	No	No	37.76	128.21	1.88	0.026	11
1003-3-20	Yes	No	No	No	86.90	238.97	1.77	0.025	1
1003-4-10	Yes	No	Yes	No	34.62	111.42	1.99	0.028	11
1003-4-20	Yes	No	Yes	No	80.96	263.09	1.89	0.024	1
1009-1-10	No	No	No	No	51.54	188.42	1.88	0.028	11
1009-1-20	Yes	No	Yes	No	105.14	298.89	1.40	0.020	1
1009-1-10	Yes	No	No	No	46.53	262.50	1.50	0.018	1
1009-1-20	Yes	No	No	No	166.91	327.00	1.49	0.018	1
1010-1-10	Yes	No	No	No	87.17	207.87	1.44	0.020	11

The four buttons that appear on the screen (one above and three below) are described below:

Button	Icon	Action
Flag Definitions		Displays a description of each flag.
Output to Excel		Exports results directly to Microsoft Excel.
Build Data Queries		Saves the breakthrough calculation results and displays the Build GAC Data Query screen where additional information for each treatment study can be viewed along with the breakthrough results.
Previous Screen		Closes the current screen and displays the Calculate Breakthrough Data screen. The user has the option to save the breakthrough calculation results after clicking this button.

The different columns appearing above the results are described below:

Field Name	Description
TSRunID	<p>Treatment Study Run Identification: A unique ID assigned to each GAC column operated during a treatment study. For example, during most RSSCT treatment studies, eight columns were operated over four quarters. Each column was assigned an ID, hence each RSSCT treatment study was assigned eight TSRunIDs, one for each column.</p> <p>The format of the TSRunID numbering system is:</p> <p style="text-align: center;">Treatment Study#-Quarter-EBCT</p> <p>For example, 1040-1-10 is a TSRunID that corresponds to treatment study #1040 (West End Plant in Topeka, KS) conducted during quarter 1 at an empty-bed contact time (EBCT) of 10 minutes. In a few cases, treatment studies that were conducted at the same EBCT but different pH, pretreatment conditions, or carbon type include an additional descriptor following the EBCT. For example, 1081-3-10pH7.0 and 1081-3-10pH7.5 were conducted at the same EBCT of 10 minutes but at a different influent pH, 1039-3-10 and 1039-3-10EC were conducted at the same EBCT but the latter was conducted under enhanced coagulation pretreatment conditions, and 1010-2-10Bit and 1010-2-10Lig were conducted at the same EBCT but with different carbons (bituminous vs. lignite).</p> <p>The first digit in the four-digit treatment study number corresponds to the following type of treatment study:</p> <p>1xxx: Regular treatment study 3xxx: Study conducted by multiple plants within the same public water system 4xxx: Grandfathered study 5xxx: Dummy study TSID associated with plants that participated in a joint treatment study, but were not considered the primary plant (i.e., PlantICR_2, PlantICR_3). Thus, these TSIDs are included to make their plant information available to the user.</p>
RTsc	Runtime for a single contactor.
RTbl	Calculated runtime for a blended effluent of a multiple, parallel contactor system.
Flag 1, Flag 2, Flag 3, or Flag 4	Exception (Click the Flag Definitions button to view information on each flag).
Water Quality Parameters (with units)	List of water quality parameters selected in the Output WQ Parameters frame from the previous screen.

5.3.1. Flag definitions

The output will display four flag columns. The flag identifies exceptions that were encountered during the calculation. The following table briefly describes each flag. Please refer to Appendix 10.2.1 for a more detailed explanation of each flag.

Flag	Flag Result	Description
1	Yes	The blended runtime (RTbl) entered by the user or that corresponding to the breakthrough criterion entered by the user exceeds the maximum blended contactor runtime (RTbl_max) for the treatment study run (TSRunID). As a result, the value displayed for RTbl is the maximum blended contactor runtime. Furthermore, the concentrations of selected water quality parameters were calculated using the single contactor runtime (RTsc) corresponding to RTbl_max.
2	Yes	The single contactor runtime (RTsc) entered by the user exceeds the maximum single contactor runtime (RTsc_max) for the target water quality parameter and treatment study run (TSRunID). As a result, the value displayed for RTsc is the maximum single contactor runtime. Furthermore, the concentrations of selected water quality parameters were calculated using RTsc_max.
3	Yes	The concentration entered by the user for the target water quality parameter is equal to or exceeds the maximum concentration (C_max) for the treatment study run (TSRunID). If Flag 3 = YES and Flag 1 = NO, then the concentrations of selected water quality parameters were calculated using the single contactor runtime (RTsc) corresponding to C_max. If Flag 3 = YES and Flag 1 = YES, then the concentrations of selected water quality parameters were calculated using the single contactor runtime (RTsc) corresponding to the maximum blended contactor runtime.
4	Yes	The maximum concentration for one or more selected water quality parameters occurred before the displayed runtime. The flag indicates that the breakthrough curve for one or more selected water quality parameters has a maximum concentration that occurs prior to the end of the breakthrough curve.


5.3.2. 88888 or 99999 flags

If a value for a water quality parameter can not be calculated, the database will identify the problem by assigning the parameter a value of 88888 or 99999. Again, please refer to Appendix 10.2.1 for a more detailed description of each flag.


Flag	Description
88888	A value could not be reported for the blended runtime (RTbl) since the value reported for the single contactor runtime (RTsc) exceeds the value of RTsc corresponding to the maximum blended runtime.
99999	A value could not be reported for the specified water quality parameter because the single contactor runtime (RTsc) exceeds the upper or lower bound on single contactor runtime for the equation describing the specified water quality parameter.

5.3.3. Revising the breakthrough calculation criteria


To revise any of the breakthrough criteria or to select additional output water quality parameters, return to the previous screen.

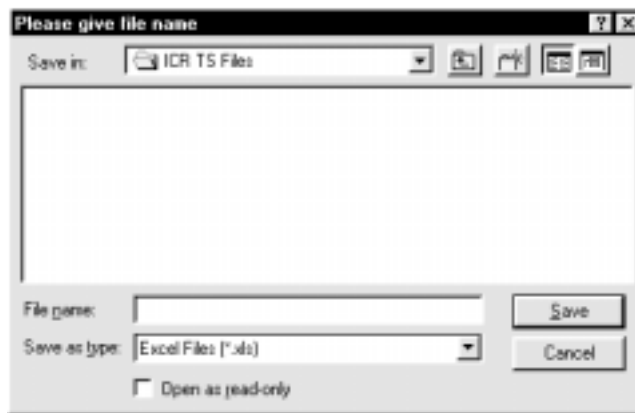
1. Click the **Previous Screen** button  to return to the previous screen. A dialog box will appear prompting you to save the results.
2. Choose **No** if you do not want to save the results.
– or –

Choose **Yes** to save the results. The system will automatically generate an Access table with a name based on the specified breakthrough criteria and target concentration. **Example:** The table name for HAA6 at 24 µg/L is “GAC_HAA6_24”. A table name for blended runtime of 50 days is “GAC_RTbl_50”.

3. Upon returning to the Calculate Breakthrough Data screen, you can revise the target breakthrough criteria and select (or deselect) additional output water quality parameters.
4. Click the **Calculate** button  to generate new results.

5.3.4. Exporting results to Microsoft Excel

1. While viewing the Breakthrough Calculation Results Screen, click the **Output to Excel** button  and the following screen will appear:



2. Select a directory in which the file will be saved.
3. In the **File Name** text box, enter a name for the file. **Note:** It is not necessary to include the file type extension, “.xls”.
4. Click the **Save** button.
5. Microsoft Excel will open with the exported document. You can work with the data in Excel or return to Access.
6. To return to the Treatment Study Database, press **ALT+TAB**.

5.3.5. Building data queries from the results

The calculated data appearing on this screen can be viewed in conjunction with other information specific to the treatment study. Access to other information pertinent to the treatment study is available by building a data query.

1. While viewing the Breakthrough Calculation Results Screen, click the **Build Data Queries** button to view the Build GAC Data Query screen. A dialog box will appear prompting you to save the results.

2. Choose **Yes** to save the results. The system will automatically generate a table with a name based on the specified water quality parameter and target concentration.
Example: The table name for HAA6 at 24 µg/L is “GAC_HAA6_24”. A table name for blended runtime of 50 days is “GAC_RTbl_50”. A dialog box will appear displaying the name of the saved table. Click OK to continue.
3. The Build GAC Data Query screen will appear. Please refer to the following section on GAC Data Queries for instructions on using the Build Data Query screen.

5.4. GAC Data Queries

Now that the breakthrough calculations have been performed, the next step is to modify the breakthrough calculation output by:

- Including additional fields (such as plant name, city, state, influent water quality data, etc.), and
- Filtering results by empty-bed contact time (EBCT), plant name, scale of study, and/or source water category (optional)
 - ☞ The Build Data Query screen can be accessed directly from the GAC Main Menu by clicking on the Build Data Queries button. It is not necessary to generate breakthrough calculation results before building queries.

Once the query is generated, the user can:

- Save the query results as a table in the current database, or
- Export the results to Microsoft Excel.
 - ☞ Queries can be created and modified extensively, limited only by the user’s familiarity with Microsoft Access. Please refer to documentation on Microsoft Access and Chapter 8, Query Results, in this document for further instructions on using and modifying queries.

5.4.1. Viewing the Build Data Queries screen

Click the **Build Data Queries** button. The following screen will appear:

The screen is divided into the following frames:

Frame	Description
Data Tables	Lists the tables that can be linked together. The drop-down boxes next to each table name list the fields available in each table.
Selected Parameters	Lists the fields selected by the user for the query.
Filter Criteria (Optional)	Restricts the output of the query based on values selected by the user.



The five buttons that appear on the bottom of the screen are described below:

Button	Icon	Action
Run Query		Generates results based on the selected parameters and filter criteria
Clear All		Clears all selected tables, fields and filter criteria
View Saved Queries		Views previously saved queries (for advanced users)
Help		Defines the Data Tables and their corresponding Fields
Previous Screen		Closes the current screen and displays the previous screen

5.4.2. Building a query

The following procedure describes how to build a query.

1. Click the **Clear All** button to clear any previously selected fields or filter criteria.
Note: The TSID and TSSRunID fields are displayed by default.


2. In the **Data Tables** frame, select the field names you would like to appear in the output from the drop-down box next to each table name.
 - ☞ Multiple field names can be selected and will appear in the text box to the right. Each field name can only be selected once.
 - ☞ To remove a selected field name, highlight the field name (including the comma) from the Selected Parameters frame and press the Delete key. To remove all field names from a text box, click the  button located to the right of each text box in the Selected Parameters frame.
3. Repeat the above step to select field names from other tables.
4. (Optional) To view calculated data in the output of your query, select a table from the **GAC Effluent WQ Data** field. Repeat steps 2-3 to display fields from the selected GAC Effluent WQ Data table in the output.
 - ☞ As mentioned earlier, the table names in the GAC Effluent WQ Data field are a combination of the water quality parameter and the target concentration (or if the table is based on runtime, the name is a combination of the runtime parameter and the number of days). **Example:** The table name for TOC at 4 mg/L is “GAC_TOC_4”. A table name for blended runtime of 50 days is “GAC_RTbl_50”.
 - ☞ Please refer to the Chapter 9, Maintenance, for information on removing unwanted table names from the Effluent WQ Data list.
5. Click the **Run Query** button  to view the query results.
 - ☞ Please refer to Chapter 8, Query Results, for information on saving, editing, and exporting query results.
6. To return to the Build GAC Data Query screen, choose the **File, Close** menu option. A dialog box will appear prompting you to save the results. Chose **No** if you do not want to save the results, or, chose **Yes** to save the results.

5.4.3. Filtering results

When building a query, results can be filtered so that the only records that appear are those that meet a specified criteria. The fields that can be used for filtering appear in the table below:


Filter Field	Filter Description
EBCT	Selects records from studies conducted at a specific full-scale empty-bed contact time (rounded to the nearest 0.5 minute)
Plant Name	Selects records for a specific plant
Scale of Study	Selects records from bench-, pilot-, or full-scale studies
Source Category	Selects records from surface water (SW) plants or ground water (GW) plants

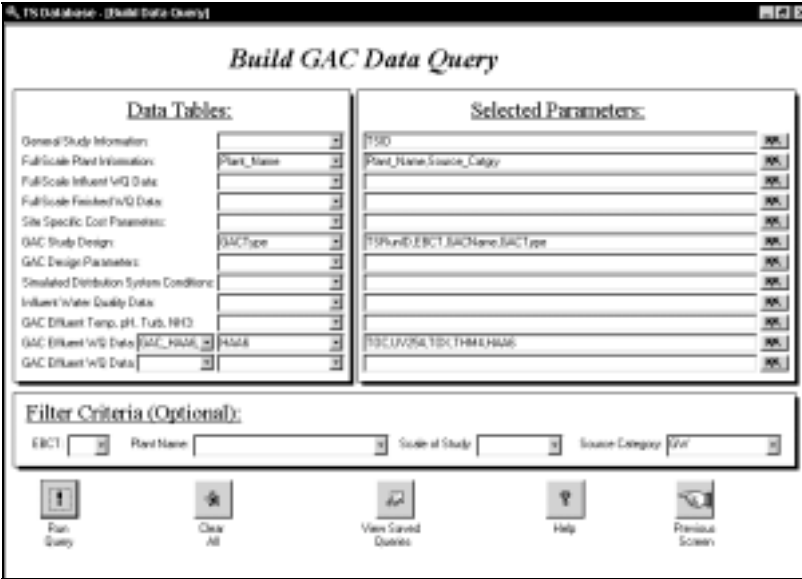
1. In the **Filter Criteria** frame, move the cursor to the field that will be filtered.
2. Select a criterion from the list.
 - ☞ The field selected for filtering will automatically appear in the Selected Parameters frame.

3. (Optional) Repeat the above steps for one or more of the other three filters.
4. Click the **Run Query** button  to view the query results.

5.4.4. Example: building a GAC query

Suppose a user wants to query design data, full-scale plant information, and GAC effluent data for the breakthrough criteria $\text{HAA6} = 24 \mu\text{g/L}$, and wants to filter the output to only show data for studies evaluating groundwater.

1. Click the **Clear All** button  to clear any previously selected fields or filter criteria.
Note: The TSID and TSSRunID fields are displayed by default.
 2. In the **Data Tables** frame, the field names are selected from the drop-down box next to each table name:
 - From the **GAC Study Design** table: **EBCT**, **GACName**, and **GACType**
 - From the **GAC_HAA6_24** table: **TOC**, **UV254**, **TOX**, **THM4**, and **HAA6**
 - From the **Full-Scale Plant Information** table: **Plant_Name**
 3. In the **Filter Criteria** Frame, **Source Category** field, select **GW**
- ☞ **Note:** The **Source_Catgry** parameter from the **Full-Scale Plant Information** table automatically appears in the Selected Parameters frame




Build GAC Data Query

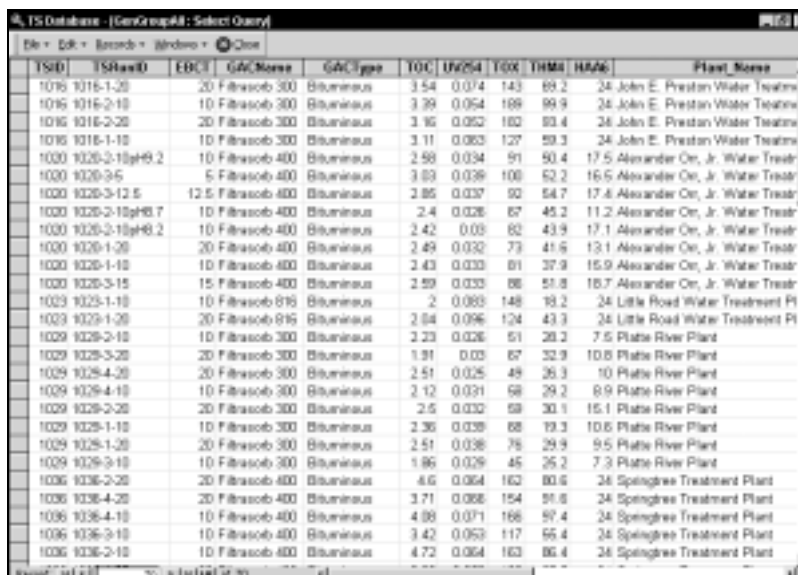
Data Tables:		Selected Parameters:	
General Study Information:		TSID	
Full Scale Plant Information:	Plant_Name	Plant_Name, Source_Catgry	
Full Scale Influent WQ Data:			
Full Scale Effluent WQ Data:			
Site Specific Cost Parameters:			
GAC Study Design:	GACType	TSSRunID, EBCT, GACName, GACType	
GAC Design Parameters:			
Simulated Distribution System Conditions:			
Influent Water Quality Data:			
GAC Effluent Temp, pH, Turb, NH3:			
GAC Effluent WQ Data:	GAC_HAA6	TOC, UV254, TOX, THM4, HAA6	
GAC Effluent WQ Data:			

Filter Criteria (Optional):

EBCT: Plant Name: Scale of Study: Source Category: GW

Run Query Clear All View Saved Queries Help Previous Screens

4. Click the **Run Query** button  to view the query results. The following screen showing the results will appear.



TSID	TSHawID	EOC	GACName	GACType	TOC	UF254	TOX	THMA	HAAS	Plant Name
1016	1016-1-20	20	Filtracarb 300	Bituminous	3.54	0.074	143	89.2	24	John E. Preston Water Treatme
1016	1016-2-10	10	Filtracarb 300	Bituminous	3.39	0.054	189	99.9	24	John E. Preston Water Treatme
1016	1016-2-20	20	Filtracarb 300	Bituminous	3.16	0.052	182	93.4	24	John E. Preston Water Treatme
1016	1016-1-10	10	Filtracarb 300	Bituminous	3.11	0.063	127	59.3	24	John E. Preston Water Treatme
1020	1020-2-10pH6.2	10	Filtracarb 400	Bituminous	2.98	0.034	91	50.4	17.5	Alexander Cer, Jr. Water Treatr
1020	1020-3-5	5	Filtracarb 400	Bituminous	3.83	0.039	108	52.2	15.5	Alexander Cer, Jr. Water Treatr
1020	1020-3-12.5	12.5	Filtracarb 400	Bituminous	3.85	0.037	92	54.7	17.8	Alexander Cer, Jr. Water Treatr
1020	1020-2-10pH6.7	10	Filtracarb 400	Bituminous	2.4	0.026	67	45.2	11.2	Alexander Cer, Jr. Water Treatr
1020	1020-2-10pH6.2	10	Filtracarb 400	Bituminous	2.42	0.03	62	43.9	17.1	Alexander Cer, Jr. Water Treatr
1020	1020-1-20	20	Filtracarb 400	Bituminous	2.49	0.032	73	41.5	13.1	Alexander Cer, Jr. Water Treatr
1020	1020-1-10	10	Filtracarb 400	Bituminous	2.43	0.033	81	37.9	15.9	Alexander Cer, Jr. Water Treatr
1020	1020-3-15	15	Filtracarb 400	Bituminous	2.59	0.033	86	51.8	18.7	Alexander Cer, Jr. Water Treatr
1023	1023-1-10	10	Filtracarb 815	Bituminous	2	0.083	148	19.2	24	Little Road Water Treatment Pl
1023	1023-1-20	20	Filtracarb 815	Bituminous	2.84	0.096	124	43.3	24	Little Road Water Treatment Pl
1029	1029-2-10	10	Filtracarb 300	Bituminous	2.23	0.026	51	28.2	7.5	Platte River Plant
1029	1029-3-20	20	Filtracarb 300	Bituminous	1.91	0.03	67	32.9	10.8	Platte River Plant
1029	1029-4-20	20	Filtracarb 300	Bituminous	2.51	0.025	49	35.3	10	Platte River Plant
1029	1029-4-10	10	Filtracarb 300	Bituminous	2.12	0.031	58	29.2	8.9	Platte River Plant
1029	1029-2-20	20	Filtracarb 300	Bituminous	2.5	0.032	59	30.1	15.1	Platte River Plant
1029	1029-1-10	10	Filtracarb 300	Bituminous	2.36	0.039	68	19.3	10.6	Platte River Plant
1029	1029-1-20	20	Filtracarb 300	Bituminous	2.51	0.038	75	29.9	9.5	Platte River Plant
1029	1029-3-10	10	Filtracarb 300	Bituminous	1.86	0.029	45	25.2	7.3	Platte River Plant
1036	1036-2-20	20	Filtracarb 400	Bituminous	4.6	0.064	162	80.6	24	Springree Treatment Plant
1036	1036-4-20	20	Filtracarb 400	Bituminous	3.71	0.066	154	91.6	24	Springree Treatment Plant
1036	1036-4-10	10	Filtracarb 400	Bituminous	4.98	0.071	166	97.4	24	Springree Treatment Plant
1036	1036-3-10	10	Filtracarb 400	Bituminous	3.42	0.053	117	55.4	24	Springree Treatment Plant
1036	1036-2-10	10	Filtracarb 400	Bituminous	4.72	0.064	163	85.4	24	Springree Treatment Plant

☞ Please refer to Chapter 8, Query Results, for information on saving, editing, and exporting query results.

5. To return to the Build GAC Data Query screen, choose the **File, Close** menu option. A dialog box will appear prompting you to save the results. Chose **No** if you do not want to save the results, or, chose **Yes** to save the results.

6. Membrane TS Data

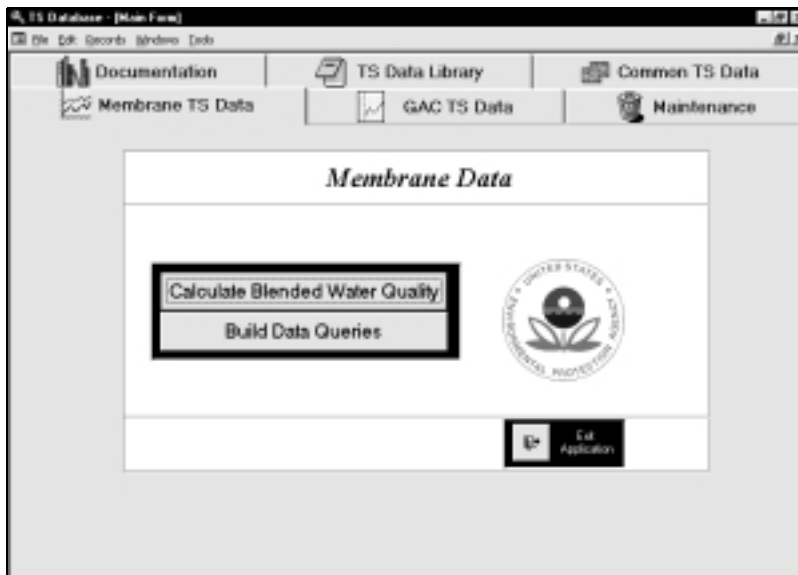
The Membrane TS Data module is used to:

- Conduct blending calculations for different water quality criteria defined by the user
- Build queries linking information from various membrane tables, including blending calculation tables.

All of the results generated in the Membrane Data Module can be saved within the database and can be exported to Microsoft Excel.

6.1. Viewing the Membrane Data screen




When viewing the Main Form, select the **Membrane TS Data** tab. The Membrane Data page will appear.



The definitions for key terms used throughout the Membrane TS Data chapter are listed below:

Term	Definition
Blend Ratio	Blend ratio (i.e., permeate-to-total flow ratio) necessary to achieve the target concentration.
System/Stage Designation	The system or stage designation for water quality and productivity data. The database assigns the following numerical values to the each stage and the system: System = 0 Stage 1 = 1 Stage 2 = 2 Stage 3 = 3
Membrane Name	Manufacturer trade name of the membrane evaluated for the study.
Target WQ Parameter	Water quality parameter (i.e., TOC or HAA6) used to establish a target concentration.
Target Concentration	The target concentration of the water quality parameter.
Scale of Study	Whether the study was conducted at a bench-, pilot- or full-scale level.
Source Category	Whether the source water is a ground water or a surface water.

The Membrane Data page has three buttons described below:

Button	Icon	Action
Calculate Blended Water Quality		Displays the Calculate Blended Water Quality Screen used to perform blending calculations
Build Data Queries		Displays the Build Membrane Data Query screen used to link information from various membrane tables.
Exit Application		Exits the database

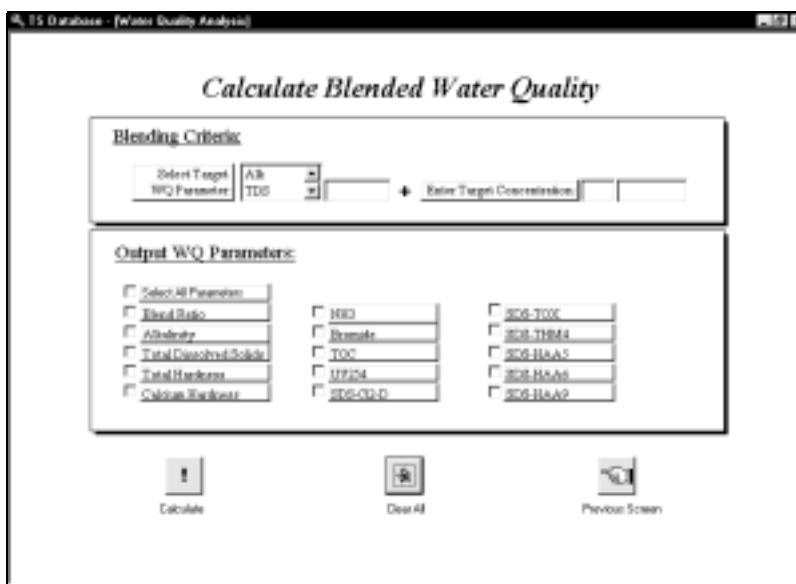
Based on the selected criteria, the database will generate blended water quality data at a given blend ratio for the selected water quality parameters for each treatment study run. The blended water quality is calculated from mass balance equations, influent water quality and permeate water quality values stored in the database. For more information on the algorithm used to calculate membrane blended water quality, refer to the *Base Analysis Document: Membrane Studies*.

6.2. Membrane Blending Calculations

The first step in viewing the results of the Membrane Data Module of the database is to generate the blended water quality data according to user specified treatment objectives.

6.2.1. Viewing the Calculate Blended Water Quality screen




Click the **Calculate Blended Water Quality** button. The following screen will appear:



The Calculate Blended Water Quality screen is divided into two frames described below:



Frame	Description
Blending Criteria	Select the water quality parameter and target concentration that will be used in the blending algorithm.
Output WQ Parameters	Select additional water quality parameters to be displayed when the blending data is generated.

The three buttons that appear on the bottom of the screen are described below:

Button	Icon	Action
Calculate		Generates blended water quality data based on user-entered criteria. ☞ For information on the blending calculation algorithm, please refer to the <i>Base Analysis Document: Membrane Studies</i>
Clear All		Clears all selected blending criteria and output parameters.
Previous Screen		Closes the current screen and displays the Membrane Data page.


6.2.2. Generating blended water quality data

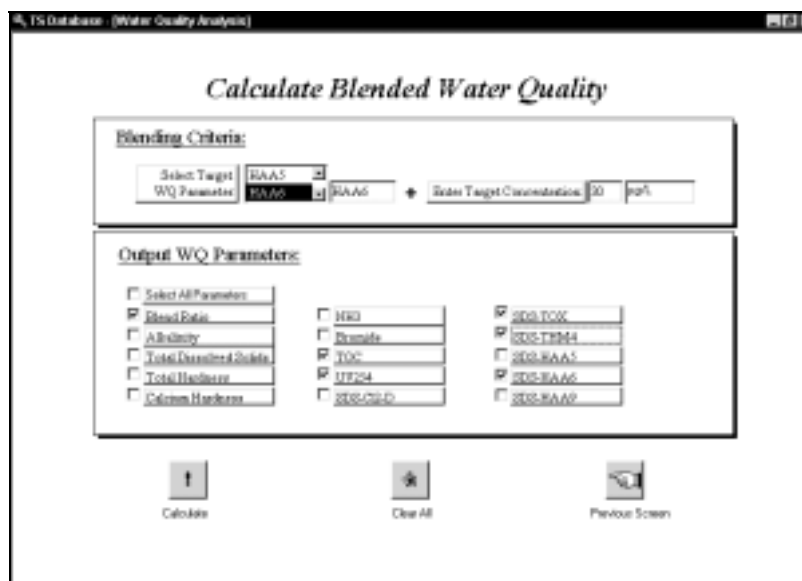
To generate blended water quality data for all selected parameters based on a user defined blending criteria, follow the steps outlined below.



1. Click the **Clear All** button  to clear any previously selected criteria.
2. In the **Blending Criteria** frame, select a **Target WQ Parameter** from the list box by double-clicking the selected parameter. The parameter will appear in the field to the right of the list.
3. Enter a target concentration in the **Target Concentration** field. (Concentrations must be entered in the specified units.)
☞ **Note:** If the target concentration lies outside of the feed-permeate concentration range, then blending cannot be used to achieve the target concentration. In this case, Flag 2 will indicate the exception. Please refer to the flag definitions in Section 6.3 for further explanation.
4. In the **Output WQ Parameters** frame, select the desired water quality parameters for which blended concentrations are desired. **Note:** The Blend Ratio and the parameter selected in the Blending Criteria frame are automatically selected.
☞ To select all parameters, check the **Select All Parameters** box at the top of the list.
5. Click the **Calculate** button  to generate the blended data.
6. The results will appear in the Blended Water Quality Results screen. For information on using this screen, refer to Section 6.3, Using the Blended Water Quality Results Screen.

6.2.3. Example: generating results for a target water quality parameter

Suppose you are interested in answering the following question: What is the blend ratio for a blended HAA6 concentration of 30 µg/L? Also, what are the corresponding blended concentrations of SDS-THM4, SDS-TOX, TOC, and UV₂₅₄?

1. Click the **Clear All** button  to clear any previously selected criteria.
2. In the Blending Criteria frame, select **HAA6** as the water quality parameter.
3. Enter **30** for the target concentration.
4. In the Output WQ Parameters frame, select **TOC, UV254, SDS-TOX, and SDS-THM4**. **Note:** The **Blend Ratio** and **HAA6** parameters have already been selected.



5. Click the **Calculate** button  to generate the results. The results will appear in the Blended Water Quality Results screen. For information on using this screen, refer to the following section on Using the Blended Water Quality Results Screen
-  **Note:** Blended water quality is calculated from the **system** influent and the **system** permeate water quality data; thus, blended water quality cannot be predicted for the individual stages.

6.3. Using the Blended Water Quality Results





The Blended Water Quality Results screen displays the results of the blending calculations.

TSTRUNID	Flag1	Flag2	BlendRatio	TOC_B (mg/L)	UAC254_B (l/cm)	TOC_B (µgC/L)	THM4_B (µg/L)
1001-1-TFC-S	N/A	0	0.932	1.20	0.002	127	
1002-1-CALP	N/A	0	0.819	0.78	0.012		
1002-1-ESMAJ	N/A	0	0.476	1.62	0.022		
1002-1-LFC1	N/A	0	0.990	0.40	0.011		
1002-2-CALP	N/A	1	1.000	0.38	0.024		
1002-2-ESMAJ	N/A	1	1.000	0.77	0.012		
1002-2-LFC1	N/A	0	0.911	0.63	0.017		
1002-3-CALP	N/A	0	0.906	0.58	0.031		
1002-3-ESMAJ	N/A	1	1.000	1.98	0.037		
1004-1-NF45	N/A	0	0.386	2.09	0.033	155	
1004-1-NTR7450	N/A	0	0.680	2.02	0.065	163	
1004-2-NF45	N/A	0	0.587	1.69	0.024	134	
1004-2-NTR7450	N/A	0	0.788	1.67	0.059	138	
1004-3-NF45	N/A	0	0.688	1.23	0.020	135	
1004-3-NTR7450	N/A	0	0.754	0.94	0.023	146	

The different columns appearing above the results are described below:

Field Name	Description
TSTRUNID	<p>Treatment Study Run Identification: A unique ID assigned to each membrane during each session of a treatment study. For example, RBSMT treatment studies typically evaluated two membranes over four quarters. Each membrane run was assigned an ID, hence each RBSMT treatment study was assigned eight TSTRUNIDs, one for each membrane for each session. For more information on the determination of TSTRUNIDs, please see the <i>Base Analysis Document: Membrane Studies</i>.</p> <p>The format of the TSTRUNID numbering system is:</p> <p style="text-align: center;">Treatment Study#-Session-Membrane Name</p> <p>For example, 1004-1-NF45 is a TSTRUNID that corresponds to treatment study 1004 (Lake Kilby Water Treatment Facility in Portsmouth, VA) conducted during quarter 1 using a NF45 membrane.</p> <p>The first digit in the four-digit treatment study number corresponds to the following type of treatment study:</p> <ul style="list-style-type: none"> 1xxx: Regular treatment study 3xxx: Study conducted by multiple plants within the same public water system 4xxx: Grandfathered study 5xxx: Dummy study TSID associated with plants that participated in a joint treatment study, but were not considered the primary plant (i.e., PlantICR_2, PlantICR_3). Thus, these TSIDs are included to make their plant information available to the user.
Flag 1, Flag 2	Exception (Click the Flag Definitions button to view information on each flag).
BlendRatio	Blend ratio (i.e., permeate-to-total flow ratio) needed to achieve the target concentration.
Water Quality Parameters (with units)	List of water quality parameters selected in the Output WQ Parameters frame from the previous screen.

The four buttons that appear on the Blended Water Quality Results screen (one above and three below) are described below:

Button	Icon	Action
Flag Definitions		Displays a description of each flag.
Output to Excel		Exports results directly to Microsoft Excel.
Build Data Queries		Saves the blending calculation results and displays the Build Membrane Data Query screen where additional information for each treatment study can be viewed along with the blending results.
Previous Screen		Closes the current screen and displays the Calculate Blended Water Quality screen. The user has the option to save the breakthrough calculation results after clicking this button.


6.3.1. Flag definitions

The output will display two flag columns. The flags identify exceptions that were encountered during the calculation. The table below briefly describes each flag. Please refer to Appendix 10.2.2 for a more detailed explanation of each flag.

Flag	Flag Result	Description
1	Yes	For a treatment study run (TSRunID) with Flag 1 = 'Yes', the permeate concentration exceeds the influent concentration for the target water quality parameter. In this case, nanofiltration may not be an appropriate process to achieve the target treatment objective, and a blend ratio of '0' is calculated resulting in a blended concentration (C_B) equal to the influent concentration (C_IN).
2	1	For a treatment study run (TSRunID) with Flag 2 = '1', the permeate concentration for the target water quality parameter is greater than the target concentration. In this case, nanofiltration cannot achieve the target treatment objective, and a blend ratio of '1' is calculated resulting in a blended concentration (C_B) equal to the permeate concentration (C_P).
	0	For a treatment study run (TSRunID) with Flag 2 = '0', the concentration for the target water quality parameter is between the permeate and influent concentrations. In this case, the permeate to total flow blend ratio will achieve the target treatment objective.
	-1	For a treatment study run (TSRunID) with Flag 2 = '-1', the influent concentration for the target water quality parameter is less than the target concentration. In this case, nanofiltration is not required to achieve the target treatment objective, and a blend ratio of '0' is calculated resulting in a blended concentration (C_B) equal to the influent concentration (C_IN).


6.3.2. Revising the blending criteria

To revise any of the previously selected criteria or to select additional output water quality parameters, return to the previous screen.

1. Click the **Previous Screen** button  to return to the previous screen. A dialog box will appear prompting you to save the results.
2. Choose **No** if you do not want to save the results.

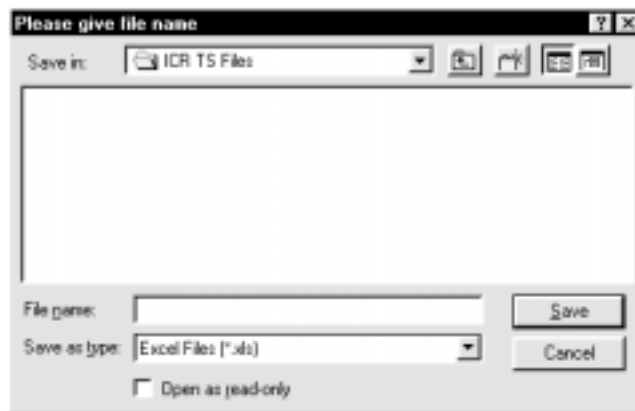
-or-

Choose **Yes** to save the results. The system will automatically generate an Access table with a name based on the selected water quality parameter and target concentration. **Example:** The table name for HAA6 at 30 µg/L is “MEM_HAA6_30”.

3. Revise the target water quality parameter and select (or deselect) additional output water quality parameters.
4. Click the **Calculate** button  to generate new results.

6.3.3. Exporting results to Microsoft Excel


1. Click the **Output to Excel** button  and the following screen will appear:



2. Select a directory in which the file will be saved.
3. Enter a name in the **File Name** text box. **Note:** It is not necessary to include the file type extension, “.xls”.
4. Click the **Save** button.
5. Microsoft Excel will open with the exported document. You can work with the data in Excel or return to Access.
6. To return to the Treatment Study Database, press **ALT+TAB**.

6.3.4. Building data queries from the results

The calculated data appearing on this screen can be viewed in conjunction with other information specific to the treatment study. Access to other information pertinent to the treatment study can be viewed by building a data query.

1. Click the **Build Data Queries** button  to view the Build Membrane Data Query screen. A dialog box will appear prompting you to save the results.
2. Choose **Yes** to save the results. The system will automatically generate a table with a name based on the selected water quality parameter and target concentration.
Example: The table name for HAA6 at 30 µg/L is “MEM_HAA6_30”.
3. The Build Membrane Data Query screen will appear. Please refer to the following section on Membrane Data Queries for instructions on using the Build Data Query screen.

6.4. Membrane Data Queries

Now that the blending calculations have been performed, the next step is to modify the blending calculation output by:

- Including additional fields (such as plant name, city, state, influent water quality data, etc.); and
- Filtering results by membrane name, plant name, scale of study, source water category, and/or system/stage designation.

The Build Membrane Data Query screen can be accessed directly from the Membrane Main Menu by clicking on the Build Data Queries button. It is not necessary to generate blended water quality results before building queries.

Once the query is generated, the user can:

- Save the query results as a table in the current database; or
- Export results to Microsoft Excel.

Queries can be created and modified extensively, limited only by the user's familiarity with Microsoft Access. Please refer to documentation on Microsoft Access and Chapter 8, Query Results, in this document for further instructions on using and modifying queries.

6.4.1. Viewing the Build Data Queries screen

Click the **Build Data Queries** button. The following screen will appear:

The screen is divided into the following frames:




Frame	Description
Data Tables	Lists the tables that can be linked together. The drop-down boxes next to each table name list the fields available in each table.
Selected Parameters	Lists the fields selected by the user for the query.
Filter Criteria (Optional)	Restricts the output of the query based on values selected by the user.

The five buttons that appear on the right side of the screen are described below:

Button	Icon	Action
Run Query		Generates results based on the selected parameters and filter criteria
Clear All		Clears all selected tables, fields and filter criteria
View Saved Queries		Views previously saved queries (for advanced users)
Help		Defines the Data Tables and their corresponding Fields
Previous Screen		Closes the current screen and displays the previous screen

6.4.2. Building a query

The following procedure describes how to build a query:


1. Click the **Clear All** button  to clear any previously selected fields or filter criteria.
Note: The TSID and TSSRunID fields are displayed by default.
2. In the **Data Tables** frame, select the field names you would like to appear in the output from the drop-down box next to each table name.
 - ☞ Multiple field names can be selected and will appear in the text box to the right. Each field name can only be selected once.
 - ☞ To remove a selected field name, highlight the field name (including the comma) from the Selected Parameters frame and press the Delete key. To remove all field names from a text box, click the  button located to the right of each text box in the Selected Parameters frame.
3. Repeat the above step to select field names from other tables.
4. (Optional) To view calculated data in the output of your query, select a table from the **NF Blended WQ Data** drop-down box. Repeat steps 2-3 to display fields from the selected NF Blended WQ Data table in the output.
 - ☞ The table names in the NF Blended WQ Data field are a combination of the water quality parameter and the target concentration.
5. Click the **Run Query** button  to view the query results. A screen showing the results of the query will appear.
 - ☞ Please refer to Chapter 8, Query Results, for information on saving, editing and exporting query results.
6. To return to the Build Data Query screen, choose the **File, Close** menu option. A dialog box will appear prompting you to save the results. Chose **No** if you do not want to save the results, or, chose **Yes** to save the results.

6.4.3. Filtering results

When building a query, you can filter the results so that the only records that appear are those that meet a specified criteria. The fields that can be used for filtering appear in the table below:

Filter Field	Filter Description
Plant Name	Selects records from a study conducted by a specific plant
System/Stage Designation	Selects water quality or productivity data for stage 1, 2 or 3 or the entire system ☞ For more information, please refer to Section 6.4.4, System/Stage Designation
Source Category	Selects records from surface water (SW) plants or ground water (GW) plants
Membrane Name	Selects records from studies in which a specific membrane was evaluated
Scale of Study	Selects records from bench-, pilot-, or full-scale studies

1. In the **Filter Criteria** frame, move the cursor to a field that will be filtered.

2. Select a criteria from the list.
 - ☞ The field name selected for filtering will automatically appear above in the Selected Parameters frame.
3. (Optional) Repeat the above steps for one or more of the other four filters.
4. Click the **Run Query** button  to view the query results.

6.4.4. System/Stage designation

The System/Stage Designation field is included in four tables in the membrane module of the database: Membrane Productivity, Predicted Permeate WQ, Predicted Concentrate WQ, and Differential WQ Model Design. This field allows you to filter a query to display data for an individual stage or for the system.

- ☞ A user cannot select System/Stage Designation as a filter criteria unless a parameter from one of the four tables listed above is selected.

The following table summarizes the stage and system data that is available from the various types of membrane studies conducted during the ICR:

Study Type	Membrane Productivity	Predicted Permeate WQ	Predicted Concentrate WQ	Differential WQ Model Design
3-stage pilot- or full-scale	System and Stages 1, 2 & 3	System and Stages 1, 2 & 3	System and Stages 1, 2 & 3	System and Stages 1, 2 & 3
2-stage pilot- or full-scale	System and Stages 1 & 2	System and Stages 1, 2 & 3	System and Stages 1, 2 & 3	System and Stages 1, 2 & 3
LTSEBST SEBST RBSMT	System	System and Stages 1, 2 & 3	System and Stages 1, 2 & 3	System and Stages 1, 2 & 3

Since productivity data is derived directly from the raw treatment study data, **stage** productivity data is only available from studies that used a staged membrane system; however, all studies include **system** productivity data. Studies that used a 2-stage system will also have productivity data for stages 1 and 2, and studies that used a 3-stage system will also have productivity data for stages 1, 2 and 3.

Predicted permeate and concentrate water quality data is derived from the differential WQ model, which is designed to scale-up the water quality results from any study type to a full-scale, 3-stage array. Therefore, all studies will have **predicted** permeate and concentrate water quality for the system as well as for stages 1, 2 and 3.


Influent, concentrate, permeate and osmotic pressures were predicted and used in the differential WQ model. These predicted parameters are listed in the Membrane Productivity table for the system, and all three stages, for every membrane TSSRunID.

The model used to scale-up the water quality results required the development of a full-scale, 3-stage system configuration. Specifically, the model required the number of pressure vessels, the number of membrane elements, and the membrane area to be defined for each stage. This information is reported in the Differential WQ Model Design table for each TSSRunID. In all cases, a 3-2-1 array was used in the model, with 3 pressure vessels in the first stage, 2 pressure vessels in the second stage and 1 pressure vessel in the third stage. Six elements were specified for each pressure vessel resulting in 18 elements in the first stage, 12 elements in the second stage and 6 elements in the third stage. For more information on the model and full-scale design assumptions used to scale up the permeate and concentrate water quality data, see *Base Analysis Document: Membrane Studies*.

The following tables contain records that are specific to the system or to an individual stage: Membrane Productivity, Predicted Permeate WQ, Predicted Concentrate WQ, and Differential WQ Model Design. The fields in all other tables are applicable to **both** the system and individual stages. For example, the system influent water quality data can be queried with both the system and the stage permeate water quality data. In the following example query results, the influent TOC concentration is the same for the system and stages 1, 2 and 3, while the permeate TOC concentration is different for the system and each stage.


TSSID	TSSRunID	Stg_Num	TOC_P (mg/L)	TOC_W_AWG (mg/L)
1001	1001-1-TFC-S	0	0.30	12.57
1001	1001-1-TFC-S	1	0.20	12.67
1001	1001-1-TFC-S	2	0.40	12.57
1001	1001-1-TFC-S	3	0.76	12.57
1002	1002-1-CALP	0	0.31	2.81
1002	1002-1-CALP	1	0.19	2.81
1002	1002-1-CALP	2	0.34	2.81
1002	1002-1-CALP	3	0.63	2.81
1002	1002-1-ESNAI	0	0.25	2.86
1002	1002-1-ESNAI	1	0.26	2.86
1002	1002-1-ESNAI	2	0.25	2.86
1002	1002-1-ESNAI	3	0.25	2.86
1002	1002-1-LFC1	0	0.25	14.73
1002	1002-1-LFC1	1	0.26	14.73
1002	1002-1-LFC1	2	0.25	14.73
1002	1002-1-LFC1	3	0.25	14.73
1002	1002-2-CALP	0	0.36	13.49
1002	1002-2-CALP	1	0.20	13.49
1002	1002-2-CALP	2	0.41	13.49
1002	1002-2-CALP	3	0.60	13.49
1002	1002-2-ESNAI	0	0.77	19.40
1002	1002-2-ESNAI	1	0.77	19.40
1002	1002-2-ESNAI	2	0.77	19.40
1002	1002-2-ESNAI	3	0.77	19.40
1002	1002-2-LFC1	0	0.31	3.68
1002	1002-2-LFC1	1	0.31	3.68
1002	1002-2-LFC1	2	0.31	3.68

In the Stg_Num field, the System is designated as “0,” while stages are designated by their respective numbers (i.e., 1, 2, or 3). The System/Stage Designation filter criteria can be used when a user wishes to view only the data for the system, or for one of the stages. If you wish to view data for the system and all three stages, then leave the System/Stage Designation filter blank.

 **Note:** Blended water quality can only be viewed for the system; thus, when a parameter from the NF Blended WQ tables is selected, the System/Stage Designation filter is automatically set to “System.” Conversely, fields from the NF Blended WQ tables cannot be queried if the user has selected one of the Stages as a filter criteria.

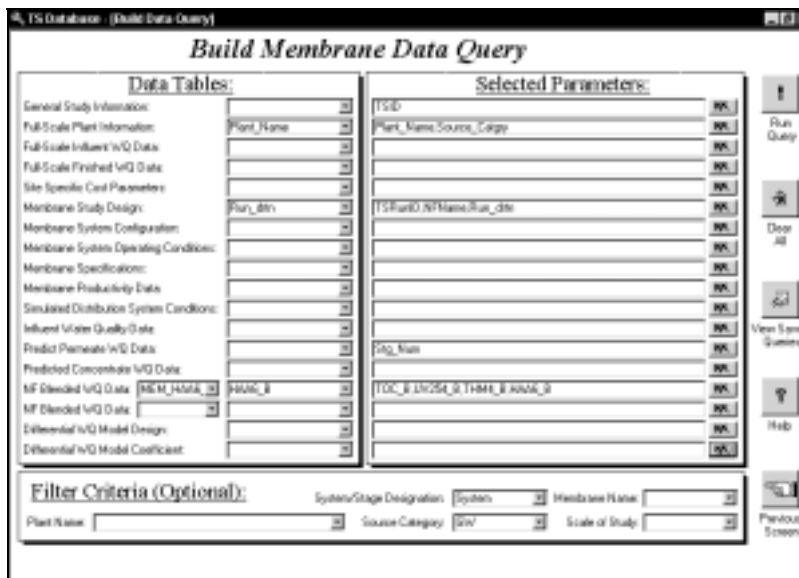
6.4.5. Example: building a membrane query

Suppose a user wants to query design data, full-scale plant information, and blended water quality data for the blending criteria HAA6 = 30 µg/L, and wants to filter the output to only show data for studies evaluating groundwater.

1. Click the **Clear All** button  to clear any previously selected fields or filter criteria.
Note: The TSID and TSSRunID fields are displayed by default.
 2. In the **Data Tables** frame, the field names are selected from the drop-down box next to each table name:
 - From the **Membrane Study Design** table: **NFName** and **Run_drtn**
 - From the **MEM_HAA6_30** table: **TOC_B**, **UV254_B**, **THM4_B**, and **HAA6_B**

☞ **Note:** When the user selects a parameter from a NF Blended WQ table, the **Stg_Num** parameter from the **Predict Permeate WQ Data** table is automatically selected and the System/Stage Designation filter is automatically set to “**System**”

 - From the **Full-Scale Plant Information** table: **Plant_Name**
 - 3. In the **Filter Criteria** Frame, **Source Category** field, select **GW**
- ☞ **Note:** The **Source_Catgry** parameter from the **Full-Scale Plant Information** table automatically appears in the Selected Parameters frame




Build Membrane Data Query

Data Tables:		Selected Parameters:	
General Study Information:		TSID	
Full-Scale Plant Information:	Plant_Name	Plant_Name,Source_Catgry	
Full-Scale Influent WQ Data:			
Full-Scale Finished WQ Data:			
Site Specific Cost Parameters:			
Membrane Study Design:	Run_drtn	TSSRunID, NFName,Run_date	
Membrane System Configuration:			
Membrane System Operating Conditions:			
Membrane Specifications:			
Membrane Productivity Data:			
Simulated Distribution System Conditions:			
Influent Water Quality Data:			
Predict Permeate WQ Data:		Stg_Num	
Predicted Concentrate WQ Data:			
NF Blended WQ Data:	MEM_HAA6_30	TOC_B, UV254_B, THM4_B, HAA6_B	
MF Blended WQ Data:			
Differential WQ Model Design:			
Differential WQ Model Coefficient:			

Filter Criteria (Optional):

System/Stage Designation: System Membrane Name:
 Plant Name: Source Category: GW Scale of Study:
 Run Query, Clear All, View Screen, Help, Previous Screen

4. Click the **Run Query** button  to view the query results. The following screen showing the results will appear.



TSD	TSDName	Stg Nam	NFName	Run dtn	Plant Name	Source	Catgy	TOC	B	UF
1001	1001-1-TFC-S	0	TFC-S	365	Palm Beach County WTP-3	GW		1.3		
1005	1005-1-NF7D	0	NF7D	183	Boynton Beach Membrane Plant	GW		1.3		
1005	1005-2-NF7D	0	NF7D	189	Boynton Beach Membrane Plant	GW		1.4		
1006	1006-1-PvD1	0	PvD1	388	North Collier Regional Treatment Plant	GW		1.87		
1013	1013-1-ESNA1	0	ESNA1	183	Glades Road Water Treatment Plant	GW		1.43		
1013	1013-1-NF200B	0	NF200B	189	Glades Road Water Treatment Plant	GW		1.83		
1014	1014-1-BW3D	0	BW3D	76	Ralph Brennan Plant	GW		2.27		
1014	1014-2-BW3D	0	BW3D	188	Ralph Brennan Plant	GW		2.07		
1017	1017-1-TFC-S	0	TFC-S	113	Hialeah Water Treatment Plant	GW		2.71		
1017	1017-2-TFC-S	0	TFC-S	285	Hialeah Water Treatment Plant	GW		2.8		
1032	1032-1-NTR745D	0	NTR745D	6	Fresh Water Treatment Plant	GW		2.44		
1032	1032-1-TFC-SR	0	TFC-SR	6	Fresh Water Treatment Plant	GW		2.02		
1032	1032-2-NTR745D	0	NTR745D	7	Fresh Water Treatment Plant	GW		2.27		
1032	1032-2-TFC-SR	0	TFC-SR	7	Fresh Water Treatment Plant	GW		1.99		
1032	1032-3-NTR745D	0	NTR745D	7	Fresh Water Treatment Plant	GW		2.27		
1032	1032-3-TFC-SR	0	TFC-SR	6	Fresh Water Treatment Plant	GW		1.25		
1032	1032-4-NTR745D	0	NTR745D	6	Fresh Water Treatment Plant	GW		2.13		
1032	1032-4-TFC-SR	0	TFC-SR	6	Fresh Water Treatment Plant	GW		1.64		
1035	1035-1-ESNA1	0	ESNA1	9	Magate Groundwater Treatment Plant	GW		2.08		
1035	1035-1-NF200B	0	NF200B	23	Magate Groundwater Treatment Plant	GW		2.62		
1035	1035-1-NF7D	0	NF7D	23	Magate Groundwater Treatment Plant	GW		2.68		
1035	1035-1-TFC-S	0	TFC-S	9	Magate Groundwater Treatment Plant	GW		2		
1035	1035-2-ESNA1	0	ESNA1	4	Magate Groundwater Treatment Plant	GW		2.1		
1035	1035-2-NF200B	0	NF200B	4	Magate Groundwater Treatment Plant	GW		1.93		
1035	1035-2-NF7D	0	NF7D	5	Magate Groundwater Treatment Plant	GW		2.25		
1035	1035-2-TFC-S	0	TFC-S	5	Magate Groundwater Treatment Plant	GW		2.23		
1052	1052-1-NTR745D	0	NTR745D	9	City of Hollywood Water Treatment Plant	GW		1.34		

☞ Please refer to Chapter 8, Query Results, for information on saving, editing, and exporting query results.

5. To return to the Build Membrane Data Query screen, choose the **File, Close** menu option. A dialog box will appear prompting you to save the results. Chose **No** if you do not want to save the results, or, chose **Yes** to save the results.

7. Common TS Data


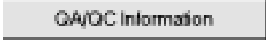
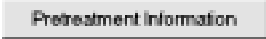

The Common TS Data module is used to view information common to GAC and membrane treatment studies, such as general information (full-scale information and water quality data, cost parameters, SDS conditions, influent water quality data), QA/QC information, and pretreatment information. The general information and limited pretreatment information are also available in the Build Data Query screens for both GAC and membrane studies; however, the QA/QC and extensive pretreatment information are not. All of the results generated in this module can be saved within the database and can be exported to Microsoft Excel.

7.1. Viewing the Common TS Data screen

When viewing the Main Form, select the **Common TS Data** tab. The Common Data page will appear.



The Common Data page has the following buttons:

Button	Icon	Action
General Information		Displays a query screen for viewing general information about treatment studies
QA/QC Information		Displays a query screen for viewing quality control data for the analyses conducted during the treatment study
Pretreatment Information		Displays a query screen for viewing pretreatment information for each treatment study
Exit Application		Exits the database

7.2. General Information






The General Information screen can be used to view and query:

- Full-scale plant information
- Full-scale influent and finished water quality parameters
- Site-specific cost parameters
- Simulated distribution system (SDS) conditions
- Influent water quality data for the treatment study

7.2.1. Viewing the General Information screen

When viewing the Common TS Data page, click the **General Information** button. The General Information Query screen will appear.




The five buttons that appear on the bottom of the screen are described below:

Button	Icon	Action
Run Query		Generates results based on the selected parameters and filter criteria
Clear All		Clears all selected fields and filter criteria
View Saved Queries		Views previously saved queries (for advanced users)
Help		Defines the Data Tables and their corresponding Fields
Previous Screen		Closes the current screen and displays the previous screen

The General Information Data Query screen is divided into the following frames:

Frame	Description
Data Tables	Lists the tables that can be linked together. The drop-down boxes next to each table name list the fields available in each table.
Selected Parameters	Lists the fields selected by the user for the query.
Filter Criteria (Optional)	Restricts the output of the query based on values selected by the user.

7.2.2. Building a query


1. Click the **Clear All** button  to clear all fields. **Note:** The TSID field is displayed by default.
2. In the **Data Tables** frame, select the field names you would like to appear in the output from the drop-down box next to each table name.
 - ☞ Multiple field names can be selected and will appear in the text box to the right. Each field name can only be selected once.
 - ☞ To remove a selected field name, highlight the field name (including the comma) from the Selected Parameters frame and press the Delete key. To remove all field names from a text box, click the  button located to the right of each text box in the Selected Parameters frame.
3. Repeat the above step to select field names from other tables.
4. Click the **Run Query** button  to view the query results. A screen showing the results of the query will appear.
 - ☞ Please refer to Chapter 8, Query Results, for information on saving, editing, and exporting query results.
5. To return to the General Information Query screen, choose the **File, Close** menu option. A dialog box will appear prompting you to save the results. Chose **No** if you do not want to save the results, or, chose **Yes** to save the results.

7.2.3. Filtering results

When building a query, you can filter the results so that the only records that appear are those that meet specified criteria. The fields that can be used for filtering appear in the table below:

Filter Field	Filter Description
Study Technology	Selects records from GAC or membrane studies
Source Category	Selects records from surface water (SW) plants or ground water (GW) plants
Scale of Study	Selects records from bench-, pilot-, or full-scale studies
Plant Name	Selects records from a study conducted by a specific plant


1. In the **Filter Criteria** frame, move the cursor to a field that will be filtered.
2. Select a criterion from the list.
 - ☞ The field name selected for filtering will automatically appear above in the Selected Parameters frame.

3. (Optional) Repeat the above steps for one or more of the other three filters.
4. Click the **Run Query** button  to view the query results.

7.3. QA/QC Information

The QA/QC Information screen is used to view quality control and quality assurance data submitted by the utilities and laboratories that were involved in conducting the treatment study. The reported QA/QC data includes:

- Analytical duplicate relative percent error (RPE)
- Performance evaluation (PE) recovery
- Laboratory matrix spike (LMS) recovery
- Field duplicate relative percent error

 **Note:** The analytical duplicate RPEs were calculated by dividing the difference between the primary and duplicate values by the average of the primary and duplicate values; the field duplicate RPEs were calculated by dividing the difference in the primary and duplicate field samples, by the value of the primary sample.

In addition to generating user-defined queries, an option exists to view predefined reports formatted to provide the most commonly referenced QA/QC data. Groupings by treatment study, laboratory, or analysis are permitted and the output can be filtered to display data pertaining to a specific laboratory, treatment study, or analysis.

7.3.1. Sets

A “set” is defined as all the quality control data summarized for a specific 1) treatment study, 2) analyte, 3) method, 4) Minimum Reporting Level (MRL), and 5) laboratory. The output consists of a statistical summary for each set of QA/QC data, including:

- Count
- Average
- Standard deviation
- 25th, 50th (median), and 75th percentile (for counts ≥ 6)

The three examples below illustrate how sets are defined.

Example 1: Suppose that during the course of a four-quarter RBSMT or RSSCT treatment study only one laboratory was used (Lab A) to conduct TOC analyses. Also suppose that the method used was SM 5310 C and the MRL was 0.50 mg/L. Then the set would be defined as Lab A, SM 5310 C, MRL = 0.50 mg/L and the QC data for all four quarters summarized together.

Example 2: Using example 1 above, suppose that during the second quarter Lab A changed their MRL from 0.50 mg/L to 0.25 mg/L. Then one set would be defined as Lab A, SM 5310 C, MRL = 0.50 mg/L and the QC data for the first quarter summarized. A second set would be defined as Lab A, SM 5310 C, **MRL = 0.25** mg/L and the QC data for

the remaining three quarters summarized together.

Example 3: Using example 2 above, suppose that during the third and fourth quarters, TOC samples were sent to a new lab (Lab B, SM 5310 C, MRL = 0.50 mg/L). Then the first set would be defined as Lab A, SM 5310 C, MRL = 0.50 mg/L and the QC data for the first quarter summarized. A second set would be defined as Lab A, SM 5310 C, MRL = 0.25 mg/L and the QC data for the second quarter summarized. Finally, a third set would be defined as **Lab B**, SM 5310 C, MRL = 0.50 mg/L and the QC data for the third and fourth quarters summarized together.

7.3.2. Class Sums

For THM4, HAA5, HAA6 and HAA9, QC statistics are summarized across all species that comprise the class sum. First, the average of the QC parameter (i.e., RPE for analytical and field duplicates, percent recovery for matrix spikes, and percent recovery for PE samples) is calculated for the individual species that make up the class sum. Second, statistics are calculated based on the average of the class sums. An example below illustrates how class sum statistics are calculated.

Example: Suppose that a laboratory analyzed all THM4 samples in six separate batches, each with its own set of QC data. To calculate the average RPE for analytical duplicates for THM4, first the average RPE is calculated for each batch. Then statistics are calculated across all batches based on the average RPE calculated for each batch. A numerical example follows:

Analyte	Batch #1	Batch #2	Batch #3	RPE		
				Batch #4	Batch #5	Batch #6
SDS-CHCl ₃	10%	7%	BMRL	8%	6%	2%
SDS-BDCM	14%	8%	BMRL	9%	15%	3%
SDS-DBCM	19%	10%	25%	4%	7%	4%
SDS-CHBr ₃	15%	11%	22%	6%	20%	6%
THM4 (Avg)	15%	9%	24%	7%	12%	4%

☞ **Note:** Batch #3 contains two samples that were below the minimum reporting level (BMRL). Any BMRL results are ignored when RPE class averages are calculated.

The calculated statistics based on the average RPE for analytical duplicates for THM4 appear below:

Statistic	Result
Count	6
Average	11.6%
Std Deviation	7.0%
25 th Percentile	7.3%
50 th Percentile	10.5%
75 th Percentile	13.9%

7.3.3. Viewing the QA/QC Information screen

When viewing the Common TS Data page, click the **QA/QC Information** button. The QA/QC Information screen will appear.





The screen is divided into the following frames:

Frame	Description
Data Tables	Lists the tables that can be linked together. The drop-down boxes next to each table name list the fields available in each table.
Selected Parameters	Lists the fields selected by the user for the query.
Filter Criteria (Optional)	Restricts the output of the query based on values selected by the user.

The six buttons that appear on the bottom of the screen are described below:

Button	Icon	Action
Run Query		Generates results based on the selected parameters and filter criteria
Clear All		Clears all selected fields and filter criteria
View Saved Queries		Views previously saved queries (for advanced users)
View Reports		Views predefined reports that are grouped by analysis, laboratory, or treatment study, and that can also be filtered
Help		Defines the Data Tables and their corresponding Fields
Previous Screen		Closes the current screen and clears all fields


7.3.4. Building a query

1. Click the **Clear All** button  to clear all fields. **Note:** The TSID and AnalytName fields are displayed by default.
2. In the **Data Tables** frame, select the field names you would like to appear in the output from the drop-down box next to each table name.
 - ☞ Multiple field names can be selected and will appear in the text box to the right. Each field name can only be selected once.
 - ☞ To remove a selected field name, highlight the field name (including the coma) from the Selected Parameters frame and press the Delete key. To remove all field names from a text box, click the  button located to the right of each text box in the Selected Parameters frame.
3. Repeat the above step to select field names from other tables.
 - ☞ Click the  button to select all field names for the output. All field names belonging to that table will appear in the text box in the Selected Parameters Frame.
4. Click the **Run Query** button  to view the query results. A screen showing the results of the query will appear.
 - ☞ Please refer to Chapter 8, Query Results, for information on saving, editing, and exporting query results.
5. To return to the QA/QC and Laboratory Data Query screen, choose the **File, Close** menu option. A dialog box will appear prompting you to save the results. Chose **No** if you do not want to save the results, or, chose **Yes** to save the results.

7.3.5. Filtering results

When building a query, you can filter the results so that the only records that appear are those that meet specified criteria. The fields that can be used for filtering appear in the table below:

Filter Field	Filter Description
TSID	Select records belonging to a specific treatment study
Analyte Name	Selects records for a specific analyte
Laboratory Name	Selects records for a specific laboratory

1. In the **Filter Criteria** frame, move the cursor to a field that will be filtered.
2. Select a criteria from the list.
 - ☞ The field name selected for filtering will automatically appear above in the Selected Parameters frame.
3. (Optional) Repeat the above steps for one or more of the other two filters.
4. Click the **Run Query** button  to view the query results.





7.3.6. Accessing the QA/QC Report Generator

As mentioned earlier, predefined reports exist that will group and display QA/QC data. Click the **View Reports** button and the Report Generator for QA/QC Data screen will appear.


The screen is divided into two frames. The two frames are described below:

Frame	Description
Lab QA/QC Data	Lists the analytical QC results reported by all laboratories (utility, university, and commercial) that conducted sample analysis for the treatment studies. The QC results include RPE, PE recoveries, and LMS recoveries. The reports can be grouped by treatment study, laboratory, or analyte. The report can also be filtered to show results for a specific treatment study, laboratory, and/or analysis.
Field Duplicate Data	Summarizes the recoveries for all field duplicates for each treatment study.


The screen also contains four buttons. The buttons are described below:

Button	Icon	Action
Generate Lab QA/QC Report		Generates a laboratory report based on the groupings and filters applied by the user.
View List of Laboratories		Generates a list of laboratories that conducted analyses in support of the treatment studies.
Generate Field Duplicate Report		Generates a report summarizing the recoveries for field duplicates based on the groupings and filters applied by the user.
Previous Screen		Closes the screen and returns to the previous screen.


7.3.7. Viewing the Laboratory QA/QC Report

1. In the **Lab QA/QC Data** frame, select a grouping option from the **Group Report By** field.
2. (Optional) In the filtering fields (TSID, Analyte Name, Lab Name), select a criteria for filtering from the drop-down lists.
3. Click the **Generate Lab QA/QC Report** button  to view the report.
4. To print the report, choose the **File, Print** menu command.
5. To close the report window, choose the **File, Close** menu command.

7.3.8. Viewing a list of all participating laboratories

1. In the **Laboratory Data** frame, click the **View List of Laboratories** button  to view the report.
2. To print the report, choose the **File, Print** menu command.
3. To close the report window, choose the **File, Close** menu command.

7.3.9. Viewing the Field Duplicate Report

1. In the **Field Duplicate Data** frame, select a grouping option from the **Group Report By** field.
2. (Optional) In the filtering fields (TSID, Analyte Name), select a criteria for filtering from the drop-down lists.
3. Click the **Generate Field Duplicate Report** button  to view the report.
4. To print the report, choose the **File, Print** menu command.
5. To close the report window, choose the **File, Close** menu command.

7.4. Pretreatment Information

The Pretreatment Information screen can be used to view pretreatment processes and pretreatment chemicals used during each treatment study run.

7.4.1. Viewing the Pretreatment Information screen

When viewing the Common TS Data page, click the **Pretreatment Information** button. The Pretreatment Information screen will appear.





The six buttons that appear on the bottom of the screen are described below:

Button	Icon	Action
Run Query		Generates results based on the selected parameters and filter criteria
Clear All		Clears all selected fields and filter criteria
View Saved Queries		Views previously saved queries (for advanced users)
View Report		Views pre-defined reports that can be filtered
Help		Defines the Data Tables and their corresponding Fields
Previous Screen		Closes the current screen and clears all fields

The Pretreatment Data Query screen is divided into the following frames:

Frame	Description
Data Tables	Lists the tables that can be linked together. The drop-down boxes next to each table name list the fields available in each table.
Selected Parameters	Lists the fields selected by the user for the query.
Filter Criteria (Optional)	Restricts the output of the query based on values selected by the user.


7.4.2. Building a query

1. Click the **Clear All** button  to clear all fields. **Note:** The TSSRunID field is displayed by default.
2. In the **Data Tables** frame, select the field names you would like to appear in the output from the drop-down box next to each table name.
 - ☞ Multiple field names can be selected and will appear in the text box to the right. Each field name can only be selected once.
 - ☞ To remove a selected field name, highlight the field name (including the comma) from the Selected Parameters frame and press the Delete key. To remove all field names from a text box, click the  button located to the right of each text box in the Selected Parameters frame.
3. Repeat the above step to select field names from other tables.
 - ☞ Click the  button to select all field names for the output. All field names belonging to that table will appear in the text box to the right.
4. Click the **Run Query** button  to view the query results. A screen showing the results of the query will appear.
 - ☞ Please refer to Chapter 8, Query Results, for information on saving, editing, and exporting query results.
5. To return to the Pretreatment Data Query screen, choose the **File, Close** menu option. A dialog box will appear prompting you to save the results. Choose **No** if you do not want to save the results, or, choose **Yes** to save the results.

7.4.3. Filtering results

When building a query, you can filter the results so that the only records that appear are those that meet specified criteria. The fields that can be used for filtering appear in the table below:

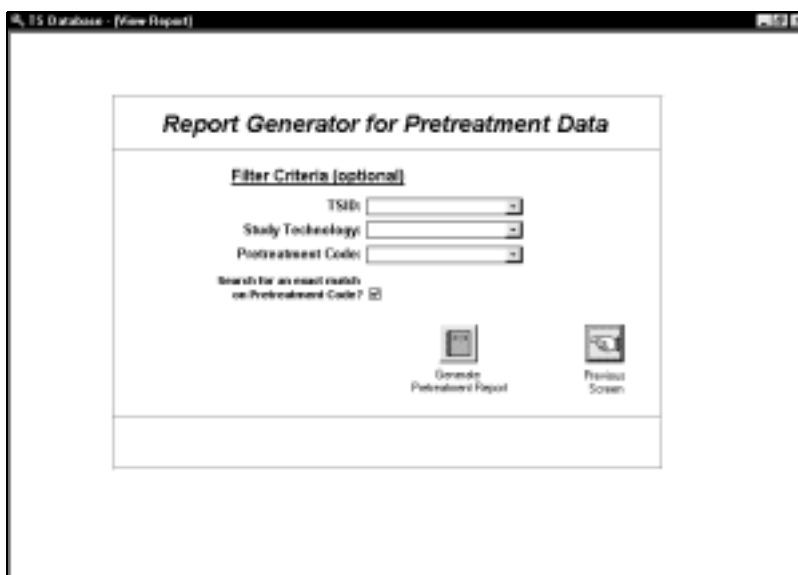
Filter Field	Filter Description
TSID	Selects records belonging to a specific treatment study
Study Technology	Selects either GAC or membrane treatment studies
Pretreatment Code	Selects records matching a specific treatment code ☞ A list of pretreatment codes appears in Appendix 10.3
Process Name	Selects records matching a specific process (flocculation, sedimentation, filtration, etc.)
Chemical Name	Selects records matching a specific chemical

1. In the **Filter Criteria** frame, move the cursor to a field that will be filtered.
2. Select a criteria from the list.
 - ☞ The field name selected for filtering will automatically appear above in the Selected Parameters frame.
3. (Optional) Repeat the above steps for one or more of the other four filters.
4. Click the **Run Query** button  to view the query results.



7.4.4. Accessing the Pretreatment Report Generator

As mentioned earlier, predefined reports also exist that will filter and display pretreatment data for each treatment study run.

Click the **View Report** button  and the Report Generator for Pretreatment Information screen will appear.




The screen contains two buttons described below:

Button	Icon	Action
Generate Pretreatment Report		Generates a pretreatment report for each treatment study session based on the filters applied by the user.
Previous Screen		Closes the screen and returns to the previous screen.

7.4.5. Viewing the Pretreatment Report

1. (Optional) In the filtering fields (TSID, Technology, Pretreatment Code), select a criteria for filtering from the drop-down lists. **Note:** The Pretreatment Code field contains a list of all pretreatment codes used to identify each TSSRunID. The checkbox titled “Search for an exact match on Pretreatment Code” gives you the option to either search for an exact match on Pretreatment Code or a wildcard match on Pretreatment Code. For example, to search for all TSSRunIDs using conventional pretreatment (“CONV”) including those TSSRunIDs where other pretreatment codes in addition to “CONV” were used, enter “CONV” in the Pretreatment Code field and uncheck the Exact Match checkbox.

 To view all pretreatment data, leave filtering fields blank.

2. Click the **Generate Pretreatment Report** button  to view the report.
3. To print the report, choose the **File, Print** menu command.
4. To close the report window, choose the **File, Close** menu command.

8. Query Results

8.1. Introduction

As mentioned previously, the data query screen appears whenever you build a query for any of the following five data modules:


- GAC TS Data
- Membrane TS Data
- General Information
- QA/QC Information
- Pretreatment Information

An example of a typical data query screen appears below:

TSD	TSP	TSC	GACName	GACType	TDC	UV254	THMs	HAAs	Plant Name
1009	1003-1-10	10	Neot GAC 1240	Stuminox	2.31	0.03	32.9	16.6	Makoning Valley Sanitary District
1009	1003-1-20	20	Neot GAC 1240	Stuminox	2.08	0.028	28.9	13.6	Makoning Valley Sanitary District
1009	1003-2-10	10	Neot GAC 1240	Stuminox	1.82	0.029	33.8	19.5	Makoning Valley Sanitary District
1009	1003-2-20	20	Neot GAC 1240	Stuminox	1.89	0.026	29.4	18.1	Makoning Valley Sanitary District
1009	1003-3-10	10	Neot GAC 1240	Stuminox	1.89	0.026	54.7	20.4	Makoning Valley Sanitary District
1009	1003-3-20	20	Neot GAC 1240	Stuminox	1.77	0.026	51.2	17.9	Makoning Valley Sanitary District
1009	1003-4-10	10	Neot GAC 1240	Stuminox	1.99	0.028	80.5	18.7	Makoning Valley Sanitary District
1009	1003-4-20	20	Neot GAC 1240	Stuminox	1.89	0.024	51.9	17.2	Makoning Valley Sanitary District
1009	1008-1-10	10	Filtrast 300	Stuminox	1.8	0.028	41.2	34	Hap Creek Water Plant
1009	1008-1-20	20	Filtrast 300	Stuminox	1.4	0.02	34.4	17.4	Hap Creek Water Plant
1009	1009-1-10	10	Filtrast 300	Stuminox	1.5	0.018	28.4	14.7	Dublin Road Water Plant
1009	1009-1-20	20	Filtrast 300	Stuminox	1.49	0.018	28.3	19	Dublin Road Water Plant
1010	1010-1-10	10	Filtrast 400	Stuminox	1.44	0.02	19.8	22.8	Akron Water Supply Plant
1010	1010-1-20	20	Filtrast 400	Stuminox	1.27	0.013	21.6	17.8	Akron Water Supply Plant
1010	1010-2-10	10	Filtrast 400	Stuminox	1.42	0.016	25.3	16.3	Akron Water Supply Plant
1010	1010-2-20	20	Filtrast 400	Stuminox	1.51	0.017	25.4	17.6	Akron Water Supply Plant
1010	1010-3-10	10	Hydrex 4000	Lignite	1.29	0.012	21.2	15.8	Akron Water Supply Plant
1010	1010-3-20	20	Hydrex 4000	Lignite	1.53	0.019	26.3	18.6	Akron Water Supply Plant
1010	1010-3-10	10	Filtrast 400	Stuminox	1.47	0.019	30.8	19.1	Akron Water Supply Plant
1010	1010-3-20	20	Filtrast 400	Stuminox	1.32	0.014	17.1	13.7	Akron Water Supply Plant
1015	1015-1-10	10	Filtrast 400	Stuminox	1.72	0.022	130.9	24	O.N. Stevers Water Treatment Plant
1015	1015-1-20	20	Filtrast 400	Stuminox	1.83	0.02	106.3	20.2	O.N. Stevers Water Treatment Plant
1015	1015-2-10	10	Filtrast 400	Stuminox	1.97	0.029	136.1	22.6	O.N. Stevers Water Treatment Plant
1015	1015-2-20	20	Filtrast 400	Stuminox	1.81	0.027	128.6	22.3	O.N. Stevers Water Treatment Plant
1015	1015-3-10	10	Filtrast 400	Stuminox	2.64	0.037	114.6	21.4	O.N. Stevers Water Treatment Plant
1015	1015-3-20	20	Filtrast 400	Stuminox	1.96	0.023	97.6	14	O.N. Stevers Water Treatment Plant
1015	1015-4-10	10	Filtrast 400	Stuminox	2.12	0.028	117.6	24	O.N. Stevers Water Treatment Plant

The data query screen displays data in a spreadsheet-style format, with each record appearing in a row, and each selected field appearing in a column across the top.

The following table below lists useful menu options available to you while viewing the data query screen:

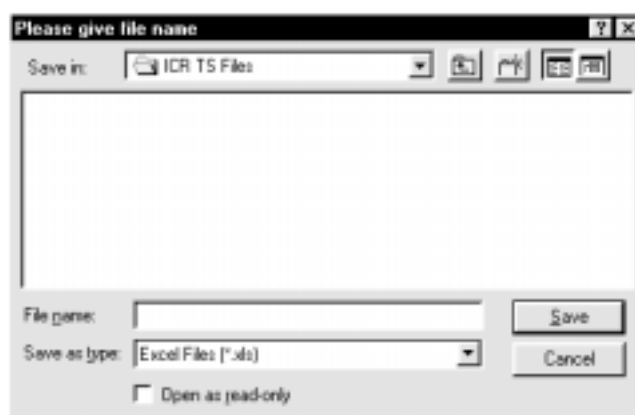
Menu	Menu Option	Description
File	Query Design	(For advanced users) Displays the Access query design view
	Run Query	Runs the query
	Save as Table	Saves results as a table in the current database
	Output to Excel	Exports results to Microsoft Excel
	Page Setup	Allows the user to change margins and paper size
	Print Preview	Previews the printed output on the screen
	Print	Prints the output to a printer
Edit	Find	Finds a record
Records	<i>Various filtering options</i>	(For advanced users) These menu options allow for additional filtering of records beyond what is provided in the Build Data Query screen
Windows	Contents and Index	Displays Access Help Feature
		Closes the screen and displays the Build Data Query screen

8.2. Using the Query Results Screen

When the query results screen appears, you have the option to return to the previous screen and revise the query, save the query results in a table, export the query results, or modify the query through the Access query design grid. **Note:** Instructions on modifying the query in the Access query design grid is beyond the scope of this user's guide. Please refer to documentation on Microsoft Access for further instructions.

8.2.1. Exporting results to Microsoft Excel

1. While viewing the query output, choose the **File, Output to Excel** menu option. The following screen will appear:



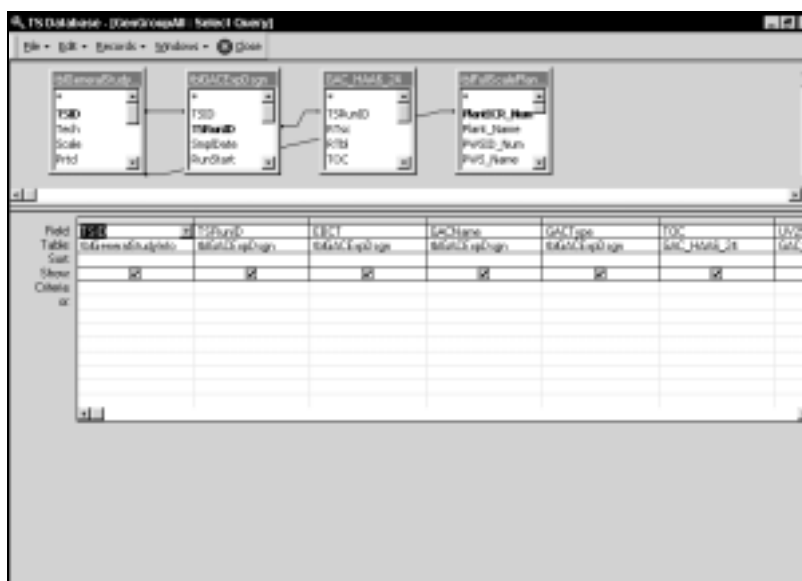
2. Select a directory in which the file will be saved.

3. Enter a name in the **File Name** text box. **Note:** It is not necessary to include the file type extension, “.xls”.
4. Click the **Save** button.
5. Microsoft Excel will open with the exported document. You can work with the data in Excel or return to Access.
6. To return to the Treatment Study Database, press **ALT+TAB**.

8.2.2. Viewing the Query Design (for advanced users)

Advanced users of Microsoft Access can view the design of the current query, modify the design and re-run the query.


1. Choose the **File, Query Design** menu option. The following screen will appear:



2. Make changes to the query design. Please refer to the Access documentation for guidance on the use of this screen.
3. Re-run the query by choosing the **File, Run Query** menu option.

8.2.3. Saving the Query Results (for advanced users)

Once results are generated, the data can be saved in a table for later use.



 Queries cannot be saved. Only the data from the query can be saved in a table format. Therefore, it is recommended that you record the query and filter criteria used to generate the table for later reference.

1. Choose the **File, Save As Table** menu option. A dialog box will appear prompting you for a table name. **Note:** Use a naming convention that will help you keep track of information in different tables.

2. Enter a table name and click the **OK** button.
3. A dialog box will appear displaying the saved table's name. Click the **OK** button to continue.

8.2.4. Filtering results (for advanced users)

Advanced users of Microsoft Access can apply sophisticated filtering options to view a subset of the current results. Instruction on using the filtering options available in Microsoft Access is beyond the scope of this user's guide. Please refer to documentation on Microsoft Access for further instructions.

1. Choose the **Records, Filter by Form** menu option (the most frequently used filter option is Filter by Form).
2. Click the **Clear Grid** button  on the Toolbar to delete any existing conditions.
3. Add filtering conditions.
 - ☞ Microsoft Access accepts AND, OR, "<", and ">" operators, to name a few. Refer to Microsoft Access documentation for additional information.
4. Click the **Apply Filter** button  on the Toolbar to run the revised query.


8.2.5. Closing the Query Results Screen

Closing the query results screen will return the user to the Build Data Query screen where additional modifications can be made.

1. Choose the **File, Close** menu option. A dialog box will appear prompting you to save the results.
2. Choose **No** if you do not want to save the results.

-or-

Choose **Yes** to save the results. A dialog box will appear prompting you to enter a name for the table. **Note:** Use a naming convention that will help you keep track of information in different tables.

☞ The table will be saved in the *TS Database* and is only available by clicking on the **View Saved Queries** button  in the Build Data Query screen.


3. The Build Data Query screen will appear.

8.3. Viewing Previously Saved Query Data (for Advanced Users)


Data that has been saved during the Build Data Query process can be viewed, filtered and exported. As mentioned in earlier, data queries can be created and the generated tables can be saved in any of the following database modules:

- GAC TS Data
- Membrane TS Data
- General Information
- QA/QC Information
- Pretreatment Information


8.3.1. Viewing saved GAC Query Results


1. Starting from the Main Form, click the **GAC TS Data** tab and the GAC Data page will appear.
2. Click the **Build Data Queries** button. The Build Data Query screen will appear.
3. Click the **View Saved Queries** button  and the following screen will appear:





4. Select a table from the list. **Note:** Tables appearing in the list can be deleted through the Maintenance Module of the database as described in Chapter 9.
5. Click the **View Data In Query Design** button  and the table will appear in a query design view.
6. To return to the previous screen, choose the **File, Close** menu command.

8.3.2. Viewing saved Membrane Query Results



1. Starting from the Main Form, click the **Membrane TS Data** tab and the Membrane Data page will appear.
2. Click the **Build Data Queries** button. The Build Data Query screen will appear.
3. Click the **View Saved Queries** button  and a dialog box that lists previously saved queries will appear.

4. Select a table from the list. **Note:** Tables appearing in the list can be deleted through the Maintenance Module of the database as described in Chapter 9.
5. Click the **View Data In Query Design** button  and the table will appear in a query design view.
6. To return to the previous screen, choose the **File, Close** menu command.



8.3.3. Viewing saved General Information Query Results

1. Starting from the Main Form, click the **Common TS Data** tab and the Common Data page will appear.
2. Click the **General Information** button. The General Information Query screen will appear.
3. Click the **View Saved Queries** button  and a dialog box that lists previously saved queries will appear.
4. Select a table from the list. **Note:** Tables appearing in the list can be deleted through the Maintenance Module of the database as described in Chapter 9.
5. Click the **View Data In Query Design** button  and the table will appear in a query design view.
6. To return to the previous screen, choose the **File, Close** menu command.

8.3.4. Viewing saved QA/QC Query Results

1. Starting from the Main Form, click the **Common TS Data** tab and the Common Data page will appear.
2. Click the **QA/QC Information** button. The QA/QC and Laboratory Data Query screen will appear.
3. Click the **View Saved Queries** button  and a dialog box that lists previously saved queries will appear.
4. Select a table from the list. **Note:** Tables appearing in the list can be deleted through the Maintenance Module of the database as described in Chapter 9.
5. Click the **View Data In Query Design** button  and the table will appear in a query design view.
6. To return to the previous screen, choose the **File, Close** menu command.

8.3.5. Viewing saved Pretreatment Query Results

1. Starting from the Main Form, click the **Common TS Data** tab and the Common Data page will appear.
2. Click the **Pretreatment Information** button. The Pretreatment Data Query screen will appear.
3. Click the **View Saved Queries** button  and a dialog box that lists previously saved queries will appear.
4. Select a table from the list. **Note:** Tables appearing in the list can be deleted through the Maintenance Module of the database as described in Chapter 9.
5. Click the **View Data In Query Design** button  and the table will appear in a query design view.
6. To return to the previous screen, choose the **File, Close** menu command.

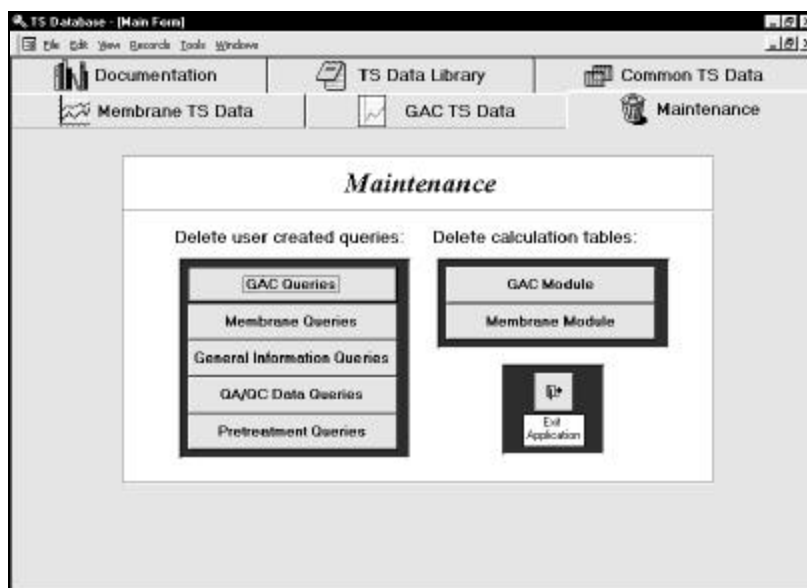
9. Maintenance

9.1. Deleting User Created Tables

The Maintenance Module is used to delete user-created tables or query tables in GAC, Membrane, General Information, QA/QC Data, and Pretreatment Information modules. It is recommended that users periodically delete tables that are no longer needed in order to keep the database from growing too large, thereby affecting performance.

9.1.1. Viewing the Maintenance Screen

When viewing the *TS Database* Main Form, click the **Maintenance** tab. The Maintenance page will appear.





The page is divided into the following frames:

Frame	Description
Delete User Created Queries	Deletes the query tables (results of a query) which were saved during GAC, Membrane, General Information, QA/QC Information, and Pretreatment Information analysis.
Delete Calculation Tables	Deletes the calculation results that were saved when generating GAC breakthrough or membrane blending data.

9.1.2. Deleting a user created query or calculation table

1. When viewing the Maintenance page, click the desired module button. The Delete User Created Data screen will appear.



2. Select the table to be deleted.
3. Click the **Delete** button  to delete the table. A confirmation dialog box will appear.
4. Click the **OK** button to confirm the deletion.
5. Repeat steps 2-4 to delete additional tables.
6. When finished, click the **Previous Screen** button  to return to the Maintenance page.

9.2. Compacting the Database

After you have deleted many user created queries or data calculation tables, the database will need to be compacted. Compacting will reduce the size of the database, thereby freeing up hard drive space. Furthermore, the database will run more efficiently after it has been compacted.

1. When viewing the Main Form, choose the **Tools, Database Utilities, Compact Database** menu option.
2. The compacting process will begin and can take up to several minutes to complete.
3. When the compacting process has finished, the Welcome screen will appear.

10. Appendices

The following Appendices are included in this document:

Appendix	Description
Appendix 10.1 Using Adobe Acrobat Reader	Provides basic information on viewing files in Acrobat Reader
Appendix 10.2 Explanation of Flags	Describes the flags used during the generation of GAC breakthrough and membrane blending data
Appendix 10.3 List of Pretreatment Codes	Lists and describes each pretreatment code used in the database

10.1. Appendix: Using Adobe Acrobat Reader

Several documents stored in this database require the use of Adobe Acrobat Reader. Below are basic instructions on using Adobe Acrobat Reader. For further information on using the Reader, please refer to the Adobe Acrobat User's Guide.

10.1.1. Navigating through a document

Once a document has been opened in Adobe Acrobat Reader:

Press the **Up** or **Down** arrow keys on the keyboard to view each page.

—or—

Press the **PageUp** or **PageDown** keys on the keyboard to view the document.

—or—

Use the mouse and use the vertical scroll bars located on the right of the window.

10.1.2. Printing a document

Once a document has been opened in Adobe Acrobat Reader:

1. Choose the **File, Print** menu option and the Print dialog box will appear.
2. (Optional) Enter the desired page range in the **Page Range** fields.
—or—
(Optional) Click the **Current Page** option to print just the current page
3. Click the **OK** button to print the document.

10.1.3. Returning to the TS Database

To return to the *TS Database*, while leaving the document opened for later access:

Click the *TS Database* button on the **Start Menu** bar (usually located at the bottom of the screen).

—or—

Press **ALT+TAB** to switch between applications.

10.1.4. Exiting Adobe Acrobat Reader

To exit the document in Adobe Acrobat Reader, choose the **File, Exit** menu option and you will return to the *TS Database*.

10.2. Appendix: Explanation of Flags

10.2.1. GAC Flags

Flag 1 - Condition 1

Flag 1 applies to blended contactor runtime criteria only, and can be triggered in two ways. Under the first condition, the blended contactor runtime (RTbl), **A**, entered by the user, exceeds the maximum blended contactor runtime (RTbl_max), **B**, as shown in Figure 1. In this case, the query returns a value for RTbl equal to RTbl_max and triggers Flag 1. The calculation algorithm then determines the single contactor runtime (RTsc), **C**, which corresponds to the RTbl_max (refer to *Base Analysis Document: GAC Studies* for additional detail on the calculation algorithm). This RTsc is used to determine the concentrations of all selected water quality parameters for the specific treatment study run (TSRunID). Note that the algorithm allows the blended contactor runtime to be extrapolated to 150% of the maximum single contactor runtime.

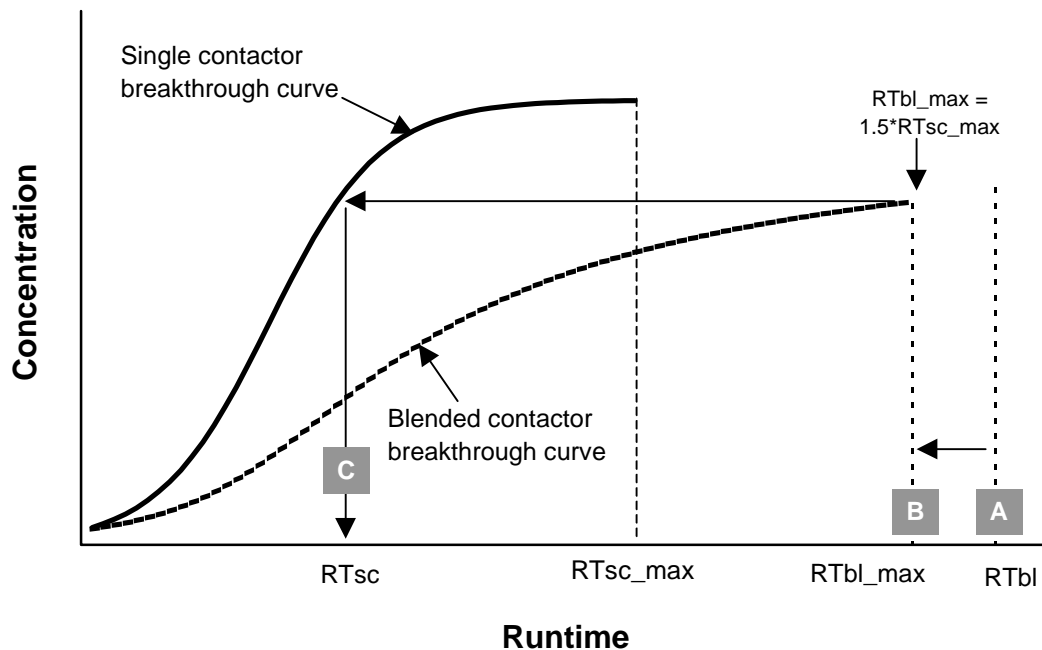


Figure 1. Blended Contactor Breakthrough Criteria, Flag 1 = Yes: RTbl entered by the user exceeds RTbl_max

Flag 1 - Condition 2

Under the second condition the user has entered a blended contactor target concentration (Cbl), **A**, which is greater than the maximum concentration reached by the blended contactor curve, (Cbl_max), **B**, even after extrapolation. In this case, the query returns the Cbl_max, returns a value for RTbl equal to RTbl_max, **C**, and triggers Flag 1. The calculation algorithm then determines the single contactor runtime (RTsc), **D**, which corresponds to RTbl_max (refer to *Base Analysis Document: GAC Studies* for additional detail on calculation algorithm). This RTsc is used to determine the concentrations of all selected water quality parameters for the specific TSSRunID. Note that the algorithm allows the blended contactor runtime to be extrapolated to 150% of the maximum single contactor runtime.

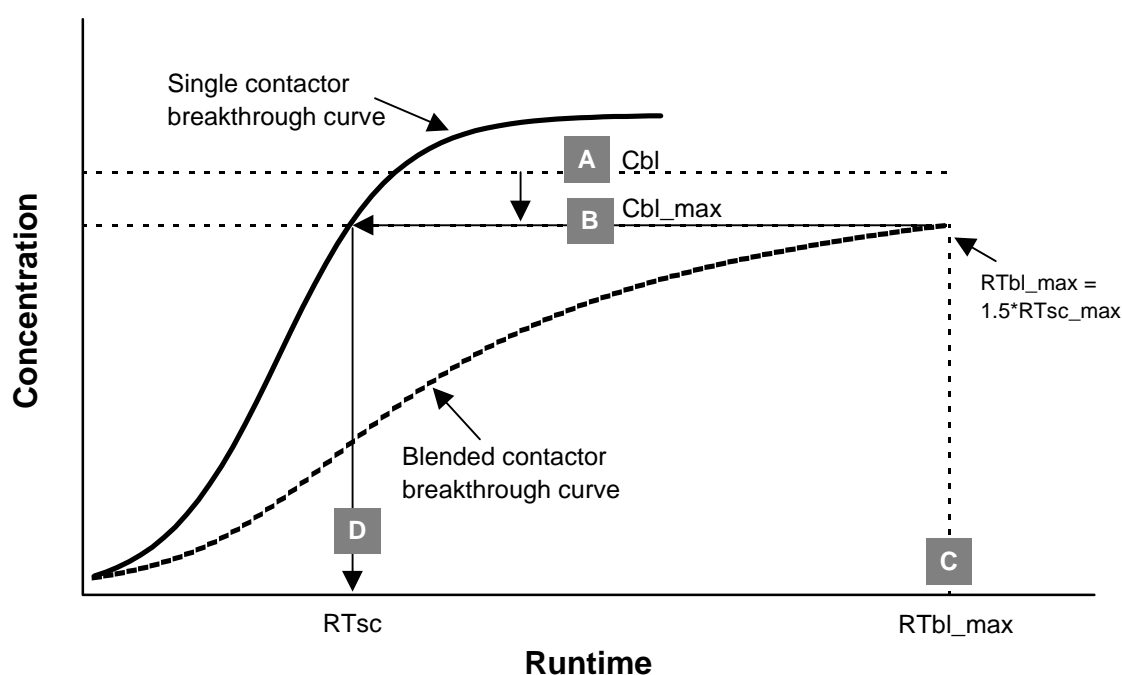


Figure 2. Blended Contactor Breakthrough Criteria, Flag 1 = Yes: Cbl entered by the user exceeds the Cbl_max

Flag 2

Flag 2 applies to single contactor runtime criteria, and is triggered when the user enters a single contactor runtime (RTsc), **A**, which is greater than the maximum single contactor runtime (RTsc_max), **B**, for the target water quality parameter for a TSSRunID. In this case, the query returns a value for RTsc equal to RTsc_max and triggers Flag 2. The calculation algorithm determines the concentrations of all selected water quality parameters at this RTsc_max.

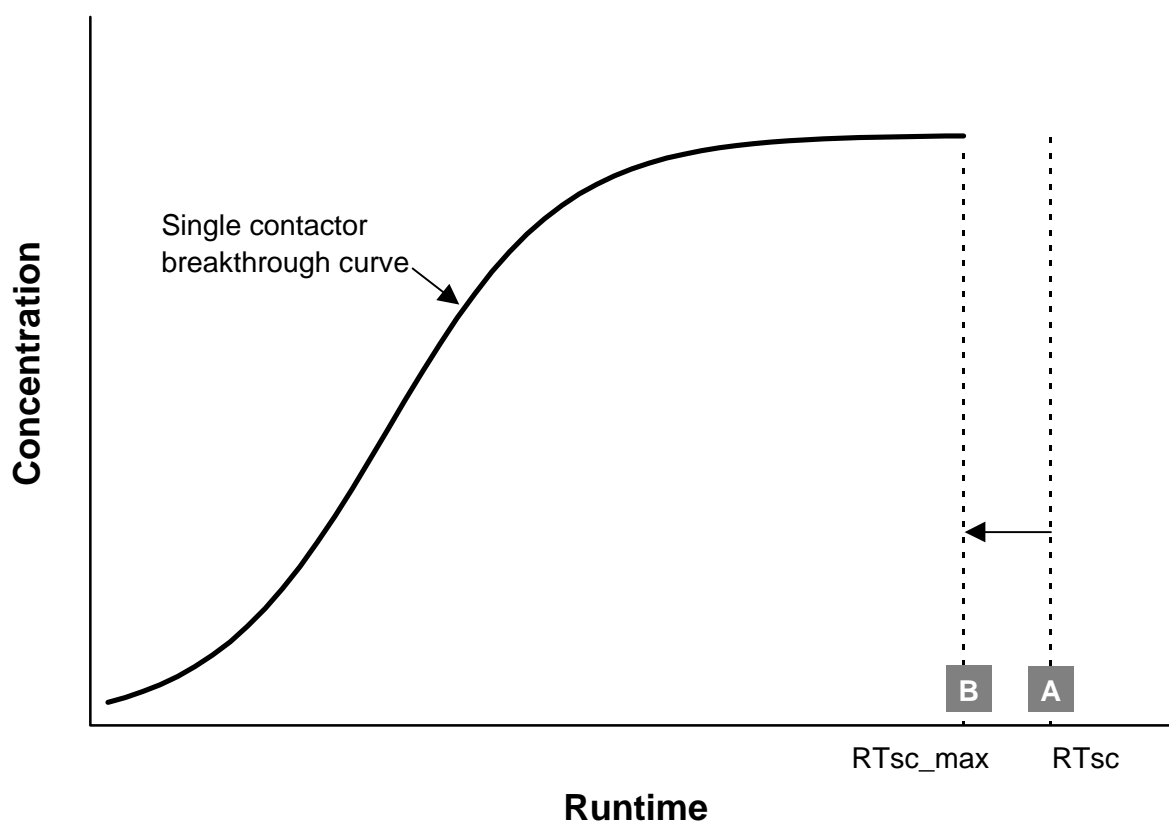


Figure 3. Single Contactor Breakthrough Criteria, Flag 2 = Yes: RTsc entered by the user exceeds RTsc_max

Flag 3

Flag 3 applies to single contactor runtime criteria and is triggered when the user enters a target concentration (C_{sc}), **A**, that is greater than the maximum concentration (C_{sc_max}), **B**, for that parameter for a TSSRunID. In this case, the query returns a concentration equal to C_{sc_max} , as shown in Figure 4. If Flag 3 is triggered and Flag 1 is not triggered, then the concentrations of selected water quality parameters for the specific TSSRunID are calculated using the single contactor run time corresponding to C_{sc_max} , **C**. If both Flag 3 and Flag 1 are triggered, then the concentrations of selected water quality parameters are calculated using the RTsc corresponding to the maximum blended contactor runtime (see Figure 2).

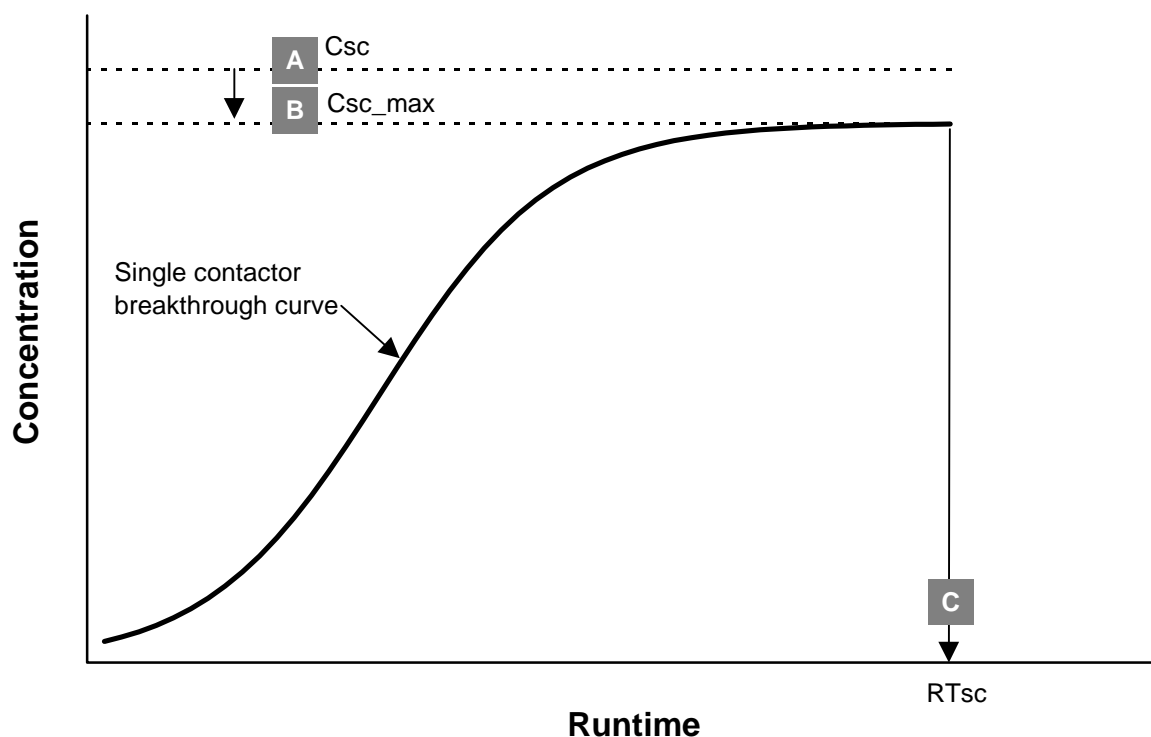


Figure 4. Single Contactor Breakthrough Criteria, Flag 3 = Yes: C_{sc} entered by the user exceeds C_{sc_max} for Target Parameter

Flag 4

Flag 4 applies to all breakthrough curve calculations and all selected water quality parameters except the target parameter. Flag 4 is triggered for a specific TSSRunID when the maximum concentration (C_{max}), **A**, for one or more selected parameters occurs before the displayed runtime, RT, **B**. If this Flag is triggered for a specific TSSRunID, it may apply to multiple water quality parameters in that TSSRunID. Flag 4 does not apply to the target parameter: if the target parameter is a peak curve, and a target concentration is entered, the runtime when the single contactor first exceeds the target concentration will be displayed.

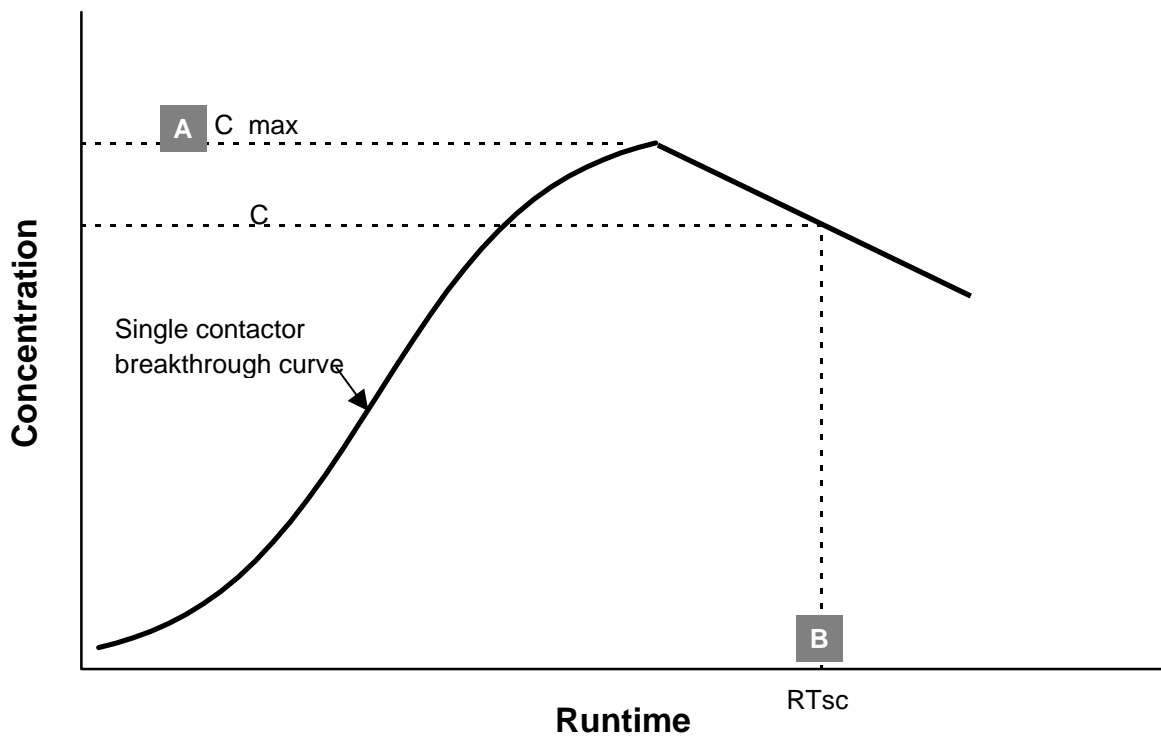


Figure 5. Single or Blended Breakthrough Contactor Criteria, Flag 4 = Yes: C_{max} occurs prior to displayed RT

Flag 88888 (Concentration = 88888.88)

Flag 88888 is triggered when a value for the blended contactor runtime could not be reported. Specifically, the Flag is triggered when the single contactor concentration (Csc), **A**, entered by the user (or the concentration corresponding to the user-entered entered single contactor runtime (RTsc), **B**), exceeds the maximum blended concentration (Cbl_max), **C**. Flag 88888 is only triggered for the above conditions when the calculations are based on single contactor breakthrough criteria. When blended contactor criteria are entered and a blended concentration or a blended runtime exceeds Cbl_max or RTbl_max, respectively, Flag 1 is triggered and the maximum blended value is returned (see Figures 1 and 2).

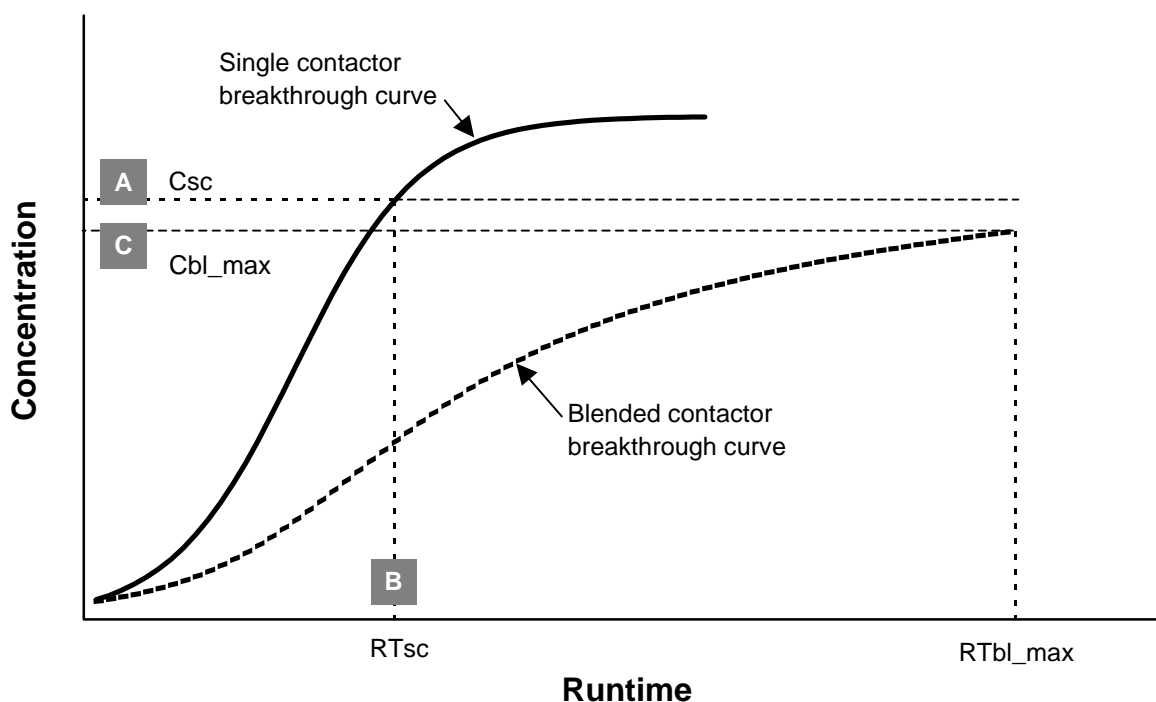


Figure 6. Single Contactor Breakthrough Criteria, Flag 88888: A value for RTbl could not be calculated

Flag 99999 (Concentration = 99999) Condition 1

Flag 99999 applies to both single and blended contactor criteria and to all selected water quality parameters, except the target parameter. Flag 99999 can be triggered in two ways. Under the first condition the single contactor runtime (RTsc), **A**, determined by the calculation algorithm for the target water quality parameter is greater than the maximum single contactor runtime (RTsc_max), **B**, for any other selected parameter, as shown in Figure 7. In this case the query returns the Flag 99999 instead of a concentration for this selected water quality parameter. However, the Flag does not apply to the target parameter: when the maximum runtime is exceeded for a target parameter, Flags 1 or 2 are triggered and the maximum value is returned.

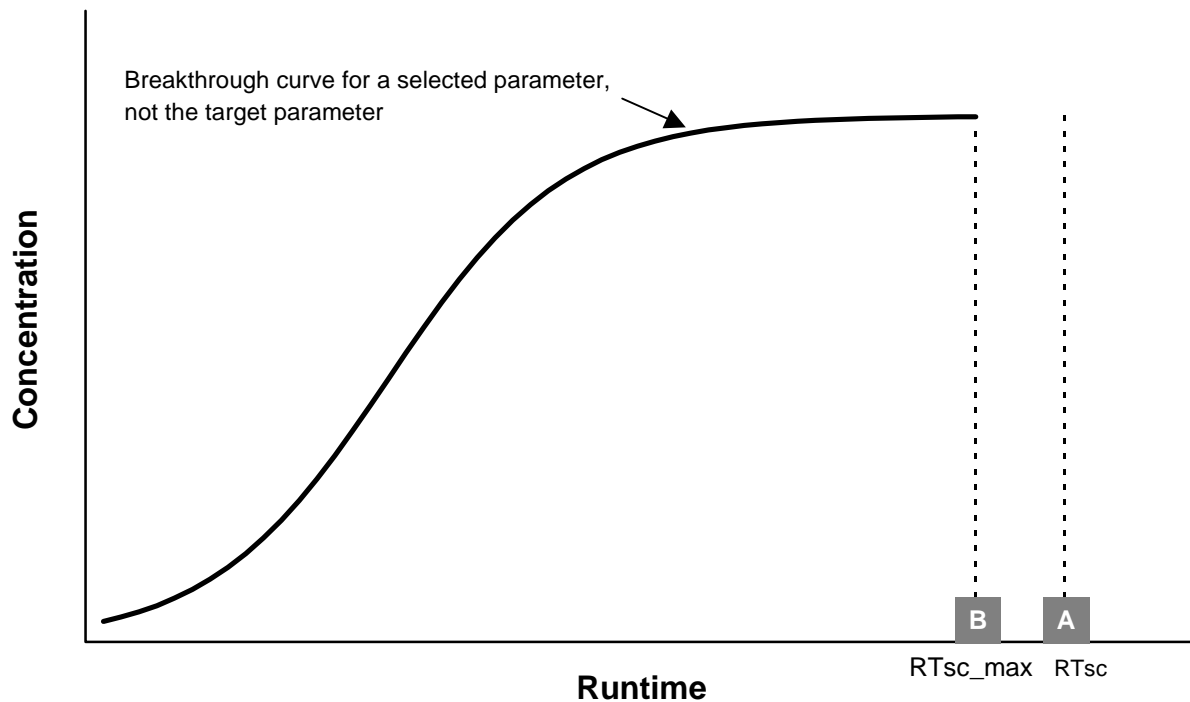


Figure 7. Single or Blended Contactor Breakthrough Criteria, Flag 99999: The calculated RTsc exceeds the RTsc_max for the selected parameter (other than the target parameter)

Flag 99999 (Concentration = 99999) Condition 2

Under the second condition, the single contactor runtime (RTsc), **A**, determined by the calculation algorithm for the target water quality parameter is less than the minimum single contactor runtime (RTsc_min), **B**, for any other selected parameter, as shown in Figure 8. In this case the query returns the Flag 99999 instead of a concentration for this selected water quality parameter. However, the Flag does not apply to the target parameter: when the RTsc is below the RTsc_min for a target parameter, the minimum concentration and corresponding RTsc_min are returned.

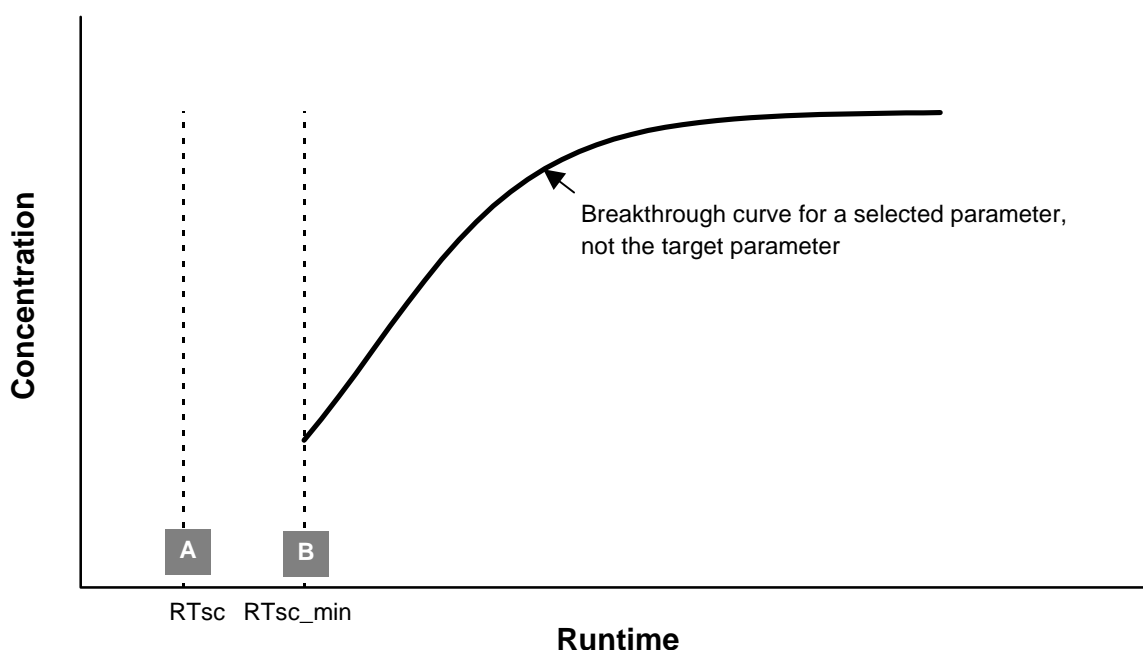


Figure 8 Single or Blended Contactor Breakthrough Criteria, Flag 99999: The calculated RTsc is less than the RTsc_min for the selected parameter (other than the target parameter)

Blank

A blank returned for a selected parameter (including the target parameter) indicates that there was no reportable data for this parameter. This occurs when data for the selected parameter was not analyzed or was omitted for QC reasons for a specific TSSRunID. For example, the analysis of DCBAA, CDBAA, and TBAA was not required during the treatment studies and many TSSRunIDs do not have values for these parameters.

10.2.2. Membrane Flags

The membrane flags are graphically described in Figure 9. For more information on blending calculations, see the *Base Analysis Document: Membrane Studies*.

Flag 1

Flag 1 is triggered when the permeate concentration exceeds the influent concentration for the target water quality parameter for a specific treatment study run (TSRunID). The database returns a value for the blend ratio equal to 0, resulting in a blended concentration equal to the influent concentration. In this case nanofiltration may not be an appropriate process to achieve the target treatment objective, since nanofiltration resulted in an increase in the concentration of the contaminant of concern.

Flag 2 = -1

When Flag 2 = -1, the influent concentration for the target water quality parameter is less than the user-defined target concentration for a specific TSRunID. The database returns a value for the blend ratio equal to 0, resulting in a blended concentration equal to the influent concentration. In this case nanofiltration is not needed to achieve the treatment objective.

Flag 2 = 1

When Flag 2 = 1, the permeate concentration for the target water quality parameter exceeds the user-defined target concentration for the TSRunID. The database returns a value for the blend ratio equal to 1, resulting in a blended concentration equal to the permeate concentration. In this case nanofiltration cannot achieve the treatment objective.

Flag 2 = 0

When Flag 2 = 0, the user-defined target concentration falls between the permeate and feed concentrations of the target water quality parameter for a specific TSRunID. In this case the database returns a value for the blend ratio (between 0 and 1) that will achieve the treatment objective.

Blank

A blank returned for a selected parameter (including the target parameter) indicates that there was no reportable data for this parameter. This occurs when data for the selected parameter was not analyzed or was omitted for QC reasons for a specific TSRunID. For example, the analysis of DCBAA, CDBAA, and TBAA was not required during the treatment studies and many TSRunIDs do not have values for these parameters.

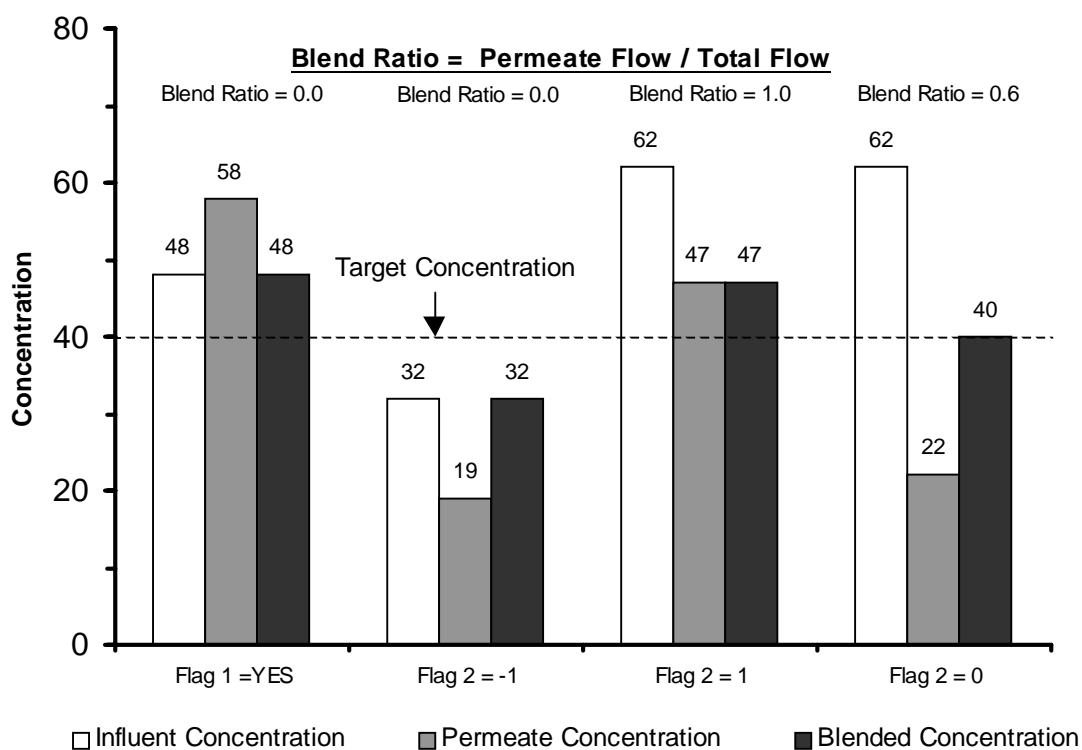


Figure 9. Definition of Membrane Flags

10.3. Appendix: List of Pretreatment Codes

In the Pretreatment Information module of the database and in the GAC Study Design and Membrane Study Design tables, there are Pretreatment Codes that succinctly describe the pretreatment processes used prior to the GAC or membrane process for a specific TSSRunID. These codes were developed from an analysis of the raw pretreatment information and are intended to standardize the different pretreatment process combinations to allow for effective querying of study results based on pretreatment. The following table describes the Pretreatment Codes that are used in this database.

Pretreatment Code	Description
AER	Aeration, typically using packed-tower aerators, tray aerators or bubble diffusers.
AER+pH-decrease	Aeration followed by chemical addition to decrease the pH.
AER+pH-increase	Aeration followed by chemical addition to increase the pH.
AER+ScalCtrl+MFILT	Aeration followed by chemical addition to control precipitation of inorganic salts followed by microfiltration.
AER+SOFT	Aeration followed by chemical softening.
CONV	Conventional filtration (i.e., coagulation, flocculation, sedimentation and filtration).
CONV+CL2	Conventional filtration followed by chlorine addition.
CONV+MFILT+ScalCtrl	Conventional filtration followed by microfiltration followed by chemical addition to control scale formation.
CONV+OZONE	Conventional filtration followed by ozonation.
CONV+pH-increase	Conventional filtration followed by chemical addition to increase the pH.
CONV+ScalCtrl	Conventional filtration followed by chemical addition to control scale formation.
CONV+ScalCtrl+CL2Rmvl	Conventional filtration followed by chemical addition to control scale formation followed by a chlorine removal process.
CONV+UVDIS+ScalCtrl	Conventional filtration followed by UV-disinfection followed by chemical addition to control scale formation.
CS/SOFT+pH-decrease	Conventional filtration and chemical softening followed by chemical addition to decrease the pH.
CS/SOFT+ScalCtrl	Conventional filtration and chemical softening followed by chemical addition to control scale formation.
ENHC	Conventional filtration under enhanced coagulation conditions.
FILT	Filtration using either media or cartridge filters.
MFILT+ScalCtrl	Microfiltration followed by chemical addition to control scale formation.
MFILT+ScalCtrl+CLM	Microfiltration followed by chemical addition to control scale formation followed by chloramination.
OZONE	Ozonation for disinfection and/or pre-oxidation.
OZONE+CS/SOFT+OZONE	Pre-ozonation followed by conventional filtration and softening followed by post-ozonation.
OZONE+SOFT+pH-decrease	Pre-ozonation followed by chemical softening followed by chemical addition to decrease the pH.
ScalCtrl+FILT	Chemical addition to control scale formation followed by cartridge filtration.
SOFT	Chemical softening (i.e., lime/soda addition, flocculation, sedimentation and filtration).
SOFT+pH-decrease	Chemical softening followed by chemical addition to decrease the pH.
SOFT+pH-decrease+OZONE	Chemical softening followed by chemical addition to decrease the pH followed by ozonation.
SOFT+ScalCtrl	Chemical softening followed by chemical addition to control scale formation.
TS/SOFT	Two-stage chemical softening.
TS/SOFT+pH-decrease	Two-stage chemical softening followed by chemical addition to decrease the pH.
TS/SOFT+pH-decrease+OZONE	Two-stage chemical softening followed by chemical addition to decrease the pH followed by ozonation.
UFILT+ScalCtrl	Ultrafiltration followed by chemical addition to control scale formation.
UVDIS	Disinfection by ultraviolet irradiation.