THE USE OF SPREADSHEET PLATFORMS TO DEVELOP
STOCHASTIC ENVIRONMENTAL SIMULATORS

BY

LARRY E. LOCKWOOD

Bachelor of Science in Geological Engineering
South Dakota School of Mines and Technology
Rapid City, South Dakota
1972

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
July, 1995
THE USE OF SPREADSHEET PLATFORMS TO DEVELOP
STOCHASTIC ENVIRONMENTAL SIMULATORS

Thesis Approved:

William J. McFerson
Thesis Adviser

Donald R. Smith

Dean of the Graduate College
ACKNOWLEDGEMENTS

I wish to thank Dr. William McTernan for his assistance in developing the stochastic models used in this paper, without his input their final forms and functions would not have been achieved. I would also like to thank him for his guidance in writing this paper and his overall support throughout this work.

I would like to thank Dr. Donald R. Snethen and Dr. John N. Veenstra for serving on my advisory committee and reviewing this work.

Finally, I would like to thank my wife, Kathleen, for her love and support throughout this process. I also want to thank her for her help in word processing, proofing, and assembling this paper.
# TABLE OF CONTENTS

Chapter | Page
---|---
I. THE USE OF SPREADSHEET PLATFORMS TO DEVELOP STOCHASTIC ENVIRONMENTAL SIMULATORS... | 1
   INTRODUCTION | 1
   MODEL | 2
   UNCERTAINTY | 3
II. METHODOLOGY | 10
   THE SPREADSHEET PLATFORM | 10
   BACKGROUND | 15
   RISC2 OBJECTIVE | 17
   INDUSTRIAL SOURCE COMPLEX DISPERSION (ISC2) MODEL | 20
   LOTUS 1-2-3® MACRO FOR RISC2 | 21
   RISC2 PROGRAM | 24
   RISC2 PREPROCESSOR MODULE | 24
   RISC2 FILE AND MODEL MODULES | 47
   RISC2 RISK MODULE GENERAL INFORMATION | 48
   MONTE CARLO PROCESSING | 49
   THE @RISK® ADD-IN | 52
   STRUCTURE OF RISK OPTION | 56
   COGMOD OBJECTIVE | 60
   GENERAL ALGORITHM | 60
   CONDITIONAL SIMULATION | 61
   COGMOD STRUCTURE | 74
III. RESULTS | 93
   RISC2 | 93
   COGMOD | 128
IV. DISCUSSION AND SUMMARY | 146

SELECTED BIBLIOGRAPHY | 149
APPENDIXES | 152
   APPENDIX A - LOTUS ADVANCED MACRO COMMANDS | 153
   APPENDIX B - COMPLETE SERIES OF GUIDANCE SCREENS FOR RISC2 (ISC2) EXAMPLE PROBLEM | 168
APPENDIX C - COMPLETE SERIES OF GUIDANCE SCREENS FOR COGMOD EXAMPLE
PROBLEM FROM 3M SITE .................. 239

APPENDIX D - LIST OF PROGRAMMING CODE (MACROS)
FOR RISC2 AND RISC2A ................... 304

APPENDIX E - LIST OF PROGRAMMING CODE (MACROS)
FOR COGMOD .............................. 389
LIST OF TABLES

Table | Title | Page
--- | --- | ---
1. | Source of Uncertainty | 6
2. | Partial List of Lotus® Menu Commands Used in the Effort | 12
3. | Partial List of Advanced Macro Commands Used in the Effort | 14
4. | Example of Macro Menu Structure for "Height" Macro Menu | 23
5. | List of ISC2 "CO" Pathway Keywords and Parameters with the Corresponding Spreadsheet Menus and Macro Names | 27
6. | List of ISC2 "SO" Pathway Keywords and Parameters with the Corresponding Spreadsheet Menus and Macros | 37
7. | List of "RE" Pathway Keywords and Parameters with the Corresponding Spreadsheet Menus and Macros | 39
8. | List of the ISC2 "ME" Pathway Keywords and Parameters with the Corresponding Spreadsheet Menus and Macros | 40
9. | List of ISC2 "OU" Pathway Keywords and Parameters with the Corresponding Spreadsheet Menus and Macros | 41
10. | List of ISC2 "EV" Pathway Keywords and Parameters with the Corresponding Spreadsheet Menus and Macros | 41
11. | List of Probability Distribution Functions Included with the @RISK® | 54
12. | List of STATPAC Programs Used in this Effort and Their Function | 66
13. | 3M Site example problem parameters | 129
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Primary Structure of STOCHASTIC Decision Support System: RISC2 ........................................ 19</td>
</tr>
<tr>
<td>2.</td>
<td>Macro Menu Structure for the ISC2 &quot;CO&quot; Pathway Keywords and Parameters in the RISC2 Preprocessor ........................................ 26</td>
</tr>
<tr>
<td>3.</td>
<td>Macro Menu Structure for the ISC2 &quot;SO&quot; Pathway Keywords and Parameters in the RISC2 Preprocessor ........................................ 35</td>
</tr>
<tr>
<td>4.</td>
<td>Macro Menu Structure for the ISC2 &quot;RE&quot; Pathway Keywords and Parameters in the RISC2 Preprocessor ........................................ 43</td>
</tr>
<tr>
<td>5.</td>
<td>Macro Menu Structure for the ISC2 &quot;ME&quot; Pathway Keywords and Parameters in the RISC2 Preprocessor ........................................ 44</td>
</tr>
<tr>
<td>6.</td>
<td>Macro Menu Structure for the ISC2 &quot;EV&quot; and &quot;OU&quot; Pathway Keywords and Parameters in the RISC2 Preprocessor ........................................ 46</td>
</tr>
<tr>
<td>7.</td>
<td>Illustration of the Processing Steps Required for a Monte Carlo Simulation ........................................ 51</td>
</tr>
<tr>
<td>8.</td>
<td>Macro and Macro Menu Structure for the RISK Module of RISC2 ........................................ 55</td>
</tr>
<tr>
<td>9.</td>
<td>General Flow Diagram of Steps Required to Perform a Conditional Simulation ........................................ 62</td>
</tr>
<tr>
<td>10.</td>
<td>Steps Required for Conditional Simulation and the Programs Used to Perform each Step in this Effort ........................................ 65</td>
</tr>
<tr>
<td>11.</td>
<td>General Structure of COGMOD SETUP and FUNCTION Menus and the Interaction of the Associated Modules ........................................ 75</td>
</tr>
<tr>
<td>12.</td>
<td>Illustration of the Macro Structure for the DATA Module ........................................ 77</td>
</tr>
<tr>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>13</td>
<td>The Macro Structure for the KRIGE Module</td>
</tr>
<tr>
<td>14</td>
<td>The Macro Structure for the RUNMOD Module</td>
</tr>
<tr>
<td>15</td>
<td>Flow Diagram of the Macros and Subroutines Associated with the ITER1 for Command in the RUNMOD Module</td>
</tr>
<tr>
<td>16</td>
<td>Flow Diagram of the Macros and Subroutines Associated with the ITER Subroutine</td>
</tr>
<tr>
<td>17</td>
<td>Printout of ISCST2 Example Problem Runstream File from ISC2 User Manual page 2-11</td>
</tr>
<tr>
<td>18</td>
<td>RISC2 Title Page</td>
</tr>
<tr>
<td>19</td>
<td>Display of Second RISC2 Title Screen</td>
</tr>
<tr>
<td>20</td>
<td>RISC2 Screen Display for Main Macro Menu of Program Options</td>
</tr>
<tr>
<td>21</td>
<td>RISC2 Screen Display for Main Function Menu in Preprocessor Module</td>
</tr>
<tr>
<td>22</td>
<td>Screen Display of Main Menu for &quot;CO&quot; Pathway</td>
</tr>
<tr>
<td>23</td>
<td>Screen Display of MODEL OPTS Menu for Selection of Various Default and Nondefault Model Options</td>
</tr>
<tr>
<td>24</td>
<td>Screen display of AVERTIME Menu Which Appears Following the Selection of the Short Term Model from the Previous Menu (not shown)</td>
</tr>
<tr>
<td>25</td>
<td>Screen Display of User Prompt and Comment Screen for User Input of AVERTIME Time Intervals</td>
</tr>
<tr>
<td>26</td>
<td>Screen Display of Main &quot;SO&quot; Pathway Menu</td>
</tr>
<tr>
<td>27</td>
<td>Screen Display of Location Coordinate and Source Type Selection Menu</td>
</tr>
<tr>
<td>28</td>
<td>Screen Display of Point Source Parameters Menu</td>
</tr>
<tr>
<td>29</td>
<td>Screen Display of the Main Menu for the &quot;RE&quot; Pathway</td>
</tr>
<tr>
<td>30</td>
<td>Screen Display for Menu of Polar Grid Options</td>
</tr>
<tr>
<td>31</td>
<td>Screen Display for Main Menu for &quot;ME&quot; Pathway</td>
</tr>
<tr>
<td>32</td>
<td>Screen Display of Main Menu for &quot;OU&quot; Pathway</td>
</tr>
</tbody>
</table>
33. Screen Display for Menu of "OU" Tabular Options 118
34. Screen Display of Main Menu for RISK Module.... 119
35. Screen Display of Menu for Selection of Statistical of Graphic Results of Model Output......................... 122
36. Screen Display of Statistical Output Table..... 124
37. Screen Display of Menu for Selecting RISC2 Output Graphs................................. 125
38. Graph of 3 Hour Mean Results vs number of Iterations.................................... 126
39. Graph of Probability Percent for Maximum 3 Hour Concentrations............................. 127
40. COGMOD Main Menu for Module Selection........... 130
41. Screen Display of STATPAC TERFIL Interactive Program...................................... 132
42. Screen Display of STATPAC FILTER Program....... 133
43. Screen Display of Basic Statistics Results in BASTAT........................................... 134
44. Screen Display of Prompt and Comments for Converting Raw Data to Form Acceptable for Kriging.................................................. 136
45. Display of Semivariogram and Model Parameters for Example Problem.......................... 137
46. Screen Display of Result after Kriging in the SS2DGRID STATPAC Program...................... 140
47. Screen Display of 19 Grid Values from the First Iteration of the Example Problem........... 141
48. Screen Display of Same Grid Points as Figure 48 with Values from Second Iteration.......... 142
49. Screen Display of Values from Third Iteration for Same Grid Points as Previous Figures........... 143
50. Screen Display of Values from Fourth Iteration of Same Grid Points in Example Problem........... 144
51. Screen Display of Fifth Iteration from Same Grid Points as Previous Figures

145
CHAPTER I

THE USE OF SPREADSHEET PLATFORMS TO
DEVELOP STOCHASTIC ENVIRONMENTAL SIMULATORS

INTRODUCTION:

Engineers and scientists are often required to predict the values for a variable at some unmeasured point. In many cases it is not practical to measure data at the desired point due to the location being physically inaccessible, having prohibitive sampling costs or if the value is required at a future time or under alternative conditions. Mathematical modeling of these and related situations may prove to be the only viable approach when proceeding with environmental decision making. The United States Environmental Protection Agency (EPA) recognizes this in their Risk Assessment Guidance for Superfund Volume 1 Human Evaluation Manual (Part A) which lists three (3) specific instances where fate and transport modeling may be required:

1. Where exposure points are spatially separate from monitoring points.
2. Where temporal distribution of data is lacking.
3. Where monitoring data are restricted by the limit of quantitation. (EPA, 1989)

The most practical and commonly accepted method for prediction
is to use some type of model.

MODELS:

A model is defined as "an abstract representation of a (real-world) physical, social, or other system in terms of mathematical equations, flow diagrams, computer programs, or algorithms" (Lewis and Orav, 1989). In this definition a system is any collection of interacting parts. The most practical method of creating such a system is to use some type of computer modeling program. One common type of computer model is the deterministic code in which a partial differential equation is solved (numerically or analytically) for a given set of input values, parameters, and boundary conditions. The result is a single output value. The majority of "ground-water-management" models are dependent on deterministic flow and solute transport assumptions (ASCE, 1990). In this type of model the input parameters are assumed to be known throughout the system (Fetter, 1993). This assumption is never completely true due to uncertainties in the data. These uncertainties can be addressed by stochastic modeling.

P. A. Lewis and E. J. Orav refer to stochastic models as simulations, which they define as "a controlled statistical
sampling technique (experiment) that is used, in conjunction with a model, to obtain approximate answers for questions about complex, multifactor probabilistic problems" (Lewis and Orav, 1989). Deutsch and Journel (1992) use a simpler definition of stochastic model, which is more appropriate to this discussion, by defining it as the process of building alternative, equally probable, high resolution models of the spatial distribution of the variable or variables in question. In stochastic modeling it is assumed that there is a statistical uncertainty in the value of certain input parameters. This method of solution depends on determining or knowing the distribution of these properties within the system and will result in a range of values rather than a unique value. (Fetter, 1993).

UNCERTAINTY:

All computer models that deal with physical data have the problem of uncertainty. Uncertainty, in its simplest form refers to data or assumptions that are indeterminate, indefinite, contain doubt or not reliable. L. G. Langley and William McTernan discuss three types of uncertainties which are generally considered to be the major uncertainties affecting (groundwater) model accuracy and precision:

1. transport mechanisms,
2. proper choice of model code and
3. accurate input parameters (Langley and McTernan, 1992-93).

C. John Mann (1993) divided uncertainties into three types, based on how each arises and is treated. Type I uncertainty comes from measurement error, bias or imprecision. All measurements contain some amount of error, bias or imprecision and should have an associated plus or minus value. In many cases this value is so small in relation to the measured value as to be insignificant, but it does exist and methods have been developed to treat this uncertainty. Type II uncertainty comes from the inherent variation or randomness in natural parameters. This type of uncertainty is particularly important to geologists and others trying to model natural processes and phenomena that is basically stochastic (random). One way to address this type of uncertainty is through the use of probability density functions and stochastic modeling. Type III uncertainty is due to lack of knowledge or scientific ignorance and the inability to model nature accurately. This type of uncertainty includes incomplete knowledge of relationships of components within a model, or an imperfect mathematical model. This type of uncertainty is always present when predictions are made into the future because all the necessary formulations can not be known or estimated accurately. "The uncertainty is proportional to the length of time into the future or past over which the predictions are made" (Mann, 1993). Type III uncertainties have been largely
ignored since they are due to a lack of knowledge and therefore are theoretically undeterminable. Since the EPA now requires a probabilistic standard in its licensing requirements for nuclear waste, Type III uncertainties are now evaluated subjectively in risk assessments for those repositories (Mann, 1993).

A simplified list of the common sources for the three types of uncertainties was presented by Mann (1993) and is includes as Table 1. The uncertainties induced by Type I and Type II sources can be described by probability density functions and these functions can be used in stochastic models. Type III uncertainties can only be evaluated subjectively at this time. A comparison of the three types of uncertainty addressed by Langely and McTernan with the list in Table 1 indicates that both the uncertainty of 1) transport mechanisms and 2) proper choice of model code parallel the entries "imperfect concepts" and "imperfect (or incorrect) models under the Type III sources. These sources can not currently be addressed subjectively. The uncertainty of accurate input parameters is a type II, or stochastic, uncertainty and as such can be addressed with stochastic modeling.

Although stochastic modeling addresses the Type II uncertainties it also presents some problems. Either an acceptable stochastic model must be found or the elements of
### TABLE 1: SOURCES OF UNCERTAINTY

#### Type I Uncertainty (errors, bias, imprecision)

- Errors in measurement (gross, bias, operator, conceptual, etc.)
- Conceptual error in population measured
- Bias in measurement process (device, method, technique)
- Imprecision of measurement process (device, method, technique)
- Inadequate sampling
- Physical limitation to sampling
- Inability to determine accurate pdf's
- Inability to know true accuracy (true bias)
- Inability to truly isolate a system
- Computational inaccuracies (mathematical analog imperfect)

#### Type II Uncertainty (stochasticity)

- Inherent natural variation
- Heterogeneity in materials
- Anisotropy in parameters
- Inability to characterize a variable adequately
- Inability to determine an accurate pdf for a variable
- Physical inability to sample adequately
- Practical need to use average values or other indicators rather than pdf's
  - Noise in natural system
  - Noise in computational system

#### Type III Uncertainty (ignorance)

**A. Lack of knowledge**
- Incomplete knowledge
- Erroneous knowledge
- Imperfect concepts, laws, hypotheses, and principles
- Use of subjective probabilities rather than objective probabilities
- Ambiguity in concepts, data, models
- Vagueness in concepts, data, models
- Fuzziness in concepts, data, models
- Distortion in concepts, data, models
- Confusion in evidence
- Dissonance in evidence
- Nonspecificity in evidence

**B. Need for generalizations**
- Need for simplifications
- Use of incorrect models (conceptual or mathematical)
- Use of imperfect models (conceptual or mathematical)
- Computational inaccuracies (mathematical analog imperfect)

Source: Mann, 1993
stochastic modeling must be applied to an acceptable deterministic model. If a deterministic model is used, the distribution functions of the variable input parameters must be statistically sampled and the model run a number of times until a statistically acceptable answer is obtained. This sampling must either be done manually or by some type of computer program specifically written to perform this function. Obviously, manually performing a statistical sampling of the distribution function, then imputing that variable into the model and running it for hundreds or maybe thousands of repetitions is not practical. Likewise, creating a program to perform these functions is often not practical for many environmental professionals who are not trained computer programmers. Programming may require a large and impractical investment of time to 1) learn the programming language and 2) perform the programming itself. This time requirement is reduced significantly if the "programmer" already knows the programming language and is working within a familiar framework.

One approach to addressing the shortfall between the computer programmer and user is to use the programming (macro) capability in conjunction with the DOS command interface functions present in spreadsheet programs such as Lotus 1-2-3®, Excel®, or Quattro Pro®. These programs have the capability to manipulate data, perform complex mathematical
calculations, and control other programs. Most engineers, if they are computer literate at all, are familiar with one or more of the popular spreadsheet programs. Recent advances in the availability of stochastic "ADD-IN"s for these spreadsheet programs, as well as the proliferation of public domain software which can be called from the spreadsheet allow for the development of sophisticated stochastic models within a platform both readily available and understood by most engineers.

This paper discusses two applications of Lotus 1-2-3® macros and spreadsheet capabilities to develop environmental simulators capable of addressing uncertainty. In this way, the public domain EPA codes were altered from a deterministic to a stochastic base. The first application uses a series of macros to control the generation of Monte Carlo realizations of one or more selected input parameters, save those parameters in the proper format, call and run the EPA's Industrial Source Complex Diffusion (ISC2) deterministic model and retrieve the model output into the spreadsheet. This process is automatically repeated for the number of realizations selected by the operator.

The second application uses the spreadsheet capabilities to manipulate data, control input and output functions and run several different DOS programs to generate the values
necessary to create a conditioned geostatisical simulation of a selected parameter or variable. The macro generates a field of conditioned geostatisical values which can be input to a deterministic model. As in the first application, the macros will repeat this process automatically for a number of realizations selected by the operator to generate a stochastic model.
CHAPTER II

METHODOLOGY:

THE SPREADSHEET PLATFORM:

A spreadsheet is a computer representation of an accountant's columnar pad. Each worksheet is divided into cells which may contain a number, a formula or text. In addition, a cell may contain a special formula called an @function. An @function is a built in formula within Lotus 1-2-3® that can be accessed by entering its name in a cell. These formulas can be used for financial, statistical, and scientific calculations, as well as creating conditional formulas which allow the spreadsheet to switch between optional calculations or actions. Regardless of its content, each cell may be linked to any other cell or cells in the worksheet so changes in one cell can effect the content of other cells.

LOTUS 1-2-3® was used as the spreadsheet platform for this effort due to its overwhelming availability to the engineering community, the availability of probability based "ADD-IN"s and its capabilities to call DOS programs through MACROS. Other spreadsheets, however, could have also been as easily applied.
Lotus 1-2-3® has a menu of command options that can be activated by pressing the [/] key (the square brackets [] will be used throughout this paper to designate an individual key entry). Table 2 shows some of the most common Lotus® menu options used in these applications. Once the menu is activated by pressing the [/] key, individual options can be selected by either moving the cursor to the desired option and pressing [ENTER] or by typing the first letter of the option name, i.e. [R] activates the RANGE option.

It is also possible to record a series of keystrokes and 1-2-3 commands in a worksheet so they can be played back, as needed, to perform a set task. This series of recorded keystrokes, @functions and macro commands is called a Macro. A macro may be initiated by pressing the [ALT] and [F3] together, then selecting the desired macro’s name from the menu that follows. Macros with names containing only a backslash \ and a single letter, such as "\A", may be initiated by pressing [ALT] and the letter ("A" in the example) together. Macro commands and keystrokes are input as labels (text) within a named range (normally a series of cells within a column). There can be (and usually are) more than one keystroke or command per cell. Keystrokes refer to single key entries such as [/] (slash) whereas commands can be either a key name such as [PGDN] or an advanced macro command such as {BRANCH}, both of which are written in braces {} in the macro. Macros can be linked
TABLE 2.

PARTIAL LIST OF LOTUS® MENU COMMANDS

<table>
<thead>
<tr>
<th>PRIMARY COMMAND</th>
<th>SECONDARY COMMAND</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORKSHEET</td>
<td>various</td>
<td>Change various options on the worksheet.</td>
</tr>
<tr>
<td>RANGE</td>
<td>ERASE</td>
<td>Erases data in a range.</td>
</tr>
<tr>
<td>RANGE</td>
<td>NAME</td>
<td>Creates and deletes range names.</td>
</tr>
<tr>
<td>RANGE</td>
<td>VALUE</td>
<td>Copies a range of data, replacing any copied formulas with their current values.</td>
</tr>
<tr>
<td>COPY</td>
<td></td>
<td>Copies a range of data, including formulas &amp; formats to another range in the same or different file.</td>
</tr>
<tr>
<td>MOVE</td>
<td></td>
<td>Transfers a range of data, including formulas and formats to another range in the same file.</td>
</tr>
<tr>
<td>FILE</td>
<td>COMBINE</td>
<td>Incorporates data from a worksheet file on disk into the current file.</td>
</tr>
<tr>
<td>FILE</td>
<td>IMPORT</td>
<td>Reads data from a text file on disk into the current worksheet.</td>
</tr>
<tr>
<td>FILE</td>
<td>OPEN</td>
<td>Reads a worksheet file into memory and places it before or after the current file.</td>
</tr>
<tr>
<td>FILE</td>
<td>RETRIEVE</td>
<td>Reads a worksheet file into memory. The retrieved file replaces the file that was current.</td>
</tr>
<tr>
<td>FILE</td>
<td>SAVE</td>
<td>Saves worksheet files on disk.</td>
</tr>
<tr>
<td>PRINT</td>
<td>PRINTER</td>
<td>Selects the printer as the output destination.</td>
</tr>
<tr>
<td>PRINT</td>
<td>FILE</td>
<td>Selects a text file on disk as the print destination. Allows the operator to create text files to share data with other programs.</td>
</tr>
<tr>
<td>PRINT</td>
<td>[P,F] ALIGN</td>
<td>[P,F] indicates second level command can be either PRINTER or File. Align command assures that page breaks, headers, footers and graphs are placed in the proper position on the printed page.</td>
</tr>
<tr>
<td>PRINT</td>
<td>[P,F] CLEAR</td>
<td>Removes the print Range and other settings from existing print specifications.</td>
</tr>
<tr>
<td>Print</td>
<td>GO</td>
<td>Go sends the selected data to the printer or file.</td>
</tr>
<tr>
<td>PRINT</td>
<td>OPTIONS</td>
<td>Allows the operator to select various additional print options including Other-Unformatted which is used to suppress page breaks in test files.</td>
</tr>
<tr>
<td>GRAPH</td>
<td>various</td>
<td>Various graph commands are used to create and view graphs of selected data.</td>
</tr>
<tr>
<td>DATA</td>
<td>PARSE</td>
<td>Separates and converts a single column of long labels into several columns of data.</td>
</tr>
<tr>
<td>DATA</td>
<td>QUERY</td>
<td>Locates and edits selected records in a database.</td>
</tr>
<tr>
<td>DATA</td>
<td>SORT</td>
<td>Arranges records in a database table in the order the operator specifies.</td>
</tr>
<tr>
<td>SYSTEM</td>
<td></td>
<td>Temporarily suspends 1-2-3 and returns to DOS so DOS commands can be used without ending the current 1-2-3 session.</td>
</tr>
<tr>
<td>QUIT</td>
<td></td>
<td>Ends the current 1-2-3 session and returns to DOS system.</td>
</tr>
</tbody>
</table>
together to form complex command structures and create a "program" within the worksheet. One major advantage of using macros is that there will be only a relative few new commands to learn, unlike a normal programming language such as Fortran or Basic. Table 3 lists the names and descriptions of some of the "advanced macro commands" commonly used in these applications. A complete list of advanced macro commands, along with their description and form is in appendix C.

Another feature of the LOTUS 1-2-3® spreadsheet is the availability of ADD-IN programs such as @RISK® (Palisade 1992). An ADD-IN is a program that communicates directly with LOTUS 1-2-3® and extends the capabilities of LOTUS 1-2-3®. There are three types of ADD-INS: @functions, macro commands, and applications. The ADD-IN @functions and macro commands are accessed in the same way and behave the same as built in @functions and macro commands once the ADD-IN has been loaded into memory. ADD-IN applications usually are created to perform a specific task. An ADD-IN program can contain any combination of @functions, macro commands and applications.

In the first application program, called RISC2, the ADD-IN @RISK® was used to provide Monte Carlo processing capability to Lotus 1-2-3® and to the U. S. Environmental Protection Agency’s Industrial Source Complex Diffusion (ISC2) air pollution model. The @RISK® ADD-IN programs can be also be
### TABLE 3.

**PARTIAL LIST OF ADVANCED MACRO COMMANDS USED IN THIS EFFORT**

<table>
<thead>
<tr>
<th>MACRO COMMAND</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>{APPENDBELOW}</code></td>
<td>Copies data in one range to the bottom of another range, automatically extending the second range to include the copied data.</td>
</tr>
<tr>
<td><code>{APPENDRIGHT}</code></td>
<td>Copies data in one range to the right of another range, automatically extending the second range to include the copied data.</td>
</tr>
<tr>
<td><code>{CONTENTS}</code></td>
<td>Copies the contents of one cell to another cell as a label. Usually used to store a numeric value as a string.</td>
</tr>
<tr>
<td><code>{LET}</code></td>
<td>Enters a label or number in a cell.</td>
</tr>
<tr>
<td><code>{CLOSE}</code></td>
<td>Closes an open text cell.</td>
</tr>
<tr>
<td><code>{OPEN}</code></td>
<td>Opens a new or existing text file so work can be performed on that file.</td>
</tr>
<tr>
<td><code>{READ}</code></td>
<td>Copies a series of bytes from the open text file to a cell.</td>
</tr>
<tr>
<td><code>{READLN}</code></td>
<td>Copies an entire line from the open file to a cell.</td>
</tr>
<tr>
<td><code>{SETPOS}</code></td>
<td>Changes the location in the open file at which data is read from or written to.</td>
</tr>
<tr>
<td><code>{WRITE}</code></td>
<td>Writes a string to the open text file.</td>
</tr>
<tr>
<td><code>{WRITELN}</code></td>
<td>Writes a string to the open text file and adds an end-of-line sequence.</td>
</tr>
<tr>
<td><code>{subroutine}</code></td>
<td>Performs a subroutine call: Executes the subroutine at the specified location before continuing down the current column of instructions.</td>
</tr>
<tr>
<td><code>{BRANCH}</code></td>
<td>Performs a branch: Transfers macro control from the current column of macro instructions to another location.</td>
</tr>
<tr>
<td><code>{FOR}</code></td>
<td>Creates a for loop: Repeats a subroutine a specified number of times.</td>
</tr>
<tr>
<td><code>{IF}</code></td>
<td>Sets up a condition that 1-2-3 evaluates to determine whether to continue with the macro instructions that follow <code>{IF}</code> in the same cell or to go directly to the instructions in the next cell.</td>
</tr>
<tr>
<td><code>{QUIT}</code></td>
<td>Ends the macro, returning keyboard control to the user.</td>
</tr>
<tr>
<td><code>{RETURN}</code></td>
<td>Used in subroutines to end the subroutine and return macro control to the instruction following the subroutine.</td>
</tr>
<tr>
<td><code>{SYSTEM}</code></td>
<td>Temporarily suspends the 1-2-3 session and passes command to the operating system. When the operating system command is completed, automatically resumes the 1-2-3 session and continues the macro --VERY IMPORTANT--</td>
</tr>
<tr>
<td><code>{GETLABEL}</code></td>
<td>Displays a prompt in the control panel, waits for a response to the prompt, and enters the response as a label in a cell.</td>
</tr>
<tr>
<td><code>{GETNUMBER}</code></td>
<td>Displays a prompt in the control panel, waits for a response to the prompt, and enters the response as a number in a cell.</td>
</tr>
<tr>
<td><code>{MENUBRANCH}</code></td>
<td>Displays a customized menu in the control panel, waits for the operator to select a menu item, then branches to the macro instructions associated with that menu item.</td>
</tr>
<tr>
<td><code>{FRAMEOFF}</code></td>
<td>Turns off the display of the worksheet frame (column letters and row numbers).</td>
</tr>
<tr>
<td><code>{FRAMEON}</code></td>
<td>Restores display of worksheet frame.</td>
</tr>
</tbody>
</table>
used to perform risk analysis of spreadsheet data. The combination of the risk analysis capability with the spreadsheet's capability to manipulate data, perform complex mathematical calculations, and control other programs and functions through the use of macros provides a powerful tool for environmental engineers. Spreadsheets can be used to accomplish all this without the need to learn the complex command structure of most programming languages.

BACKGROUND:

Lotus 1-2-3® and other spreadsheet software allow the spreadsheet to interface with DOS programs. In general, LOTUS 1-2-3® will interface with models (DOS programs) that use some form of an ASCII file for input and output. This ability is crucial to the effort discussed in this paper. The menu selection [/] System listed in Table 2 allows the operator to temporarily exit the spreadsheet without ending or effecting the current worksheet and execute DOS commands. The worksheet can be reactivated be typing "EXIT" at the DOS prompt. The more important system option is the advanced macro command {SYSTEM} as described in Table 3. This command allows the macro to exit the spreadsheet and automatically execute a DOS command. When the DOS command is complete the spreadsheet is reactivated and the macro continues with the next command in
There are four basic steps in using Lotus 1-2-3® to create a stochastic model from a deterministic one:

1) Create a range of lotus cells with input values or alphanumeric strings that, when output in ASCII format (text file), duplicates the input format required by the deterministic model.

2) Retrieve an appropriate statistical value of the random variable into the Lotus spreadsheet and, if necessary convert it into a usable form.

3) Create a "Macro" to:
   1) replace the desired variable within the input range with the appropriate statistical value,  
   2) run the deterministic model 1 time, and  
   3) import the output value from the deterministic model to a range within the spreadsheet (if desired).

4) Create a "Macro" to repeat steps 2 and 3 the desired number of times for the simulation.

The spreadsheet can be expanded to include preprocessing of the model input, post processing of the model results and linking models together. The two example programs demonstrate some of these capabilities. The first application is named RISC2 and uses the @RISK® ADD-IN to create a number of Monte Carlo realizations of the selected variable which are input to the EPA’s Industrial Source Complex Diffusion (ISC2) deterministic model to determine the probability range of output concentrations. The second application is named COGMOD and uses the spreadsheet capabilities in conjunction with COVAR, and various STATPAC programs to generate a conditioned simulations of a geostatistical distribution for subsequent
input into a deterministic model. More detailed descriptions of each of these applications follow.

RISC2 OBJECTIVE:

The objective of this effort was to create an environmental decision support model (system) employing a stochastic air pollution model developed from a public domain DOS based deterministic code. Controlled by the spreadsheet platform and augmented by the Monte Carlo "ADD-IN" this DOS code becomes capable of being accessed repeatedly with randomly selected inputs to produce a stochastic output. The EPA Industrial Source Complex (ISC2) Dispersion model, a Lotus 1-2-3® worksheet and the @RISK® "ADD-IN" were used in this effort.

A Decision Support System is defined by G. L. Simons, in his book "Expert Systems and Micros, (1985)," as: "...an interactive data processing and display system which is used to assist in a concurrent decision-making process and which also conforms to the following characteristics:

i. it is sufficiently user-friendly to be used by the decision maker(s) in person

iii. it displays its information in a format and terminology which is familiar to its user(s)

iii. it is selective in its provision of information and
Decision support systems are designed to assist in decision making, but not remove the human element from the process.

To satisfy the criteria for a decision support system, RISC2 was created to be almost entirely menu driven. This model consists of two main and two minor divisions, either of which can be selected from the main menu. The flowsheet in Figure 1 shows how these four divisions interact. The first major division of the worksheet is designated as the preprocessor module which Figure 1 shows as the FUNCTION menu within an area labeled PREPROCESSOR MODULE. This division creates an input file for the ISC2 model by using a series of menus and Lotus® macros. The second major portion (designated as the RISK MODULE) combines certain functions of the Lotus® "ADD-IN" program @RISK® with LOTUS 1-2-3® macros and the ISC2 model to perform a Monte Carlo simulation. This module is represented by the RISK menu enclosed in the RISK MODULE area. Figure 1 also presents the structure of the entire macro prepared for this effort. The two minor divisions, MODEL and FILE, (see Menu Section) are also introduced. These run the IS CST model a single time and either import or export ASCII files to and from the spreadsheet, respectively. These will be discussed more fully later in this paper.
Figure 1. Primary Structure of Stochastic Decision Support System: RISC2
INDUSTRIAL SOURCE COMPLEX DISPERSION (ISC2) MODEL:

The ISC2 models (long term, ISCLT and short term, ISCST) were specifically designed for the EPA to meet the specifications in their Guideline on Air Quality Models (EPA, 1992). They are popular with the modeling community in part due to the large number of options for various conditions that the model will accept. Two types of input data are required, 1) the runstream setup file which contains the modeling options, source and receptor location information, meteorological file specifications and output options and 2) the meteorological data file. The macros discussed in this paper only affect the runstream setup file input data. The meteorological data are not subject to randomization with this version of RISC2. Although the ISCLT and ISCST are separate models, many of the runstream input parameters are identical and both models are included in the ISC2 documentation. The ISC2 runstream setup file consists of a series of lines or records, each of which must contain a "pathway", a keyword and one or more parameters. Each item or "field" in a record must be separated from the others by at least one blank space. There are five different "pathways" which must be included in the ISC2 runstream file in a specific order. These pathways and the order in which they must be input are as follows:

CO - Specify overall job COntrol options
SO - Specify SOurce information
RE - Specify REceptor information
ME - Specify MEteorology information and
OU - Specify OUtput options

Each pathway starts with the keyword "STARTING" and ends with the keyword "FINISHED". The keyword specifies the type of option or input data on a line, while the parameter defines the specific option selected or input data. The runstream line (or record) generally has the appearance of this example CO record:

```
CO MODLOPT DFAULT RURAL CONC
```

where CO is the PATHWAY, MODLOPT is the KEYWORD and DFAULT, RURAL and CONC are PARAMETERS specifying 1) that the model use the EPA default options, 2) in a rural (vs urban) setting with 3) all input and output contaminant values in concentrations (vs depositions).

**LOTUS 1-2-3® MACROS FOR RISC2:**

The macros in RISC2 create the runstream setup file. The lines (or records) are created by a series of menu selections and interactive input by the operator. The macro prompts the operator to select an area for comments (usually the "HOME" screen) and an area where the runstream file will be created (usually [PGDN] one time from home to location A23). The Lotus "frame", the row of letters across the top and the
column of numbers down the left side of the screen, is turned off by the macro command \{FRAMEOFF\} to improve appearance and avoid potential confusion during the creation of the runstream file.

The macro menus are created in much the same way as the macros discussed in the section on the spreadsheet platform. These menu items are entered, one per cell, in the first row of the menu location. The cell below each item is reserved for a description (up to 512 characters) of the menu item and is not used in the macro operation. The macro commands start in the following cell (third row) below each menu item and continue down the column until either a command redirects the macro or a blank cell is encountered. The macro menu is named by using the "/ Range Name Create" command to name the first cell of the macro menu. An example of the macro menu structure for the HEIGHTS macro menu which sets the keyword for receptor heights in the runstream file is found in Table 4. When this macro menu is accessed the screen will display a menu showing two selections, FLAT, for setting all receptors at a constant height, and ELEV, which allows the operator to input receptors at varying heights. When either of these selections is highlighted the cell below that selection, either "IGNORE ALL TERRAIN HEIGHTS or ALLOWS INPUT OF RECEPTOR HEIGHTS", will be displayed to describe the selection. When an item is selected, by highlighting that item and pressing [ENTER], the
## TABLE 4.

**EXAMPLE OF MACRO MENU STRUCTURE FOR "HEIGHT" MACRO MENU**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HEIGHT</td>
<td>FLAT</td>
<td>ELEV</td>
<td>MENU SELECTION</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>macro name</td>
</tr>
<tr>
<td>2</td>
<td>IGNORE ALL</td>
<td>ALLOWS INPUT</td>
<td></td>
<td>description of option</td>
</tr>
<tr>
<td></td>
<td>TERRAIN</td>
<td>OF RECEPTOR</td>
<td></td>
<td>option</td>
</tr>
<tr>
<td></td>
<td>HEIGHTS</td>
<td>HEIGHTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>{LET OPT,FLAT}</td>
<td>{LET OPT,ELEV}</td>
<td></td>
<td>macro command</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>{LET}</td>
</tr>
<tr>
<td>4</td>
<td>/RNDOPT~</td>
<td>/RNDOPT~</td>
<td></td>
<td>macro keystrokes</td>
</tr>
<tr>
<td>5</td>
<td>{MENUBRANCH T}</td>
<td>{MENUBRANCH T}</td>
<td></td>
<td>macro command</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>{MENUBRANCH}</td>
</tr>
</tbody>
</table>

Macro commands below the description are followed, one keystroke or command at a time until the macro is completed.

In this example, if FLAT is selected from the menu, the first cell below the description contains a macro command, in braces{}, which places the word "FLAT" in the cell previously named "OPT". The following cell contains a series of keystrokes that call up the Lotus® menu [/], range [R], name [N], options, and delete [D] the name "OPT". The final cell in the macro contains the {MENUBRANCH} command which transfers the command line of the macro to a macro menu, in this case the macro menu named "T".
RISC2 PROGRAM:

The first macro menu is the "SELECT" menu which contains the options to run "PREPROCESSOR", "RISK", "MODEL", "FILE" or "QUIT". Figure 1, which was previously discussed, shows how the various selections in this menu interact. The "QUIT" selection exits the macro and returns the operator to normal Lotus® operations. Each of the other selections initiates a series of macros which will be referred to as modules. Since the functions and macro structure of the modules vary significantly each module will be discussed separately starting with the "PREPROCESSOR" module.

RISC2 PREPROCESSOR MODULE:

Selection of the "PREPROCESSOR" module calls up the "FUNCTION" macro menu as shown in Figure 1. This menu contains the ISC2 runstream pathway name selections "CO", "SO", "RE", "ME", "EV", and "OU" in the order they must be addressed (from left to right). Selection of any of the pathways causes the macro to first write the corresponding pathway name and the word "STARTING" in the first blank line of the runstream file, then proceed to the first menu of selections for that pathway. In this way the ISC2 runstream file operations developed by the U.S. EPA and previously introduced are now controlled by the
The "CO" pathway contains more options and is more complex than the other pathways addressed in the preprocessor module. Figure 2 shows the structure of the menus used to create the runstream records for the "CO" pathway. Table 5 lists the ISC2 (short term) keywords and input parameters used in this pathway and shows what menu and macro is used to input each keyword or parameter in the appropriate field and record. The "CO" pathway will be discussed in detail to demonstrate the construction of the program. The first menu in the "CO" pathway is the "T" macro menu which contains selections for "TITLES", "MODELopts", "INTERVALS", "POLLUTION ID", "RUN OR NOT", "TERRAIN HEIGHTS", "MORE" and "QUIT". These selections are mandatory keywords and are ordered from left to right in the same order as they should appear in the ISC2 runstream file. The "TITLES" selection allows the operator to type up to two (2) lines of titles or comments in the runstream file. The macro places the "CO" pathway designation in the first cell of the first blank line of the runstream file, moves right one (1) cell and gives that cell a name (TITLE1). Almost all selections from any menu in this "PREPROCESSOR" will perform these same functions prior to performing any specific functions unique to that selection, therefore this step will not be discussed in subsequent selections. The

spreadsheet platform and easily accessed by MACROS developed for this effort.
Figure 2. Macro menu structure for the ISC2 CO pathway keywords and parameters in the RISC2 Preprocessor
TABLE 5.

LIST OF ISC2 "CO" PATHWAY KEYWORDS AND PARAMETERS
WITH THE CORRESPONDING SPREADSHEET MENUS AND MACRO NAMES

<table>
<thead>
<tr>
<th>KEYWORD</th>
<th>PARAMETER</th>
<th>MENU</th>
<th>MACRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>TITLEONE</td>
<td>Title1</td>
<td>T</td>
<td>TITLES</td>
</tr>
<tr>
<td>TITLETWO</td>
<td>Title2</td>
<td>T</td>
<td>TITLES</td>
</tr>
<tr>
<td>MODELOPT</td>
<td>DFAULT</td>
<td>MODEL</td>
<td>DFAULT</td>
</tr>
<tr>
<td>MODELOPT</td>
<td>CONC or DEPOS</td>
<td>MODEL</td>
<td>CONC or DEPOS</td>
</tr>
<tr>
<td>MODELOPT</td>
<td>RURAL or URBAN</td>
<td>MODEL</td>
<td>RURAL OR URBAN</td>
</tr>
<tr>
<td>MODELOPT</td>
<td>GRDIS</td>
<td>MODEL2</td>
<td>GRDIS</td>
</tr>
<tr>
<td>MODELOPT</td>
<td>NOSTD</td>
<td>MODEL2</td>
<td>NOSTD</td>
</tr>
<tr>
<td>MODELOPT</td>
<td>NOBID</td>
<td>MODEL2</td>
<td>NOBID</td>
</tr>
<tr>
<td>MODELOPT</td>
<td>NOCALM</td>
<td>MODEL2</td>
<td>NOCALM</td>
</tr>
<tr>
<td>MODELOPT</td>
<td>MSGPRO</td>
<td>MODEL2</td>
<td>MSGPRO</td>
</tr>
<tr>
<td>AVERTIME</td>
<td>Time1</td>
<td>II</td>
<td>TIME1</td>
</tr>
<tr>
<td>AVERTIME</td>
<td>Time2</td>
<td>II</td>
<td>TIME2</td>
</tr>
<tr>
<td>AVERTIME</td>
<td>Time3</td>
<td>II</td>
<td>TIME3</td>
</tr>
<tr>
<td>AVERTIME</td>
<td>Time4</td>
<td>II</td>
<td>TIME4</td>
</tr>
<tr>
<td>AVERTIME</td>
<td>MONTH</td>
<td>II</td>
<td>MONTH</td>
</tr>
<tr>
<td>AVERTIME</td>
<td>PERIOD</td>
<td>II</td>
<td>PERIOD</td>
</tr>
<tr>
<td>POLLUTID</td>
<td>Pollut</td>
<td>T</td>
<td>POLLUTION ID</td>
</tr>
<tr>
<td>HALFLIFE</td>
<td>Haflif</td>
<td>C</td>
<td>HALFLIFE</td>
</tr>
<tr>
<td>DCAYCOEF</td>
<td>Decay</td>
<td>C</td>
<td>DECAY COEFF</td>
</tr>
<tr>
<td>TERRHGTS</td>
<td>FLAT or ELEV</td>
<td>HEIG</td>
<td>FLAT OR ELEV</td>
</tr>
<tr>
<td>ELEVUNIT</td>
<td>METERS or FEET</td>
<td>E</td>
<td>FEET OR METERS</td>
</tr>
<tr>
<td>FLAGPOLE</td>
<td>Flagdf</td>
<td>C</td>
<td>FLAGPOLE</td>
</tr>
<tr>
<td>RUNORNOT</td>
<td>RUN or NOT</td>
<td>R</td>
<td>RUN or NOT-RUN</td>
</tr>
<tr>
<td>EVENTFIL</td>
<td>Evfile</td>
<td>S</td>
<td>EVFILE</td>
</tr>
<tr>
<td>EVENTFIL</td>
<td>Evopt</td>
<td>S</td>
<td>SOCONT or DETAIL</td>
</tr>
<tr>
<td>SAVEFILE</td>
<td>Savfil</td>
<td>RS2</td>
<td>SAVFIL</td>
</tr>
<tr>
<td>SAVEFILE</td>
<td>Savfil2</td>
<td>RS2</td>
<td>SAVFIL2</td>
</tr>
<tr>
<td>MULTYYEAR</td>
<td>Savfil</td>
<td>RS1</td>
<td>SAVFIL</td>
</tr>
<tr>
<td>MULTYYEAR</td>
<td>Inifil</td>
<td>RS1</td>
<td>INIFIL</td>
</tr>
<tr>
<td>ERRORFIL</td>
<td>Errfil</td>
<td>C</td>
<td>ERROR FILE</td>
</tr>
<tr>
<td>ERRORFIL</td>
<td>DEBUG</td>
<td>C</td>
<td>ERROR FILE</td>
</tr>
</tbody>
</table>
macro then prompts the operator for Title 1 which may contain
up to 80 alpha-numeric characters by using the macro
{GETLABEL} command. The {GETLABEL} command follows the
structure {GETLABEL "operator prompt",range name}. The macro
command shows whatever "operator prompt" that is entered in
the command at the top of the screen. Once the operator
responds to the prompt and presses [ENTER] the response is
entered in the named range (TITLE1). This macro command is
used extensively throughout this worksheet since it allows the
operator to input character strings without interrupting the
macro commands.

The second menu selection is "MODEL OPTS". After the macro
inserts the "CO" pathway and "MODELOPT" keyword in the
runstream file it lists a series of optional keywords and
descriptions on the comment screen, then proceeds to the
"MODEL" macro menu which contains these optional keywords as
selections. If the operator chooses "DFAUOT", "CONC", "DEPOS",
"RURAL" or "URBAN" the macro moves the cursor to the end of
the runstream file and names the cell "OPT". It then enters
the selection name in the "OPT" cell and deletes the name
"OPT". The model allows any number of selections to be made
from the "MODEL" menu with all selections being placed on the
same line. Selection of the "NON-DEFAULT" option transfers
macro command to the "MODEL2" macro menu. This macro menu
contains the non-default optional keyword selections "GRDRIS"
for gradual plume rise, "NOSTD" for no stack-tip downwash, "NOBID" for no buoyancy-induced dispersion, "NOCALM" to bypass calms, and "MSGPRO" to specify use of a missing data routine. The macro treats these selections in the same manner as the selections from the "MODEL" macro menu. In addition to these selections the "MODEL2" macro menu contains the selection "RETURN". This option returns the macro command to the "MODEL" menu. Both the "MODEL" menu and the "MODEL2" menu contain the "QUIT" option. The "QUIT" selection from either menu returns the operator to the "T" menu for additional selections.

Selection of the "INTERVALS" mandatory keyword from the "T" menu transfers macro command to the "I" macro menu. This menu allows the operator to select either the short term or long term ISC2 model and "QUIT" to return to the "T" macro menu. Selection of the "SHORT TERM" interval inputs the number "1" in the macro worksheet cell named "TERM" whereas the "LONG TERM" selection inputs a "2" in this same cell. This cell will be accessed by the macro later. Assuming the "SHORT TERM" model is selected, after the "1" is input into "TERM" the macro command is transferred to the "II" macro menu. This macro menu contains four (4) time interval selections named "TIME1", "TIME2", "TIME3" and "TIME4". The selection of any of these options causes the macro to prompt the operator to enter the short term averaging period in hours. A list of
possible time intervals to be employed is displayed on the comments screen to assist the user. The macro then returns command to the "II" menu for another selection. The "II" menu also contains the optional keywords "MONTH" and "PERIOD". The selection of either of these keywords enters the selected keyword in the "TIME" cell which is created and deleted in the same manner is previously discussed. As in the other menus, this menu also contains a "QUIT" option which returns command to the "T" menu.

The next selection in the "T" macro menu is the "POLLUTION ID" mandatory keyword. This selection prompts the operator for the name of the pollutant (up to 8 characters) by using the "GETLABEL" command then transfers the entered string to the last line of the runstream file and returns to the "T" menu. The "GETLABEL" macro command has the same structure and functions in the same manner as the "GETNUMBER" macro command discussed earlier. The difference in the two commands is the "GETLABEL" command inputs the characters entered as a label whereas the "GETNUMBER" command inputs the numeric characters as a value.

The "RUN OR NOT" option transfers macro command to the "R" menu. This menu allows the operator to select either the optional keyword "RUN" or "NOT" which is then input in the appropriate cell of the runstream file and the macro command
again returned to the "T" macro menu.

Selection of the "TERRAIN HEIGHT" option transfers the macro command to the "HEIGHTS" macro menu which has two (2) options: "FLAT" and "ELEV". The selection of either option inputs the selected keyword in the appropriate cell (temporarily named "OPT") at the end of the runstream file, deletes the cell name and returns the macro command to the "T" menu.

The "MORE" selection transfers macro command to the "C" macro menu which contains the options "HALFLIFE", "DECAY COEFF" "ELEV UNITS", "FLAGPOLE", "EVENT", "RE-START", and "ERROR FILE". In addition the menu contains the "QUIT" option which returns command to the "T" macro menu. The options "HALFLIFE", "DECAY COEFF" and "FLAGPOLE" each create the appropriate keyword at the first free line of the runstream file then names the next cell to the right of the keyword. The macro then prompts the operator for the keyword's corresponding value and places the value in the named cell. The cell's name is deleted and macro command is returned to the "C" menu. The "ELEV UNITS" selection transfers macro command to the "E" macro menu which contains two (2) selections: "FEET" and "METERS". Either option enters the keyword "ELEVUNIT" on the first blank line of the runstream file then enters either "FEET" or "METERS", depending on the selection made, in the cell immediately to the right of the
keyword. Macro command is returned to the "C" macro menu. The "EVENT" option transfers macro command to the "S" macro menu.

The "S" macro menu contains four options: "EVFILE", "SOCONT", "DETAIL" and "QUIT". The "EVFILE" option moves the cursor to the first blank line of the runstream file and enters the keyword "EVENTFIL" then moves one (1) cell to the right on the same line and names that cell "EVFILE". The operator is prompted for the name to be used for the input file which is entered into the cell named "EVFILE". The cell name "EVFILE" is deleted and the macro returns to the "S" menu. The option "SOCONT" moves the cursor to the first empty cell in same line as the previous selection and enters the keyword "SOCONT" in that cell. The option "DETAIL" moves the cursor to the same line and enters the keyword "DETAIL" in the first empty cell. The "QUIT" selection returns macro command to the "C" menu.

The next option in the "C" menu is "RE-START" which allows the operator to specify optional ISC2 keywords and parameters to generate an unformatted file of intermediate ISC2 results. This option allows a modeling session to be continued later if it is interrupted for any reason. This menu option also accesses another menu ("RS"). The "RS" menu contains two (2) selections: "SAVEFILE" and "MULTIYEAR", each of which transfers macro command to an additional macro menu. The
"SAVEFILE" option moves the cursor to the first blank line of the runstream file, inputs the keyword "SAVEFILE" and names the first cell to the right "SAVFIL". It then transfers command to the "RS2" menu. This menu has options of "SAVFIL", "DAYINC", "SAVFIL", "INIFILE" and "RETURN". The "SAVFIL" option prompts the operator for the intermediate storage filename which is then entered in the "SAVFIL" cell. The "DAYINC" option moves the cursor one cell to the right of the "SAVFIL" cell and names the cell "DAYINC". The macro then prompts the operator for number of days between dumps which the macro enters in the "DAYINC" cell. If the operator selects the "INIFILE" the macro moves the cursor to the next blank line, enters the keyword "INIFILE" and names the next cell to the right "INIFIL". It then prompts the operator for the filename for intermediate results. The "RETURN" option transfers macro command to the "C" macro menu. The "MULTIYEAR" selection moves the cursor to the next blank line in the runstream file and enters the "MULTIYEAR" keyword and names two cells to the right. It then transfers macro command to the "RS1" macro menu. This menu contains the options "SAVFIL", "INIFIL" and "RETURN". These selections perform the same functions as the selections with the same names in the previous menu.

The "ERROR FILE" selection from the "C" macro menu moves the cursor to the next blank line of the runstream file and enters
the "ERRORFIL" keyword. It prompts the operator for the name of the file of error messages. This name is input in the cell to the right if the keyword and the operator is asked if the "DEBUG" option is desired. If the "DEBUG" options is selected with "Y" for yes the macro inputs the "DEBUG" keyword in the next cell to the right of the file name. The macro then returns to the "C" macro. If the operator chooses "QUIT" from the "C" menu the macro command returns to the "T" macro menu. If the operator chooses "QUIT" from the "T" menu the macro moves the cursor to the next blank line in the runstream file and enters the pathway "CO" followed by the keyword "FINISHED". The macro command is then transferred to the "FUNCTION" menu to change pathways.

The second selection in the "FUNCTION" menu is "SO" for source information. This selection moves the cursor to the next blank line of the runstream file, enters the pathway name "SO" followed by the "STARTING" keyword. The macro command is then transferred to the "SO" macro menu. The "SO" macro menu contains selections for "LOCATION", "DOWNWASH", "EMISSIONS", "UNITS", "VARIABLES", "GROUPS" and "QUIT".

Figure 3 shows the structure and interaction of the various "SO" options. The "LOCATION" option accesses the "SOO" menu which controls input for the X, Y, and Z source coordinates and the source type. The "SOURCE TYPE" selection in this menu
Figure 3. Macro menu structure for the ISC2 "SO" pathway keywords and parameters in the RISC2 preprocessor
accesses the "SSO" menu which contains menu options for "POINT", "VOLUME" and "AREA", each of which access a menu of parameters specific to that type of contaminant source. When the required parameters have been entered from the selected type menu, "SOP" (point), "SOA", (area) or "SOV" (volume) macro control is returned to the "SO" menu by selecting "QUIT". The "DOWNWASH" selection accesses the "DOWN" menu of downwash parameters and returns to the "SO" menu. The "EMISSIONS" selection first determines if the model selected is short term (ISCST) or long term (ISCLT) by using the advanced macro {IF} command. Depending on the model selected the macro then accesses either the EMISFACS (short term) menu or the EMISFACL (long term) menu. Following the selection of the appropriate parameters from either of these menus the macro command is again returned to the "SO" menu. The selections of "UNITS" or "GROUPS" causes the macro to prompt the operator for certain parameters and return to the "SO" menu whereas the "VARIABLES" selection accesses another menu (VAR) for additional selections. Table 6 lists the "SO" pathway's keywords and parameters as well as the menus and macros associated with them. The macro structures, commands and menus used for the "SO" pathway are very similar to those used for the "CO" pathway parameters so they will not be discussed in detail. A complete listing of these macros, however, is located in appendix C.
**TABLE 6.**

**LIST OF ISC2 "SO" PATHWAY KEYWORDS AND PARAMETERS WITH THE CORRESPONDING SPREADSHEET MENUS AND MACROS**

<table>
<thead>
<tr>
<th>KEYWORD</th>
<th>PARAMETER</th>
<th>MENU</th>
<th>MACRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION</td>
<td>Srcid</td>
<td>SO</td>
<td>LOCATION</td>
</tr>
<tr>
<td>LOCATION</td>
<td>Srcstat</td>
<td>SO</td>
<td>Xs</td>
</tr>
<tr>
<td>LOCATION</td>
<td>Xs</td>
<td>SO</td>
<td>Ys</td>
</tr>
<tr>
<td>LOCATION</td>
<td>Zs</td>
<td>SO</td>
<td>Zs</td>
</tr>
<tr>
<td>SRCPARAM</td>
<td>Srcid, Ptemis, Stkht, Stktemp, Stkvel, Stkdia (point source)</td>
<td>SO</td>
<td>LOCATION</td>
</tr>
<tr>
<td>SRCPARAM</td>
<td>Srcid, Vlemis, Relhgt, Syinit, Szinit (volume source)</td>
<td>SO</td>
<td>LOCATION</td>
</tr>
<tr>
<td>SRCPARAM</td>
<td>Srcid, Aremis, Relhgt, Xinit (area source)</td>
<td>SO</td>
<td>LOCATION</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Srcid, Dsbh</td>
<td>SO</td>
<td>LOCATION</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Srcid, Dsbw</td>
<td>SO</td>
<td>LOCATION</td>
</tr>
<tr>
<td>LOWBOUND</td>
<td>Srcid, Idswak</td>
<td>SO</td>
<td>LOCATION</td>
</tr>
<tr>
<td>EMISFACT</td>
<td>Srcid, Qflag, Qfact</td>
<td>EMISPAC</td>
<td>SEASON, MONTH, HOUR, STAR, SEASON &amp; HOUR</td>
</tr>
<tr>
<td>EMISUNIT</td>
<td>Emifac, Emilbl, Conbl or Deplbl</td>
<td>SO</td>
<td>UNITS</td>
</tr>
<tr>
<td>SETVELOC</td>
<td>Srcid, Vsn</td>
<td>VAR</td>
<td>SETTLING-VELOCITIES</td>
</tr>
<tr>
<td>MASSFRAC</td>
<td>Srcid, Phi</td>
<td>VAR</td>
<td>MASS FRACTIONS</td>
</tr>
<tr>
<td>REFLCOEF</td>
<td>Srcid, Gamma</td>
<td>VAR</td>
<td>REFLECTION-COEFFICIENT</td>
</tr>
<tr>
<td>SRCGROUP</td>
<td>Grpid, Srcid's, Srcrng's</td>
<td>SO</td>
<td>GROUPS</td>
</tr>
</tbody>
</table>
A new type of macro command not previously discussed is found in the "HEIGHT" macro of the "DOWN" menu which is derived from the DOWNWASH selection in the "SO" menu. The "HEIGHT" selection macro starts with a macro "IF" command. The {IF} macro command has the structure {IF condition}. If the condition is true the macro continues with the macro command immediately following the {IF} command and in the same cell. If the condition is false the macro continues with the command located in the next cell in the column. In the "HEIGHT" macro the cell containing the "IF" command is \{IF <<RISC2>>TERM=2\}{BRANCH HTLT}. This can be interpreted as "if the cell named "TERM" in the "RISC2" file equals 2 (long term model) transfer macro command to the macro named HTLT. Since this paper only deals with the short term model, the value in "TERM" is 1 and the macro command proceeds to the next cell in the column. The macro continues through the remainder of the pathway menus until the "SO" pathway is completed.

The remaining selections from the "FUNCTION" menu ("RE", "ME", "EV", and "OU") access menus and operator prompts for the receptor (RE), meteorological (ME), event (EV) and output (OU) pathways. The keywords and parameters associated with each of these pathways along with their program menu location are listed in Tables 7 through 10.

These macros use the same general menu structure as the
### TABLE 7.

LIST OF "RE" PATHWAY KEYWORDS AND PARAMETERS
WITH THE CORRESPONDING SPREADSHEET MENUS AND MACROS

<table>
<thead>
<tr>
<th>KEYWORD</th>
<th>PARAMETER</th>
<th>MENU</th>
<th>MACRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRIDCART</td>
<td>Netid, STA</td>
<td>GRID</td>
<td>CARTESIAN</td>
</tr>
<tr>
<td>GRIDCART</td>
<td>XYINC, Xinit, Xnum, Xdelta, Yinit, Ynum, Ydelta</td>
<td>GRID2</td>
<td>INCREMENTS</td>
</tr>
<tr>
<td></td>
<td>Gridx1, Gridx2, Gridx3, etc &amp; Gridy1, Gridy2, Gridy3, etc.</td>
<td>GRID2</td>
<td>X-POINTS</td>
</tr>
<tr>
<td></td>
<td>Gridid1, Gridx2, Gridx3, etc &amp; Gridy1, Gridy2, Gridy3, etc.</td>
<td>GRID2</td>
<td>Y-POINTS</td>
</tr>
<tr>
<td>GRIDCART</td>
<td>ELEV, Row, Zelev1, Zelev2, Zelev3, etc.</td>
<td>GRID2</td>
<td>ELEVATIONS</td>
</tr>
<tr>
<td></td>
<td>Row, Zelev1, Zelev2, Zelev3, etc.</td>
<td>GRID2</td>
<td>ELEVATIONS</td>
</tr>
<tr>
<td></td>
<td>Ring1, Ring2, Ring3, etc</td>
<td>GRID3</td>
<td>DISTANCES</td>
</tr>
<tr>
<td>GRIDPOLR</td>
<td>Netid, STA</td>
<td>GRID</td>
<td>POLAR</td>
</tr>
<tr>
<td></td>
<td>ORIG, Xinit, Yinit</td>
<td>GRID3</td>
<td>ORIGIN</td>
</tr>
<tr>
<td>GRIDPOLR</td>
<td>DIST, Ring1, Ring2, Ring3, etc</td>
<td>GRID3</td>
<td>DISTANCES</td>
</tr>
<tr>
<td></td>
<td>Dir1, Dir2, Dir3, etc</td>
<td>GRID3</td>
<td>DISCRETE DIR</td>
</tr>
<tr>
<td>GRIDPOLR</td>
<td>GDIR, Dirnum, Dirini, Dirinc</td>
<td>GRID3</td>
<td>GENERATED DIR</td>
</tr>
<tr>
<td></td>
<td>ELEV, Rad, Zelev1, Zelev2, Zelev3, etc</td>
<td>GRID3</td>
<td>ELEVATIONS</td>
</tr>
<tr>
<td></td>
<td>Rad, Zelev1, Zelev2, Zelev3, etc</td>
<td>GRID3</td>
<td>ELEVATIONS</td>
</tr>
<tr>
<td></td>
<td>Flag, Zflag1, Zflag2, Zflag3, etc</td>
<td>GRID3</td>
<td>FLAGPOLE</td>
</tr>
<tr>
<td>DISCCART</td>
<td>Xcoord, Ycoord</td>
<td>RE</td>
<td>DISCRETE-CARTESIAN</td>
</tr>
<tr>
<td>DISCPOLR</td>
<td>Srcid, Range, Direct</td>
<td>RE</td>
<td>DISCRETE POLAR</td>
</tr>
<tr>
<td>BOUNDARY</td>
<td>Srcid, Dist,(36)</td>
<td>RE</td>
<td>PLANT BOUNDARY</td>
</tr>
<tr>
<td>Boundlev</td>
<td>Srcid, Zelev, (36)</td>
<td>RE</td>
<td>BOUNDARY-ELEVATIONS</td>
</tr>
</tbody>
</table>
### TABLE 8.

**LIST OF THE ISC2 "ME" PATHWAY KEYWORDS AND PARAMETERS WITH THE CORRESPONDING SPREADSHEET MENUS AND MACROS**

<table>
<thead>
<tr>
<th>KEYWORD</th>
<th>PARAMETER</th>
<th>MENU</th>
<th>MACRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUTFIL</td>
<td>Metfil</td>
<td>ME</td>
<td>FILENAME</td>
</tr>
<tr>
<td>ANEMHIGHT</td>
<td>Zref</td>
<td>ME</td>
<td>HEIGHT</td>
</tr>
<tr>
<td>SURFDATA</td>
<td>Stanum,</td>
<td>DATA2 / ME</td>
<td>STATION</td>
</tr>
<tr>
<td></td>
<td>Year</td>
<td>ME</td>
<td>STATION</td>
</tr>
<tr>
<td>UAIRDATA</td>
<td>Stanum,</td>
<td>DATA2 / ME</td>
<td>STATION</td>
</tr>
<tr>
<td></td>
<td>Year</td>
<td>ME</td>
<td>STATION</td>
</tr>
<tr>
<td>STARTEND</td>
<td>Strtyr,</td>
<td>PERIOD1</td>
<td>START DATE</td>
</tr>
<tr>
<td></td>
<td>Strtmn,</td>
<td>PERIOD1</td>
<td>START DATE</td>
</tr>
<tr>
<td></td>
<td>Strtdy,</td>
<td>PERIOD1</td>
<td>END DATE</td>
</tr>
<tr>
<td></td>
<td>Endyr,</td>
<td>PERIOD1</td>
<td>END DATE</td>
</tr>
<tr>
<td></td>
<td>Endmn,</td>
<td>PERIOD1</td>
<td>END DATE</td>
</tr>
<tr>
<td></td>
<td>Enddy,</td>
<td>PERIOD1</td>
<td>END DATE</td>
</tr>
<tr>
<td></td>
<td>Endhr</td>
<td>PERIOD1</td>
<td>END HOUR</td>
</tr>
<tr>
<td>DAYRANGE</td>
<td>Range1,</td>
<td>PERIOD1</td>
<td>DAYRANGE</td>
</tr>
<tr>
<td></td>
<td>Range2,</td>
<td>PERIOD1</td>
<td>DAYRANGE</td>
</tr>
<tr>
<td></td>
<td>Range3, etc</td>
<td>PERIOD1</td>
<td>DAYRANGE</td>
</tr>
<tr>
<td>STARDATA</td>
<td>(long term)</td>
<td>STARDAT</td>
<td>STARDATA</td>
</tr>
<tr>
<td>WDRotate</td>
<td>Rotang</td>
<td>DATA</td>
<td>WIND ALIGNMENT</td>
</tr>
<tr>
<td>WINDPROF</td>
<td>Stab,</td>
<td>DATA</td>
<td>EXPONENTS</td>
</tr>
<tr>
<td></td>
<td>Prof1,</td>
<td>DATA</td>
<td>EXPONENTS</td>
</tr>
<tr>
<td></td>
<td>Prof2,</td>
<td>DATA</td>
<td>EXPONENTS</td>
</tr>
<tr>
<td></td>
<td>Prof3,</td>
<td>DATA</td>
<td>EXPONENTS</td>
</tr>
<tr>
<td></td>
<td>Prof4,</td>
<td>DATA</td>
<td>EXPONENTS</td>
</tr>
<tr>
<td></td>
<td>Prof5,</td>
<td>DATA</td>
<td>EXPONENTS</td>
</tr>
<tr>
<td></td>
<td>Prof6</td>
<td>DATA</td>
<td>EXPONENTS</td>
</tr>
<tr>
<td>DTETADZ</td>
<td>Stab,</td>
<td>DATA</td>
<td>TEMP GRAD</td>
</tr>
<tr>
<td></td>
<td>Dtdz1,</td>
<td>DATA</td>
<td>TEMP GRAD</td>
</tr>
<tr>
<td></td>
<td>Dtdz2,</td>
<td>DATA</td>
<td>TEMP GRAD</td>
</tr>
<tr>
<td></td>
<td>Dtdz3,</td>
<td>DATA</td>
<td>TEMP GRAD</td>
</tr>
<tr>
<td></td>
<td>Dtdz4,</td>
<td>DATA</td>
<td>TEMP GRAD</td>
</tr>
<tr>
<td></td>
<td>Dtdz5,</td>
<td>DATA</td>
<td>TEMP GRAD</td>
</tr>
<tr>
<td></td>
<td>Dtdz6</td>
<td>DATA</td>
<td>TEMP GRAD</td>
</tr>
<tr>
<td>WINDCATIONS</td>
<td>Ws1,</td>
<td>DATA</td>
<td>WIND SPEED</td>
</tr>
<tr>
<td></td>
<td>Ws2,</td>
<td>DATA</td>
<td>WIND SPEED</td>
</tr>
<tr>
<td></td>
<td>Ws3,</td>
<td>DATA</td>
<td>WIND SPEED</td>
</tr>
<tr>
<td></td>
<td>Ws4,</td>
<td>DATA</td>
<td>WIND SPEED</td>
</tr>
<tr>
<td></td>
<td>Ws5</td>
<td>DATA</td>
<td>WIND SPEED</td>
</tr>
<tr>
<td>AVEESPEED</td>
<td>(long term)</td>
<td>DATA1</td>
<td>WIND SPEED</td>
</tr>
<tr>
<td>AVETEMPS</td>
<td>(long term)</td>
<td>DATA1</td>
<td>AVERAGE TEMPS</td>
</tr>
<tr>
<td>AVEMIXHT</td>
<td>(long term)</td>
<td>DATA1</td>
<td>MIXING HEIGHTS</td>
</tr>
</tbody>
</table>
### Table 9.

**LIST OF ISC2 "OU" PATHWAY KEYWORDS AND PARAMETERS WITH THE CORRESPONDING SPREADSHEET MENUS AND MACROS**

<table>
<thead>
<tr>
<th>KEYWORD</th>
<th>PARAMETER</th>
<th>MENU</th>
<th>MACRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECTABLE</td>
<td>Aveper</td>
<td>OUI 1</td>
<td>RECEPTOR TABLE</td>
</tr>
<tr>
<td></td>
<td>FIRST,</td>
<td>OUI 1</td>
<td>RECEPTOR TABLE</td>
</tr>
<tr>
<td></td>
<td>SECOND,...</td>
<td>OUI 1</td>
<td>RECEPTOR TABLE</td>
</tr>
<tr>
<td></td>
<td>SIXTH,</td>
<td>OUI 1</td>
<td>RECEPTOR TABLE</td>
</tr>
<tr>
<td></td>
<td>INDSRC</td>
<td>OUI 1</td>
<td>RECEPTOR TABLE</td>
</tr>
<tr>
<td>MAXTABLE</td>
<td>Aveper,</td>
<td>OUI 1</td>
<td>MAXIMUM VALUE-</td>
</tr>
<tr>
<td></td>
<td>Maxnum,</td>
<td>OUI 1</td>
<td>TABLE</td>
</tr>
<tr>
<td></td>
<td>INDSRC,</td>
<td>OUI 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SOCONT</td>
<td>OUI 1</td>
<td></td>
</tr>
<tr>
<td>DAYTABLE</td>
<td>Avper1,</td>
<td>OUI 1</td>
<td>CONCURRENT VALUES</td>
</tr>
<tr>
<td></td>
<td>Avper2,</td>
<td>OUI 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avper3,</td>
<td>OUI 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avper4</td>
<td>OUI 1</td>
<td></td>
</tr>
<tr>
<td>MAXFILE</td>
<td>Aveper,</td>
<td>OUI 3</td>
<td>MAXIMUM VALUES</td>
</tr>
<tr>
<td></td>
<td>Grpid,</td>
<td>OUI 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thresh,</td>
<td>OUI 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filnam</td>
<td>OUI 3</td>
<td></td>
</tr>
<tr>
<td>PLOTFILE</td>
<td>Aveper,</td>
<td>OUI 3</td>
<td>PLOT FILES</td>
</tr>
<tr>
<td></td>
<td>Grpid,</td>
<td>OUI 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hivalu,</td>
<td>OUI 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filnam</td>
<td>OUI 3</td>
<td></td>
</tr>
<tr>
<td>POSTFILE</td>
<td>Aveper,</td>
<td>OUI 3</td>
<td>POST PROCESSING</td>
</tr>
<tr>
<td></td>
<td>Grpid,</td>
<td>OUI 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Format,</td>
<td>OUI 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filnam</td>
<td>OUI 3</td>
<td></td>
</tr>
</tbody>
</table>

### Table 10.

**LIST OF ISC2 "EV" PATHWAY KEYWORDS AND PARAMETERS WITH THE CORRESPONDING SPREADSHEET MENUS AND MACROS**

<table>
<thead>
<tr>
<th>KEYWORD</th>
<th>PARAMETER</th>
<th>MENU</th>
<th>MACRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVENTPER</td>
<td>Evname</td>
<td>EV</td>
<td>PERIOD</td>
</tr>
<tr>
<td></td>
<td>Aveper</td>
<td>EV</td>
<td>PERIOD</td>
</tr>
<tr>
<td></td>
<td>Grpid</td>
<td>EV</td>
<td>PERIOD</td>
</tr>
<tr>
<td></td>
<td>Date</td>
<td>EV</td>
<td>PERIOD</td>
</tr>
<tr>
<td>EVENTLOC</td>
<td>Evname</td>
<td>EV</td>
<td>CARTESIAN-LOCATION / POLAR LOCATION</td>
</tr>
<tr>
<td></td>
<td>XR</td>
<td>EV</td>
<td>LOCATION / POLAR LOCATION</td>
</tr>
<tr>
<td></td>
<td>YR</td>
<td>EV</td>
<td>LOCATION / POLAR LOCATION</td>
</tr>
</tbody>
</table>
previous two pathways. Figure 4 illustrates the macro and menu structure of the RECEPTOR or "RE" ISC2 pathway from the FUNCTION menu. The main menu for this pathway is the "RE" menu which contains selections for "GRID", "DISCRETE CARTESIAN" , "DISCRETE POLAR", "PLANT BOUNDARY", "BOUNDARY ELEVATIONS" and "QUIT". All of these selections except "GRID" prompt the operator for specific input parameters then return to the "RE" menu for additional selections. The "GRID" option accesses a menu by the same name which has options for "CARTESIAN" and "POLAR", each of which access an additional menu. The "GRID2" menu provides parameter options for receptors located on a Cartesian grid whereas "GRID3" provides polar grid options. When complete the "END" option returns the operator to the "RE" menu. The "QUIT" selection on the "RE" menu returns the macro command to the "FUNCTION" menu.

Figure 5 illustrates the structure of the various meteorological, "ME", pathway menus. These menus control the input parameters that affect how the meteorological data file is used by the ISC2 model but do not affect the meteorological data file itself. The main pathway for this pathway is the "ME" menu. The "FILENAME" selection from this menu accesses the "MES1" menu which contains options for various meteorological input file formats. The "HEIGHT" option in the "ME" menu allows the operator to specify the height of the meteorological sampling point and the "STATION" option
Figure 4. Macro menu structure for the ISC2 "RE" pathway keywords and parameters in the RISC2 preprocessor
Figure 5. Macro menu structure for the ISC2 "ME" pathway keywords and parameters in the RISC2 preprocessor
allows the operator to specify the station to be used for the model. The "PERIOD" selection macro uses an {IF} command, as discussed earlier, to determine whether the short term (ISCST) or long term (ISCLT) model is used. It then branches to either the short term menu, PERIOD1, or the long term menu, STARDAT, both of which return to the "ME" menu after the appropriate parameters are selected. The final "ME" menu selection is "DATA" which accesses the "DATA" menu which allows the operator to make corrections to some meteorological input file data. The "DATA" menu also accesses an additional menu (DATA1) if long term meteorological data is used.

The macro menu structures for the "EVENT" (EV) pathway and the "OUTPUT" (OU) pathway are shown in Figure 6. Selection of the "EV" pathway option from the "FUNCTION" menu accesses the "EV" menu of options that can be used in conjunction with EVENT processing. The "OU" selection from the "FUNCTION" menu accesses the "OU" menu which has options for "TABULAR" output or "SPECIAL PURPOSE" output. The "SPECIAL PURPOSE" option accesses another menu with options to output maximum values, plot files or files for post processing. The "TABULAR" option macro first uses the {IF} advanced macro command to switch between ISCST and ISCLT output options. The ISCST options in menu "OU1" include "RECEPTOR TABLE" which accesses "OU2" menu of high values to be summarized by receptor. The "CONCURRENT VALUE TABLE" selection also accesses another menu named II.
Figure 6. Macro menu structure for the ISC2 "EV" and "OU" pathways keywords and parameters in the RISC2 preprocessor
This is the same menu II as is accessed in the "CO" pathway. In this pathway this menu specifies time intervals to report concentrations at all receptors. Once all the selected keywords and parameters have been entered for a pathway, the operator can finish the pathway and return to the "FUNCTION" menu by entering "QUIT".

Once the input has been completed for all the pathways the operator may save the runstream file and return to the "SELECT" macro menu by choosing "QUIT" from the function menu. This option automatically saves the runstream file by transferring the macro command to the "SAVE" macro within the "FIL" menu. This macro prompts the user for the runstream file name and whether or not it is a new file. This macro not only saves the file to the disk but also inputs the file name in the appropriate locations in other macros so the correct file is automatically run with the model or risk options. The "SAVE" (file) option may also be accessed from the "SELECT" menu by using the "FILE" option.

**RISC2 FILE AND MODEL MODULES:**

The general structure of the minor divisions "FILE" and "MODEL" were shown in Figure 1, which was previously discussed. The FILE option accesses the "FIL" menu which
contains the "IMPORT" selection in addition to the "SAVE" macro previously discussed. The "IMPORT" option allows the operator to import a text file into the worksheet. The macro automatically returns to the "SELECT" menu after the file operations are completed.

The "MODEL" selection from the "SELECT" menu runs the ISC2 model one time in a deterministic manner. The macro determines if the input runstream file is for the short term or long term model, then exits Lotus® through use of the {SYSTEM} macro command and initiates the ISC2 model. Once the ISC2 program finishes running the model the macro command returns to the "SELECT" menu for further processing.

**RISC2 RISK MODULE GENERAL INFORMATION:**

The RISK module is the second major division of the RISC2 program (following the Preprocessor module). The various options in this division are combined with the ISC2 (under the ITERATIONS and RUN options of RISK) to generate a range of output values at the receptor points and perform a statistical analysis of these values. The method used for this simulation is called Monte Carlo modeling. Monte Carlo modeling directly transforms variations in input parameters to variations in output values. (Nichols and Freshley, 1993).
MONTE CARLO PROCESSING:

The general deterministic modeling process is represented by the equation

\[ C_w = g(X) \]  (1)

where \( C_w \) represents the value of the variable at the receptor, \( g \) represents the fate and transport model and \( X \) represents the vector of all model inputs (Dean et. al. 1989). Given a set of deterministic input parameters \( X_1, X_2, X_3, \ldots X_n \), equation (1) can be expanded so the computed the output variable at the receptor becomes:

\[ C_w = g(X_1, X_2, X_3, \ldots X_n) \]  (2)

Since some or all of the model input parameters \( X \) contain elements of uncertainty, as previously discussed, they may be considered random variables that are defined by their cumulative probability distribution functions (cpdf). If \( X \) is defined by a cpdf and a stochastic model is utilized, the resulting variable output at the receptor will be a cdf \( F_{C_w}(C_w') \) where

\[ F_{C_w}(C_w') = \text{Probability} \ (C_w \leq C_w') \]  (3)

and \( C_w' \) is a given output concentration (Dean et.al. 1989).

The objective of Monte Carlo simulation, or any stochastic modeling, is to estimate the cumulative distribution function
of the variable at a receptor location given the probability
distribution of the input parameter(s) (Dean et. al. 1989).
The Monte Carlo method involves the repeated generation of
random numbers that conform to the cpdf of the selected input
variable and the application of the selected model to derive
a series of output values at the receptor(s). These values
are subsequently analyzed to determine their cpdf and meet the
objective of the model. Figure 7 illustrates the six steps
Dean et.al. define as the Monte Carlo process. The steps in
the figure are summarized by Dean as:

"i. Selection of representative cumulative probability
distribution functions for the relevant input
variable(s).

ii. Generation of pseudo-random numbers from the
distributions selected in (i).

iii. Application of the model to compute the derived
inputs and output(s).

iv. Repeated application of steps (ii) and (iii).

v. Presentation of the series of output (random)
values generated in step (iii) as a cumulative
probability distribution function (cdf).

vi. Analysis and application of the cumulative
probability distribution of the output as a tool
for decision making" (Dean et.al. 1989).

Monte Carlo sampling techniques from the input variable PDF
are entirely random but do reflect the probability
distribution, i.e. a greater number of values will be drawn
from the areas of the distribution which have higher
probabilities of occurrence (@RISK 1992). If an infinite
number of sample values are derived from a given PDF the PDF
STEP 1
SELECT REPRESENTATIVE DISTRIBUTION FUNCTION FOR INPUT VARIABLE(S)

STEP 2
GENERATE PSEUDO-RANDOM NUMBER FROM DISTRIBUTION IN (1)

STEP 3
APPLICATION OF MODEL TO COMPUTE DERIVED INPUTS AND OUTPUTS

STEP 4
REPEAT STEPS 2 AND 3 MANY TIMES

STEP 5
GENERATE CUMULATIVE DISTRIBUTION FUNCTION FROM RESULTS OF STEP 4

STEP 6
APPLICATION OF RESULTS IN DECISION MAKING

Figure 7. Illustration of the processing steps required for a Monte Carlo simulation
will be reproduced. If a smaller number of samples are used, the values may be "clustered" and not accurately reflect the PDF. As the number of samples increases, the values increasingly reflect the original PDF and the sampling error decreases. After sufficient sample iterations the decrease in sampling error becomes very small and additional iterations do not significantly increase the precision of the results (ASCE 1990). Determination of sufficient model iterations may be performed graphically.

**THE @RISK® ADD-IN:**

@RISK® is a Lotus® "ADD-IN" (discussed previously) designed to integrate a stochastic simulation into the 1-2-3® worksheet. This specialized program uses either a Monte Carlo sampling technique or Latin Hypercube to randomize the input values from the PDF. This application is limited to the Monte Carlo sampling method since it is widely accepted and proven (Rubinstein, 1981). The @RISK® ADD-IN contains its own specialized screens for selecting variables with uncertainties, inputing the distribution functions for those variables, selecting the number of iterations, running the model and analyzing the output results. This is very efficient but only works on models completely contained within the LOTUS worksheet. That is, the input parameters, the model
equations and the output must be contained within normal worksheet cells and can not be dependent upon the execution of a macro. @RISK® only works on models contained within the worksheet because it most of its functions are controlled internally. It automatically recalculates the worksheet for the number of iterations requested, and records the results of each iteration within @RISK® (not on the spreadsheet). Any statistical analyses and graphing of these results are also performed on these internal results, not on values recorded in the worksheet. Since the RISC2 application requires not only a Lotus® macro, but also an external DOS model, most of the @RISK® capability cannot be used. However, that remaining portion of @RISK® that can be used is very important because of the Monte Carlo sampling routine and the wide variety of probability distribution functions supported.

The @RISK® program supports Monte Carlo sampling of forty different probability distributions, called @functions, as listed in Table 11. These @functions look and work the same as the other Lotus® @functions (once @RISK® is loaded). These distribution functions (@functions) are discussed at length and illustrated in the @RISK® manual. Each iteration of a simulation enters a new value for each PDF @function in the appropriate cell of the worksheet.
## TABLE 11.

**LIST OF PROBABILITY DISTRIBUTION FUNCTIONS INCLUDED WITH @RISK®**

<table>
<thead>
<tr>
<th>Function 1</th>
<th>Function 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>@BETA</td>
<td>@HYPERGEO</td>
</tr>
<tr>
<td>@BINOMIAL</td>
<td>@INDEP</td>
</tr>
<tr>
<td>@CORRMat</td>
<td>@INDEPC</td>
</tr>
<tr>
<td>@CHISQ</td>
<td>@LOGISTIC</td>
</tr>
<tr>
<td>@CUMUL</td>
<td>@LOGNORM</td>
</tr>
<tr>
<td>@DEP</td>
<td>@LOGNORM2</td>
</tr>
<tr>
<td>@DEPC</td>
<td>@NEGBIN</td>
</tr>
<tr>
<td>@DISCRETE</td>
<td>@NORMAL</td>
</tr>
<tr>
<td>@DISCRETER</td>
<td>@PARETO</td>
</tr>
<tr>
<td>@DUNIFORM</td>
<td>@POISSON</td>
</tr>
<tr>
<td>@DUNIFORMR</td>
<td>@SIMTABLE</td>
</tr>
<tr>
<td>@ERF</td>
<td>@SIMTABLER</td>
</tr>
<tr>
<td>@ERLANG</td>
<td>@TEXPON</td>
</tr>
<tr>
<td>@EXPON</td>
<td>@TLOGNORM</td>
</tr>
<tr>
<td>@GAMMA</td>
<td>@TNORMAL</td>
</tr>
<tr>
<td>@GEOMETRIC</td>
<td>@TRIANG</td>
</tr>
<tr>
<td>@GENERAL</td>
<td>@TRI1090</td>
</tr>
<tr>
<td>@GENERALR</td>
<td>@TRIGEN</td>
</tr>
<tr>
<td>@HISTOGRM</td>
<td>@UNIFORM</td>
</tr>
<tr>
<td>@HISTOGRMR</td>
<td>@WEIBULL</td>
</tr>
</tbody>
</table>
Figure 8. Macro and macro menu structure for the RISK module of RISC2
STRUCTURE OF RISK OPTION:

The RISK module, as illustrated in Figure 8, has much simpler structure than the PREPROCESSOR module. The main "RISK" menu contains options for "LOAD", "SELECT", "OUTPUT", "ITERATIONS", "RUN", "VIEW", "MAIN" and "QUIT". Four of these macro options, "LOAD", "SELECT", "OUTPUT", and "ITERATIONS" prompt the operator for input parameters then return to the "RISK" menu. The "RUN" selection macro uses a {FOR} advanced macro command to run the remainder of the macro and its subroutines the required number of iterations. The {FOR} advanced macro command is followed by an {IF} macro command to determine if the ISCST or ISCLT model is to be used. The remainder of the macro calls the ISC2 model and imports selected output back into the worksheet before returning to the "RISK" menu. The VIEW selection macro accesses the "VIEW1" menu which contains options for "STATISTICS" and "GRAPHS" and "RETURN". The "STATISTICS" option displays the cumulative statistics of the model output while the "GRAPHS" option accesses another menu, called "GRAPHS" to select various output graphs. Both the "VIEW" and "GRAPHS" macros return to the "VIEW1" menu where "RETURN" transfers macro command to the "RISK" menu. The final two options in the "RISK" menu are "MAIN", which returns macro command to the main "SELECT" menu, and "QUIT", which stops all macro processing. Together these options use the spreadsheet platform to control the DOS ISC2 program and
generate a stochastic model.

The "RISK" menu and its associated macros are contained on a separate worksheet file which is named RISC2A. This worksheet is automatically opened after the current worksheet and the worksheet file RISC2 is automatically closed. This operation is necessary because in large worksheets, such as the RISC2, the time required for each keystroke or command recalculation is significantly increased when @RISK® is loaded. Using the separate (smaller) worksheet file eliminates this problem.

The first item in the "RISK" menu is the "LOAD" option which loads the @RISK® "ADD-IN". "ADD-IN"s are loaded into the computer memory to interact with the Lotus 1-2-3® program rather than called with an executable file like regular DOS programs. In addition to loading the @RISK® "ADD-IN" this macro assigns the key combination [ALT]-[F7] (pressed at the same time) to activate @RISK®. It also changes the Lotus® spreadsheet calculation mode from automatic to manual. The manual recalculation mode causes Lotus® to only recalculate the cells in the spreadsheet when the [F9] (recalculation) key is pressed or called from a macro. The "SELECT" option allows the operator to select the variable parameter by moving the cursor, highlighting its cell, and pressing [ENTER]. Once the parameter has been selected the operator is prompted to enter the distribution function to be substituted for the value
Currently in the cell.

The third selection in the RISK menu is the OUTPUT option. This option prompts the operator to select the upper left corner of the range of output values. The macro then names several cells for later use during the output of the model values.

The "ITERATIONS" selection from the RISK menu prompts the operator for the number of iterations desired. The macro saves this value in the cell named "NUM" where it will be accessed by the "RUN" macro. This value for the number of iterations is NOT input into the @RISK® ADD-IN functions. This completes step (i) of the Monte Carlo process outlined by Dean et. al. (1989).

The "RUN" selection from the "RISK" menu completes step (ii) through step (iv) of that process. This macro first calls the @RISK® ADD-IN and selects Monte Carlo sampling with 1 Iteration per simulation within @RISK each time [CALC] is entered, either manually or through the macro. Since the @RISK® Monte Carlo sampling technique uses a random number that is representative of the probability distribution function for each iteration and each iteration is independent, for a given model and a given number of iterations, the output results will be statistically the same whether the number of
iterations are controlled by @RISK® or by the some other source, such as the macro. The macro proceeds to the {FOR} command which controls the number of iterations for the RUN macro and its subroutines. The RUN macro determines if the ISCST or ISCLT model is to be used and calls the appropriate model. After the ISC2 model is completed, the RUN macro accesses the \C macro which retrieves and stores the output results in tabular form within the Lotus® worksheet. Once the total number of iterations requested have been reached the macro returns to the "RISK" menu.

The VIEW options accesses the VIEW1 menu which contains selections for STATISTICS, GRAPHS and RETURN. RETURN transfers macro command back to the RISK menu. The VIEW1 menu completes steps v and vi of the Monte Carlo process. The STATISTICS option creates an output table of statistical values including the mean, variance, and standard deviation for the maximum 3 hour and 24 hour model output values. The macro displays the table of results on the screen until the operator presses [ENTER].

The GRAPHS option in the VIEW1 menu accesses the GRAPHS menu which has selections for the three hour and 24 hour means, standard deviations, variances and probabilities. When one of these options is selected the macro creates and displays the corresponding graph.
The QUIT option in the RISK menu stops macro processing and returns the operator to normal LOTUS 1-2-3® worksheet functions.

**COGMOD OBJECTIVE:**

The objective of this example was to create a conditional simulation program using the LOTUS spreadsheet platform and the readily available or public domain programs COVAR (Williams and El-Kadi, 1986) and STATPAC (Grundy and Miesch, 1987). The LOTUS platform not only controls these programs, but also processes and converts the data between programs. This effort was directed at conditioning hydraulic conductivity but any other two-dimensional spatially correlated data set can be generated by these methods. This (conditioned simulation) follows that of Delhomme (1979) as outlined by M. D. Varljen and J. M. Shafer (1991).

**GENERAL ALGORITHM:**

Varljen and Shafer define the procedure for performing a conditional simulation of hydraulic conductivity as follows:

1. Define the spatial correlation structure $\gamma$ from the measured values of hydraulic conductivity $z(x)$ at the sample points $x_j, j=1,\ldots,M$. 
2. Calculate the kriged hydraulic conductivity values $z^*(x)$ at each location $x_i$ in the kriged grid area where $i = M+1, \ldots, N$ by using the spatial correlation structure $\gamma$ and the measured values $x_j$ from step 1.

3. Generate the unconditioned random field $s(x)$ at each grid point while preserving the spatial correlation structure $\gamma$ of the original measured values at the sample points.

4. Calculate the kriged field $s^*(x)$ for each point in the grid area $x_i, i = M+1, \ldots, N$. These values are generated by using the spatial correlation $\gamma$ and the simulated values $s(x_j)$ at the original sample points $x_j, j = 1, \ldots, M$.

5. Calculate the conditioned hydraulic conductivity random field $z_s(x)$ from $z_s(x) = z^*(x) + [s(x) - s^*(x)]$.

Repeat steps 3 through 5 to generate additional hydraulic conductivity random fields.

Figure 9 schematically illustrates the steps applied in this process.

**CONDITIONAL SIMULATION:**

The first step in the conditional simulation process was to create a number of realizations of the random function $S(x)$ which have the same spatial correlation as the measured values at the sample points. In this paper the program COVAR (Williams and El-Kadi, 1986) was used to create unconditioned hydraulic conductivity realizations. The second part of the procedure was to force a consistency between the simulated
Figure 9. General flow diagram of steps required to perform a conditional simulation
values and the measured values at the sampling locations (i.e. conditioning). This was done by using the group of STATPAC (Grundy and Miesch, 1987) programs to derive an estimated value of the true value at each point in the grid area by kriging the actual data from the sample points. This kriged value varies from the true value by some kriging error value which is expressed as \([z(x) - z^*(x)]\) (Delhomme 1978). This relationship is represented by the equation:

\[
\text{true value} = \text{kriged estimate} + \text{kriging error}
\]

\[
z(x) = z^*(x) + [z(x) - z^*(x)] \quad (4)
\]

The kriging error is not known but can be simulated by using the values derived from the random simulation of the function \(S(x)\) in COVAR. The function \(S(x)\) must have the same mean, variance and spatial correlation as the measured values at the sample points.

The values of the function \(s(x)\) at the sampling points are kriged to derive a new set of estimated values, \(s^*(x)\) for each point in the grid. These kriged values also have a kriging error which is estimated as \([s(x) - s^*(x)]\). This kriging error from the simulated function \(s(x)\) is substituted for the actual kriging error \([z(x) - z^*(x)]\) and the conditioned simulation defined as

\[
z_s(x) = z^*(x) + [s(x) - s^*(x)]. \quad (5)
\]

63
Point kriging is an exact interpolator so the kriging error, \([s(x) - s^*(x)]\) must be equal to zero at the sample points and the measured values at those points are used in the simulation.

Figure 10 schematically illustrates the steps and show the various COGMOD programs applied to this process. The solid "repeat" line shows where steps 3 through 5 are repeated per Varljen and Shafer. The dashed "repeat" line shows where this application repeats steps 4 and 5. This application uses this alternative repeat sequence because all the random field realizations are created at once, then each realization is imported into the kriging application as required rather than creating one realization at a time as in the Varljen and Shafer.

COGMOD uses various STATPAC programs to create the Semivariogram and krige the data. Table 12 lists the STATPAC programs used in this effort and their functions. It does not include all the programs available to the user within the STATPAC package. Since none of the STATPAC programs were modified for this program the user is referred to the STATPAC instruction manual for detailed information and instructions about these programs (Grundy and Miesch, 1987).
Figure 10. Steps required for conditional simulation and the programs used to perform each step in this effort
LIST OF STATPAC PROGRAMS USED IN THIS EFFORT
AND THEIR FUNCTION

<table>
<thead>
<tr>
<th>PROGRAM NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERFIL</td>
<td>Creates a STATPAC data input file</td>
</tr>
<tr>
<td>FILTER</td>
<td>Converts file created by TERFIL to ASCII format for editing</td>
</tr>
<tr>
<td>UNFILTER</td>
<td>Converts ASCII file to STATPAC data input file format</td>
</tr>
<tr>
<td>BASTAT</td>
<td>Performs basic statistical analysis of input data</td>
</tr>
<tr>
<td>SS2DPREP</td>
<td>Preprocess a STATPAC data file for other kriging programs</td>
</tr>
<tr>
<td>SS2DVCTL</td>
<td>Prepare an ASCII control file for program SS2DGAMH (or use spreadsheet)</td>
</tr>
<tr>
<td>SS2DGAMH</td>
<td>Compute experimental variograms in one to five directions</td>
</tr>
<tr>
<td>SS2DXVAL</td>
<td>Cross-validate variogram/drift models</td>
</tr>
<tr>
<td>SS2DGRID</td>
<td>Create a grid file for contour mapping by program SS2DCONT</td>
</tr>
<tr>
<td>SS2DCONT</td>
<td>Make high resolution contour map of grid file created by SS2DGRID</td>
</tr>
</tbody>
</table>
Step 1 uses the STATPAC programs SS2DGAMH and SS2DXVAL to define the semivariogram of the measured data. These programs will not run unless the STATPAC programs TERFIL and SS2DPREP have been previously employed. TERFIL creates a raw data file of values at sample point coordinates and SS2DPREP prepares these data for use in various other STATPAC programs. These two programs will be discussed later in this paper. In addition, SS2DGAMH requires a control file which can either be created in the STATPAC program SS2DVCTL or from within the LOTUS spreadsheet. This paper will only cover special considerations since normal input parameters are covered in the STATPAC documentation and since actual input parameters are data dependent.

The SS2DVCTRL control file for SS2DGAMH contains several parameters including an option to use a logarithmic conversion in the semivariogram. While the usual response to this option is "no" as the STATPAC kriging programs do not support lognormal kriging, in this application lognormal kriging is supported through LOTUS by means of a macro prepared for this effort. The STATPAC kriging programs are not considered to support lognormal kriging because they do not convert the kriged data either into or out of the logarithmic form. This application has an election within LOTUS to select a lognormal option after the semivariogram options. If the lognormal option is desired it must be selected within the LOTUS
application. Once the control file has been created, the SS2DGAMH program requires only a few simple interactive responses to create an experimental variogram.

The initial estimates of the variogram parameters are made by visually fitting a curve to the experimental variogram created by SS2DGAMH. Once the initial estimates have been made the "goodness" of fit can be tested by using the STATPAC program SS2DXVAL. This program performs the cross-validation using one of three options: 1) hole-by-hole suppression, 2) every-other-hole and 3) selected row cross-validation. Hole by hole suppression performs cross validation by deleting one point in the grid then predicting the value at that point using the variogram parameters and the kriging algorithm. Once the value has been predicted, the original value is restored to the data set. The process is repeated until all the points have been tested. In the every-other-hole method the data set is randomly permuted then split into two subsets and one subset used to predict the values of the points in the other subset. In this option the STATPAC program PERMUTER must be used to create the randomly permuted data set. In the selected row option the user specifies the starting row for predicted values. The values of each point from the specified row through the last row of data are predicted from the values of the remaining points. The STATPAC manual states that this option is mostly used to predict values of data points which
have not yet been sampled.

Each of the SS2DXVAL options creates the same output for every point in the grid: 1) the kriging error, 2) the theoretical standard deviation of the error and 3) the normalized error. The STATPAC users manual contains a list of criteria for judging the acceptability of the variogram model based on these results. Once the variogram parameters have been determined either from these STATPAC programs or various other programs the user is ready to proceed to step 2.

Step 2 of Varljen and Shafer’s procedure is to krig the grid area using the original values at the sample points. In this application the values are kriged in the STATPAC program SS2DGRID. When operated through STATPAC the input parameters for this program are usually entered interactively, in this application, however, the program parameters are entered from a control file created within the LOTUS worksheet. This control file is required for the subsequent kriging iterations of the unconditioned values.

The kriging module is accessed from the worksheet’s main function menu. The macro proceeds through a series of interactive questions to create the control file. These questions are the same questions as in the STATPAC SS2DGRID program and are detailed in the STATPAC manual. The second
question of the series asks the user if an ASCII output file is desired. The STATPAC manual indicates that the usual response is no but in this application the user must answer "yes" so the kriged results can be imported into the worksheet for additional processing. Additional parameters include the variogram parameters, the maximum distance for the search radius and the maximum number of holes allowed in calculating the kriged values. Care should be taken in selecting these parameters to assure that each point in the grid area can be kriged. If a point is not kriged it results in a zero at that point and an error in the conditioning process. One other input parameter that needs comment is the X-Y coordinates of the southwest corner of the grid area. In the STATPAC programs the southwest corner is assumed to be at the 0-0 coordinate.

Step 3 of the conditioning process is the creation of random field of values for each point in the grid area. There are several different methods of creating this random field including "turning bands" and matrix decomposition. In this application the matrix decomposition method was selected and the program COVAR selected. COVAR is a separate code, not included in the STATPAC package. It is integrated into the conditional simulation by the Lotus® macro. The creation of the unconditioned values while maintaining the same spatial correlation structure is essential to the conditioning process.
and warrants an in-depth investigation of the program selected.

COVAR, written by Stan A. Williams and Aly I. El-Kadi (1986) was designed to generate two dimensional fields of autocorrelated parameters by matrix decomposition. This program is distributed and supported by the International Ground Water Modeling Center. The matrix decomposition is based on the Choleski algorithm described by Nash (1979). It is used to decompose a symmetric, non-negative definite matrix into a lower triangular matrix. The Choleski algorithm is based on the equation:

$$A = LL^T = R^TR$$ (6)

where \(A\) is a symmetric and positive definite matrix. This equation can be expanded to:

$$A_{ij} = \sum_{k=1}^{\min(i,j)} L_{ik} L_{jk}^T = \sum_{k=1}^{\min(i,j)} L_{ik} L_{jk}$$ (7)

The decomposition of this matrix can be performed where

$$L = R^T$$ (8)

is the lower triangular matrix.

The program itself requires the operator to first create a data file of X and Y-coordinate locations. This file can be created within LOTUS as part of the DATA module. The file is created interactively with the operator supplying the initial
X and Y coordinates and the distance between points. The Lotus® macro assumes a 20x20 point grid. Lotus® then directly accesses COVAR which is interactive with the operator entering the various required parameters including format, matrix size, mean, standard deviation, correlation length and the number of realizations.

1. The distance between the points in the X direction must be equal to the distance between the points in the Y direction. In addition the maximum X or Y-coordinate value in the data file must be less then 100. The operator must multiply the actual values by a number that will reduce the maximum value to some number less than 100. The new values can be restored in the LOTUS worksheet by using the inverse of the multiplier.

2. The format values must be enclosed in ( ).

3. The maximum number of realizations to be used must be created at the same time since although each realization from a given data set is unique, if COVAR is rerun with the same data set it will generate the same field of values for each realization.

4. The spatial correlation used in the COVAR realization must be the same as that used in the Kriging program in order to create a valid conditioned simulation.
5. COVAR only shows numbers to the fourth place behind the decimal (10⁻⁵). When dealing with a normal or lognormal distribution of hydraulic conductivity the derived values can be less than COVAR shows unless a multiplier is used.

6. COVAR uses log₁₀ for lognormal data. Many other programs, including STATPAC, output lognormal values as natural logs or logₑ. Care must be taken to use log₁₀ values for all lognormal input into COVAR.

Step 4 of the conditioning process is the kriging of a new data field over the original grid area using the random values created in step 4 at each of the original sample points. The same STATPAC kriging program, SS2DGRID, and control file as in step 2 is used. This kriging is done automatically from within the Lotus® macro as part of the RUNMOD module. In this step the application first imports the correct random field realization output from COVAR and places the hydraulic conductivity values with the proper coordinate values. The macro then extracts the unconditioned hydraulic conductivity value for each of the original sample points and saves these values with the proper format in the STATPAC input file. This file is automatically converted in SS2DPREP and kriged in SS2DGRID using the control file created earlier. These
operations will be discussed in more detail later in this paper.

Step 5 calculates the conditioned hydraulic conductivity at each point in the grid area from the equation

\[ z_s(x) = z^*(x) + [s(x) - s^*(x)]. \]  

where \( z_s(x) \) is the conditioned value, \( z^*(x) \) is the kriged value derived from the measured values, \( s(x) \) is the unconditioned value generated by COVAR and \( s^*(x) \) is the kriged value derived from the unconditioned values at the sample points. This calculation is made automatically within the LOTUS worksheet as part of the RUNMOD module. Each of the required values is copied into one area of worksheet. The above formula is copied to the same area with the cells containing the required values substituted for the values in the formulas. As the values in the cell change, the values in the cells are automatically substituted into the formula. This operation will be discussed in more detail later. In this application, steps four and five are repeated for a number of iterations selected by the operator.

**COGMOD STRUCTURE:**

The COGMOD macros are contained on two worksheets. The general structure of these macros is shown in Figure 11. The
Figure 11. General structure of COGMOD SETUP and FUNCTION menus and the interaction of the associated modules
macros are combined into modules which perform specific functions. The first worksheet contains the title screens, a module to change the directories and file names, and a module to save the changes. Each of the modules can be selected from a menu. Once any desired changes have been made, the macros on the second worksheet can be accessed by selecting the "continue" option from the menu.

The macros on the second worksheet start by allowing the operator to select an area for comments and naming several "cells" just below the comment area. These cells are used by the macros to store certain values or characters which are used internally to process and manipulate the data. The macro then accesses a menu which contains three module selections, DATA, KRIGE and RUNMOD. In addition, this menu has a selection to access a third menu and an option to quit. The third menu allows the operator to run the programs COVAR, STATPAC and MOC directly without the built in LOTUS interface modules. These options may be useful if the operator needs to debug a specific program. Quit exits the macro and returns control to normal LOTUS operations.

The data module allows the operator to create data files for STATPAC and COVAR then prepare the data for kriging and conditioning. The major subroutines and features of the "DATA" module are shown in Figure 12. The module starts with
DATA MODULE SELECTION

DATA1

YES

CONDITIONAL

NO

DATA2

CONTINUE COVAR INPUT

NO

YES

ASCII NO

FILE CREATED

ALREADY

PERFORM BASIC STATS

NO

YES

CHANGE RAW DATA FILE

YES

CREATE ASCII FILE

TER.BAT

CREATE RAW DATA FILE

YES

NO

FILE CONVERTED

PREP

YES

NO

PREP.BAT

YES

PERFORM SEMI VARIOGRAM ANALYSIS

NO

SEMI

CTRL.BAT

VARIO.BAT

XVARIO.BAT

CREATE COVAR DATA FILE

YES

NO

RUN.BAT

MENU

FUNCTION

Figure 12. Illustration of the macro structure for the DATA module
If an unconditioned simulation is selected the macro branches to the "Data2" macro and the operator inputs the required parameters for COVAR interactively. A "branch" action refers to the macro transferring macro control from one location to another. This differs from a subroutine in that with a branch control remains at the new location whereas in a subroutine the control is returned to the command following the subroutine in the original column of commands (see appendix of macro commands for details). The macro assumes a 20x20 grid for both the conditioned and unconditioned simulations. The macro prompts the operator for the minimum horizontal and vertical distances and the X and Y coordinates of the southwest corner of the grid area. It then selects the appropriate multiplier and generates a table of X-Y coordinates that conform to the limits imposed by COVAR.

Once the data file has been created the macro exits LOTUS and automatically starts the COVAR program. The macro is capable of exiting LOTUS and starting an independent program by combining the Lotus® macro command "System command" with a simple DOS batch file. This ability is essential to the operation of this procedure. COVAR is interactive and the operator must input the required parameters directly into the program. Once the parameters are entered COVAR generates the
requested number of realizations then returns to the Lotus® macro which in turn returns the operator to the "Function Menu" for additional selections.

If a conditioned simulation is specified the macro branches to the "Datal" macro which exits LOTUS and initiates the STATPAC program named "TERFIL". TERFIL is an interactive program which creates a raw data file compatible with the other STATPAC programs. Once this file is created, command is returned to the LOTUS macro where the operator is asked if an ASCII data file is desired. If the operator answers yes, the macro again exits LOTUS and initiates the interactive STATPAC program named "Filter". If the operator answers "No" to this or any other yes/no question, the macro proceeds to the next question or command line. This program creates a new ASCII data file from the information in the "TERFIL" raw data file. Command is returned to the macro where the operator is next asked if any changes in the raw data set are desired. If this is answered yes, the macro exits to yet another STATPAC file named "FIXIT" where changes can be made prior to returning to the macro. The operator is asked if basic statistics on the raw data are desired. If this option is selected the macro again exits LOTUS and initiates the STATPAC program "BASTAT" then returns to the macro when "BASTAT is completed. At this point the macro exits the "Datal" macro and switches command to the "Prep" subroutine. This operation is necessary because
the STATPAC variogram and kriging programs require the raw data file from "TERFIL" in a different format. This subroutine prompts the operator for a series of parameters necessary to create a control file for the STATPAC program "SS2DPREP". The parameters are recorded in the Lotus® worksheet then saved as an unformatted text file without margins by the macro using the Lotus® "/ print text" command. This command saves the range of cells as an "unformatted" ASCII file which can be used as a control file for SS2DPREP. All ASCII files from Lotus® in this application are created using the same print command structure. Although the parameters can be entered into "SS2DPREP" directly the program does not save the parameters and it will be necessary to run the program multiple times during the stochastic modelling process. Once the control file is created the macro exits LOTUS, runs "SS2DPREP" then returns to the "Datal" macro at the next command line. The operator has the option to perform a semivariogram analysis within STATPAC at this point. The STATPAC semivariogram analysis is optional but some form of semivariogram analysis is required for the spatial correlation. If the STATPAC semivariogram analysis is selected the macro transfers command to the "Semi" subroutine where the operator is asked a series of questions to create a control file for the semivariogram program. Once all the parameters are recorded the macro runs the STATPAC program "SS2DGAMH" to create an experimental semivariogram which the
operator must fit to a mathematical form visually. The macro then automatically runs the STATPAC program SS2DXVAL to cross-validate the model. Once the semivariogram has been created and cross validated the macro returns command to the "Data1" macro for continued processing. The final option in the "Data1" macro is to create a raw data file for COVAR. If this option is selected the macro branches to the "Data2" macro and the operator proceeds through the same steps as outlined in the unconditioned option. A "No" response to any of the options causes the macro to skip that option and prompts the operator at the next selection.

The major subroutines and features of the Krige module are shown in Figure 13. The "Krige" macro creates a control file similar to the one created for SS2DPREP and has an option to convert the raw data to their logarithms. The control file is necessary for the later repetitive kriging operations. The log option is important since hydraulic conductivity is usually considered to be lognormally distributed but the STATPAC kriging programs do not support log functions. This macro finishes by creating a single kriged realization of the sampled data over a given 20x20 grid area.

The macro starts by asking the operator if the raw data have been preprocessed. Normally the answer will be yes if the operator followed the steps outlined by the "Data" module. If
Figure 13. The macro structure for the KRIGE module
for some reason the data have not been preprocessed at this point a "No" response will transfer the command to the "Prep" subroutine (as outlined previously) where the data are converted and the command returned to the "Krige" macro. The operator is next asked if the lognormal option is desired. A "Yes" response transfers command to the "Lntest" macro.

The "Lntest" macro imports the ASCII file of the raw STATPAC data (created in the "Data" module) by using the LOTUS "/ file import text" command. This command imports each line of the text file as a label in a single cell. In order for the macro to convert the original values into their respective logarithms it must first convert the text back to a values in individual cells. The problem is complicated somewhat in this instance by the fact that only every other line of the text file can be converted to values without destroying the spatial integrity of the characters in the ASCII file. The "Lntest" macro uses a special "FOR" command and a subroutine named "Pars" to accomplish this. The subroutine counts the total number of lines present and calculates the number of times it is to parse a line. It then goes to the first line of values and separates the values into individual cells. It skips one line then parses the next line. After it has parsed the correct number of lines the macro command goes to the next line of the "Lntest" macro. The values are changed by using another "FOR" command and the subroutine "Ln". This
combination works much the same way as the last "For" statement except instead of parsing each desired line the cell containing the value is edited to automatically calculate the natural log of that value. Since only the value in a cell is displayed (not the formula) the file can be saved as a text file with no change in the spatial characters as discussed previously. The "Lntest macro then exits Lotus® and converts the text file back into a raw data file using the STATPAC program UNFILTER. The macro runs SS2DPREP on this data using the same control file created in the data module. Once all this is finished, the command is returned to the next line of the Krige macro which starts a series of interactive questions to create a control file for the STATPAC kriging program SS2DGRID. As discussed earlier the parameters in the control file are the same as those that are asked by SS2DGRID in the interactive mode. The control file is created so SS2DGRID can be run multiple times without operator intervention. When all the parameters are complete the macro saves the control file as a text file in the same manner discussed earlier. The macro then asks if the operator wants to save any existing kriged output files. This application is set up to erase all existing kriged output files each time the data is kriged so the same file name can be retrieved for additional processing when running multiple iterations. If the operator wants to save an existing output file he must manually save the file under different file name extension. Following this question
the macro asks the operator if he wants to continue as a fail-safe device to protect existing kriged files. If the operator indicates a Yes the macro exits Lotus®, runs SS2DGRID using the control file, then returns command to the macro. The macro then asks if the operator wants to produce a map of the kriged data. If this option is selected the macro exits Lotus®, runs the STATPAC program SS2DCONT to produce a map of the kriged results and returns to the main function menu.

The RUNMOD module is the module that is capable of running multiple iterations of either a conditioned or unconditioned simulation then record the output results of that simulation. It is outlined in Figure 14. This module is selected from the main function menu and activates the macro "RUNMOD". The macro initially clears the screen, clears all existing named ranges and sets up a new series of named cells (for internal calculations). Once this housekeeping is completed it asks the operator if this is a conditioned simulation. If the operator enters a No, the simulation is unconditioned and the macro branches to the macro "Uncond" for further processing. Since the unconditioned simulation is simpler it will be discussed first.

The "Uncond" macro first asks the operator to input the maximum distance from origin in either the X or Y direction. This value will be used later in the macro to determine the
Figure 14. The macro structure for the RUNMOD module
appropriate multiplier to use with the X-Y coordinates from the COVAR raw data file. The macro imports the COVAR data file of X-Y coordinates into an empty area of the worksheet and parses the text into values in cells. The X-Y values are restored to their original values by multiplying each value by a predetermined constant based on the maximum distance. The operator is prompted for the number of iterations desired as well as the maximum and minimum hydraulic conductivity values allowed to be input. The macro creates the range for output before it goes to the "For" statement that runs the subroutine "Iter1" for the requested number of iterations.

The macro "Iter1" opens the COVAR output file and transfers the command to the "Read" subroutine which searches each line of the output file until it finds a match to the realization number desired, then imports the appropriate lines from the file into the LOTUS worksheet. The lines are parsed and values moved to the corresponding X-Y coordinates where they are rounded to the nearest whole number and constrained within the limits defined by the operator in the "Uncond" macro. These values can be saved to a file or a table for subsequent input into flow model. The macro then returns to the first command in "Iter1" to repeat the process until the required number of iterations have been completed. The macros and subroutines associated with "Iter1" are displayed in the Figure 15 flow diagram.
Figure 15. Flow diagram of the macros and subroutines associated with the ITER1 for command in the RUNMOD module.
If the operator selects a conditioned simulation the macro asks if an ASCII file has already been created. Normally the file has been created and the macro proceeds by retrieving the ASCII data file into the worksheet. If the file has not been created the macro first creates the file in the same manner as discussed in the DATA module section. This text file is parsed to change the text into values in individual cells and any unused lines are deleted. The COVAR data text file of X-Y coordinates is imported into the worksheet and also changed into values in individual cells in the same manner as in the unconditioned "Runmod". The operator must indicate if the data is normal or lognormal and enter the number of iterations as well as the minimum and maximum hydraulic conductivity values allowable. The macro imports the initial file of kriged grid values created by SS2DGRID and parses the resulting range into values. Since a new TERFIL file is required for each iteration the macro creates a set of header information to be combined the table of X-Y coordinates and the hydraulic conductivities to create the TERFIL data file. The macro then creates the output area of the worksheet and runs the requested number of iterations of ITER. The flow diagram for this subroutine is displayed in Figure 16.

The subroutine ITER first reads the current realization from COVAR into the worksheet, parses the data and transfers the values to the appropriate position in the table of X-Y
Figure 16. Flow diagram of the macros and subroutines associated with the ITER subroutine
coordinates (in the same manner as in ITER1). IF the lognormal option was selected the macro converts the value into the natural log of the value. The macro extracts the new covar value (or ln of the value) for each sample point from the table of values and creates a new TERFIL raw data file. It prepares the new raw data file with SS2DPREP and Kriges the grid area with SS2DGRID based on the new values. The kriged output file is imported back into the worksheet and parsed. If this is the first iteration of ITER the macro transfers command to the subroutine KRIGI which creates a new table containing the X-Y coordinates of each of the grid points and the corresponding initial kriged values of those points (based on the original sample values). The command is returned to ITER and the new kriged values are copied to the column immediately to the right of the initial kriged values. The values from the COVAR realization are copied into the next column to the right. These values in these two columns will be replaced by new values on each subsequent iteration. The macro copies the conditioning formula (equation 5) for \( z_s(x) \) into each cell of the next column to the right of the table. This formula is as follows:

\[
  z_s(x) = z^*(x) + [s(x) - s^*(x)] \quad (5)
\]

where \( z^*(x) \) is the initial kriged value, \( s(x) \) is the value from the COVAR realization and \( s^*(x) \) is the kriged output based on the new COVAR values at the sample points. The formula also contains a command to round the resultant value
to a whole number and an "if" statement to convert the values from logs back to real numbers if the lognormal option was used. Command is transferred to the subroutine EXT1 through a FOR statement. EXT1 uses each set of X-Y coordinates as the search criteria for a data base of original sample points and values. It extracts the original sample value for each sample point and substitutes this value for the calculated value in the output table for strict conformance to the conditioning formula. A sampling of the calculated vs measured values showed the calculated values were within 1 of the measured values in all instances. The difference was due to rounding errors. Once the original values are substituted command is returned to ITER and one more column is created to the right of the existing table. Each cell in this column contains two if statements to limit the output to the limits specified by the operator earlier in RUNMOD and to round the final output to a whole number. The values in this column can be transferred to the appropriate position in a subsequent model input file or saved to a table. The subroutine ITER then starts again and continues until the requested number of iterations has been completed.
CHAPTER III

RESULTS:

This effort resulted in the creation of two separate programs which use the Lotus 1-2-3® spreadsheet platform to generate a stochastic simulation by combining and controlling various parameters and DOS programs. These programs were created in Lotus 1-2-3® version 3.1 for DOS on an IBM compatible with a 486 processor using eight megabytes of RAM. These programs will have to be modified for older versions of Lotus® since some macros are different and there is some variation in macro structure between versions. Likewise, it is anticipated that the programs may require modification for newer versions of Lotus® or other spreadsheet program. Modification of the user's computer configuration may be required if problems are encountered running these programs.

RISC2:

The first example is the RISC2 stochastic air pollution model which uses the EPA's ISC2 deterministic model. This program is designed to be a decision support system with a series of menus and user prompts. This section includes screen displays
of the major user prompts and menus required to input the simple example problem found on page 2-11 in the ISC2 users manual and shown in Figure 17. This example is used to illustrate the results of this programming effort.

The user must first call up Lotus 1-2-3® from a DOS prompt and display a blank worksheet before running the program. The RISC2 program is initiated automatically by retrieving the RISC2.WK3 file from the disk into the worksheet. This is done from the Lotus® menu with the [/], [F]ile, [R]etrieve, RISC2, [ENTER] keystrokes (commands). Once the file is retrieved the user is greeted with the title page as displayed in Figure 18. A second title page of information, as shown in Figure 19, is displayed when the operator presses [ENTER]. After exiting the second title page the user is prompted to select an area in the worksheet for the program to display comments and an area for the table used to create the ISC2 runstream file. The comments area is usually located at the HOME screen, i.e. the first twenty rows and eight columns of the worksheet, while the table of input parameters is usually located starting in column "A" on approximately row 23. However, the location of both areas is at the discretion of the user and can be located anywhere in the worksheet. Once these have been defined the program displays the first menu of user options as shown in Figure 20. This screen allows the operator to select from options of: 1) proceeding to the
Figure 17. Printout of ISCST2 example problem runstream file from ISC2 users manual page 2-11  
Source: EPA 1992
Figure 18. Display of first RISC2 title screen
THIS PROGRAM HAS BEEN DEVELOPED AT
OKLAHOMA STATE UNIVERSITY
STILLWATER, OKLAHOMA 74078

BY
LARRY E LOCKWOOD

AND
WILLIAM F. McTERNAN

PRESS {ENTER} TO CONTINUE

Figure 19. Display of second RISC2 title screen
Figure 20. Screen display of main menu of RISC2 program options
preprocessor (PREPROCESSOR), 2) running a stochastic model (RISK) or 3) deterministic model (MODEL), 4) performing certain file operations (FILE) such as saving or importing a text file, or 5) stopping the program (QUIT).

The first operation in the example problem is to input the runstream file using the PREPROCESSOR module. Once this module is selected (by highlighting the selection with the cursor and pressing [ENTER]) from the main menu shown in Figure 20, the program displays the main function menu for the preprocessor module as shown in Figure 21. Each of the selections on this menu (CO, SO, RE, ME, EV AND OU) represent an ISC2 "Pathway" and accesses a series of additional menus and user prompts which are used to complete the table for the ISC2 runstream file. When all the optional keywords and parameters have been specified for the selection (ISC pathway) the program returns to the menu in Figure 21 for additional pathway selections. When all the pathway selections are complete the operator selects QUIT to exit this portion of the program and return to the main menu previously displayed in Figure 20.

Selection of the "CO" option causes the program to display the "CO" menu, as shown in Figure 22, and enter the two keywords "CO STARTING" on the first line of the ISC runstream table. This menu accesses all the "CO" keywords and parameters thru
Figure 21. Screen display of main menu in PREPROCESSOR module
Figure 22. Screen display of main menu for "CO" pathway
subsequent menus and prompts. The first selection from the "CO" menu (Figure 22) is usually TITLES which causes the program to prompt the user for two title lines of up to eighty characters each. In the example problem the title is input by the user as "A Simple Example Problem for the ISCST2 (RISC2) Model".

The next selection from the "CO" menu is MODEL OPTS which allows the user to specify which model options are to be used. This option accesses a menu of both default and non-default model options as shown in Figure 23. The options keywords DEFAULT, RURAL, and CONC are entered in the appropriate runstream file locations when these items are selected from the menu in the example problem. QUIT returns the user to the previous menu (Figure 22) for additional "CO" options.

Selection of the INTERVALS option from the "CO" menu (Figure 22) provides the user with a menu (not shown) from which to select either the short term or long term ISC2 model. Since this example problem is for a short term model, the short term model is selected from the menu and the macro changes the screen display to a menu of time options as shown in Figure 24. Selection of TIME1 through TIME4 results in a user prompt for the time interval and a comment screen as displayed in Figure 25. The menu selections of TIME1 followed by a prompt response of 3, and TIME2 followed by a prompt response of 24
DEFAULT -- Specifies that the regulatory default options will be used.

CONC -- Specifies that CONCentration values will be calculated.

DEPOS -- Specifies that dry DEPOSition values will be calculated.

RURAL -- Specifies that RURAL dispersion parameters will be used.

URBAN -- Specifies that URBAN dispersion parameters will be used.

GRDRIS -- Use non-default option for gradual plume rise.

HOSTO -- Use non-default option for no stack-tip downwash.

ROBIO -- Use non-default option for no buoyancy-induced dispersion.

NOCALM -- Use non-default option to bypass the calms processing routine.

NSGPRO -- Use non-default option for the missing data processing routine

Figure 23. Screen display of MODEL OPTS menu for selection of various default and nondefault model options
Figure 24. Screen display of AVERTIME menu which appears following the selection of the Short Term Model from the previous menu (not shown)
Figure 25. Screen display of user prompt and comments screen for user input of AVERTIME time intervals
correspond to the first two AVERTIME entries in the example problem. Selection of the PERIOD option from this menu completes the AVERTIME parameters and QUIT returns the operator to the "CO" menu (Figure 22).

The final two "CO" menu (Figure 22) selections necessary to run the example problem are POLLUTID and RUNORNOT. The POLLUTID selection prompts the user for an eight character identifier for the pollutant being modeled while the RUNORNOT selection accesses a two item menu with selections of RUN or NOT RUN. In the example problem the POLLUTID is SO2 and the RUNORNOT selection is RUN. The screen displays for these selections is included in appendix B. The selection of QUIT completes the "CO" pathway selections for the example problem, returns the operator to the main PREPROCESSOR menu (Figure 21) and enters the keywords "CO FINISHED" in the runstream table.

Selection of "SO" from the PREPROCESSOR menu in Figure 21 advances the program to the "SO" pathway menu as shown in Figure 26. This menu contains selections for LOCATION, DOWNWASH, EMISSIONS and UNITS. The first selection required for the example is LOCATION. This selection first prompts the user to give the source a name to be used with subsequent parameters assigned to this source location. The program then accesses the menu in Figure 27 for specification of the location and source type. The selections Xs, Ys and Zs each
Figure 26. Screen display of main "SO" pathway menu.
Figure 27. Screen display of location coordinate and source type selection menu
prompt the user for the respective X-Y-Z coordinate of the source while the SOURCE TYPE selection allows the user to choose a POINT, AREA or VOLUME source from the subsequent menu. Each of these type of sources requires specific input parameters which are accessed on separate menus when the source type is selected. This example problem is for a point source so POINT is selected from the menu and the subsequent menu of point source parameters is displayed as shown in Figure 28. Each of the parameters in this menu is a required input as noted in the comments screen displayed in Figure 28. Each of the selections on this menu causes the program to prompt the user for the appropriate parameter value then returns to the menu in Figure 28.

When all the necessary LOCATION parameters have been input the operator returns to the main "SO" menu by selecting QUIT. The selection of DOWNWASH from the "SO" menu (Figure 26) initiates a series of thirty-six user prompts for the building heights at 10 degree intervals around the source followed by a series of thirty-six building widths for the same intervals. The user must also input the source name (selected above) associated with these values once for the building heights and once for the building widths. The program automatically repeats the source name on subsequent lines, as needed, and returns to the main "SO" menu when all these parameters have been entered.
Figure 28. Screen display of point source parameters menu
The final selection from the "SO" menu for the example problem is GROUP which allows the user to combine multiple sources into a group for modeling their combined affect. This selection also gives the user a prompt and some help on the comments screen. The input of "ALL" in the example problem combines all sources into one group.

The "RE" pathway specifies keywords and parameters associated with the receptor array. The main "RE" menu as shown in Figure 29 is accessed by selecting RE from the main PREPROCESSOR menu. The first required input for this pathway is to specify whether these receptors are on a Cartesian or Polar grid. Selection of GRID from the "RE" menu accesses a menu (not shown) with CARTESIAN and POLAR options. Once the grid type is selected (POLAR in the example problem), the program prompts the user for a grid ID or name and displays the menu of Polar options shown in Figure 30. The ORIGIN selection from this menu prompts the user for the X-Y coordinates of the origin of the receptor grid which is 0,0 for the example problem. The next selection, DISTANCES, prompts the operator for a series distances from the origin to each "ring" of receptors. This series of prompts is structured such that the operator can enter as many rings as necessary to define the receptor array.

The GENERATED DIR selection from the menu shown in Figure 30
Figure 29. Screen display of the main menu for the "RE" pathway
Figure 30. Screen display for menu of Polar grid options
causes the program to prompt the user for the parameters necessary to generate the set of polar directions to be used with the ring distances specified earlier. The program prompts the user for the number of directions (thirty-six in the example problem), followed by the starting direction and the increment, both of which are ten in the example. This completes the parameter input on this grid and since there is only one grid in the example problem, the "RE" pathway input is also completed.

The "ME" pathway selection from the main PREPROCESSOR menu (Figure 21) accesses the meteorological file menu shown in Figure 31. The selections from this menu cause the program to prompt the user for the required information associated with each option. The selections required for the example problem are FILENAME to enter the INPUTFIL file information, HEIGHT to enter the ANEMHGT parameters, and STATION for the SURFDATA and UAIRDATA station data. The operator selects RETURN to exit the "ME" pathway and return to the main PREPROCESSOR menu.

The final pathway used in the example problem is the "OU" pathway which is accessed by selecting OU from the main PREPROCESSOR menu. The main menu for this pathway is shown in Figure 32 and has three selections, TABULAR, SPECIAL PURPOSE, and QUIT. The RECTABLE and MAXTABLE parameters specified in the example problem are accessed by first selecting TABULAR
Figure 31. Screen display of main menu for "ME" pathway.
### Specify filename and format information for input file

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
</tbody>
</table>

**Figure 32.** Screen display of main menu for "OU" pathway
from the menu in Figure 32 then selecting either RECTABLE or MAXTABLE from the subsequent menu of tabular options shown in Figure 33. Both the RECTABLE and MAXTABLE selections cause the program to prompt the operator for the required parameters appropriate to that selection. This concludes the input parameters for the "OU" pathway in the example problem. When QUIT is selected from the "OU" menu shown in Figure 32, the program automatically saves the table as a runstream file for the ISC2 model. This completes the input portion of the model and returns the user to the main menu shown in Figure 20.

The next operation is either to run a deterministic model by selecting MODEL or run the stochastic model with the RISK selection. This example problem assumes the selection of the RISK option from the main menu shown in Figure 20.

Selection of the RISK option accesses the second major module of this program. The various macros associated with this option are contained on a separate worksheet called RISC2A which is automatically called into memory with the RISC2 worksheet automatically removed from memory. The operator is now presented with the main RISK menu shown in Figure 34.

This menu allows the user to select options to: (1) load the @RISK® ADD-IN into memory (LOAD), (2) select the variable to be sampled and define the distribution function for the
Figure 33. Screen display for menu of "OU" tabular options
Figure 34. Screen display of main menu for RISK module
variable (SELECT), (3) define the area in the worksheet where
the results of the modeling are to be stored (OUTPUT), (4)
input the number of iterations for which the model is to be
run (ITERATIONS), (5) run the stochastic model for the number
of iterations specified (RUN), (6) view the results of the
stochastic model either as a table of statistical values or as
one of several graphs (VIEW), (7) return to the main RISC2
menu (MAIN) and stop macro processing (QUIT). The options for
LOAD, OUTPUT, and ITERATIONS must be specified prior to
running the stochastic model since these supply vital
information to the modeling program.

Selection of the LOAD option from the menu in Figure 34
automatically loads the @RISK® ADD-IN into memory and sets
certain parameters within @RISK®. The program automatically
returns to the menu in Figure 34 once @RISK® has been properly
loaded.

The next option from this menu is SELECT which, when accessed,
prompts the user to move the cursor to the variable to be
sampled and press [ENTER]. Once the variable has been
selected, the user is prompted to enter the distribution
function for that variable in the form recognized and
supported by @RISK®. Multiple variables may be used in the
same model by accessing the SELECT option repeatedly. In the
example problem the source emission rate was selected as the
parameter to be sampled in the model. The original ISC2 example problem used an emission rate of 1 g/s. This rate was arbitrarily modified to be a normal distribution with a mean of 1 g/s and a standard deviation of 0.5.

The OUTPUT selection in the main RISK menu allows the operator to specify in what area of the worksheet the results of the model are to be stored. The area normally used is approximately ten rows below the bottom of the runstream table and starting in column B. Although this position is normally used the position is arbitrary.

The ITERATIONS option prompts the user to enter the number of iterations used in the stochastic model. This number is stored in the worksheet and can be updated if necessary.

The RUN selection from the RISK menu automatically initiates the Monte Carlo sampling, runs the ISCST2 deterministic model for the number of iterations requested and saves the results of each iteration in a table. The program also saves the worksheet file after each iteration so if the modeling session is interrupted it can be restarted without loss of data.

After the model has been run successfully, the results can be viewed by using the VIEW option. This option accesses another menu, as shown in Figure 35, which has selections for viewing.
Figure 35. Screen display of menu for selection of statistical or graphic results of model output
the statistical results and various graphs. If the STATISTICS option is selected the table of statistical values shown in Figure 36 is displayed. The GRAPHS option accesses the additional menu of graph options shown in Figure 37. This menu includes options for both three and twenty-four hour graphs for (1) mean vs number of iterations, (2) standard deviation vs number of iterations and (3) concentration vs probability. Figure 38 presents the graph of the three (3) hour mean vs number of iterations and Figure 39 displays the graph of probability for the three (3) hour maximum concentrations in the example problem. The QUIT selection returns the user to the main program menu.

The table of statistics and the probability graphs provide the environmental decision maker with a powerful tool for analyzing the potential contaminant concentrations at receptor sites and for addressing the uncertainties associated with model parameters.
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>345</td>
<td>STATISTICAL ANALYSIS OF MODEL OUTPUT</td>
</tr>
<tr>
<td>346</td>
<td></td>
</tr>
<tr>
<td>347</td>
<td></td>
</tr>
<tr>
<td>348</td>
<td>MEAN (AVERAGE) VALUE OF 3 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>349</td>
<td>STANDARD DEVIATION OF 3 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>350</td>
<td>POPULATION VARIANCE OF 3 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>351</td>
<td>MEAN (AVERAGE) VALUE OF 24 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>352</td>
<td>STANDARD DEVIATION OF 24 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>353</td>
<td>POPULATION VARIANCE OF 24 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>354</td>
<td></td>
</tr>
<tr>
<td>355</td>
<td></td>
</tr>
<tr>
<td>356</td>
<td></td>
</tr>
<tr>
<td>357</td>
<td></td>
</tr>
<tr>
<td>358</td>
<td></td>
</tr>
<tr>
<td>359</td>
<td></td>
</tr>
<tr>
<td>360</td>
<td></td>
</tr>
<tr>
<td>361</td>
<td>NUMBER OF MODEL ITERATIONS PERFORMED</td>
</tr>
<tr>
<td>362</td>
<td></td>
</tr>
<tr>
<td>363</td>
<td></td>
</tr>
<tr>
<td>364</td>
<td>PRESS ENTER TO CONTINUE</td>
</tr>
</tbody>
</table>

Figure 36. Screen display of statistical output table
Figure 37. Screen display of menu for selecting RISC2 output graphs
Figure 38. Graph of 3 Hour Mean Results vs number of Iterations
Figure 39. Graph of Probability percent for Maximum 3 Hour Concentrations
The COGMOD program is initiated automatically by retrieving the `COGMOD.WK3` file from the disk into the worksheet with the Lotus® menu FILE RETRIEVE command. Once the file is retrieved, the user is greeted with the program title screen shown in Figure 39. A second title screen identical to the RISC2 screen in Figure 17 follows the title screen. The user is presented a menu (not shown) with the option of changing directories and file names. Once any changes have been made, the operator automatically calls the main program file into memory and initiates the macro program by selecting continue from the menu.

An example problem with the associated display screens and major prompts is used to illustrate the results of this programming effort. The example problem uses hydraulic conductivity data from a 1991 report by Geraghty and Miller, Inc. on the 3M site in Weatherford, Oklahoma. This report did not have reference locations so a point was arbitrarily selected (in the southwest corner of the plat) from which to physically measure the distances to the sample (well) locations. A table of the measured X and Y coordinates from a the southwest corner of the field as well as the reported hydraulic conductivities at each sample point is included in Table 13. These values were used to define the semivariogram
Figure 40. COGMOD main menu for module selection
first prompts (asks) the user for a Y (yes) or N (no) response to determine if a conditional simulation is desired. It is assumed that the example problem is a conditional simulation. A Yes response to the above question results in another prompt which asks the user if a raw data file is to be created. A Yes response to this question causes the macro to temporarily exit the worksheet and automatically call up the STATPAC input file named TERFIL. This and the other STATPAC programs are discussed fully in the STATPAC users manual (Grundy and Miesch, 1987). An example of the TERFIL screen display is shown in Figure 41. Once the raw data file has been created in TERFIL, the program automatically returns to the spreadsheet and asks the operator if an ASCII data file is desired. This question is also answered Yes and the program again exits the spreadsheet and automatically calls up the interactive STATPAC program named FILTER. An example of the screen display for this program is shown in Figure 42. Once the ASCII file is created the program returns to the spreadsheet and asks the user if any changes to the raw data are desired. A No response causes the program to ask the user if basic statistical calculations are to be made at this point which is answered Yes for the example. The program automatically exits the spreadsheet and calls the STATPAC program BASTAT. Figure 43 shows some of the interactive questions and responses as well as some of the results of the basic statistical calculations for the example problem. After
C:\ENVIR\STATPAK>terfil
GIVE A ROOT NAME FOR THE STATPAC OUTPUT FILE
DO NOT ADD AN EXTENSION TO THE ROOT NAME: test
DOES THE INPUT DATA CONTAIN INTEGER LAT/LONG DEGREES-MINUTES-SECONDS? Y/N: N
DOES THE INPUT DATA CONTAIN QUALIFYING CODES? Y/N: N
HOW MANY ROWS IN THE DATA SET? 17
HOW MANY VARIABLES IN THE DATA SET? 3
GIVE 3 VARIABLE ID S - END EACH WITH CR
X
Y
COND

Figure 41. Screen display of STATPAC TERFIL interactive program
C:\ENVIR\STATPAK\FILTER
ENTER THE NAME OF STATPAC INPUT FILE: test.stp
DATA SET ID = ABCDEFGH
   M = 7
   M = 3
   X    Y    COND
DO YOU WANT TO SEE THE DATA OF THE FIRST ROW OF THE FILE? Y/N: n
DO YOU WANT TO CREATE AN ASCII OUTPUT FILE OF SELECTED ROWS? Y/N: y

GIVE A NAME FOR THE OUTPUT FILE
PRN WILL GO TO PRINTER; COM WILL GO TO SCREEN; FILESPEC WILL GO TO DISK FILE
ENTER NAME: test.dat
DO YOU WANT THE OUTPUT FILE TO CONTAIN:
   1) ALL THE INFORMATION FOR EACH SELECTED ROW, OR
   2) ONLY THE ROWID, LAT-LONG, AND ROW NUMBER FOR EACH SELECTED ROW?
      ANSWER 1 OR 2: 1
GIVE NUMBERS OF FIRST AND LAST ROWS TO BE TYPED (XX,XXX): 01,07
   7 ROWS WILL BE WRITTEN.
   7........READING DATA
TYPE PRINTER FILE TEST.DAT
NORMAL END OF PROGRAM
C:\ENVIR\STATPAK>

Figure 42. Screen display of STATPAC FILTER program
Figure 43. Screen display of basic statistics results in BASTAT
the program returns to the spreadsheet it asks the user if the raw data file is to be converted at that point in the processing. The raw data must be converted prior to processing the semivariogram or kriging the data. This prompt and the accompanying comments screen are displayed in Figure 44. A Yes response to this prompt is assumed for the example problem. Following the Yes response, the user is given a series of prompts which create a control file for the STATPAC program SS2DPREP. After the control file is created the program temporarily exits the spreadsheet, automatically runs the SS2DPREP program and returns to the spreadsheet.

The program next asks the user if a semivariogram analysis is to be performed. A Yes response causes the program to prompt the operator for a series of parameters necessary to create a control file for the STATPAC semivariogram analysis program SS2DGAMH. These prompts include parameters for type of variogram, normal or lognormal analysis, class distances and angle among others. The screen displays for these prompts can be found in the appendix C. Once the control file is completed the program again automatically calls the semivariogram analysis program, runs it and returns to the spreadsheet. The semivariogram used for the example problem is shown in Figure 45. The model parameters used for kriging are displayed below the curve in the same figure.
Figure 44. Screen display of prompt and comments for converting raw data to form acceptable for kriging.
Figure 45. Display of semivariogram and model parameters for example problem

Nugget = 20      Sill = 275      Range = 825'      Lag = 200'
Exponential
Once the semivariogram option is completed the program asks if a COVAR input file is to be created. This file is a table of X-Y coordinates that comprise the grid area to be kriged. Since in the example problem the grid is a 20x20 or 400 points it is not practical to input them manually. If the option to create a COVAR input file is selected the program prompts the user for the distance between grid points in both the X and Y direction along with the minimum X and Y values. It then generates the input file and saves it in the proper format for COVAR. Following the creation of the input file the program exits the spreadsheet and activates COVAR, which is interactive. Once COVAR is complete the program returns to the spreadsheet and the main program menu shown in Figure 40.

If the KRIGE option is selected from the main module menu (Figure 40) the program prompts the user for a series of parameters necessary to create a kriging control file similar to the semivariogram control file. The individual screen displays for this process are included in the appendix. Once the control file has been created the program exits the spreadsheet, runs the STATPAC kriging program called SS2DGRID and returns to the main module menu. Figure 46 shows some of kriged input parameters and the output message for the example data. The program returns to the menu in Figure 40 following a successful kriging operation.
The final module to select is RUNMOD which generates the conditional simulation from the various components as discussed in the COGMOD structure section. The module has only a limited number of prompts for the operator since most of the manipulation is performed by Lotus® within the spreadsheet and by accessing the various programs automatically. The user is asked to select an area in the spreadsheet to store data and if an ASCII file has been created yet. It then displays a comment screen and asks the operator if the macro should continue with the simulation, i.e. if all the conditions necessary have been met. Following this screen the program prompts the user for the number of iterations desired, followed by two screens for the maximum and minimum output values allowed. The program then automatically runs the conditional simulation for the number of iterations specified by the user and returns to the main menu when completed. Figures 47 through 51 show the screen displays for the first five conditional simulation iterations of the example problem. A total of four hundred points are calculated and output for each iteration. Once the initial geostatistical information is gathered and processed the conditional simulation requires very little input from the user and generates multiple sets of statistically valid hydraulic conductivity values to be input into other modeling programs.
Figure 46. Screen display of results after kriging in the SS2DGRID STATPAK program
<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1386</td>
<td>0</td>
<td>0</td>
<td>16.54</td>
<td>38.04</td>
<td>27.2267</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>1387</td>
<td>0</td>
<td>30</td>
<td>16.41</td>
<td>37.56</td>
<td>33.9714</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>1388</td>
<td>0</td>
<td>60</td>
<td>16.89</td>
<td>37.8</td>
<td>14.2956</td>
<td>-7</td>
<td>0.01</td>
</tr>
<tr>
<td>1389</td>
<td>0</td>
<td>90</td>
<td>16.52</td>
<td>37.8</td>
<td>37.2675</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>1390</td>
<td>0</td>
<td>120</td>
<td>17.21</td>
<td>38.01</td>
<td>22.0271</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1391</td>
<td>0</td>
<td>150</td>
<td>17.93</td>
<td>38.21</td>
<td>25.2611</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>1392</td>
<td>0</td>
<td>180</td>
<td>18.59</td>
<td>38.41</td>
<td>13.4242</td>
<td>-6</td>
<td>0.01</td>
</tr>
<tr>
<td>1393</td>
<td>0</td>
<td>210</td>
<td>19.14</td>
<td>38.55</td>
<td>16.5413</td>
<td>-3</td>
<td>0.01</td>
</tr>
<tr>
<td>1394</td>
<td>0</td>
<td>240</td>
<td>19.48</td>
<td>38.58</td>
<td>28.0787</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>1395</td>
<td>0</td>
<td>270</td>
<td>19.56</td>
<td>38.32</td>
<td>31.3999</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>1396</td>
<td>0</td>
<td>300</td>
<td>19.34</td>
<td>37.58</td>
<td>26.3724</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>1397</td>
<td>0</td>
<td>330</td>
<td>18.83</td>
<td>36.29</td>
<td>16.6489</td>
<td>-1</td>
<td>0.01</td>
</tr>
<tr>
<td>1398</td>
<td>0</td>
<td>360</td>
<td>18.07</td>
<td>34.65</td>
<td>29.1839</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>1399</td>
<td>0</td>
<td>390</td>
<td>17.15</td>
<td>32.93</td>
<td>15.3124</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>1400</td>
<td>0</td>
<td>420</td>
<td>16.16</td>
<td>31.34</td>
<td>32.9624</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>1401</td>
<td>0</td>
<td>450</td>
<td>16.62</td>
<td>29.77</td>
<td>30.3131</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>1402</td>
<td>0</td>
<td>480</td>
<td>15.27</td>
<td>28.71</td>
<td>29.0617</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>1403</td>
<td>0</td>
<td>510</td>
<td>14.93</td>
<td>27.9</td>
<td>21.0718</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

**Figure 47.** Screen display of 18 grid values from the first iteration of the example problem.
<table>
<thead>
<tr>
<th>A</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1384</td>
<td>X-COORD</td>
<td>Y-COORD</td>
<td>INIT VAL</td>
<td>KRIE VAL</td>
<td>COV VAL</td>
<td>VAL</td>
<td>CONDIT</td>
<td>VALUE</td>
</tr>
<tr>
<td>1385</td>
<td>0</td>
<td>0</td>
<td>16.54</td>
<td>20.96</td>
<td>20.2256</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>1386</td>
<td>0</td>
<td>30</td>
<td>16.41</td>
<td>20.84</td>
<td>19.89</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>1387</td>
<td>0</td>
<td>60</td>
<td>16.89</td>
<td>20.75</td>
<td>8.9877</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>1388</td>
<td>0</td>
<td>90</td>
<td>16.52</td>
<td>19.85</td>
<td>25.4058</td>
<td>22</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>1389</td>
<td>0</td>
<td>120</td>
<td>17.21</td>
<td>19.71</td>
<td>15.5848</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>1390</td>
<td>0</td>
<td>150</td>
<td>17.93</td>
<td>19.52</td>
<td>26.0462</td>
<td>24</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>1391</td>
<td>0</td>
<td>180</td>
<td>18.59</td>
<td>19.26</td>
<td>19.8672</td>
<td>19</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>1392</td>
<td>0</td>
<td>210</td>
<td>19.14</td>
<td>18.91</td>
<td>22.3392</td>
<td>23</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>1393</td>
<td>0</td>
<td>240</td>
<td>19.48</td>
<td>18.5</td>
<td>20.0407</td>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>1394</td>
<td>0</td>
<td>270</td>
<td>19.56</td>
<td>18.86</td>
<td>31.601</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>1395</td>
<td>0</td>
<td>300</td>
<td>19.34</td>
<td>17.67</td>
<td>36.8184</td>
<td>38</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>1396</td>
<td>0</td>
<td>330</td>
<td>18.83</td>
<td>17.38</td>
<td>22.6456</td>
<td>24</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>1397</td>
<td>0</td>
<td>360</td>
<td>18.87</td>
<td>17.13</td>
<td>13.313</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>1398</td>
<td>0</td>
<td>390</td>
<td>17.15</td>
<td>16.86</td>
<td>16.3616</td>
<td>17</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>1399</td>
<td>0</td>
<td>420</td>
<td>16.16</td>
<td>16.55</td>
<td>23.544</td>
<td>23</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td>0</td>
<td>450</td>
<td>16.02</td>
<td>16.37</td>
<td>21.8686</td>
<td>22</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>1401</td>
<td>0</td>
<td>480</td>
<td>15.27</td>
<td>16.18</td>
<td>25.8671</td>
<td>25</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>1402</td>
<td>0</td>
<td>510</td>
<td>14.93</td>
<td>16.21</td>
<td>24.7419</td>
<td>23</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

Figure 48. Screen display of same grid points as Figure 47.

with values from second iteration.
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1384</td>
<td>X-COORD</td>
<td>Y-COORD</td>
<td>INIT</td>
<td>VAL</td>
<td>KRIEG</td>
<td>VAL</td>
<td>COV</td>
<td>VAL</td>
</tr>
<tr>
<td>1385</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1386</td>
<td>0</td>
<td>0</td>
<td>16.54</td>
<td>25.51</td>
<td>24.8556</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>1387</td>
<td>0</td>
<td>30</td>
<td>16.41</td>
<td>25.13</td>
<td>19.263</td>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>1388</td>
<td>0</td>
<td>60</td>
<td>16.89</td>
<td>24.75</td>
<td>30.2329</td>
<td>22</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>1389</td>
<td>0</td>
<td>90</td>
<td>16.52</td>
<td>25.35</td>
<td>24.8744</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>1390</td>
<td>0</td>
<td>120</td>
<td>17.21</td>
<td>24.84</td>
<td>7.4563</td>
<td>0</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>1391</td>
<td>0</td>
<td>150</td>
<td>17.93</td>
<td>24.27</td>
<td>17.7948</td>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>1392</td>
<td>0</td>
<td>180</td>
<td>18.59</td>
<td>23.65</td>
<td>25.4269</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>1393</td>
<td>0</td>
<td>210</td>
<td>19.14</td>
<td>23.82</td>
<td>32.9584</td>
<td>29</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>1394</td>
<td>0</td>
<td>240</td>
<td>19.48</td>
<td>22.46</td>
<td>17.803</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>1395</td>
<td>0</td>
<td>270</td>
<td>19.56</td>
<td>22.12</td>
<td>24.7256</td>
<td>22</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>1396</td>
<td>0</td>
<td>300</td>
<td>19.34</td>
<td>22.23</td>
<td>13.3136</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>1397</td>
<td>0</td>
<td>330</td>
<td>18.83</td>
<td>22.91</td>
<td>18.0528</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>1398</td>
<td>0</td>
<td>360</td>
<td>18.07</td>
<td>24.84</td>
<td>43.8435</td>
<td>38</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>1399</td>
<td>0</td>
<td>390</td>
<td>17.15</td>
<td>25.42</td>
<td>15.9137</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td>0</td>
<td>420</td>
<td>16.16</td>
<td>26.87</td>
<td>22.3206</td>
<td>12</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>1401</td>
<td>0</td>
<td>450</td>
<td>16.82</td>
<td>28.13</td>
<td>18.52</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>1402</td>
<td>0</td>
<td>480</td>
<td>15.27</td>
<td>29.2</td>
<td>27.6258</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>1403</td>
<td>0</td>
<td>510</td>
<td>14.93</td>
<td>29.88</td>
<td>21.4471</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Figure 49. Screen display of values from third iteration for same grid points as previous figures
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1386</td>
<td>0</td>
<td>6</td>
<td>16.54</td>
<td>20.35</td>
<td>11.1602</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>1387</td>
<td>0</td>
<td>30</td>
<td>16.41</td>
<td>20.23</td>
<td>23.8897</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>1388</td>
<td>0</td>
<td>60</td>
<td>16.89</td>
<td>20.27</td>
<td>27.3818</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>1389</td>
<td>0</td>
<td>90</td>
<td>16.52</td>
<td>21.53</td>
<td>37.08</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>1390</td>
<td>0</td>
<td>120</td>
<td>17.21</td>
<td>21.66</td>
<td>15.886</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>1391</td>
<td>0</td>
<td>150</td>
<td>17.93</td>
<td>21.82</td>
<td>26.4424</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>1392</td>
<td>0</td>
<td>180</td>
<td>18.59</td>
<td>21.99</td>
<td>34.9262</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>1393</td>
<td>0</td>
<td>210</td>
<td>19.14</td>
<td>22.19</td>
<td>33.0945</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>1394</td>
<td>0</td>
<td>240</td>
<td>19.48</td>
<td>22.44</td>
<td>26.1596</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>1395</td>
<td>0</td>
<td>270</td>
<td>19.56</td>
<td>22.79</td>
<td>29.8654</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>1396</td>
<td>0</td>
<td>300</td>
<td>19.34</td>
<td>23.33</td>
<td>17.2138</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>1397</td>
<td>0</td>
<td>330</td>
<td>18.83</td>
<td>24.10</td>
<td>34.9868</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>1398</td>
<td>0</td>
<td>360</td>
<td>18.07</td>
<td>25.09</td>
<td>36.2375</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>1399</td>
<td>0</td>
<td>390</td>
<td>17.15</td>
<td>26.20</td>
<td>18.1074</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>1400</td>
<td>0</td>
<td>420</td>
<td>16.16</td>
<td>27.35</td>
<td>24.3053</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>1401</td>
<td>0</td>
<td>450</td>
<td>16.02</td>
<td>28.66</td>
<td>48.7588</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>1402</td>
<td>0</td>
<td>480</td>
<td>15.27</td>
<td>29.44</td>
<td>47.4085</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>1403</td>
<td>0</td>
<td>510</td>
<td>14.93</td>
<td>29.84</td>
<td>14.5338</td>
<td>0</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Figure 50  Screen display of values from fourth iteration of same grid points in example problem
Figure 51. Screen display of fifth iteration for same grid points as previous figures
CHAPTER IV

DISCUSSION AND SUMMARY

This study addresses the problem of uncertainty in computer modeling input parameters by using a spreadsheet platform to control readily available or public domain deterministic software in a stochastic simulation. Spreadsheets are commonly used and understood by engineers so they provide a familiar framework in which to create a program without having to learn a new programming language. In addition recent advances in stochastic spreadsheet "ADD-IN"s significantly increase the modeling capabilities of spreadsheets.

Two programs were developed for this effort. The first program (RISC2) was designed to satisfy the criteria of a decision support system by using macro menus to control the processing. This program used a series of Lotus 1-2-3® macros to control the generation of a Monte Carlo (random) realization of the variable parameters within the spreadsheet platform. The U. S. Environmental Protection Agency's Industrial Source Complex (ISC2) Diffusion deterministic model for air pollution was then accessed repeatedly with these random entries with the results recorded for subsequent probability determinations. In this way a stochastic air
pollution model was automatically repeated many times and the results created which offered ease of use and rigor of computation with an additional feature of uncertainty analysis.

The second application program used the spreadsheet platform to manipulate data within the spreadsheet and to interface with several different DOS programs to generate a conditioned two-dimensional geostatistical simulation of hydraulic conductivity values. In this way, multiple, randomly selected two-dimensional hydraulic conductivity fields can be generated which maintain the spatial correlation structure defined by the original field data while simultaneously addressing measurement and estimation uncertainty in this critical variable. Specific findings and/or achievements include:

RISC2

- Development of a useful and inexpensive decision support system which enhances the capability of the ISC2 model.

- The spreadsheet platform can effectively control a sophisticated model.

- The @RISK® ADD-IN can address uncertainty parameters in DOS models by using the Lotus® spreadsheet platform to control both @RISK® and the model.

- Lotus® macros can be developed into sophisticated programming tools capable of emulating many of the functions attributed to much more complex programming languages.
The Lotus spreadsheet platform can control and automatically access multiple DOS programs to generate a conditional simulation of geostatistical data (hydraulic conductivity).

Spreadsheet macros can be used to prompt the user for input parameters, provide helpful comments and reduce the input volume.

The Lotus® spreadsheet platform can transform data from an ASCII tabular output to ASCII columnar input without user intervention.

The primary applications for this technique are models which use a single DOS deterministic model and where the deterministic input file has already been created. In these applications the stochastic model can be created much quicker and easier than either finding and learning how to run another model or converting the deterministic model to a stochastic model by using conventional programming techniques. The technique is also useful for stochastic modeling where resources or access to programming personnel are limited.

Applications such as the examples in this paper require a significant amount of time to develop and approach the point where conventional computer programming may be more efficient. This technique has limited resale potential since it is not a stand alone program, i.e. it requires additional commercial programs such as Lotus® and/or @RISK® to run and requires modification for specific applications.
SELECTED BIBLIOGRAPHY


APPENDIXES
APPENDIX A

LOTUS® ADVANCED MACRO COMMANDS

(AS DESCRIBED IN THE LOTUS® HELP SCREENS)
Advanced Macro Commands

{subroutine [arg1],[arg2],...[argn]}

Calls a subroutine, which is discrete unit of macro instructions. When 1-2-3 encounters a {subroutine} command, it:

1. Shift macro control from the current column of macro instructions to the subroutine whose range name or address is in the braces.
2. Passes any arguments included in the {subroutine} command to the subroutine's {DEFINE} command for evaluation and storage.
3. Executes the instructions in the subroutine.
4. When 1-2-3 reaches either a {RETURN} command in the subroutine or a blank or numeric cell, it returns to the original macro location and continues the macro at the instruction immediately following the {subroutine} command.

{?} Suspends macro execution to let you move the cell pointer, complete part of a command or enter data. When you press ENTER the macro continues. To have the macro enter what you typed while the macro was suspended, follow{?} with a~(tilde).

{APPENDBELOW target-location, source-location}

Copies the contents of source-location to the rows immediately below target-location. Expands a defined range that begins or ends in the last row of target-location to include the rows that contain the appended...
{APPENDRIGHT target-location, source-location}

Copies the contents of source-location to the columns immediately to the right of target-location. Expands any defined range that begins or ends in the rightmost column of target-location to include the columns of appended data.

{BEEP [tone-number]}

Sounds the computer’s bell. The optional tone-number argument (1, 2, 3, or 4) specifies the bell’s tone. Use {BEEP} to signal the end of a macro or the presence of an on-screen message.

{BLANK location}

Erases the contents of location.

{BRANCH location}

Transfers macro control from the current column of macro instructions to the specified location. Use {BRANCH} with {IF} to have the macro do different things depending on the current data, or us it to crate a looping (repeating) macro. {BRANCH} differs from {subroutine} on that 1-2-3 does not automatically return to the original macro location when it completes the instructions in the
{BRANCH} location.

{BREAK}
During data entry or selection of a 1-2-3 command, returns 1-2-3 to Ready mode.

{BREAKOFF}
Disables CTRL-BREAK, preventing interruption of a macro until the macro ends or reaches {BREAKON}.

{BREAKON}
Restores use of CTRL-BREAK while macro is running, undoing a {BREAKOFF} command.

{CLOSE}
Closes the open text file, if one is open. After executing a {CLOSE} command, 1-2-3 goes directly to the next cell in the macro. Do not include any further macro instructions in the same cell as the {CLOSE} command because 1-2-3 will not execute them.

{CONTENTS target-location, source-location,[width],[cell-format]}
Copies the contents of source-location to target-location as a label. Use {CONTENTS} to store a numeric value as a string for use in a string formula.
Code number for [cell-format]:

0 - 15   Fixed, 0-15 decimals
16 - 31  Scientific, 0-15 decimals
32 - 47  Currency, 1-15 decimals
48 - 63  Percent, 0-15 decimals
64 - 79  Comma, 0-15 decimals
112      +/-
113      General
114      D1 (DD-MMM-YY)
115      D2 (DD-MMM)
116      D3 (MMM-YY)
117      Text
118      Hidden
119      D6 (HH:MM:SS AM/PM)
120      D7 (HH:MM AM/PM)
121      D4 (Long Intn’l Date)
122      D5 (Short Intn’l Date)
123      D8 (Long Intn’l Time)
124      D9 (Short Intn’l Time)
127      Worksheet’s global cell format

{DEFINE location1, location2, ...locationn}

Used in a subroutine to store any arguments a
{subroutine} command passes to the subroutine so those
arguments can be used later in the subroutine. {DEFINE}
must have the same number of arguments as the
corresponding {subroutine} command. By default, {DEFINE}
stores {subroutine} arguments as labels. To have
{DEFINE} evaluate a {subroutine} argument as a number,
formula, or cell reference, add the suffix :v to the
corresponding {DEFINE} location argument.

{DEPATCH location}

Performs an indirect branch by transferring macro control
to the cell whose name or address is entered in location.
You must specify a single cell as the location argument.
{FILESIZE location}

Enter in location the number of bytes is the open text file.

{FOR counter, start-number, stop-number, step-number, subroutine}

Creates a for loop that repeats the specified subroutine. The start, stop and step (increment) numbers determine the total number of repetitions to be performed. The counter cell keeps a running count of the repetitions performed so far.

{FORBREAK}

Ends a for loop created by a {FOR} command. Macro execution continues at the macro instruction that immediately follows the {FOR} command.

CAUTION Use {FORBREAK} only within a for loop. Using it anywhere else causes the macro to terminate with an error.

{FORM input-location,[call-table],[include-list],[exclude list]}

Suspends macro execution so you can enter and edit data in the unprotected cells in input-location. Macro
execution resumes when you press ENTER or ESC while the mode indicator displays READY.

* Input location is a range that includes unprotected cells.

* Call-table is a two-column range. The first column contains a list of macro key names; the second contains subroutines that 1-2-3 executes when you press the keys listed in the first column.

* Include-list and exclude-list are ranges that contain list of allowable keystrokes and keystrokes to ignore, respectively. (Use one or the other of these arguments; if you use both, 1-2-3 ignores the exclude-list argument.)

{FORMBREAK}

   Ends a {FORM} command. Macro execution continues at the macro instructions that immediately follow the {FORM} command.

   CAUTION Use {FORMBREAK} only in a call-table subroutine. Using it anywhere else causes the macro to terminate with an error.

{FRAMEOFF}

   Suppresses display of the worksheet frame (worksheet, letter, column letters, and row numbers.)

{FRAMEON}

   Redisplays the worksheet frame hidden by {FRAMEOFF}.

159
{GET location}
Suspends macro execution until you press a key, then records your keystrokes as a left-aligned label in location and continues the macro. You can press any key except CTRL-BREAK.

{GETLABEL prompt, location}
Displays prompt in the control panel and suspends macro execution while you type a response. When you press ENTER, stores your response as a left-aligned label in location and continues the macro.

{GETNUMBER prompt, location}
Displays prompt in the control panel and suspends macro execution while you type a response, which must be a number or numeric formula. When you press ENTER, evaluates your response, stores the resulting number in location, and continues the macro.

{GETPOS location}
Enters a number in location. This number reports the current byte-pointer position (position at which data is read from or written to) in the open text file. After executing a {GETPOS} command, 1-2-3 skips any further macro instructions in the same cell and goes directly to the next cell in the macro. If no text file is open, 1-
2-3 ignores \{GETPOS\} and executes the instructions that follow it in the same cell.

\begin{verbatim}
{GRAPHOFF}
Removes a graph displayed by a \{GRAPHON\} command from the screen and redisplays the worksheet.

\begin{verbatim}
{GRAPHON [named-graph],[nodisplay]}
Has three possible results, depending on the arguments you use. In all cases, the macro continues to run while \{GRAPHON\} is in effect.
* \{GRAPHON\} with no arguments displays the current graph.
* \{GRAPHON named-graph\} makes the named-graph settings current and displays the graph.
* \{GRAPH named-graph, nodisplay\} makes the named-graph settings current but does not display the graph.
\end{verbatim}

1-2-3 clears a graph displayed by \{GRAPHON\} from the screen when it reaches a \{GRAPHON\} command, another \{GRAPHON\} command, or the end of the macro. 1-2-3 also clears a graph displayed by \{GRAPHON\} then it reaches a \{?\} or \{INDICATE\} command or a command that displays a prompt or menu in the control panel.

\begin{verbatim}
{IF condition}
Evaluates condition as true or false. If condition is true, 1-2-3 executes the macro instructions that follow the \{IF\} command in the same cell. If condition is
\end{verbatim}
false, 1-2-3 skips to the cell above the \{IF\} command and executes the macro instructions there.

Condition is typically a logical formula (a formula that uses one of the logical operators $< > = <> >= <= \#NOT\# \#AND\# and \#OR\#), or a reference to a cell that contains a logical formula.

\{INDICATE [string]\}
Displays string as the mode indicator in the upper right corner of the screen. \{INDICATE\} with no argument restores standard operation of the mode indicator.

\{LET location, entry\}
Enters a number or label in location. For the entry argument, you can use a number, literal string, formula, or reference to cell containing a number, label or formula. If you use a formula, 1-2-3 enters the result in location. You can add the suffix :s or :v to the entry argument to tell 1-2-3 whether to treat the argument as a literal string or to evaluate the argument before entering it.

\{LOOK location\}
Records in location the first keystroke in the typeahead buffer. If the buffer is empty, 1-2-3 enters an
apostrophe in location.

{MENUBRANCH location}
Displays in the control panel the macro menu found at location and waits for you to select an item from the menu. Then executes the macro instructions associated with the new item.

A macro menu usually consists of at least three rows. The first row indicates the menu items (up to eight), the second row includes descriptions for each menu, and the third row (and any consecutive rows) includes macro instructions for each menu item.

{MENUCALL location}
Like {MENUBRANCH} except that when you select a menu item, 1-2-3 performs the associated macro instructions as a subroutine. 1-2-3 then performs the macro instructions immediately following the {MENUCALL} command.

{ONERROR branch-location, [message-location]}
Traps errors that occur while a macro is running. If an error occurs during a macro after an {ONERROR} command, 1-2-3 branches to the macro instructions in branch-location (optionally recording the error message in
message-location) instead of terminating the macro.

{OPEN file-name, access-type}

Opens a new text file with write access (w), or opens an existing text file with either read (r), modify (m), or append access (a).

{PANELOFF [clear]}

Freezes the control panel and status line until 1-2-3 encounters a {PANELON} command or the macro ends. The optional clear argument clears the control panel and status line before freezing them.

{PANELON}

Unfreezes the control panel and status line after {PANELOFF}.

{PUT location, column-offset, row-offset, entry}

Within the range specified as location, enters a number or label in the cell specified with the column and row offset numbers.

{QUIT}

Ends a macro, returning keyboard control to the user.

{READ byte-count, location}
Copies the specified number of bytes (byte-count) from the open text file to location and advances the byte pointer the same number of bytes in the text file.

{READLN location}

Copies the remainder of the current line form the open text file to location and advances the byte pointer to the beginning of the next line in the file.

{RECALC location,[condition],[iterations]}

Recalculates the values in location row by row. The optional condition argument tells 1-2-3 to repeat the recalculation until condition is true. The optional iterations arguments tell 1-2-3 to perform the specified number of recalculation passes.

{RECALCCOL location, [condition],[iterations]}

Like {RECALC} except recalculation proceeds column by column.

{RESTART}

Used in a subroutine to clear the subroutine stack. When 1-2-3 encounters {RESTART}, it finishes the current subroutine, clears the subroutine stack, and ends the macro.
{RETURN}
Ends a subroutine called by a {subroutine}, {MENUCALL}, OR /XC command and returns macro control to the location from which the command was issued. In a subroutine called by a {FOR} command, {RETURN} starts the next repetition of the for loop.

{SETPOS offset-number}
Positions the byte pointer offset-number of bytes after the first byte in the open text file.

{SYSTEM command}
Temporarily suspends 1-2-3 and executes the specified operating system command. When the command is completed, the macro continues.

{WAIT time-number}
Suspends the macro, displays the WAIT mode indicator until the time specified by time-number, for example, {WAIT @NOW+@TIME(0,0,10)}.

{WINDOWSOFF}
Freezes the worksheet area of the screen during a macro until 1-2-3 reaches a {WINDOWSON} command or the macro ends.
{WINDOWSON}

Unfreezes the worksheet area of the screen after
{WINDOWSOFF}.

{WRITE string}

Copies string to the open text file, starting at the
current byte-pointer position in the open text file.

{WRITELN string}

Same as {WRITE} except that it adds a carriage-return and
line-feed sequence to the string it writes to the open
file.
APPENDIX B

COMPLETE SERIES OF GUIDANCE

SCREENS FOR RISC2

(ISC2) EXAMPLE PROBLEM
RISK-BASED INDUSTRIAL SOURCE COMPLEX (ISC2) DISPERSION MODEL

WELCOME TO RISC2

A STOCHASTIC AIR POLLUTION MODELING PROGRAM

DESIGNED TO GENERATE A MONTE CARLO SIMULATION USING @RISK AND ISC2

IN A LOTUS VERSION 3.1 SHELL

PRESS {ENTER} TO CONTINUE

RISC2.WK3
THIS PROGRAM HAS BEEN DEVELOPED AT
OKLAHOMA STATE UNIVERSITY
STILLWATER, OKLAHOMA 74078

BY

LARRY E LOCKWOOD

AND

WILLIAM F. MCTERMAN

PRESS {ENTER} TO CONTINUE
MACRO REQUIRES 1 SCREEN AREA FOR COMMENTS AND HELP.

MOVE CURSOR TO UPPER LEFT CORNER OF AREA TO BE RESERVED FOR COMMENTS

PRESS ENTER TO CONTINUE
MOVE CURSOR TO UPPER LEFT HAND CORNER OF RANGE FOR TABLE OF INPUT VALUES

PRESS ENTER TO CONTINUE
Select Job control functions from menu"
Select Job control functions from menu
A:823: [W18] 'STARTING
TITLES MODEL OPTS INTERVALS POLLUTION ID RUN OR NOT TERRAIN HEIGHTS MORE QUIT
UP TO 2 LINES OF TITLES MAY BE INPUT

CO STARTING

FILE0005.WK3

CMD RUN
Select job control functions from menu.
DEFAULT -- Specifies that the regulatory default options will be used.

CONC -- Specifies that CONCentration values will be calculated.

DEPOS -- Specifies that dry DEPOsition values will be calculated.

RURAL -- Specifies that RURAL dispersion parameters will be used.

URBAN -- Specifies that URBAN dispersion parameters will be used.

GRDRIS -- Use non-default option for gradual plume rise.

NOSTO -- Use non-default option for no stack-tip downwash.

NOBIO -- Use non-default option for no buoyancy-induced dispersion.

NOCALM -- Use non-default option to bypass the calms processing routine.

MSGPRO -- Use non-default option for the missing data processing routine.
Select short term or long term time interval from menu.

FILE0005.VK3

178
Select short term or long term time interval from menu.
SELECT FROM THE FOLLOWING SHORT TERM AVERAGING PERIODS: 
SELECT SHORT TERM OR LONG TERM TIME INTERVAL FROM MENU.

1 (hr) 
2 (hrs) 
3 (hrs) 
4 (hrs) 
6 (hrs) 
8 (hrs) 
12 (hrs) 
24 (hrs)
A:A1: [W3]
RUN NOT-RUN
RUN MODEL & PERFORM ALL CALCULATIONS
STARTING

LOCATION DOWNWASH EMISSIONS UNITS VARIABLES GROUPS QUIT

CO STARTING
CO TITLEONE TEST TITLE
CO TITLETWO TEST
CO MODELOPT DEFAULT RURAL CONC
CO AVERAGE 3 24 PERIOD
CO POLLUTIO SO2
CO RUNNORMOT RUN
CO FINISHED
SD STARTING

RISEX.WK3

CAD CALC RUN
ENTER SOURCE ID (UP TO 8 CHARACTERS) AND PRESS ENTER:

SOURCE TYPE, Xs AND Ys COORDINATES MUST BE ENTERED AFTER EACH ID.
THE Zs COORDINATE IS OPTIONAL.
(EAST-WEST) COORDINATE OF SOURCE LOCATION (IN METERS)

ENTER SOURCE ID (UP TO 8 CHARACTERS) AND PRESS ENTER:

SOURCE TYPE, Xs AND Ys COORDINATES MUST BE ENTERED AFTER EACH ID.
THE Zs COORDINATE IS OPTIONAL.
THE X (EAST-WEST) AND Y (NORTH-SOUTH) COORDINATES ARE
THE CENTER OF THE SOURCE FOR POINT AND VOLUME SOURCES AND
THE SOUTHWEST CORNER OF THE SOURCE FOR AREA SOURCES
THE X (EAST-WEST) AND Y (NORTH-SOUTH) COORDINATES ARE

THE CENTER OF THE SOURCE FOR POINT AND VOLUME SOURCES AND

THE SOUTHWEST CORNER OF THE SOURCE FOR AREA SOURCES
ENTER THE SOURCE ELEVATION AND PRESS ENTER:

THE X (EAST-WEST) AND Y (NORTH-SOUTH) COORDINATES ARE

THE CENTER OF THE SOURCE FOR POINT AND VOLUME SOURCES AND

THE SOUTHWEST CORNER OF THE SOURCE FOR AREA SOURCES.
THE X (EAST-WEST) AND Y (NORTH-SOUTH) COORDINATES ARE
THE CENTER OF THE SOURCE FOR POINT AND VOLUME SOURCES AND
THE SOUTHWEST CORNER OF THE SOURCE FOR AREA SOURCES
THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR POINT SOURCES.
THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR POINT SOURCES.

ENTER POINT EMISSION RATE IN g/s: _
THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR POINT SOURCES.

ENTER RELEASE HEIGHT ABOVE GROUND (IN METERS):_
The above parameters are required input for point sources.

Enter stack gas exit temperature (degrees K) : _
THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR POINT SOURCES.

ENTER STACK GAS EXIT VELOCITY (M/S) : -

THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR POINT SOURCES.
THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR POINT SOURCES.

ENTER STACK INSIDE DIAMETER (IN METERS): _

THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR POINT SOURCES.
BUILDING DOWNWASH ALGORITHMS DO NOT APPLY TO VOLUME OR AREA SOURCES.
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION

USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY

A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S)
A:A10: [W3]
ENTER BUILDING HEIGHT (METERS) FOR 10 DEGREES :-

FOR THE SHORT TERM MODEL --

USER INPUTS 36 DIRECTION-SPECIFIC BUILDING HEIGHTS (IN METERS)
BEGINNING WITH THE 10 DEGREE FLOW VECTOR (WIND BLOWING TOWARD 10
DEGREES FROM NORTH) AND INCREMENTING BY 10 DEGREES
IN A CLOCKWISE DIRECTION
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION

USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING WIDTHS APPLY.

A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED
BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S)
ENTER BUILDING WIDTH (METERS) FOR 10 DEGREES:

FOR THE SHORT TERM MODEL --

USER INPUTS 36 DIRECTION-SPECIFIC BUILDING WIDTHS (IN METERS)

BEGINNING WITH THE 10 DEGREE FLOW VECTOR (WIND BLOWING TOWARD 10
DEGREES FROM NORTH) AND INCREMENTING BY 10 DEGREES

IN A CLOCKWISE DIRECTION
THE GROUP ID IS A UNIQUE IDENTIFIER FOR EACH GROUP OF SOURCES
THE GROUP ID "ALL" IS USED TO AUTOMATICALLY SETUP A SOURCE GROUP CALL "A"
THAT INCLUDES ALL SOURCES MODELED FOR A PARTICULAR RUN.
Select cartesian or polar grid system

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>STACK1 POINT</th>
<th>B</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRCPARAN</td>
<td>STACK1</td>
<td>1</td>
<td>35</td>
<td>432</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>25.5</td>
<td>28.56</td>
<td>15</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>15</td>
<td>28.56</td>
<td>25.5</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>0</td>
</tr>
</tbody>
</table>

FILE0005.WK3
Program will allow 5 gridded receptor networks of either (or both) types in a single run, plus discrete receptors of either type.
<table>
<thead>
<tr>
<th>Location</th>
<th>Stack1</th>
<th>Point</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRCFILM</td>
<td>1</td>
<td>35</td>
<td>432</td>
<td>11.7</td>
<td>2.4</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>25.5</td>
<td>28.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>25.5</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>15</td>
<td>28.56</td>
<td>25.5</td>
<td>29.66</td>
<td>32.92</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
<td>35.43</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>35.43</td>
<td>36.45</td>
<td>0</td>
<td>35.18</td>
<td>32.92</td>
</tr>
</tbody>
</table>
Specify origin of the Polar network.

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>Stack1</th>
<th>Point</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SACPARAM</td>
<td>Stack1</td>
<td>1</td>
<td>35</td>
<td>432</td>
<td>11.7</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack1</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td>29.66</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack1</td>
<td>35.43</td>
<td>36.45</td>
<td>0</td>
<td>35.18</td>
</tr>
<tr>
<td>SRGROUP</td>
<td>ALL</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
ENTER X COORDINATE FOR ORIGIN OF POLAR NETWORK:  

<table>
<thead>
<tr>
<th>S0 STARTING</th>
<th>S0 LOCATION</th>
<th>STACK1</th>
<th>POINT</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0 SRCPARAM</td>
<td>STACK1</td>
<td>1</td>
<td>35</td>
<td>432</td>
<td>11.7</td>
<td>2.4</td>
</tr>
<tr>
<td>S0 BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>S0 BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>S0 BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>S0 BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>S0 BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>S0 BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>S0 BUILDHGT</td>
<td>STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
</tbody>
</table>

| S0 BUILDWID   | STACK1      | 35.43  | 36.45 | 36.37 | 35.18 | 32.92 |
| S0 BUILDWID   | STACK1      | 25.5   | 28.56 | 15    | 28.56 | 25.5 |
| S0 BUILDWID   | STACK1      | 32.92  | 35.18 | 36.37 | 36.45 | 25.5 |
| S0 BUILDWID   | STACK1      | 15     | 28.56 | 25.5  | 29.66 | 32.92 |
| S0 BUILDWID   | STACK1      | 36.37  | 36.45 | 35.43 | 33.33 | 35.43 |
| S0 BUILDWID   | STACK1      | 35.43  | 36.45 | 0     | 35.18 | 32.92 |

S0 SRCGROUP: ALL  
S0 FINISHED  
RE STARTING  
RE GRIDPOLR POL1 STA  
RE GRIDPOLR POL1 ORIG  
FILE0005.WK3  

END  
NUM CAP
<table>
<thead>
<tr>
<th>SD LOCATION STACK1</th>
<th>POINT</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD SRCPARAM STACK1</td>
<td>1</td>
<td>35</td>
<td>432</td>
<td>11.7</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD BUILDWID STACK1</th>
<th>35.43</th>
<th>36.45</th>
<th>36.37</th>
<th>35.18</th>
<th>32.92</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td>29.66</td>
<td>32.92</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
<td>35.43</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>0</td>
<td>35.18</td>
<td>32.92</td>
</tr>
</tbody>
</table>

| SD SRCGROUP ALL    |      |     |     |     |     |
| SD FINISHED        |      |     |     |     |     |
| RE STARTING        |      |     |     |     |     |

| RE GRIDPOLR POL1  STA |     |     |     |     |     |
| RE GRIDPOLR POL1  ORIG |     |     |     |     |     |
| RE GRIDPOLR POL1  DIST |   CMD |     |     |     |     |

FILE08085.WK3
<table>
<thead>
<tr>
<th>Location</th>
<th>Stack 1 Point</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Src para</td>
<td>Stack 1</td>
<td>1</td>
<td>35</td>
<td>432</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Hgt</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Build Wld</td>
<td>Stack 1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
</tr>
<tr>
<td>Build Wld</td>
<td>Stack 1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
</tr>
<tr>
<td>Build Wld</td>
<td>Stack 1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
</tr>
<tr>
<td>Build Wld</td>
<td>Stack 1</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>Build Wld</td>
<td>Stack 1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
</tr>
<tr>
<td>Build Wld</td>
<td>Stack 1</td>
<td>35.43</td>
<td>36.45</td>
<td>0</td>
</tr>
</tbody>
</table>

So, do you want to continue with another ring (Y or N)? _
<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
<th>Stack 1</th>
<th>Stack 2</th>
<th>Stack 3</th>
<th>Stack 4</th>
<th>Stack 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRCFARA</td>
<td>Stack 1</td>
<td>1</td>
<td>35</td>
<td>432</td>
<td>11.7</td>
<td>2.4</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDHGT</td>
<td>Stack 1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack 1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack 1</td>
<td>25.5</td>
<td>28.56</td>
<td>15</td>
<td>28.56</td>
<td>25.5</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack 1</td>
<td>32.82</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>25.5</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack 1</td>
<td>15</td>
<td>28.56</td>
<td>25.5</td>
<td>29.66</td>
<td>32.92</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack 1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
<td>35.43</td>
</tr>
<tr>
<td>BUILDWID</td>
<td>Stack 1</td>
<td>35.43</td>
<td>36.45</td>
<td>38</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SRCGROUP</td>
<td></td>
<td>All</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRIDPOLR</td>
<td>POL1</td>
<td>STA</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRIDPOLR</td>
<td>POL1</td>
<td>ORIG</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
</tr>
<tr>
<td>GRIDPOLR</td>
<td>POL1</td>
<td>DIST</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
</tr>
<tr>
<td>GRIDPOLR</td>
<td>POL1</td>
<td>GDIR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

File: 0805.WK3
ENTER STARTING DIRECTION OF THE POLAR GRID:  

<table>
<thead>
<tr>
<th>SO SRCPARM STACK1</th>
<th>1</th>
<th>35</th>
<th>432</th>
<th>11.7</th>
<th>2.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO SJRCGROUP ALL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 STA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 ORIG</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 DIST</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 GDIR</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FILE08005.WK3
**ENTER INCREMENT (IN DEGREES) FOR DEFINING DIRECTIONS:**

<table>
<thead>
<tr>
<th>SO SRCPARAM STACK1</th>
<th>1</th>
<th>35</th>
<th>432</th>
<th>11.7</th>
<th>2.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td>29.66</td>
<td>32.92</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
<td>35.43</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>35.18</td>
<td>32.92</td>
<td></td>
</tr>
<tr>
<td>SO SRCGROUP ALL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RE STARTING**

<table>
<thead>
<tr>
<th>RE GRIDPOLR POL1 STA</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RE GRIDPOLR POL1 ORIG</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 DIST</td>
<td>180</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 GOIR</td>
<td>36</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FILE8805.WK3

211
FILENAME  HEIGHT STATION PERIOD DATA RETURN
Specify filename and format information for input file

SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDHGT STACK1  34  34  34  34  34
SO BUILDWID STACK1  35.43  36.45  36.37  35.18  32.92
SO BUILDWID STACK1  25.5  20.56  15  20.56  25.5
SO BUILDWID STACK1  32.92  35.18  36.37  36.45  25.5
SO BUILDWID STACK1  15  20.56  25.5  29.66  32.92
SO BUILDWID STACK1  36.37  36.45  35.43  33.33  35.43
SO BUILDWID STACK1  35.43  36.45  0  35.18  32.92
SO SRCGROUP ALL
SO FINISHED
RE STARTING
RE GRIDPOLR POL1 STA
RE GRIDPOLR POL1 ORIG  0  0
RE GRIDPOLR POL1 DIST  180  200  300  500
RE GRIDPOLR POL1 GDIR  36  10  10
RE GRIDPOLR POL1 END
RE FINISHED
RE STARTING
<table>
<thead>
<tr>
<th>SO BUILDHGT STACK1</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
<td></td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>25.5</td>
<td>26.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>15</td>
<td>26.56</td>
<td>25.5</td>
<td>29.66</td>
<td>32.92</td>
<td></td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
<td>35.43</td>
<td></td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>35.43</td>
<td>32.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO SRCGROUP ALL</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO FINISHED</td>
<td>RE starting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 STA</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 ORIG</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 DIST</td>
<td>36</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 GDIR</td>
<td>36</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 END</td>
<td>RE finished</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OPTIOnAL FILE FORMATS

BLANK     -- Specifies the default ASCII format for sequential hourly file.

READ      -- Specifies the Fortran READ format for an ASCII sequential hourly file (See page 3-53 in manual).

FREE      -- Specifies free-formatted READs for an ASCII sequential hourly file.

UNFORM    -- Specifies an unformatted file generated by the RAMMET or MPRM preprocessors.

CARD      -- Specifies use of "card image" data using a default ASCII format. This option differs from option 1 (blank) by addition of hourly wind profile exponents and hourly vertical potential temperature gradients in the input file.

See Page 3-51 through 3-55 for details
**A:D51:**

**ENTER HEIGHT OF ANEMOMETER ABOVE GROUND IN METERS OR FEET:**

<table>
<thead>
<tr>
<th>SO BUILDHGT STACK1</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SO BUILDWID STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
</tr>
<tr>
<td>SO SRCGROUP ALL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 STA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 ORIG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 DIST</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 GDIR</td>
<td>36</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 END</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME INPUTFIL prepit.asc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME ANEMHIGHT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RISEX.WK3</td>
<td>CAD</td>
<td>CALL</td>
<td>RUN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
#### ENTER UNITS OF MEASUREMENT FOR ANEMOMETER HEIGHT (METERS OR FEET):

<table>
<thead>
<tr>
<th></th>
<th>STACK1</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO</td>
<td>BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SO</td>
<td>BUILDWID STACK1</td>
<td>25.5</td>
<td>28.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SO</td>
<td>BUILDWID STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>25.5</td>
</tr>
<tr>
<td>SO</td>
<td>BUILDWID STACK1</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td>29.66</td>
<td>32.92</td>
</tr>
<tr>
<td>SO</td>
<td>BUILDWID STACK1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
<td>35.43</td>
</tr>
<tr>
<td>SO</td>
<td>BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>0</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SO</td>
<td>SRCGROUP ALL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO</td>
<td>FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td>STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td>GRIDPOLR POL1 STA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td>GRIDPOLR POL1 ORIG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td>GRIDPOLR POL1 DIST</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td>GRIDPOLR POL1 GOIR</td>
<td>36</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td>GRIDPOLR POL1 END</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td>FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME</td>
<td>STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME</td>
<td>INPUTFILE PREPIT.ASC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME</td>
<td>ANEMHEIGHT</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FILE0005.WK3  END  NUT CAP
Specifies surface meteorological station

```
SO STACK1 34 34 34 34 34 34
SO BUILDWID STACK1 35.43 36.45 36.37 35.18 32.92
SO BUILDWID STACK1 25.5 20.56 15 20.56 25.5
SO BUILDWID STACK1 32.92 35.18 36.37 36.45 25.5
SO BUILDWID STACK1 15 20.56 25.5 29.66 32.92
SO BUILDWID STACK1 36.37 36.45 35.43 33.33 35.43
SO BUILDWID STACK1 35.43 36.45 0 35.18 32.92
SO SRCGROUP ALL
SO FINISHED
RE STARTING
RE GRIDPOLR POL1 STA
RE GRIDPOLR POL1 ORIG 0 0
RE GRIDPOLR POL1 DIST 100 200 300 500
RE GRIDPOLR POL1 GDIR 36 10 10
RE GRIDPOLR POL1 END
RE FINISHED
RE STARTING
ME INPUTFIL PREPIT.ASC
ME ANEMHGHT 28 FEET
ME
FILE0005.WK3
```
ENTER 5 DIGIT WBAN NUMBER FOR NWS STATIONS:  

<table>
<thead>
<tr>
<th></th>
<th>STACK1</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SD BUILDWID STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>25.5</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td>29.66</td>
<td>32.92</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
<td>35.43</td>
</tr>
<tr>
<td>SD BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>0</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>SD SRCGROUP ALL</td>
<td>FINISHED</td>
<td>RE STARTING</td>
<td>RE STARTING</td>
<td>RE STARTING</td>
<td>RE STARTING</td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 STA</td>
<td>RE GRIDPOLR POL1 ORIG</td>
<td>0</td>
<td>0</td>
<td>RE GRIDPOLR POL1 DIST</td>
<td>100</td>
</tr>
<tr>
<td>RE GRIDPOLR POL1 GDIR</td>
<td>36</td>
<td>10</td>
<td>10</td>
<td>RE GRIDPOLR POL1 END</td>
<td>RE FINISHED</td>
</tr>
</tbody>
</table>
ENTER YEAR FOR WHICH DATA IS BEING PROCESSED (2 OR 4 DIGITS): _

<table>
<thead>
<tr>
<th>STACK1</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
<th>34</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
</tr>
<tr>
<td>BUILDWID STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>BUILDWID STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>25.5</td>
</tr>
<tr>
<td>BUILDWID STACK1</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td>29.66</td>
<td>32.92</td>
</tr>
<tr>
<td>BUILDWID STACK1</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td>33.33</td>
<td>35.43</td>
</tr>
<tr>
<td>BUILDWID STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>35.18</td>
<td>32.92</td>
<td></td>
</tr>
<tr>
<td>SRCGROUP</td>
<td>ALL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRIDPOLR POL1 STA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRIDPOLR POL1 ORIG</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRIDPOLR POL1 DIST</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>GRIDPOLR POL1 GDIR</td>
<td>36</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRIDPOLR POL1 END</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INPUTFILE PREPIT.ASC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FILE 6005.WK3

END

RUN CAP
ENTER NAME OF STATION (OPTIONAL - UP TO 40 CHARACTERS):  

SD STACK1 34 34 34 34 34 34  
SD BUILDWID STACK1 35.43 36.45 36.37 35.18 32.92  
SD BUILDWID STACK1 25.5 20.56 15 20.56 25.5  
SD BUILDWID STACK1 32.92 35.18 36.37 36.45 25.5  
SD BUILDWID STACK1 15 20.56 25.5 29.66 32.92  
SD BUILDWID STACK1 36.37 36.45 35.43 33.33 35.43  
SD BUILDWID STACK1 35.43 36.45 0 35.18 32.92  
SD SRCGROUP ALL  
SD FINISHED  
RE STARTING  
RE GRIDPOLR POL1 STA  
RE GRIDPOLR POL1 ORIG 0 0  
RE GRIDPOLR POL1 DIST 100 200 300 500  
RE GRIDPOLR POL1 GDIR 36 10 10  
RE GRIDPOLR POL1 END  
RE FINISHED  
RE STARTING  
RE INPUTFIL PREPIT.ASC  
RE ANEHEIGHT 20 FEET  
RE SURFDATA 94823 1964  

FILE0805.WK3  

220
### Upper Air Station Specifications

<table>
<thead>
<tr>
<th>SO BUILDWID</th>
<th>STACK1</th>
<th>35.43</th>
<th>36.45</th>
<th>36.37</th>
<th>35.18</th>
<th>32.92</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO BUILDWID</td>
<td>STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SO BUILDWID</td>
<td>STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
</tr>
<tr>
<td>SO BUILDWID</td>
<td>STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
</tr>
<tr>
<td>SO BUILDWID</td>
<td>STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
</tr>
<tr>
<td>SO BUILDWID</td>
<td>STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
</tr>
<tr>
<td>SO SACGROUP</td>
<td>ALL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SO FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR</td>
<td>POL1</td>
<td>STA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR</td>
<td>POL1</td>
<td>ORIG</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR</td>
<td>POL1</td>
<td>DIST</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
</tr>
<tr>
<td>RE GRIDPOLR</td>
<td>POL1</td>
<td>GDIR</td>
<td>36</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>RE GRIDPOLR</td>
<td>POL1</td>
<td>END</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE INPUTFIL</td>
<td>PREPIT.ASC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE ANENHGHT</td>
<td>20 FEET</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE SURFDATA</td>
<td>94823</td>
<td>1964 PITTSBURG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>STACK1</td>
<td>STACK1</td>
<td>STACK1</td>
<td>STACK1</td>
<td>STACK1</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>BUILDWID</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td></td>
</tr>
<tr>
<td>BUILDWID</td>
<td>35.43</td>
<td>36.45</td>
<td>0</td>
<td>35.18</td>
<td>32.92</td>
<td></td>
</tr>
<tr>
<td>BUILDWID</td>
<td>25.5</td>
<td>28.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>BUILDWID</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td></td>
</tr>
</tbody>
</table>

**SRCGROUP ALL**

**FINISHED**

**STARTING**

**GRIDPOLR POL1**: STA

**GRIDPOLR POL1**: ORG 0 0

**GRIDPOLR POL1**: DIST 100 200 300 500

**GRIDPOLR POL1**: GOIR 36 18 10

**GRIDPOLR POL1**: END

**FINISHED**

**STARTING**

**INPUTFILE**: PREPIT.ASC

**AEROPHGT**: 20 FEET

**SURFDATA**: 94823 1964 PITTSBURG

**AIRDATA**: 94823 1964 PITTSBURG

**FINISHED**

**STARTING**

**RISING.WK3**

**END**, **CALC**, **RUN**, **CAP**
Specify output options for high value summary tables by receptor

SO BUILDWID STACK1 32.92 35.18 36.37 36.45 35.43
SO BUILDWID STACK1 35.43 36.45 0 35.18 32.92
SO BUILDWID STACK1 25.5 28.56 15 28.56 25.5
SO BUILDWID STACK1 32.92 35.18 36.37 36.45 35.43
SO SRCGROUP ALL
SO FINISHED
RE STARTING
RE GRIDPOLR POL1 STA
RE GRIDPOLR POL1 ORIG 0 0
RE GRIDPOLR POL1 DIST 100 200 300 500
RE GRIDPOLR POL1 GOIR 36 10 10
RE GRIDPOLR POL1 END
RE FINISHED
ME STARTING
ME INPUTFIL PREPIT.ASC
ME ANEMNHGT 20 FEET
ME SURFDATA 94823 1964 PITTSBURG
ME AIRDATA 94823 1964 PITTSBURG
ME FINISHED
DU STARTING
THE SHORT TERM AVERAGING PERIOD IS THE PERIOD
(i.e. 1, 3, 8, or 24 hrs OR MONTH)
FOR WHICH THE RECEPTOR TABLE IS SELECTED.

THE SECONDARY KEYWORDS "FIRST", "SECOND", "THIRD", "FOURTH"
FIFTH", & "SIXTH" (OR "1ST", "2ND", "3RD" ETC) SPECIFY WHICH HIGH
VALUES ARE TO BE SUMMARIZED BY RECEPTOR FOR THAT AVERAGING PERIOD.

ENTERING THE KEYWORD "ALLAVE" FOR THE SHORT TERM AVERAGING PERIOD
WILL APPLY THE SAME RECEPTOR TABLE OPTIONS TO ALL AVERAGING PERIODS
THE SHORT TERM AVERAGING PERIOD IS THE PERIOD

(i.e. 1, 3, 8, or 24 hrs OR MONTH)

FOR WHICH THE RECEPTOR TABLE IS SELECTED.

THE SECONDARY KEYWORDS "FIRST", "SECOND", "THIRD", "FOURTH" "FIFTH", & "SIXTH" (OR "1ST", "2ND", "3RD" ETC) SPECIFY WHICH HIGH
VALUES ARE TO BE SUMMARIZED BY RECEPTOR FOR THAT AVERAGING PERIOD.

ENTERING THE KEYWORD "ALLAVE" FOR THE SHORT TERM AVERAGING PERIOD

WILL APPLY THE SAME RECEPTOR TABLE OPTIONS TO ALL AVERAGING PERIODS
THE SHORT TERM AVERAGING PERIOD IS THE PERIOD
(i.e. 1, 3, 8, or 24 hrs or MONTH)
FOR WHICH THE RECEPTOR TABLE IS SELECTED
THE SECONDARY KEYWORD SPECIFIES THE NUMBER OF OVERALL MAXIMUM VALUES
TO BE SUMMARIZED FOR EACH AVERAGING PERIOD.
ENTERING THE KEYWORD "ALLAVE" FOR THE SHORT TERM AVERAGING PERIOD
WILL APPLY THE SAME RECEPTOR TABLE OPTIONS TO ALL AVERAGING PERIODS.
IS THIS A NEW (N) OR EXISTING (E) FILE? (ENTER N OR E): _

INCLUDE DOS PATH IN EACH FILENAME

EXAMPLE.DAT
<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>23</td>
<td>CO STARTING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>CO TITLE ONE TEST TITLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>CO TITLE TWO TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>CO MODELOPT DEFAULT RURAL CONC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>CO AVERAGE 3 24 PERIOD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>CO POLLUTION SO2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>CO RUNOR NOT RUN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>CO FINISHED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>SO LOCATION STACK1 POINT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>SO SRCPARAM STACK1</td>
<td>1</td>
<td>35</td>
<td>432</td>
<td>11.7</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>SO BUILDHGT STACK1</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>SO BUILDHGT STACK1</td>
<td>35.43</td>
<td>36.45</td>
<td>36.37</td>
<td>35.18</td>
<td>32.92</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>SO BUILDHGT STACK1</td>
<td>25.5</td>
<td>20.56</td>
<td>15</td>
<td>20.56</td>
<td>25.5</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>SO BUILDHGT STACK1</td>
<td>32.92</td>
<td>35.18</td>
<td>36.37</td>
<td>36.45</td>
<td>35.43</td>
<td></td>
</tr>
</tbody>
</table>

RISEx.WK3
A:A3: [W3] 'MOVE CURSOR TO THE SELECTED VARIABLE AND PRESS ENTER

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>TO SELECTED VARIABLE FOR WHICH DISTRIBUTION FUNCTION IS TO BE SUBSTITUTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>MOVE CURSOR TO THE SELECTED VARIABLE AND PRESS ENTER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXAMPLE.DAT

RISEX.WK3

CMD CALL NUT CAP
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LOVE CURSOR TO UPPER LEFT CORNER OF OUTPUT RANGE AND PRESS ENTER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EX.ly.PЕ.AT

CMD CALC NUM CAP
EXAMPLE.DAT

ENTER THE NUMBER OF REALIZATIONS TO BE RUN

A:AI: [W3]
### Statistical Analysis of Model Output

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>345</td>
<td>STATISTICAL ANALYSIS OF MODEL OUTPUT</td>
</tr>
<tr>
<td>346</td>
<td></td>
</tr>
<tr>
<td>347</td>
<td></td>
</tr>
<tr>
<td>348</td>
<td>MEAN (AVERAGE) VALUE OF 3 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>349</td>
<td>STANDARD DEVIATION OF 3 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>350</td>
<td>POPULATION VARIANCE OF 3 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>351</td>
<td></td>
</tr>
<tr>
<td>352</td>
<td>MEAN (AVERAGE) VALUE OF 24 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>353</td>
<td>STANDARD DEVIATION OF 24 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>354</td>
<td>POPULATION VARIANCE OF 24 HR MAXIMUM VALUES</td>
</tr>
<tr>
<td>355</td>
<td></td>
</tr>
<tr>
<td>356</td>
<td>NUMBER OF MODEL ITERATIONS PERFORMED</td>
</tr>
<tr>
<td>357</td>
<td></td>
</tr>
<tr>
<td>358</td>
<td>PRESS ENTER TO CONTINUE</td>
</tr>
<tr>
<td>359</td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>DISCOUNT1.WK3</td>
</tr>
</tbody>
</table>

235
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RISCOUT1.WK3

MENU

3-MEAN 3-STD 3-PROB 24-MEAN 24-STD 24-PROB RETURN

GRAPH MEAN OF 3 HR MAXIMUM VALUES VS NUMBER OF ITERATIONS

236
APPENDIX C

COMPLETE SERIES OF GUIDANCE

SCREENS FOR COGMOD

EXAMPLE PROBLEM FROM 3M SITE
CONDITIONED GEOSTATISTICAL MODELING PROGRAM

WELCOME TO COGNMOD
A CONDITIONED GEOSTATISTICAL MODELING PROGRAM
DESIGNED TO COMBINE COVAR and STATPAC IN A LOTUS VERSION 3.1 SHELL

PRESS {ENTER} TO CONTINUE
THIS PROGRAM HAS BEEN DEVELOPED AT
OKLAHOMA STATE UNIVERSITY
STILLWATER, OKLAHOMA 74078

BY

LARRY E. LOCKWOOD

AND

WILLIAM F. McTERMAN

PRESS {ENTER} TO CONTINUE
A:A41: [W7]
SETUP CONTINUE
CHANGE DIRECTORY, FILE NAME, OR VALUES

CMD

242
MACRO REQUIRES 1 SCREEN AREA FOR COMMENTS AND HELP.

MOVE CURSOR TO UPPER LEFT CORNER OF AREA TO BE RESERVED FOR COMMENTS

PRESS ENTER TO CONTINUE
DATA KRIGE RUNMOD PROGRAMS QUIT
CREATE DATA FILES

A: A  B  C  D  E  F  G  H

A) DISTANCE FROM ORIGIN IN X DIRECTION
B) DISTANCE FROM ORIGIN IN Y DIRECTION
C) HYDRAULIC CONDUCTIVITY
A:A1: 'WORKSHEET ASSUMES 3 VARIABLES --
DO YOU WISH TO RUN CONDITIONAL SIMULATION? (Y or N) _

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A)</td>
<td>B)</td>
<td>C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTANCE FROM ORIGIN IN X DIRECTION</td>
<td>DISTANCE FROM ORIGIN IN Y DIRECTION</td>
<td>HYDRAULIC CONDUCTIVITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DO YOU WISH TO CREATE A RAW DATA FILE (Y or N)?

STATPAC DATA WILL BE ENTERED DIRECTLY INTO THE STATPAC PROGRAM

"TERFIL" WHICH WILL PROMPT THE USER FOR THE NECESSARY INFORMATION.

FOR MORE INFORMATION ON "TERFIL" SEE STATPAC USER'S INFORMATION.
C:\ENVIR\STATPAK>terfil

GIVE A ROOT NAME FOR THE STATPAK OUTPUT FILE
DO NOT ADD AN EXTENSION TO THE ROOT NAME: test

DOES THE INPUT DATA CONTAIN INTEGER LAT/LONG DEGREES-MINUTES-SECONDS? Y/N: N

DOES THE INPUT DATA CONTAIN QUALIFYING CODES? Y/N: N

HOW MANY ROWS IN THE DATA SET? 17

HOW MANY VARIABLES IN THE DATA SET? 3

GIVE 3 VARIABLE ID'S - END EACH WITH CR

X
X
COMMAND
ENTER THE DATA - ROW BY ROW.
ENTER AN ALPHAMERIC SAMPLE IDENTIFIER AS THE FIRST FIELD OF EACH STATPAC ROW.
THE IDENTIFIER MUST BE 1 TO 16 CHARACTERS LONG AND MUST BE ENCLOSED IN SINGLE
QUOTES. ALL FIELDS IN A STATPAC ROW MUST BE SEPARATED FROM ADJACENT FIELDS
BY AT LEAST ONE SPACE OR BY A COMMA.
AN EXAMPLE OF ENTERING A 3X4 DATA MATRIX Follows:
ENTER ROW 1:
'DDB 63B-4' 59.7 0.0 450. 7.29
ENTER ROW 2:
'SAMPLE 2' 12.2 33.6 10. 5.
ENTER ROW 3:
'UNKNOWN SAMPLE' 65. 4.E-05 17.2 100

ENTER ROW 1:
'MM1' 1060 470 12.367
ENTER ROW 2:
'MM2' 1170 340 19.0
ENTER ROW 3:
'MM3' 1000 300 23.5
ENTER ROW 4:
'MM4' 1400 480 32.0
ENTER ROW 5:
'MM5' 1150 50 12.2
DO YOU WISH TO CREATE AN ASCII DATA FILE (Y or N)? Y

A: A  B  C  D  E  F  G  H

1  2  3  4  5  6  7  8  9  10
11 12 13 14 15 16 17 18 19 20

CMD  NUN  CAP
C:\ENVIR\STATPAK> FILTER
ENTER THE NAME OF STATPAK INPUT FILE: test.stp
DATA SET ID = ABCDEFGH
    M = 7
    M = 3
    X    Y    CMD
DO YOU WANT TO SEE THE DATA OF THE FIRST ROW OF THE FILE? Y/N: n
DO YOU WANT TO CREATE AN ASCII OUTPUT FILE OF SELECTED ROWS? Y/N: y
GIVE A NAME FOR THE OUTPUT FILE
PRN WILL GO TO PRINTER; COM WILL GO TO SCREEN; filespec WILL GO TO DISK FILE
ENTER NAME: test.dat
DO YOU WANT THE OUTPUT FILE TO CONTAIN:
  1) ALL THE INFORMATION FOR EACH SELECTED ROW, OR
  2) ONLY THE ROWID, LAT-LONG, AND ROW NUMBER FOR EACH SELECTED ROW?
     ANSWER 1 OR 2: 1
GIVE NUMBERS OF FIRST AND LAST ROWS TO BE TYPED (XX,XXX): 01,87
  7 ROWS WILL BE WRITTEN.
  ... READING DATA
TYPE PRINTER FILE TEST.DAT
NORMAL END OF PROGRAM
C:\ENVIR\STATPAK>
Fri. 03/24/95
12:17:20am

NO OF ROWS = 7
NO OF COLUMNS = 3

DO YOU WANT SELECTED ROWS ? n

DO YOU WANT SELECTED COLUMNS ? n

WHAT DO YOU WANT INCLUDED IN BASIC STATISTICS ?
1-ONLY UNQUALIFIED DATA
2-ONLY QUALIFIED DATA
3-ALL DATA (IGNORING QUALIFYING CODES)

TYPE 1, 2, OR 3: 3

7 READING DATA...

UNIVARIATE STATISTICS

<table>
<thead>
<tr>
<th>VAR COLUMN</th>
<th>MINIMUM</th>
<th>MAXIMUM</th>
<th>MEAN</th>
<th>DEVIATION</th>
<th>VALID</th>
<th>B</th>
<th>L</th>
<th>N</th>
<th>G</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>6.000E+01</td>
<td>4.800E+02</td>
<td>2.213E+02</td>
<td>1.6979E+02</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Y</td>
<td>6.000E+01</td>
<td>4.800E+02</td>
<td>3.000E+02</td>
<td>1.5588E+02</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C0ND</td>
<td>1.220E+01</td>
<td>4.017E+01</td>
<td>2.529E+01</td>
<td>1.1581E+01</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

DO YOU WANT TO SEE THE CORRELATIONS ?
DO YOU WISH TO CONVERT THE STATPAC RAW DATA FILE NOW (Y or N)? Y

THE STATPAC RAW DATA FILE MUST BE CONVERTED PRIOR TO KRIGING
OR RUNNING THE STATPAC SEMIVARIOGRAM ANALYSIS PROGRAM.

THE DATA ONLY NEEDS TO BE CONVERTED 1 TIME.

IF THE DATA HAS ALREADY BEEN CONVERTED SELECT "N" NOW TO CONTINUE.
ENTER ROOT NAME FOR THE STATPAC INPUT FILE:

The root name must include directory (if different than program) and may not include the extension (.STP).
ENTER ROOT NAME OF STATPAC OUTPUT FILE: _

THE ROOT NAME MUST INCLUDE DIRECTORY (IF DIFFERENT THAN PROGRAM) AND MAY NOT INCLUDE THE EXTENSION (.STP).
1: A4:
ENTER COLUMN NUMBER OF NORTH COORDINATE: _

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASSUME Y-COORDINATE IS NORTH COORDINATE -- THEN THIS VALUE IS 2

IF Y IS NOT NORTH -- ENTER APPROPRIATE COLUMN VALUE FROM INPUT FILE.
ENTER COLUMN NUMBER OF EAST COORDINATE:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>ASSUME X-COORDINATE IS EAST COORDINATE -- THEN THIS VALUE IS 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>IF X IS NOT EAST -- ENTER APPROPRIATE COLUMN VALUE FROM INPUT FILE.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
DO YOU WISH TO PERFORM SEMIVARIOGRAM ANALYSIS NOW (Y or N)?

TO PERFORM SEMIVARIOGRAM ANALYSIS AT THIS POINT ENTER "Y"
DO YOU WISH TO CREATE COVAR INPUT FILE NOW (Y or N) ?

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TO CREATE COVAR INPUT FILE NOW ENTER "Y"
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Input raw data points from STATPAC to COVAR program**

Move cursor to upper left corner of range for table of STATPAC values to avoid potential range overlap (& loss of data).

No data should be below selected range — press enter to continue.
Has ASCII file of raw data already been created (Y or N)? _

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Enter the minimum vertical (y) distance between points: 30

<table>
<thead>
<tr>
<th>A</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>DATA SET ID = ABCDEFGH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>N = 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>M = 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>X-COORD</td>
<td>Y-COORD</td>
<td>COND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>60</td>
<td>480</td>
<td>12.367</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>160</td>
<td>330</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>90</td>
<td>380</td>
<td>23.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>450</td>
<td>480</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>150</td>
<td>60</td>
<td>12.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>480</td>
<td>150</td>
<td>40.167</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>180</td>
<td>380</td>
<td>37.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

261
**DATA SET ID = ABCDEFGH**

<table>
<thead>
<tr>
<th>X-COORD</th>
<th>Y-COORD</th>
<th>COND</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>480</td>
<td>12.367</td>
</tr>
<tr>
<td>160</td>
<td>330</td>
<td>19</td>
</tr>
<tr>
<td>98</td>
<td>380</td>
<td>23.5</td>
</tr>
<tr>
<td>450</td>
<td>480</td>
<td>32</td>
</tr>
<tr>
<td>150</td>
<td>60</td>
<td>12.2</td>
</tr>
<tr>
<td>480</td>
<td>150</td>
<td>48.167</td>
</tr>
<tr>
<td>180</td>
<td>380</td>
<td>37.83</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>61</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

A80: =A79+HORIZ*0.1

ENTER Y-COORDINATE OF 1ST GRID POINT
INPUT INFORMATION
-----------------
ENTER TITLE OF THE RUN (80 CHARACTERS OR LESS):
EXAMPLE PROBLEM USING DATA FROM 3M SITE
ENTER NAME OF PARAMETER TO BE GENERATED (80 CHARACTERS OR LESS):
HYDRAULIC CONDUCTIVITY
ENTER 1 FOR NORMALLY DISTRIBUTED OR 0 FOR LOG-NORMALLY DISTRIBUTED
1
ENTER NUMBER OF ROWS IN LOCATION MATRIX (NOT MORE THAN 20):
20
ENTER NUMBER OF COLUMNS IN LOCATION MATRIX (NOT MORE THAN 20):
20
ENTER MEAN:
25.29
ENTER STANDARD DEVIATION:
3.0621
ENTER CORRELATION LENGTH AL (0<AL<1):
.9
ENTER TOTAL NUMBER OF REALIZATIONS:
5
ENTER NAME OF INPUT DATA FILE (e.g., XY.DAT):
INPUT FILE WILL CONSIST OF A LISTING OF X,Y-COORDINATE LOCATIONS
COVAR.DAT
ENTER INPUT FORMAT (e.g., (2F13.4)):
(2F13.4)
OUTPUT INFORMATION
-------------------
ENTER NAME OF OUTPUT FILE (e.g., RESULT.OUT):
COVAR.OUT

WOULD YOU LIKE TO HAVE THE LOWER TRIANGLE OF THE COVARIANCE
MATRIX INCLUDED IN THE OUTPUT FILE? (Y/N)

WOULD YOU LIKE TO HAVE THE LOWER TRIANGLE OF THE DECOMPOSED
COVARIANCE MATRIX INCLUDED IN THE OUTPUT FILE? (Y/N)

WOULD YOU LIKE A SEPARATE OUTPUT FILE CREATED FOR ANALYSIS
WITH PROGRAM "STAT1"? (Y/N)

ENTER FORMAT FOR OUTPUT FILE(S) (e.g., (6F13.4)):
(20F13.4)
DATA  KRIGE  RUNMODE  PROGRAMS  QUIT
KRIGE  DATA

<table>
<thead>
<tr>
<th>A</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WORKSHEET ASSUMES 3 VARIABLES --</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A) DISTANCE FROM ORIGIN IN X DIRECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B) DISTANCE FROM ORIGIN IN Y DIRECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C) HYDRAULIC CONDUCTIVITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OUTPUT.WK3
A: A1:
HAS RAW DATA FILE BEEN CONVERTED (PREPROCESSED) FOR KRIGING (Y or N)? _

<table>
<thead>
<tr>
<th>1</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OUTPUT.WK3 
THIS SERIES OF QUESTIONS WILL CREATE A CONTROL FILE FOR THE KRIGE SUBROUTINE - THEN RUN THE KRIGE SUBROUTINE 1 TIME

MOVE CURSOR TO UPPER LEFT HAND CORNER OF RANGE FOR TABLE OF CONTROL VALUE

PRESS ENTER TO CONTINUE
ENTER ROOT NAME FOR THE STATPAC DATA FILE TO BE KRIGED:

A. A B C D E F G H

1 THE ROOT NAME MUST INCLUDE DIRECTORY (IF DIFFERENT THAN PROGRAM)
2 AND MAY NOT INCLUDE THE EXTENSION.

OUTPUT.WK3
IS AN ASCII OUTPUT FILE DESIRED (Y or N)?

If this is a conditional simulation, an ASCII output file will be required for further processing.
A:A1: 'IF THIS IS A CONDITIONAL SIMULATION, AN ASCII OUTPUT FILE
ENTER ROOT NAME FOR ASCII OUTPUT FILE : _

A A B C D E F G H
1 IF THIS IS A CONDITIONAL SIMULATION, AN ASCII OUTPUT FILE
2 WILL BE REQUIRED FOR FURTHER PROCESSING.

OUTPUT.WK3

271
A:AS:
ENTER ROOT NAME FOR THE KRIGED STATPAC OUTPUT FILE :

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. THE ROOT NAME MUST INCLUDE DIRECTOY (IF DIFFERENT THAN PROGRAM)
2. AND MAY NOT INCLUDE THE EXTENSION.

OUTPUT.WK3

272
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ENTER A &quot;1&quot; (one) FOR ORDINARY KRIGING OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A &quot;2&quot; (two) FOR UNIVERSAL KRIGING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NORMALLY THIS ANSWER WILL BE 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Output WK3
A:A3:
ENTER THE NUGGET VALUE FOR VARIOGRAM : _

A  A  B  C  D  E  F  G  H

1 ENTER THE PARAMETERS DETERMINED FROM PREVIOUS VARIOGRAM
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

OUTPUT.WK3

CMD

RUN
A:A4:

ENTER THE NUMBER OF OTHER VARIOGRAMS (5 MAX) IN THE MODEL: _

A     B     C     D     E     F     G     H
1  THE NUGGET IS CONSIDERED A VARIOGRAM FOR THIS PROGRAM.
2  
3  THE NUMBER OF "OTHER VARIOGRAMS" DOES NOT INCLUDE THE NUGGET.
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20

OUTPUT.WK3

CMD

RUN

275
**A10:**

Enter number (1 thru 5) for variogram type: _

Enter the parameters determined from previous variogram

**Types of variograms -- enter number only**

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 - Spherical
2 - Exponential
3 - Linear
4 - Gaussian
5 - Cubic

**Output.WK3**

CMD

RUT
### Output File

#### Variogram Data

<table>
<thead>
<tr>
<th>A:1:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1:</td>
<td><strong>A</strong></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2</td>
</tr>
<tr>
<td>1:</td>
<td></td>
</tr>
</tbody>
</table>

**Output File:** `OUTPUT.WK3`
IS VARIOGRAM ISOTROPIC (1) OR ANISOTROPIC (2): _

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ENTER THE NUMBER 1 (one) FOR ISOTROPIC OR 2 (two) FOR ANISOTROPIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```
VARIOMGRAM
```

```
OUTPUT.WK3
```
A14: ENTER THE MAXIMUM HOLE DISTANCE FROM THE CENTROID:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INserir a distância máxima da fenda da fenda do centroide para um furo a ser incluído para Kriging.
ENTER THE MAXIMUM NUMBER OF HOLES TO BE USED WITHIN NEIGHBORHOOD:
Enter the number of north-south points: 

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Enter the distance between points in N-S direction:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
</tr>
</tbody>
</table>

20

Output.wk3
ENTER THE NUMBER OF EAST-WEST POINTS : _
Enter the distance between points in E-W direction: _

<table>
<thead>
<tr>
<th>A</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

output.wk3

CMD

NUM
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Output: 286
**A:A1:**
Enter easting of southwest corner of grid: _

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OUTPUT.WK3**

287
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enter column number of the north coordinate: _
<table>
<thead>
<tr>
<th>A</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**A:A1:**
**ENTER COLUMN NUMBER OF THE EAST COORDINATE:**

**OUTPUT.WK3**

---

289
A:A1:
IS THE ERROR MEASURE OPTION WANTED (Y or N) : _
Do you want to save your existing Krigge output files (Y or N)?

A A B C D E F G H

WARNING!!

The program will automatically erase all old Krigge output files unless the operator saves them manually to another directory.
A:C4: 'WILL BE ERASED!
DO YOU WANT TO CONTINUE (Y or N) _

A B C D E F G H

1
2 ANY REMAINING KRIGE OUTPUT FILES IN THE STATPAK SUBDIRECTORY
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20 OUTPUT.WK3 

293
SEARCH RADIUS = .40E+03
MAXIMUM NUMBER OF HOLES USED = 5

NUMBER OF POINTS IN NORTH-SOUTH DIRECTION = 20
DISTANCE BETWEEN POINTS IN NORTH-SOUTH DIRECTION = 30.00
NUMBER OF POINTS IN EAST-WEST DIRECTION = 20
DISTANCE BETWEEN POINTS IN EAST-WEST DIRECTION = 30.00
NORTHING OF SOUTHWEST CORNER OF GRID OF POINTS = .00
EASTING OF SOUTHWEST CORNER OF GRID OF POINTS = .00
SEARCH RADIUS = 400.00
MAXIMUM NUMBER OF HOLES USED = 5

400  NOW KRIGING GRID POINTS
THE DISK FILES HAVE BEEN WRITTEN
THE INPUT FILE WAS test.UPR
THE STATPAC OUTPUT FILE IS test.UGR
THE CHARACTER OUTPUT FILE IS test.FGR
RUN TIME WAS .12 MINUTES
NORMAL END OF PROGRAM
DATA KRIGE RUNMOD PROGRAMS QUIT
RUN MULTIPLE CONDITIONAL SIMULATIONS OF MODEL

WORKSHEET ASSUMES 3 VARIABLES --

A) DISTANCE FROM ORIGIN IN X DIRECTION

B) DISTANCE FROM ORIGIN IN Y DIRECTION

C) HYDRAULIC CONDUCTIVITY

04-Jan-95 11:54 AM
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Input raw data points from Statpac.

Move cursor to upper left corner of range for table of Statpac values.

To avoid potential range overlap (& loss of data).

No data should be below selected range -- press enter to continue.
A:A28:

HAS ASCII FILE OF RAW DATA ALREADY BEEN CREATED (Y or N)?

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

04-Jan-95 11:56 AM
DO YOU WISH TO CONTINUE WITH CONDITIONAL SIMULATION (Y OR N)?

CONDITIONAL SIMULATION REQUIRES MULTIPLE ITERATIONS OF THE MODELS

THIS PROCESS ASSUMES THAT THE INITIAL SAMPLE DATA HAS BEEN ANALYZED
AND SATISFACTORILY KRIGED. IT FURTHER ASSUMES THAT COVAR HAS BEEN RUN
AND THE REQUIRED NUMBER OF COVAR REALIZATIONS SUCCESSFULLY COMPLETED.

IF ANY OF THESE CONDITIONS HAVE NOT BEEN MET --
QUIT CONDITIONAL SIMULATION NOW (SELECT N) TO RETURN TO FUNCTION MENU

84-Jan-95 11:59 AM
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1386</td>
<td>0</td>
<td>16.54</td>
<td>38.04</td>
<td>27.2267</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>1387</td>
<td>0</td>
<td>16.41</td>
<td>37.56</td>
<td>33.9714</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>1388</td>
<td>0</td>
<td>16.89</td>
<td>37.8</td>
<td>14.2956</td>
<td>-7</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>1389</td>
<td>0</td>
<td>16.52</td>
<td>37.8</td>
<td>37.2675</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>1390</td>
<td>0</td>
<td>17.21</td>
<td>38.01</td>
<td>22.0271</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1391</td>
<td>0</td>
<td>17.93</td>
<td>38.21</td>
<td>25.2611</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>1392</td>
<td>0</td>
<td>18.59</td>
<td>38.41</td>
<td>13.4242</td>
<td>-6</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>1393</td>
<td>0</td>
<td>19.14</td>
<td>38.55</td>
<td>16.5413</td>
<td>-3</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>1394</td>
<td>0</td>
<td>19.48</td>
<td>38.58</td>
<td>28.0707</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>1395</td>
<td>0</td>
<td>19.56</td>
<td>38.32</td>
<td>31.3999</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>1396</td>
<td>0</td>
<td>19.34</td>
<td>37.58</td>
<td>26.3724</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>1397</td>
<td>0</td>
<td>18.83</td>
<td>36.29</td>
<td>16.6489</td>
<td>-1</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>1398</td>
<td>0</td>
<td>18.87</td>
<td>34.65</td>
<td>29.1839</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>1399</td>
<td>0</td>
<td>17.15</td>
<td>32.93</td>
<td>15.3124</td>
<td>8</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td>0</td>
<td>16.16</td>
<td>31.34</td>
<td>32.9624</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>1401</td>
<td>0</td>
<td>16.82</td>
<td>29.77</td>
<td>38.3131</td>
<td>17</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>1402</td>
<td>0</td>
<td>15.27</td>
<td>28.71</td>
<td>29.0617</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>1403</td>
<td>0</td>
<td>14.93</td>
<td>27.9</td>
<td>21.0718</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

299
<table>
<thead>
<tr>
<th>X-COORD</th>
<th>Y-COORD</th>
<th>INIT VAL</th>
<th>KRIGE VAL</th>
<th>COV VAL</th>
<th>CONDIT VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>16.54</td>
<td>20.96</td>
<td>20.2256</td>
<td>16</td>
</tr>
<tr>
<td>0</td>
<td>30</td>
<td>16.41</td>
<td>20.84</td>
<td>19.09</td>
<td>15</td>
</tr>
<tr>
<td>0</td>
<td>60</td>
<td>16.89</td>
<td>20.75</td>
<td>8.9877</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>90</td>
<td>16.52</td>
<td>19.85</td>
<td>25.4858</td>
<td>22</td>
</tr>
<tr>
<td>0</td>
<td>120</td>
<td>17.21</td>
<td>19.71</td>
<td>15.5848</td>
<td>13</td>
</tr>
<tr>
<td>0</td>
<td>150</td>
<td>17.93</td>
<td>19.52</td>
<td>26.0462</td>
<td>24</td>
</tr>
<tr>
<td>0</td>
<td>180</td>
<td>18.59</td>
<td>19.26</td>
<td>19.8672</td>
<td>19</td>
</tr>
<tr>
<td>0</td>
<td>210</td>
<td>19.14</td>
<td>18.91</td>
<td>22.3392</td>
<td>23</td>
</tr>
<tr>
<td>0</td>
<td>240</td>
<td>19.48</td>
<td>18.5</td>
<td>18.0407</td>
<td>11</td>
</tr>
<tr>
<td>0</td>
<td>270</td>
<td>19.56</td>
<td>18.86</td>
<td>31.601</td>
<td>33</td>
</tr>
<tr>
<td>0</td>
<td>300</td>
<td>19.34</td>
<td>17.67</td>
<td>36.8184</td>
<td>38</td>
</tr>
<tr>
<td>0</td>
<td>330</td>
<td>18.83</td>
<td>17.38</td>
<td>22.6456</td>
<td>24</td>
</tr>
<tr>
<td>0</td>
<td>360</td>
<td>18.07</td>
<td>17.13</td>
<td>13.313</td>
<td>14</td>
</tr>
<tr>
<td>0</td>
<td>390</td>
<td>17.15</td>
<td>16.86</td>
<td>16.3616</td>
<td>17</td>
</tr>
<tr>
<td>0</td>
<td>420</td>
<td>16.16</td>
<td>16.55</td>
<td>23.544</td>
<td>23</td>
</tr>
<tr>
<td>0</td>
<td>450</td>
<td>16.82</td>
<td>16.37</td>
<td>21.8868</td>
<td>22</td>
</tr>
<tr>
<td>0</td>
<td>480</td>
<td>15.27</td>
<td>16.18</td>
<td>25.8671</td>
<td>25</td>
</tr>
<tr>
<td>0</td>
<td>510</td>
<td>14.93</td>
<td>16.21</td>
<td>24.7419</td>
<td>23</td>
</tr>
<tr>
<td>0</td>
<td>540</td>
<td>14.60</td>
<td>15.92</td>
<td>23.643</td>
<td>23</td>
</tr>
</tbody>
</table>

300
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1385</td>
<td>1386</td>
<td>1387</td>
<td>1388</td>
<td>1389</td>
<td>1390</td>
<td>1391</td>
<td>1392</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>1385</td>
<td>1386</td>
<td>1387</td>
<td>1388</td>
<td>1389</td>
<td>1390</td>
<td>1391</td>
<td>1392</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>16.54</td>
<td>20.35</td>
<td>11.1682</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
</tr>
<tr>
<td>---</td>
<td>----</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>1385</td>
<td>0</td>
<td>0</td>
<td>16.54</td>
<td>19.3</td>
<td>34.985</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>1386</td>
<td>0</td>
<td>30</td>
<td>16.41</td>
<td>20.19</td>
<td>25.0321</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>1387</td>
<td>0</td>
<td>60</td>
<td>16.89</td>
<td>20.86</td>
<td>22.0726</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>1388</td>
<td>0</td>
<td>90</td>
<td>16.52</td>
<td>19.87</td>
<td>29.5084</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>1389</td>
<td>0</td>
<td>120</td>
<td>17.21</td>
<td>20.84</td>
<td>34.9664</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1390</td>
<td>0</td>
<td>150</td>
<td>17.93</td>
<td>21.93</td>
<td>28.1583</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>1391</td>
<td>0</td>
<td>180</td>
<td>18.59</td>
<td>23.11</td>
<td>39.6803</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>1392</td>
<td>0</td>
<td>210</td>
<td>19.14</td>
<td>24.33</td>
<td>28.7705</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>1393</td>
<td>0</td>
<td>240</td>
<td>19.48</td>
<td>25.45</td>
<td>19.7935</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>1394</td>
<td>0</td>
<td>270</td>
<td>19.56</td>
<td>26.25</td>
<td>35.8601</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>1395</td>
<td>0</td>
<td>360</td>
<td>19.34</td>
<td>26.46</td>
<td>29.7287</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>1396</td>
<td>0</td>
<td>330</td>
<td>18.83</td>
<td>25.9</td>
<td>33.2322</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>1397</td>
<td>0</td>
<td>360</td>
<td>18.87</td>
<td>24.67</td>
<td>34.3565</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>1398</td>
<td>0</td>
<td>390</td>
<td>17.15</td>
<td>23</td>
<td>33.7652</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>1399</td>
<td>0</td>
<td>420</td>
<td>16.16</td>
<td>21.14</td>
<td>19.9385</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>1400</td>
<td>0</td>
<td>450</td>
<td>16.82</td>
<td>19.81</td>
<td>27.7752</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>1401</td>
<td>0</td>
<td>480</td>
<td>15.27</td>
<td>18.35</td>
<td>25.3081</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>1402</td>
<td>0</td>
<td>510</td>
<td>14.93</td>
<td>17.52</td>
<td>30.2614</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>
APPENDIX D

LIST OF PROGRAMMING CODE (MACROS)

FOR RISC2 AND RISC2A
A

(MACRO REQUIRES 1 SCREEN AREA FOR COMMENTS AND HELP) " (DOWN) (DOWN)

MOVE CURSOR TO UPPER LEFT CORNER OF AREA TO BE RESERVED FOR COMMENTS " (DOWN) (DOWN)

PRESS ENTER TO CONTINUE " (HOME)

(*) RN COMMENTS " (PGDN) (UP) (RIGHT) "

(PGDN) (UP) (RIGHT) (LEFT) RN COMMENTS " (DOWN) RN COMMENTS " (DOWN)

(RE) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (RIGHT) "

(GOTO) COMMENTS "

MOVE CURSOR TO UPPER LEFT AND CORNER OF RANGE FOR TABLE OF INPUT VALUES " (DOWN) (DOWN)

PRESS ENTER TO CONTINUE "

(*) RN TABLE " ^ / WC30 ^ (RIGHT) / WC30"

RE COMMENTS " (GOTO) COMMENTS " (DOWN)

SELECT JOB CONTROL FUNCTIONS FROM MENU" " (DOWN)

(FRAMOFF)

(MENUBRANCH SELECT)

<table>
<thead>
<tr>
<th>SELECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREFPREPROCESSOR</td>
</tr>
<tr>
<td>RUN LOTUS PREPROCESSOR OPTION FOR MODEL, WITH @RISK OPTIONS</td>
</tr>
<tr>
<td>(MENUCALL FUNCTION) &quot;</td>
</tr>
<tr>
<td>IMPORT OR EXPORT A FILE</td>
</tr>
<tr>
<td>STOP MACRO PROCESSING</td>
</tr>
</tbody>
</table>

PREPROCESSOR

RUN LOTUS PREPROCESSOR OPTION FOR MODEL

(MENUCALL FUNCTION) "

(BRANCH C23) "

RISK

RUN MODEL WITH @RISK OPTIONS

/PORISC2A ~

FILE

IMPORT OR EXPORT A FILE

(MENUBRANCH PIL)

QUIT

STOP MACRO PROCESSING

(QUIT)

FUNCTION

<table>
<thead>
<tr>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
</tr>
<tr>
<td>OVERALL JOB CONTROL</td>
</tr>
<tr>
<td>(GOTO) TABLE &quot;CO&quot; (RIGHT) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) (GOTO) TABLE &quot;END&quot; (DOWN) &quot;RETURN&quot;</td>
</tr>
<tr>
<td>(MENUBRANCH T)</td>
</tr>
</tbody>
</table>

CO

OVERALL JOB CONTROL

(GOTO) TABLE "CO" (RIGHT) STARTING ~

(MENUBRANCH T)

EV

EVENT INFORMATION

(GOTO) TABLE "EVENT" (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) "EV" (RIGHT) STARTING ~

(MENUBRANCH EV)
### SO
**SOURCE INFORMATION**
(GOTO) TABLE ~ (END) (DOWN) (DOWN) 'SO' ~ (RIGHT) STARTING ~
(MENU BRANCH SO)

### OU
**OUTPUT OPTIONS**
(GOTO) TABLE ~ (END) (DOWN) (DOWN) 'OU' ~ (RIGHT) STARTING ~
(MENU BRANCH OU)

### RE
**RECEPTOR INFORMATION**
(GOTO) TABLE ~ (END) (DOWN) (DOWN) 'RE' ~ (RIGHT) STARTING ~
(MENU BRANCH RE)

### ME
**METEOROLOGY INFORMATION**
(GOTO) TABLE ~ (END) (DOWN) (DOWN) 'ME' ~ (RIGHT) STARTING ~
(MENU BRANCH ME)

---

**TABLE**

<table>
<thead>
<tr>
<th>TITLES</th>
<th>MODEL OPTS</th>
<th>INTERVALS</th>
<th>POLLUTION ID</th>
<th>RUN OR NOT</th>
<th>TERRAIN HEIGHTS</th>
<th>MORE</th>
<th>QUIT</th>
</tr>
</thead>
</table>
| UP TO 2 LINES OF TITLES MAY BE SELECTED. OPTIONS TO SPECIFY SHORT OR LONG TERM FRAME OF POLLUTANT TO BE OPTION TO RUN MODEL. OR PROCESS SELECT EITHER FLAT OR ELEVATED TERRAIN OPTIONS END CONTROL FUNCTION SELECTION A R (GOTO) TABLE ~ (END) (DOWN) (DOWN) 'SO' ~ (RIGHT) STARTING ~

### TITLES
**UP TO 2 LINES OF TITLES MAY BE INPUT**
(GOTO) TABLE ~ (DOWN) 'CO' ~ (RIGHT) TITLE ONE ~ (RIGHT) RND TITLE ~
(LEFT) (DOWN) (LEFT) 'CO' (RIGHT) TITLE TWO ~ (RIGHT) RND TITLE ~
(GOTO) COMMENTS ~
(GOTELABEL 'TYPE TITLE 1 (UP TO 80 CHARACTERS) AND PRESS ENTER: ', TITLE)~
(GOTELABEL 'TYPE TITLE 2 (UP TO 80 CHARACTERS) AND PRESS ENTER: ', TITLE)~
(RND TITLE) ~
(MENU BRANCH T)
MODEL_OPTS
SELECT MODEL OPTION KEYWORDS
(GOTO) TABLE ~ (END) (DOWN) (DOWN) CO ~ (RIGHT) MODEL OPT
/RECOMMENDS ~
(GOTO) COMMENTS ~ (DOWN)
DEFAULT ~ -- Specifies that the regulatory default options will be used. ~ (down) (down)
CONC ~ -- Specifies that CONCENTRATION values will be calculated. ~ (down) (down)
DEPOS ~ -- Specifies that dry DEPOSITION values will be calculated. ~ (down) (down)
RURAL ~ -- Specifies that RURAL dispersion parameters will be used. ~ (down) (down)
URBAN ~ -- Specifies that URBAN dispersion parameters will be used. ~ (down) (down)
GRDRIS ~ -- Use non-default option for gradual plume rise. ~ (down) (down)
NOSTD ~ -- Use non-default option for no stack-donwwash. ~ (down) (down)
NOBID ~ -- Use non-default option for no buoyancy-induced dispersion. ~ (down) (down)
NOBIDM ~ -- Use non-default option for no buoyancy-induced dispersion. ~ (down) (down)
NOCALM ~ -- Use non-default option to bypass the calms processing routine. (short term only) ~ (down) (down)
MSGFRO ~ -- Use non-default option for the missing data processing routine. (short term only) ~ (UP)
(MENUBRANCH MODEL)

INTERVALS
SPECIFY SHORT OR LONG TERM TIME INTERVALS
(GOTO) TABLE ~ (END) (DOWN) (DOWN) CO ~ (RIGHT) AVERAGE ~
/RECOMMENDS ~ (GOTO) COMMENTS ~ (DOWN)
Select short term or long term time interval from menu. ~ (DOWN)
(MENUCALL I)
(MENUBRANCH T)

POLLUTION ID
NAME OF POLLUTANT TO BE MODELED
(GOTO) TABLE ~ (END) (DOWN) (DOWN) CO ~ (RIGHT) POLLUTID ~
(RIGHT) RNPOLLUTID ~
(GOTO) COMMENTS ~
(GETLABEL "TYPE NAME OF POLLUTANT (8 CHARACTERS MAX) & PRESS ENTER: " POLLUTID)
/RNPOLLUTID ~
(MENUBRANCH T)

RUN OR NOT
OPTION TO RUN MODEL OR PROCESS INPUT & SUMMARIZE SETUP INFORMATION
(GOTO) TABLE ~ (END) (DOWN) (DOWN) CO ~ (RIGHT) RUN OR NOT ~ (RIGHT) ANC RUN OR NOT ~
/RECOMMENDS ~
(GOTO) COMMENTS ~
(MENUBRANCH R)

TERRAIN HEIGHTS
SELECT EITHER 'FLAT' OR 'ELEVATED' TERRAIN OPTIONS
MORE

ADDITIONAL SELECTIONS

/RECOMMENTS " (GOTO)COMMENTS " (DOWN)

Select Job control functions from menu " (DOWN)

(MENUBRANCH C)

QUIT

END CONTROL FUNCTION SELECTION & RETURN TO MAIN MENU

(GOTO)TABLE " (END) (DOWN)(DOWN)CO " (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) /RNOOPT ~

(MENUBRANCH HEIGHTS)

MODEL

<table>
<thead>
<tr>
<th>DFALULT</th>
<th>CONC</th>
<th>DEPOS</th>
<th>RURAL</th>
<th>URBAN</th>
<th>NOW - DEFAULT OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specfies that the regulatory default options will be used.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| (GOTO)TABLE " (END) (DOWN)(DOWN)CO " (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) /RNOOPT ~
| (GOTO)COMMENTS ~
| (LET OPT, DFALULT)
| (RNOOPT ~
| (MENUBRANCH MODEL)

CONC

Specifies that CONCenctration values will be calculated.

(GOTO)TABLE " (END) (DOWN)(DOWN)CO " (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) /RNOOPT ~

(GOTO)COMMENTS ~

(LET OPT, CONC)

(RNOOPT ~

(MENUBRANCH MODEL)

DEPOS

Specifies that dry DEPOSition values will be calculated.

(GOTO)TABLE " (END) (DOWN)(DOWN)CO " (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) /RNOOPT ~

(GOTO)COMMENTS ~

(LET OPT, DEPOS)

(RNOOPT ~

(MENUBRANCH MODEL)
RURAL
Specifies that RURAL dispersion parameters will be used.

(LET) TABLE ~ (END) (END) (RIGHT) (RIGHT) RNOPT ~
(LET) COMMENTS ~
(LET) OPT, RURAL
RNDOPT ~
(MENU) BRANCH MODEL

URBAN
Specifies that URBAN dispersion parameters will be used.

(LET) TABLE ~ (END) (END) (END) (RIGHT) (RIGHT) RNOPT ~
(LET) OPT, URBAN
RNDOPT ~
(MENU) BRANCH MODEL

NON-DEFAULT OPTIONS
Select various non-default options
(MENU) BRANCH MODEL

QUIT
RETURN TO PREVIOUS MENU
RNDOPT ~
(MENU) BRANCH MODEL

MOdel2

<table>
<thead>
<tr>
<th>GRIDRIS</th>
<th>NOSTD</th>
<th>NOBID</th>
<th>NOCALM</th>
<th>MSGPRO</th>
<th>RETURN</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRIDRIS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use non-default option for gradual plume rise.

(LET) TABLE ~ (END) (END) (END) (RIGHT) (RIGHT) RNOPT ~
(LET) OPT, GRIDRIS
RNDOPT ~
(MENU) BRANCH MODEL

309
NOSTD
Use non-default option for no stack-up downwash.
{GOTO}TABLE ~ (END) (DOWN) (END) (RIGHT) (RIGHT) / RNOPT ~ ~
{GOTO} COMMENTS ~
{LET OPT, NOSTD}
/RNDOPT ~
{MENUBRANCH MODEL2}

NOBID
Use non-default option for no buoyancy-induced dispersion.
{GOTO}TABLE ~ (END) (DOWN) (END) (RIGHT) (RIGHT) / RNOPT ~ ~
{GOTO} COMMENTS ~
{LET OPT, NOBID}
/RNDOPT ~
{MENUBRANCH MODEL2}

NOCALM
Use non-default option to bypass the calm processing routine. (short term only)
{GOTO}TABLE ~ (END) (DOWN) (END) (RIGHT) (RIGHT) / RNOPT ~ ~
{GOTO} COMMENTS ~
{LET OPT, NOCALM}
/RNDOPT ~
{MENUBRANCH MODEL2}

MSGPRO
Use non-default option for the missing data processing routine. (short term only)
{GOTO}TABLE ~ (END) (DOWN) (END) (RIGHT) (RIGHT) / RNOPT ~ ~
{GOTO} COMMENTS ~
{LET OPT, MSGPRO}
/RNDOPT ~
{MENUBRANCH MODEL2}

RETURN
Return to previous menu
{MENUBRANCH MODEL}

QUIT
Return to control menu
{RECOMMENTS ~
{MENUBRANCH T}
### SHORT TERM

**AVERAGING PERIODs**

Select from the following short term averaging periods:

- 1 (hr) ~ (down) (down)
- 2 (hrs) ~ (down) (down)
- 3 (hrs) ~ (down) (down)
- 4 (hrs) ~ (down) (down)

### LONG TERM

**AVERAGING PERIODs**

Select from the following short term averaging periods:

- 1 (hr) ~ (down) (down)
- 2 (hrs) ~ (down) (down)
- 3 (hrs) ~ (down) (down)
- 4 (hrs) ~ (down) (down)

### QUIT

Return to previous menu.
TIME3
AVERRAGING PERIOD #3
(GO TO) TABLE ~ (END) (DOWN) (END) (RIGHT) (RIGHT) RNC TIME ~ ~
(GO TO) COMMENTS ~ ~
Select from the following short term averaging periods: ~ (down) (down)
1 (hrs) ~ (down) (down)
2 (hrs) ~ (down) (down)
3 (hrs) ~ (down) (down)
4 (hrs) ~ (down) (down)
6 (hrs) ~ (down) (down)
8 (hrs) ~ (down) (down)
12 (hrs) ~ (down) (down)
24 (hrs) ~ (down) (down)
(GET NUMBER "ENTER SHORT TERM AVERAGING PERIOD IN HOURS: ", TIME) ~
(RND TIME) ~ ~
(RECOMMENTS) ~ ~
(MENU BRANCH II)

MONTH
CALCULATE MONTHLY AVERAGE
(GO TO) TABLE ~ (END) (DOWN) (END) (RIGHT) (RIGHT) RNC TIME ~ ~
(MONTH) ~ ~
(RND TIME) ~ ~
(GO TO) COMMENTS ~ ~
(MENU BRANCH II)

QUIT
RETURN TO PREVIOUS MENU
(RETURN)
### RUN

**RUN**

RUN MODEL & PERFORM ALL CALCULATIONS

(LET RUNORNOT.RUN)

/RANDRUNORNOT*

{MENUBRANCH T}

**NOT-RUN**

PROCESS INPUT DATA AND SUMMARIZE SETUP INFORMATION ONLY

(LET RUNORNOT.NOT)

/RANDRUNORNOT*

{MENUBRANCH T}

---

### HEIGHTS

<table>
<thead>
<tr>
<th>FLAT</th>
<th>ELEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGNORE ALL TERRAIN HEIGHTS ALLOWS INPUT OF RECEPTOR HEIGHTS</td>
<td>ALLOWS INPUT OF RECEPTOR HEIGHTS</td>
</tr>
</tbody>
</table>

- LIST OF FLAT
- LIST OF ELEV
- LET OPT, FLAT
- LET OPT, ELEV
- (MENUBRANCH T)
- (MENUBRANCH T)

---

### C

<table>
<thead>
<tr>
<th>HALFLIFE</th>
<th>DECAY COEFF</th>
<th>ELEV UNITS</th>
<th>FLAGPOLE</th>
<th>EVENT</th>
<th>RE-START</th>
<th>ERROR REL</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>HALFLIFE</td>
<td>DECAY COEFF</td>
<td>ELEV UNITS</td>
<td>FLAGPOLE</td>
<td>EVENT</td>
<td>RE-START</td>
<td>ERROR REL</td>
<td>QUIT</td>
</tr>
</tbody>
</table>

**HALFLIFE**

HALFLIFE FOR EXPONENTIAL DECAY (IN SECONDS)

(GOTO) TABLE "END" (DOWN) (DOWN) "CO" "(RIGHT) HALFLIFE "(RIGHT) /RHNCHALFLIFE "~

(GOTO) COMMENTS "~

(GET NUMBER 'ENTER HALFLIFE NUMBER IN HOURS: "HALFLIFE") ~

/RHNCHALFLIFE ~

( MENUBRANCH C)

**DECAY COEFF**

DECAY COEFFICIENT FOR EXPONENTIAL DECAY (S ~ 1) = 69.3 HALFLIFE

(GOTO) TABLE "END" (DOWN) (DOWN) "CO" "(RIGHT) DECAY "(RIGHT) /RNCDCEAY ~

(GOTO) COMMENTS "~

(GET NUMBER 'ENTER DECAY COEFFICIENT: "DECAY") ~

/RHNCDECAY ~
(GOTO) COMMENTS~
(GETNUMBER 'ENTER DECAY COEFFICIENT: "DECAY) ~
RNDDECAY ~
(BRANCH C) ~

ELEV UNITS
SPECIFIES INPUT UNITS FOR TERRAIN ELEVATIONS IN METERS OR FEET
;charset~ (GOTO) COMMENTS~ (DOWN)
SELECT EITHER FEET OR METERS FROM MENU" ~ (UP)
{MENU BRANCH E}

FLAGPOLE
VALUE FOR HEIGHT OF FLAG POLE RECEIVERS
(bpPLAE ~ (END) (DOWN) (DOWN)"CO ~ (RIGHT) FLAGE ~ (RIGHT) RNCFLG ~ ~
;charset~ (GOTO) COMMENTS~
(GETNUMBER 'ENTER HEIGHT OF FLAG POLE RECEIPTORS ABOVE GL: "FLAG) ~
RNDFLAG ~
(BRANCH C) ~

EVENT
SHORT TERM EVENT PROCESSING KEYWORDS
{MENU BRANCH S}

RE-START
STORE INTERMEDIATE RESULTS IN AN UNFORMATTED FILE
{MENU BRANCH RS}

ERROR FILE
SPECIFY A DETAILED LISTING FILE OF ALL MESSAGES GENERATED;
{GOTO) TABLE ~ (END) (DOWN) (DOWN)"CO ~ (RIGHT) ERRORFL ~ (RIGHT) RNCERRFL ~ ~ (RIGHT) RNCDEB ~ ~
;charset~ (GOTO) COMMENTS~
DEBUG OPTION ALLOWS FOR DETAILED HOURLY REPORT OF ALL PARAMETERS. "(DOWN)
(GETLABEL 'ENTER THE FILE NAME FOR THE FILE OF ERROR MESSAGES: "ERRFL)
RNDERRFL ~
{GOTO) COMMENTS~
(GETLABEL "IS AN HOURLY DETAILED LISTING DESIRED (Y or N) ? "DEB)
{IF DEB='Y')LET DEB,DEBUG
RNDDEB ~
{MENU BRANCH C}
QUIT
RETURN TO CONTROL MENU
                  (MENUBRANCH 1 T)

<table>
<thead>
<tr>
<th>FEET</th>
<th>METERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GOTO)TABLE &quot;END&quot; (DOWN) (GOTO)TABLE &quot;END&quot; (DOWN) (DOWN) &quot;CO&quot; (RIGHT) ELEVUNIT &quot;(RIGHT) RNCUNIT &quot; ~</td>
<td></td>
</tr>
<tr>
<td>RECOMMENDS &quot;(GOTO)COMMENTS&quot; (GOTO)COMMENTS</td>
<td></td>
</tr>
<tr>
<td>(LET UNIT, FEET) (LET UNIT, METERS)</td>
<td></td>
</tr>
<tr>
<td>RNDUNIT &quot; ~</td>
<td></td>
</tr>
<tr>
<td>(MENUBRANCH C)</td>
<td></td>
</tr>
</tbody>
</table>

FEET

<table>
<thead>
<tr>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GOTO)TABLE &quot;END&quot; (DOWN) &quot;CO&quot; (RIGHT) ELEVUNIT &quot;(RIGHT) RNCUNIT &quot; ~</td>
</tr>
<tr>
<td>RECOMMENDS &quot;(GOTO)COMMENTS&quot;</td>
</tr>
<tr>
<td>(LET UNIT, FEET)</td>
</tr>
<tr>
<td>RNDUNIT &quot; ~</td>
</tr>
<tr>
<td>(MENUBRANCH C)</td>
</tr>
</tbody>
</table>

METERS

<table>
<thead>
<tr>
<th>METERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GOTO)TABLE &quot;END&quot; (DOWN) &quot;CO&quot; (RIGHT) ELEVUNIT &quot;(RIGHT) RNCUNIT &quot; ~</td>
</tr>
<tr>
<td>RECOMMENDS &quot;(GOTO)COMMENTS&quot;</td>
</tr>
<tr>
<td>(LET UNIT, METERS)</td>
</tr>
<tr>
<td>RNDUNIT &quot; ~</td>
</tr>
<tr>
<td>(MENUBRANCH C)</td>
</tr>
</tbody>
</table>

S

<table>
<thead>
<tr>
<th>EVFILE</th>
<th>SOCNT</th>
<th>DETAIL</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFIES NAME OF &quot;event&quot; INPUT SPECIFIES THE LEVEL OF DETAIL SPECIFIES THE LEVEL OF DETAIL RETURN TO PREVIOUS MENU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(GOTO)TABLE &quot;END&quot; (DOWN) (GOTO)TABLE &quot;END&quot; (DOWN) (DOWN) &quot;CO&quot; (RIGHT) ELEVUNIT &quot;(RIGHT) RNCUNIT &quot; ~</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RECOMMENDS &quot;(GOTO)COMMENTS&quot; (GOTO)COMMENTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(LET UNIT, METERS) (LET UNIT, FEET)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RNDUNIT &quot; ~</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(MENUBRANCH C)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EVFILE

<table>
<thead>
<tr>
<th>EVFILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFIES NAME OF &quot;event&quot; INPUT FILE TO BE GENERATED</td>
</tr>
<tr>
<td>(GOTO)TABLE &quot;END&quot; (DOWN) &quot;CO&quot; (RIGHT) EVENTFILE &quot;(RIGHT) RNCFILE &quot;</td>
</tr>
<tr>
<td>RECOMMENDS &quot;(GOTO)COMMENTS&quot;</td>
</tr>
<tr>
<td>(LET UNIT, METERS) (LET UNIT, FEET)</td>
</tr>
<tr>
<td>RNDUNIT &quot; ~</td>
</tr>
<tr>
<td>(MENUBRANCH C)</td>
</tr>
</tbody>
</table>

QUIT
RETURN TO CONTROL MENU
                  (MENUBRANCH 1 T)

<table>
<thead>
<tr>
<th>FEET</th>
<th>METERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GOTO)TABLE &quot;END&quot; (DOWN) (GOTO)TABLE &quot;END&quot; (DOWN) (DOWN) &quot;CO&quot; (RIGHT) ELEVUNIT &quot;(RIGHT) RNCUNIT &quot; ~</td>
<td></td>
</tr>
<tr>
<td>RECOMMENDS &quot;(GOTO)COMMENTS&quot; (GOTO)COMMENTS</td>
<td></td>
</tr>
<tr>
<td>(LET UNIT, FEET) (LET UNIT, METERS)</td>
<td></td>
</tr>
<tr>
<td>RNDUNIT &quot; ~</td>
<td></td>
</tr>
<tr>
<td>(MENUBRANCH C)</td>
<td></td>
</tr>
</tbody>
</table>
SOCONT
SPECIFIES THE LEVEL OF DETAIL TO BE USED IN THE EVENT OUTPUT FILE
(GOTO) TABLE " (END) (DOWN) (END) (RIGHT) (RIGHT) (RIGHT) RCNEVOPR " ~
(RECOMMENTS " (GOTO) COMMENTS " (DOWN)
(LET EVOPT,SOCONT)
(RCNEVOPR " ~
{MENUBRANCH S})

DETAIL
SPECIFIES THE LEVEL OF DETAIL TO BE USED IN THE EVENT OUTPUT FILE
(GOTO) TABLE " (END) (DOWN) (END) (RIGHT) (RIGHT) (RIGHT) RCNEVOPR " ~
(RECOMMENTS " (GOTO) COMMENTS " (DOWN)
(LET EVOPT,DETAIL)
(RCNEVOPR " ~
{MENUBRANCH S})

QUIT
RETURN TO PREVIOUS MENU
{MENUBRANCH C})
### SAVFIL

**Primary storage file for multiyear option**

```plaintext
(GETLABEL "ENTER FILENAME FOR PRIMARY INTERMEDIATE STORAGE: ":SAVFIL)
(MENUBRANCH RS1)
```

### INIFIL

The unformatted file of intermediate results for initializing the model.

```plaintext
(GETLABEL "ENTER FILENAME OF UNFORMATTED INTERMEDIATE RESULTS: ":INIFIL)
/RNDINIFIL
```

### RETURN

**Return to previous menu**

```plaintext
(MENUBRANCH C)
```

### Table

<table>
<thead>
<tr>
<th>SAVFIL</th>
<th>DAYINC</th>
<th>SAVFL2</th>
<th>INITFIL</th>
<th>RETURN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary storage file</td>
<td>Specify the number of days between successive dumps</td>
<td>The unformatted file of intermediate results for previous menu</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(GETLABEL &quot;ENTER NUMBER OF DAYS BETWEEN SUCCESSIVE DUMPS: &quot;:DAYINC)</td>
<td>(GETLABEL &quot;ENTER FILENAME OF UNFORMATTED INTERMEDIATE RESULTS: &quot;:INIFIL)</td>
<td>(GETNUMBER &quot;ENTER NUMBER OF DAYS BETWEEN SUCCESSIVE DUMPS: &quot;:DAYINC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>/RNDDAYINC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SAVFIL

Primary storage file

```plaintext
(GETLABEL "ENTER FILENAME FOR PRIMARY INTERMEDIATE STORAGE: ":SAVFIL)
(MENUBRANCH RS2)
```

### DAYINC

Specify the number of days between successive dumps

```plaintext
(GOTO)SAVFIL ~(RIGHT) (RIGHT) RNCDAYINC ~ ~
(GETNUMBER "ENTER NUMBER OF DAYS BETWEEN SUCCESSIVE DUMPS: ":DAYINC)
/RNDDAYINC ~ ~
(MENUBRANCH RS2)
```

### SAVFL2

Secondary storage file

```plaintext
(GOTO)SAVFIL ~(RIGHT) (RIGHT) (RIGHT) RNCSAVFL2 ~ ~
(GETLABEL "ENTER FILENAME FOR SECONDARY INTERMEDIATE RESULT FILE: ":SAVFL2)
/RNDSAVFL2 ~ ~
(MENUBRANCH RS2)
```
The unformatted file of intermediate results for initializing the model.

RETURN

Return to previous menu

LOCATION

LOCATION

LOCATION
BUILDING DOWNWASH ALGORITHMS DO NOT APPLY TO VOLUME OR AREA SOURCES. 

EMISSIONS OPTIONS TO USE VARIABLE EMISSION RATES

{IF <<<RISC2>>TERM=2} {MENU_BRANCH_2} EMISFACT

{MENU_BRANCH_2} EMISFACTS

UNITS SPECIFY OUTPUT UNITS

{GETLABEL "ENTER INPUT UNIT CONVERSION FACTOR : " EMIFAC

LABEL FOR EMISSION UNITS (UP TO 40 CHARACTERS),

{GETLABEL "ENTER INPUT UNIT LABEL FOR EMISSIONS : " EMILLBL

LABEL FOR OUTPUT UNITS (UP TO 40 CHARACTERS),

{GETLABEL "ENTER OUTPUT UNIT LABEL : " ONBLBL

/END EMIFAC /END EMILLBL /END ONBLBL

{MENU_BRANCH_3}

VARIABLES SPECIFY SETTLING, REMOVAL & DEPOSITION VARIABLES

{MENU_BRANCH_VAR}

GROUPS GROUP CONTRIBUTIONS FROM SOURCES TOGETHER

{GETLABEL "ENTER GROUP ID (UP TO 8 CHARACTERS) FOR SELECTED GROUP : " GRPID

{IF GRPID="ALL"} {MENU_BRANCH_213}

/END GROUPID /END SRCID

/END GROUPS

/END SUB}

319
<table>
<thead>
<tr>
<th>Xs</th>
<th>Ys</th>
<th>Zs</th>
<th>SOURCE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (EAST—WEST) COORDINATE OF SOURCE LOCATION (IN METERS)</td>
<td>Y (NORTH—SOUTH) COORDINATE OF SOURCE LOCATION (IN METERS)</td>
<td>Z (SOUTH) SOURCE ELEVATION (ONLY USED IF CO TERRHTS ELEV OPTION IS SELECTED)</td>
<td>SOURCE TYPE</td>
</tr>
</tbody>
</table>

Xs

X (EAST—WEST) COORDINATE OF SOURCE LOCATION (IN METERS)

Ys

Y (NORTH—SOUTH) COORDINATE OF SOURCE LOCATION (IN METERS)

Zs

SOURCE ELEVATION (ONLY USED IF CO TERRHTS ELEV OPTION IS SELECTED)

SOURCE TYPE

SPECIFY SOURCE TYPE
### POINT

**POINT TYPE SOURCE**
(LET SRCTYP, POINT)

**RECOMMEND**

THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR POINT SOURCES. ~ (DOWN)

### VOLUME

**VOLUME TYPE SOURCE**
(LET SRCTYP, VOLUME)

**RECOMMEND**

THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR VOLUME SOURCES. ~ (DOWN)

### AREA

**AREA TYPE SOURCE**
(LET SRCTYP, AREA)

**RECOMMEND**

THE ABOVE PARAMETERS ARE REQUIRED INPUT FOR AREA SOURCES. ~ (DOWN)

### QUIT

RETURN TO PREVIOUS MENU

### SOP

<table>
<thead>
<tr>
<th>RATE</th>
<th>HEIGHT</th>
<th>TEMP</th>
<th>VELOCITY</th>
<th>DIAMETER</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>POINT EMISSION RATE IN GJ</td>
<td>RELEASE HEIGHT ABOVE GL</td>
<td>HEATSTACK GAS TEMP IN DEGREES</td>
<td>HEATSTACK GAS VELOCITY IN M/</td>
<td>STACK INSIDE DIAMETER IN METERS</td>
<td>RETURN TO LOCATION</td>
</tr>
<tr>
<td>(GOTO TABLE)</td>
<td>(GOTO)</td>
<td>(GOTO)</td>
<td>(GOTO)</td>
<td>(GOTO)</td>
<td>(GOTO)</td>
</tr>
</tbody>
</table>

**RECOMMEND**

***SOP***
RATE
POINT EMISSION RATE IN G/S
(GOTO)TABLE "END" (DOWN) (DOWN) "SO" "(RIGHT)
SRCPARAM "(RIGHT) RNCPARID " "(RIGHT) RNCHHEIGHT " "(RIGHT) RNCTEMP " "(RIGHT) RNCVEL " "(RIGHT) RNCDIAM " "(RIGHT)
{contents parid,srcid,9,117} (GOTO) COMMENTS "
{GETNUMBER "ENTER POINT EMISSION RATE IN G/S: ",RATE}
{RNDSRCID "RNCPARID "RNRATE "
{MENUBRANCH SOP}

HEIGHT
RELEASE HEIGHT ABOVE GL IN METERS
{GETNUMBER "ENTER RELEASE HEIGHT ABOVE GROUND (IN METERS): ",HEIGHT}
{RNDHEIGHT "
{MENUBRANCH SOP}

TEMP
STACK GAS EXIT TEMP IN DEGREESK
{GETNUMBER "ENTER STACK GAS EXIT TEMPERATURE (DEGREESK): ",TEMP}
{RNDTEMP "
{MENUBRANCH SOP}

VELOCITY
STACK GAS VELOCITY IN M/S
{GETNUMBER "ENTER STACK GAS EXIT VELOCITY (M/S): ",VEL}
{RNDVEL "
{MENUBRANCH SOP}

DIAMETER
STACK INSIDE DIAMETER IN METERS
{GETNUMBER "ENTER STACK INSIDE DIAMETER (IN METERS): ",DIAM}
{RNDDIAM "
{MENUBRANCH SOP}

QUIT
RETURN TO LOCATION
{MENUBRANCH SO}
<table>
<thead>
<tr>
<th>Rate</th>
<th>Height</th>
<th>Lateral</th>
<th>Vertical</th>
<th>Quit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rate</strong></td>
<td>Volume Emission Rate in G/S</td>
<td>(GOTO) TABLE &quot;END&quot; (DOWN) (DOWN) &quot;SO&quot; (RIGHT)</td>
<td>(GETNUMBER &quot;ENTER VOLUME EMISSION RATE IN G/S:&quot; RATE)</td>
<td>(RETURN TO LOCATION)</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>Release Height (Center of Volume) Above GL in Meters</td>
<td>(GETNUMBER &quot;ENTER RELEASE HEIGHT ABOVE GROUND (IN METERS):&quot; HEIGHT)</td>
<td>(RETURN TO LOCATION)</td>
<td></td>
</tr>
<tr>
<td><strong>Lateral</strong></td>
<td>Initial Lateral Dimension of Volume</td>
<td>(GETNUMBER &quot;ENTER INITIAL LATERAL DIMENSION OF VOLUME (METERS):&quot; SYINIT)</td>
<td>(RETURN TO LOCATION)</td>
<td></td>
</tr>
<tr>
<td><strong>Vertical</strong></td>
<td>Initial Vertical Dimension of Volume</td>
<td>(GETNUMBER &quot;ENTER INITIAL VERTICAL DIMENSION OF VOLUME (METERS):&quot; SZINIT)</td>
<td>(RETURN TO LOCATION)</td>
<td></td>
</tr>
<tr>
<td><strong>Quit</strong></td>
<td>Return to Location</td>
<td>(RETURN TO LOCATION)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The other table for SOA:

<table>
<thead>
<tr>
<th>Rate</th>
<th>Height</th>
<th>Length</th>
<th>Quit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rate</strong></td>
<td>Area Emission Rate in G/S</td>
<td>Release Height Above GL (in Square Area, Side in Meters)</td>
<td>(RETURN TO LOCATION)</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>(RETURN TO LOCATION)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td>Release Height Above Ground</td>
<td>(RETURN TO LOCATION)</td>
<td></td>
</tr>
<tr>
<td><strong>Quit</strong></td>
<td>(RETURN TO LOCATION)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GETNUMBER 'ENTER AREA EMISSION RATE IN G/SEQ M'</td>
<td>Rate entered by user.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRCPARM *(RIGHT)RNCXDARID (RIGHT)RNCXLHGT (RIGHT)RNCXINIT *</td>
<td>Source parameters defined by user.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTENTS parid,par9,117 (GOTO)A50</td>
<td>Contents of source parameters loaded.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEIGHT</td>
<td>Height entered by user in meters.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LENGTH</td>
<td>Length of side of square area in meters.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table: Model Operation**

<table>
<thead>
<tr>
<th>Model</th>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOWN</td>
<td>BUILDING HEIGHTS IN M: BUILDING WIDTHS IN M:</td>
<td>Calculate lower bound, return to source menu.</td>
</tr>
<tr>
<td></td>
<td>GETNUMBER 'ENTER BUILDING HEIGHT'</td>
<td>Width entered by user.</td>
</tr>
<tr>
<td></td>
<td>GETNUMBER 'ENTER BUILDING WIDTH'</td>
<td>Height entered by user.</td>
</tr>
</tbody>
</table>

**Notes:**
- Sources are defined by the user.
- The model provides options for specifying source ID's in a range of values.
- Heights and widths are entered by the user.
- The model calculates lower bounds for emissions.
<table>
<thead>
<tr>
<th>GBTNUMBER ENTER BUILDING</th>
<th>GETNUMBER ENTER BUILDING</th>
<th>GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 130 DEGREES</th>
<th>SPACES</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTABLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 150 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 135 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 110 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 165 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 190 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 205 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 220 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 235 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 250 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 265 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 280 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 300 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 315 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 330 DEGREES)</td>
</tr>
<tr>
<td>GBTNUMBER ENTER BUILDING</td>
<td>GETNUMBER ENTER BUILDING</td>
<td>W (GETTITLE &quot;TEND&quot;) (GETTABLE &quot;END&quot;)</td>
<td>(GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 345 DEGREES)</td>
</tr>
</tbody>
</table>

**HEIGHT**

**BUILDING HEIGHTS (IN METERS)**

```
IF <RISC2> TERM=2 (BRANCH HTLT)
  (GETTO) TABLE "END" (GETTO) "END") | (GETNUMBER ENTER SWITCH VALUE OF 0 OR 1 FOR 130 DEGREES) | SPACES
```

**SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION**

```
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY
```

```
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE IDS SEPARATED BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN IDS)
```

**FOR THE SHORT TERM MODEL**

```
USER INPUTS 36 DIRECTION-SPECIFIC BUILDING HEIGHTS (IN METERS)
```

**BEGINNING WITH THE 10 DEGREE FLOW VECTOR (WIND BLOWING TOWARD 10°)**

```
DEGREES FROM NORTH AND INCREASING BY 10 DEGREES
```

**IN A CLOCKWISE DIRECTION**

```
```
<table>
<thead>
<tr>
<th>Degree</th>
<th>Height (Meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>TEN</td>
</tr>
<tr>
<td>20</td>
<td>TWENTY</td>
</tr>
<tr>
<td>30</td>
<td>THIRTY</td>
</tr>
<tr>
<td>40</td>
<td>FOURTY</td>
</tr>
<tr>
<td>50</td>
<td>FIFTY</td>
</tr>
<tr>
<td>60</td>
<td>SIXTY</td>
</tr>
<tr>
<td>70</td>
<td>ONE</td>
</tr>
<tr>
<td>80</td>
<td>TWO</td>
</tr>
<tr>
<td>90</td>
<td>THREE</td>
</tr>
<tr>
<td>100</td>
<td>FOUR</td>
</tr>
<tr>
<td>110</td>
<td>FIVE</td>
</tr>
<tr>
<td>120</td>
<td>SIX</td>
</tr>
<tr>
<td>130</td>
<td>ONE</td>
</tr>
<tr>
<td>140</td>
<td>TWO</td>
</tr>
<tr>
<td>150</td>
<td>THREE</td>
</tr>
<tr>
<td>160</td>
<td>FOUR</td>
</tr>
<tr>
<td>170</td>
<td>FIVE</td>
</tr>
<tr>
<td>180</td>
<td>SIX</td>
</tr>
<tr>
<td>190</td>
<td>ONE</td>
</tr>
<tr>
<td>200</td>
<td>TWO</td>
</tr>
<tr>
<td>210</td>
<td>THREE</td>
</tr>
<tr>
<td>220</td>
<td>FOUR</td>
</tr>
<tr>
<td>230</td>
<td>FIVE</td>
</tr>
<tr>
<td>240</td>
<td>SIX</td>
</tr>
<tr>
<td>250</td>
<td>ONE</td>
</tr>
<tr>
<td>260</td>
<td>TWO</td>
</tr>
<tr>
<td>270</td>
<td>THREE</td>
</tr>
<tr>
<td>280</td>
<td>FOUR</td>
</tr>
<tr>
<td>290</td>
<td>FIVE</td>
</tr>
<tr>
<td>300</td>
<td>SIX</td>
</tr>
<tr>
<td>310</td>
<td>ONE</td>
</tr>
<tr>
<td>320</td>
<td>TWO</td>
</tr>
</tbody>
</table>
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR 330 DEGREES":THREE) ANDTHREE ~
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR 340 DEGREES":FOUR) ANDFOUR ~
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR 350 DEGREES":FIVE) ANDFIVE ~
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR 360 DEGREES":SIX) ANDSIX ~
RNDDSRCID ~
(MENUBRANCH DOWN)

WIDTH
BUILDING WIDTHS (IN METERS)
( IF < <RISC2> > TERM =2) (BRANCH WDLT) ~
( GOTO) TABLE ~ (END) (DOWN) (DOWN) "SO " ~ (RIGHT) BUILDWID ~ (RIGHT) RNCDSRCID ~ ~ (RIGHT) RNCTEN ~ ~ (RIGHT) RNCTWENTY ~ ~ (RIGHT) RNCTRINTY ~ ~ (RIGHT) RNCFORTY ~ ~ (RIGHT) RNCFIFTY ~ ~ (RIGHT) RNCSIXTY ~ ~
/RECOMMENTS "(GOTO)COMMENTS"
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION "(DOWN) (DOWN)
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING WIDTHS APPLY. "(DOWN) (DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED "(DOWN)
BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S) "(DOWN)
( GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE : " , DSRCID)
/RECOMMENTS "(GOTO)COMMENTS"
FOR THE SHORT TERM MODEL -- -- "(DOWN) (DOWN)
USER INPUTS 36 DIRECTION SPECIFIC BUILDING WIDTHS (IN METERS) "(DOWN) (DOWN)
BEGINNING WITH THE 10 DEGREE FLOW VECTOR (WIND BLOWING TOWARD 10 "(DOWN) (DOWN)
DEGREES FROM NORTH) AND INCREMEING BY 10 DEGREES "(DOWN) (DOWN)
IN A COUNTERCLOCKWISE DIRECTION "(DOWN)
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 10 DEGREES":TEN) RNDTEN ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 20 DEGREES":TWENTY) RNDTWENTY ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 30 DEGREES":THIRTY) RNDTHIRTY ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 40 DEGREES":FOURTY) RNDFOURTY ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 50 DEGREES":FIFTY) RNDFIFTY ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 60 DEGREES":SIXTY) RNDSIXTY ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 70 DEGREES":SEVENTY) RNDSEVENTY ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 80 DEGREES":EIGHTY) RNDEIGHTY ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 90 DEGREES":NINETY) RNDNINETY ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 100 DEGREES":ONEHUNDRED) RNDONE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 110 DEGREES":ONEHUNDREDONE) RNDONE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 120 DEGREES":TWOHUNDRED) RNDTWO ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 130 DEGREES":THREEHUNDRED) RNDTHREE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 140 DEGREES":FOURHUNDRED) RNDFOUR ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 150 DEGREES":FIVEHUNDRED) RNDFIVE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 160 DEGREES":SIXHUNDRED) RNDSIX ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 170 DEGREES":SEVENHUNDRED) RNDSEVEN ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 180 DEGREES":EIGHTHUNDRED) RNDEIGHT ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 190 DEGREES":NINETHUNDRED) RNDNINE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 200 DEGREES":TWOHUNDREDONE) RNDONE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 210 DEGREES":ONEHUNDREDONE) RNDONE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 220 DEGREES":ONEHUNDREDTWO) RNDTWO ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 230 DEGREES":ONEHUNDREDTOUGH) RNDTHREE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 240 DEGREES":ONEHUNDREDFOUR) RNDFOUR ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 250 DEGREES":ONEHUNDREDFIVE) RNDFIVE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 260 DEGREES":TWOHUNDREDONE) RNDONE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 270 DEGREES":ONEHUNDREDONE) RNDONE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 280 DEGREES":ONEHUNDREDTWO) RNDTWO ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 290 DEGREES":ONEHUNDREDTOUGH) RNDTHREE ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 300 DEGREES":ONEHUNDREDFOUR) RNDFOUR ~
(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR 310 DEGREES":ONEHUNDREDFIVE) RNDFIVE ~
LOWBOUND

CALCULATE "LOWER BOUND" CONCENTRATIONS

{GETNUMBER "ENTER SOURCE ID FOR SELECTED SOURCE: "}DSRCID

IF <DSRCID>TERM=2I{BRANCH LBLT}~

{GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE: "}DSRCID

USER MAY SPECIFY A RANGE OF SOURCES FOR THE LOWER BOUND CALCULATIONS. ~ (DOWN)(DOWN)

A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED BY A DASH. i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S) ~ (DOWN)

USER INPUTS 36 DIRECTION-SPECIFIC LOWER BOUND WAKE OPTIONS SWITCHES ~ (DOWN) (DOWN)

BEGINNING WITH THE 10 DEGREE FLOW VECTOR (WIND BLOWING TOWARD 10 ~ (DOWN)(DOWN)
DEGREES FROM NORTH) AND INCREMENTING BY 10 DEGREES " (DOWN)(DOWN)
IN A CLOCKWISE DIRECTION " (DOWN)(DOWN)
A SWITCH VALUE OF 0 MEANS TO USE THE UPPER BOUND (REGULATORY DEFAULT) " (DOWN)(DOWN)
A SWITCH VALUE OF 1 MEANS TO USE THE LOWER BOUND FOR THAT SECTOR. "

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 10 DEGREES :
(TEN)RANDTEN"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 20 DEGREES :
(TWENTY)RANDTWENTY"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 30 DEGREES :
(THIRTY)RANDTHIRTY"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 40 DEGREES :
(FOURTY)RANDFOURTY"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 50 DEGREES :
(FIFTY)RANDFIFTY"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 60 DEGREES :
(SIXTY)RANDSIX"

(GOTO)TABLE " (END) (DOWN) (DOWN)" (RIGHT)LOWBOUND " (RIGHT)RNCDSRCID2 " " (RIGHT)RNCone " 
(RIGHT)RNCtwo " " (RIGHT)RNCthree " " (RIGHT)RNCfour " " (RIGHT)RNCfive " " (RIGHT)RNCsix 

(CONTENTS DSRCID2,DSRCID,9,117)RNDDSRCID2"

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 70 DEGREES :
(ONE)RNDONE"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 80 DEGREES :
(TWO)RNDTWO"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 90 DEGREES :
(THREE)RANDTHREE"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 100 DEGREES :
(FOUR)RANDFOUR"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 110 DEGREES :
(FIVE)RNFIVE"

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 120 DEGREES :
(SIX)RNSIX"

(GOTO)TABLE " (END) (DOWN) (DOWN)" (RIGHT)LOWBOUND " (RIGHT)RNCDSRCID2 " " (RIGHT)RNCone " 
(RIGHT)RNCtwo " " (RIGHT)RNCthree " " (RIGHT)RNCfour " " (RIGHT)RNCfive " " (RIGHT)RNCsix 

(CONTENTS DSRCID2,DSRCID,9,117)RNDDSRCID2"

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 130 DEGREES :
(ONE)RNDONE"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 140 DEGREES :
(TWO)RNDTWO"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 150 DEGREES :
(THREE)RANDTHREE"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 160 DEGREES :
(FOUR)RANDFOUR"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 170 DEGREES :
(FIVE)RNFIVE"

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 180 DEGREES :
(SIX)RNSIX"

(GOTO)TABLE " (END) (DOWN) (DOWN)" (RIGHT)LOWBOUND " (RIGHT)RNCDSRCID2 " " (RIGHT)RNCone " 
(RIGHT)RNCtwo " " (RIGHT)RNCthree " " (RIGHT)RNCfour " " (RIGHT)RNCfive " " (RIGHT)RNCsix 

(CONTENTS DSRCID2,DSRCID,9,117)RNDDSRCID2"

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 190 DEGREES :
(ONE)RNDONE"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 200 DEGREES :
(TWO)RNDTWO"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 210 DEGREES :
(THREE)RANDTHREE"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 220 DEGREES :
(FOUR)RANDFOUR"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 230 DEGREES :
(FIVE)RNFIVE"

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 240 DEGREES :
(SIX)RNSIX"

(GOTO)TABLE " (END) (DOWN) (DOWN)" (RIGHT)LOWBOUND " (RIGHT)RNCDSRCID2 " " (RIGHT)RNCone " 
(RIGHT)RNCtwo " " (RIGHT)RNCthree " " (RIGHT)RNCfour " " (RIGHT)RNCfive " " (RIGHT)RNCsix 

(CONTENTS DSRCID2,DSRCID,9,117)RNDDSRCID2"

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 250 DEGREES :
(ONE)RNDONE"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 260 DEGREES :
(TWO)RNDTWO"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 270 DEGREES :
(THREE)RANDTHREE"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 280 DEGREES :
(FOUR)RANDFOUR"
(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 290 DEGREES :
(FIVE)RNFIVE"

(GETNUMBER "ENTER SWITCH VALUE OF 0 OR 1 FOR 300 DEGREES :
(SIX)RNSIX"

(GOTO)TABLE " (END) (DOWN) (DOWN)" (RIGHT)LOWBOUND " (RIGHT)RNCDSRCID2 " " (RIGHT)RNCone " 

329
<table>
<thead>
<tr>
<th>SEASON</th>
<th>MONTH</th>
<th>HOUR</th>
<th>STAR</th>
<th>SEASON &amp; HOUR</th>
<th>CONTINUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPRING</td>
<td>9:00</td>
<td>PM</td>
<td>SRCID2</td>
<td>SPRING</td>
<td>SRCID2</td>
</tr>
<tr>
<td>SUMMER</td>
<td>10:00</td>
<td>PM</td>
<td>SRCID2</td>
<td>SUMMER</td>
<td>SRCID2</td>
</tr>
<tr>
<td>FALL</td>
<td>11:00</td>
<td>PM</td>
<td>SRCID2</td>
<td>FALL</td>
<td>SRCID2</td>
</tr>
<tr>
<td>WINTER</td>
<td>1:00</td>
<td>AM</td>
<td>SRCID2</td>
<td>WINTER</td>
<td>SRCID2</td>
</tr>
</tbody>
</table>

EMISSION FACTORS:
- SPRING
- SUMMER
- FALL
- WINTER

USER INPUTS:
- SEASON: SPRING, SUMMER, FALL, WINTER
- MONTH: JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE
- HOUR: 9:00 AM TO 11:00 PM
- STAR: SRCID1, SRCID2, SRCID3, SRCID4

SWITCH VALUE OF 0 OR 1

RETURN TO SOURCE MENU
SEASON
EMISSION RATES VARY SEASONALLY

USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY. (DOWN) (DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED. (DOWN)
BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S) ~

USER INPUTS 4 SEASONAL EMISSION FACTORS IN THE FOLLOWING ORDER: ~ (DOWN) (DOWN)
WINTER, SPRING, SUMMER, FALL ~

USER INPUTS 12 MONTHLY EMISSION FACTORS IN THE FOLLOWING ORDER: ~ (DOWN) (DOWN)

MONTH
EMISSION RATES VARY MONTHLY

USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY. ~ (DOWN) (DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED. (DOWN)
BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S) ~
HOUR
EMISSION RATES VARY BY HOUR-OF-DAY
{GOTO}TABLE "END" (DOWN) "SO" "RIGHT"
EMISFACT "RIGHT",RNCESRCID ~ "RIGHT",HROFDY ~ "RIGHT",RNCONE ~ "RIGHT",RNCtwo ~ "RIGHT",RNCthree ~ "RIGHT",RNCfour ~ "RIGHT",RNCfive ~ "RIGHT",RNCsix ~ "RIGHT",RNCseven ~ "RIGHT",RNCeight ~ "RIGHT",RNCnine ~ "RIGHT",RNCTEN ~ "RIGHT",RNCeleven ~ "RIGHT",RNCtwelve ~ "RIGHT"
{GOTO}TABLE "END" (DOWN) "SO" "RIGHT"
{RECOMMENTS} ~
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION ~ (DOWN) (DOWN)
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY ~ (DOWN) (DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED ~ (DOWN)
BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S) ~ (DOWN)
{GETLABEL} "ENTER SOURCE ID FOR SELECTED SOURCE: " ,ESRCID)
{GOTO}COMMENTS ~
FOR THE SHORT TERM MODEL ~ ~ ~ (DOWN) (DOWN)
USER INPUTS 24 HOURLY EMISSION FACTORS STARTING WITH 1 AM ~ (DOWN)
{GETNUMBER} "ENTER 1:00 AM EMISSION FACTOR: " ,ONE}
{GETNUMBER} "ENTER 2:00 AM EMISSION FACTOR: " ,TWO}
{GETNUMBER} "ENTER 3:00 AM EMISSION FACTOR: " ,THREE}
{GETNUMBER} "ENTER 4:00 AM EMISSION FACTOR: " ,FOUR}
{GETNUMBER} "ENTER 5:00 AM EMISSION FACTOR: " ,FIVE}
{GETNUMBER} "ENTER 6:00 AM EMISSION FACTOR: " ,SIX}
{GETNUMBER} "ENTER 7:00 AM EMISSION FACTOR: " ,SEVEN}
{GETNUMBER} "ENTER 8:00 AM EMISSION FACTOR: " ,EIGHT}
{GETNUMBER} "ENTER 9:00 AM EMISSION FACTOR: " ,NINE}
{GETNUMBER} "ENTER 10:00 AM EMISSION FACTOR: " ,TEN}
{GETNUMBER} "ENTER 11:00 AM EMISSION FACTOR: " ,ELEVEN}
{GETNUMBER} "ENTER 12:00 NOON EMISSION FACTOR: " ,TWELVE}
{GETNUMBER} "ENTER 1:00 PM EMISSION FACTOR: " ,THIRTEEN}
<table>
<thead>
<tr>
<th>Time</th>
<th>Emission Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00 PM</td>
<td>14</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>15</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>16</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>17</td>
</tr>
<tr>
<td>6:00 PM</td>
<td>18</td>
</tr>
<tr>
<td>7:00 PM</td>
<td>19</td>
</tr>
<tr>
<td>8:00 PM</td>
<td>20</td>
</tr>
<tr>
<td>9:00 PM</td>
<td>21</td>
</tr>
<tr>
<td>10:00 PM</td>
<td>22</td>
</tr>
<tr>
<td>11:00 PM</td>
<td>23</td>
</tr>
<tr>
<td>12:00 AM</td>
<td>24</td>
</tr>
</tbody>
</table>

Rates vary by speed and stability category.
SEASON & HOUR

RATES VARY BY SEASON & HOUR-OF-DAY

<table>
<thead>
<tr>
<th>SEASON</th>
<th>WINTER</th>
<th>SPRING</th>
<th>SUMMER</th>
<th>FALL</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>HOURS OF DAY</th>
<th>1-2 AM</th>
<th>3-4 AM</th>
<th>5-6 AM</th>
<th>7-8 AM</th>
<th>9-10 AM</th>
<th>11-12 AM</th>
<th>1-2 PM</th>
<th>3-4 PM</th>
<th>5-6 PM</th>
<th>7-8 PM</th>
<th>9-10 PM</th>
<th>11-12 PM</th>
</tr>
</thead>
</table>

STAT1

\$\text{SRCID} \+$

\text{(GETLABEL "ENTER STAR EMISSION FACTOR : "ONE)}

\text{(GOTO)ONE}+

\$\text{ENDONE} \+$

\text{(RIGHT)}

\text{SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION}" (DOWN) (DOWN)

\text{USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY." (DOWN) (DOWN)}

\text{A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED" (DOWN)}

\text{BY A SPACE, IE. STACK1-SACK10. (NOTE NO SPACES BETWEEN ID'S)" (DOWN)" (DOWN)}

\text{(GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE: ",SRCID)}

\text{(GOTO)COMMENTS" (DOWN)" (DOWN)}

\text{FOR THE SHORT TERM MODEL" (DOWN) (DOWN)}

\text{USER INPUTS 24 HOURLY EMISSION FACTORS STARTING WITH 1 AM" (DOWN) (DOWN)}

\text{FOR EACH OF THE 4 SEASONS IN THE FOLLOWING ORDER: " (DOWN) (DOWN)}

\text{WINTER, SPRING, SUMMER, FALL" (DOWN)}

\text{(GOTO)TABLE" (UP)\$\text{RCORTOR1}" (RIGHT)}

\text{(LET SRCID2, SRCID)\$\text{RDSRCID2}" (GOTO)COMMENTS" (DOWN) (RIGHT)WINTER" (FOR FOR1,112,1HOUR1)}

\text{(GOTO)TABLE" (END)(DOWN)(DOWN)\$\text{SO}" (RIGHT)}

\text{EMISFACT" (RIGHT)\$\text{RNCESRCID2}" (RIGHT)SEASHR" (RIGHT)\$\text{RNCONE}" (RIGHT)\$\text{RNC TWO}" (RIGHT)\$\text{RNC THREE}" (RIGHT)\$\text{RNC FOUR}" (RIGHT)\$\text{RNCFIVE}" (RIGHT)\$\text{RNC SIX}" (RIGHT)\$\text{RNCSEVEN}" (RIGHT)\$\text{RNC EIGHT}" (RIGHT)\$\text{RNC NINE}" (RIGHT)\$\text{RNC TEN}" (RIGHT)\$\text{RNC11}" (RIGHT)\$\text{RNC12}" (RIGHT)

\text{(LET SRCID2, SRCID)\$\text{NDSRCID2}" (GOTO)COMMENTS" (DOWN) (RIGHT)WINTER" (FOR FOR1,112,1HOUR1)}

\text{(GOTO)TABLE" (END) (DOWN) (DOWN)\$\text{SO}" (RIGHT)}

\text{EMISFACT" (RIGHT)\$\text{RNCESRCID2}" (RIGHT)SEASHR" (RIGHT)\$\text{RNCONE}" (RIGHT)\$\text{RNC TWO}" (RIGHT)\$\text{RNC THREE}" (RIGHT)\$\text{RNC FOUR}" (RIGHT)\$\text{RNCFIVE}" (RIGHT)\$\text{RNC SIX}" (RIGHT)\$\text{RNCSEVEN}" (RIGHT)\$\text{RNC EIGHT}" (RIGHT)\$\text{RNC NINE}" (RIGHT)\$\text{RNC TEN}" (RIGHT)\$\text{RNC11}" (RIGHT)\$\text{RNC12}" (RIGHT)

\text{(LET SRCID2, SRCID)\$\text{NDSRCID2}" (GOTO)COMMENTS" (DOWN) (RIGHT)SPRING" (FOR FOR1,112,1HOUR1)}

\text{(GOTO)TABLE" (END) (DOWN) (DOWN)\$\text{SO}" (RIGHT)}

\text{EMISFACT" (RIGHT)\$\text{RNCESRCID2}" (RIGHT)SEASHR" (RIGHT)\$\text{RNCONE}" (RIGHT)\$\text{RNC TWO}" (RIGHT)\$\text{RNC THREE}" (RIGHT)\$\text{RNC FOUR}" (RIGHT)\$\text{RNCFIVE}" (RIGHT)\$\text{RNC SIX}" (RIGHT)\$\text{RNCSEVEN}" (RIGHT)\$\text{RNC EIGHT}" (RIGHT)\$\text{RNC NINE}" (RIGHT)\$\text{RNC TEN}" (RIGHT)\$\text{RNC11}" (RIGHT)\$\text{RNC12}" (RIGHT)
<table>
<thead>
<tr>
<th>Hour</th>
<th>Emission Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>2:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>3:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>4:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>5:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>6:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>7:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>8:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>9:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>11:00 AM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>12:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>1:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>4:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>6:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>7:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>8:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>9:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>10:00 PM</td>
<td>SHEAR</td>
</tr>
<tr>
<td>11:00 PM</td>
<td>SHEAR</td>
</tr>
</tbody>
</table>

**SUMMER**

**FALL**

**HOURS**

1. Emission FACTOR: SHEAR
2. Emission FACTOR: SHEAR
3. Emission FACTOR: SHEAR
4. Emission FACTOR: SHEAR
5. Emission FACTOR: SHEAR
6. Emission FACTOR: SHEAR
7. Emission FACTOR: SHEAR
8. Emission FACTOR: SHEAR
9. Emission FACTOR: SHEAR
10. Emission FACTOR: SHEAR
11. Emission FACTOR: SHEAR
12. Emission FACTOR: SHEAR
13. Emission FACTOR: SHEAR
14. Emission FACTOR: SHEAR
15. Emission FACTOR: SHEAR
16. Emission FACTOR: SHEAR
17. Emission FACTOR: SHEAR
18. Emission FACTOR: SHEAR
19. Emission FACTOR: SHEAR
20. Emission FACTOR: SHEAR
21. Emission FACTOR: SHEAR
22. Emission FACTOR: SHEAR
23. Emission FACTOR: SHEAR
24. Emission FACTOR: SHEAR
<table>
<thead>
<tr>
<th>SETTLING VELOCITY</th>
<th>MASS FRACTIONS</th>
<th>REFLECTION COEFFICIENT</th>
<th>SOURCE MENU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>RETURN TO SOURCE MENU</td>
</tr>
</tbody>
</table>

*GO TO TABLE* 
*DOWN* 
*END* 

**Table:** 
- **Settling Velocity:** 
- **Mass Fractions:** 
- **Reflection Coefficient:** 
- **Source Menu:** 

**Comments:**
- Return to source menu
- Menu branch 50

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8479

**Comments:**
- Menu branch 8471

**Table:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471

**Table continue:**

**Comments:**
- Go to table
- Menu branch 8471
SETTLING VELOCITIES

(GOTO) TABLE ~ (END) (DOWN) (DOWN) ~ (RIGHT)
SET VELOC ~ (RIGHT) RNCVSRCID ~ ~ (RIGHT) RNCVSNI ~ ~ (RIGHT) RNCVSN2 ~ ~ (RIGHT) RNCVSN3 ~ ~ (RIGHT) RNCVSN4 ~ ~ (RIGHT) RNCVSN5 ~ ~ (RIGHT) RNCVSN6 ~ ~ (RIGHT) RNCVSN7 ~ ~ (RIGHT) RNCVSN8 ~ ~ (RIGHT) RNCVSN9 ~ ~ (RIGHT) RNCVSN10 ~ ~
(RECOMMENDS ~)

(GOTO) COMMENTS ~
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION ~ (DOWN) (DOWN)
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE SETTLING VELOCITIES APPLY ~ (DOWN) (DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED ~ (DOWN)
BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S) ~ (DOWN)
(GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE: ", RNCVSRCID)
(RECOMMENDS ~ (GOTO) COMMENTS ~)
INPUT GRAVITATIONAL SETTLING VELOCITIES IN (M/S) ~ (DOWN) (DOWN)
FOR EACH OF THE SETTLING CATEGORIES (MAXIMUM OF 20) ~ (DOWN) (DOWN)
FOR BEST RESULTS AS MANY CATEGORIES AS POSSIBLE SHOULD BE USED ~ (DOWN) (DOWN)
THE NUMBER OF CATEGORIES MUST AGREE FOR EACH OF THE 3 KEYWORDS ~ (DOWN) (DOWN)
AN ENTRY OF 0 FOR ANY CATEGORY WILL RETURN THE USER TO THE VARIABLE MENU ~ (DOWN)
(GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 1: ", RNCVSNI)
(IF RNCVSNI =0 (BRANCH B478)
(GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 2: ", RNCVSNI)
(IF RNCVSNI =0 (BRANCH B478)
(GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 3: ", RNCVSNI)
(IF RNCVSNI =0 (BRANCH B478)
(GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 4: ", RNCVSNI)
(IF RNCVSNI =0 (BRANCH B478)
(GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 5: ", RNCVSNI)
(IF RNCVSNI =0 (BRANCH B478)
(GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 6: ", RNCVSNI)
(IF RNCVSNI =0 (BRANCH B478)
(GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 7: ", RNCVSNI)
(IF RNCVSNI =0 (BRANCH B478)
(GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 8: ", RNCVSNI)
(IF RNCVSNI =0 (BRANCH B478)
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 9: ",VSN9} 
{IF VSN9=0} (BRANCH B478) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 10: ",VSN10} 
{IF VSN10=0} (BRANCH B478) 
(GOTO) J18 " (END) (DOWN)(DOWN)

SETVELOC ~ (RIGHT)/RNCVSRCID = " (RIGHT)/RNCVSN11 = " (RIGHT)/RNCVSN12 = " (RIGHT)/RNCVSN13 = " (RIGHT)/RNCVSN14 = " (RIGHT)/RNCVSN15 = " (RIGHT)/RNCVSN16 = " (RIGHT)/RNCVSN17 = " (RIGHT)/RNCVSN18 = " (RIGHT)/RNCVSN19 = " (RIGHT)/RNCVSN20 ~ 
/CVSRCID = VSRCID) ~ 

{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 11: ",VSN11} 
{IF VSN11=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 12: ",VSN12} 
{IF VSN12=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 13: ",VSN13} 
{IF VSN13=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 14: ",VSN14} 
{IF VSN14=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 15: ",VSN15} 
{IF VSN15=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 16: ",VSN16} 
{IF VSN16=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 17: ",VSN17} 
{IF VSN17=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 18: ",VSN18} 
{IF VSN18=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 19: ",VSN19} 
{IF VSN19=0} (BRANCH B479) 
{GETNUMBER "ENTER THE SETTLING VELOCITY FOR CATEGORY 20: ",VSN20} 
/RNDVSRCID1 = RNDVSN11 ~ RNDVSN12 ~ RNDVSN13 ~ RNDVSN14 ~ RNDVSN15 ~ RNDVSN16 ~ RNDVSN17 ~ RNDVSN18 ~ RNDVSN19 ~ RNDVSN20 ~ 
/RNDVSRCID2 = RNDVSN1 ~ RNDVSN2 ~ RNDVSN3 ~ RNDVSN4 ~ RNDVSN5 ~ RNDVSN6 ~ RNDVSN7 ~ RNDVSN8 ~ RNDVSN9 ~ RNDVSN10 ~ 
(MENU) BRANCH VAR)

MASS FRACTIONS

{GOTO} TABLE " (END) (DOWN)(DOWN)50 " (RIGHT)
MASSESFRAX = " (RIGHT)/RNCVSRCID = " (RIGHT)/RNCMF1 = " (RIGHT)/RNCMF2 = " (RIGHT)/RNCMF3 = " (RIGHT)/RNCMF4 = " (RIGHT)/RNCMF5 = " (RIGHT)/RNCMF6 = " (RIGHT)/RNCMF7 = " (RIGHT)/RNCMF8 = " (RIGHT)/RNCMF9 = " (RIGHT)/RNCMF10 = " 
(RECOMMENTS) ~
(GOTO) COMMENTS ~
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION " (DOWN)(DOWN)
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE MASS FRACTIONS APPLY. " (DOWN)(DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED " (DOWN)
BY A DASH, i.e. STACK1 - STACK10. (NOTE NO SPACES BETWEEN ID'S) " (DOWN)
(GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE : ",VSRCID) 
(RECOMMENTS) " (GOTO) COMMENTS ~
INPUT MASS FRACTION (NUMBER BETWEEN 0 AND 1) " (DOWN)(DOWN)
FOR EACH OF THE CATEGORIES (MAXIMUM OF 20) " (DOWN)(DOWN)
THE MASS FRACTIONS MUST SUM TO 1.0 (+ OR - 2%) "(DOWN) (DOWN)
THE NUMBER OF CATEGORIES MUST AGREE FOR EACH OF THE 3 KEYWORDS "(DOWN) (DOWN)
AN ENTRY OF "0" FOR ANY CATEGORY WILL RETURN THE USER TO THE VARIABLE MENU "(DOWN)

(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 1: ', MF1)
(IF MF1=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 2: ', MF2)
(IF MF2=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 3: ', MF3)
(IF MF3=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 4: ', MF4)
(IF MF4=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 5: ', MF5)
(IF MF5=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 6: ', MF6)
(IF MF6=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 7: ', MF7)
(IF MF7=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 8: ', MF8)
(IF MF8=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 9: ', MF9)
(IF MF9=0) (BRANCH C478)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 10: ', MF10)
(IF MF10=0) (BRANCH C478)
(GOTO) J18 "(END) (DOWN)

(ONGO) (END) (DOWN)

(MASSFRAC "(RIGHT) /RNCVSRCID1 " "(RIGHT) /RNCMF11 " "(RIGHT) /RNCMF12 " "(RIGHT) /RNCMF13 " "(RIGHT) /RNCMF14 " "(RIGHT) /RNCMF15 " "(RIGHT) /RNCMF16 " "(RIGHT) /RNCMF17 " "(RIGHT) /RNCMF18 " "(RIGHT) /RNCMF19 " "(RIGHT) /RNCMF20 " "CVSRCID " VSRCID1 "

(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 11: ', MF11)
(IF MF11=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 12: ', MF12)
(IF MF12=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 13: ', MF13)
(IF MF13=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 14: ', MF14)
(IF MF14=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 15: ', MF15)
(IF MF15=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 16: ', MF16)
(IF MF16=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 17: ', MF17)
(IF MF17=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 18: ', MF18)
(IF MF18=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 19: ', MF19)
(IF MF19=0) (BRANCH C479)
(GETNUMBER 'ENTER THE MASS FRACTION FOR CATEGORY 20: ', MF20)

/RNDVSRCID1 /RNDMF11 /RNDMF12 /RNDMF13 /RNDMF14 /RNDMF15 /RNDMF16 /RNDMF17 /RNDMF18 /RNDMF19 /RNDMF20
REFLECTION COEFFICIENT

(GOTO) TABLE "(END) (DOWN) (DOWN) "SO " (RIGHT)
REPLACE " (RIGHT) RNDVSRID " " (RIGHT) RNDMF1 " " (RIGHT) RNDMF2 " " (RIGHT) RNDMF3 " " (RIGHT) RNDMF4 " " (RIGHT) RNDMF5 " " (RIGHT) RNDMF6 " " (RIGHT) RNDMF7 " " (RIGHT) RNDMF8 " " (RIGHT) RNDMF9 " " (RIGHT) RNDMF10

(MENUBRANCH VAR)

SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION " (DOWN) (DOWN)

USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE REFLECTION COEFFICIENTS APPLY. " (DOWN) (DOWN)

A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE IDS SEPARATED " (DOWN)

BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN IDS) " (DOWN)

(GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE : " VSRCID)

(RECOMMENTS) (GOTO) COMMENTS "

INPUT REFLECTION COEFFICIENT (NUMBER FROM 0 TO 1) " (DOWN) (DOWN)
FOR EACH OF THE CATEGORIES (MAXIMUM OF 20) " (DOWN) (DOWN)
A REFLECTION COEFFICIENT OF 1 INDICATES THAT ALL THE PLUME MATERIAL IS " (DOWN) (DOWN)
IS REFLECTED FROM THE SURFACE WITH NO DEPOSITION " (DOWN) (DOWN)
WHILE A COEFFICIENT OF 0 INDICATES THAT ALL THE PLUME MATERIAL IS COMPLETELY REMOVED WHEN IT REACHES THE SURFACE. " (DOWN) (DOWN)

THE NUMBER OF CATEGORIES MUST AGREE FOR EACH OF THE 3 KEYWORDS " (DOWN) (DOWN)
AN ENTRY OF 2 FOR ANY CATEGORY WILL RETURN THE USER TO THE VARIABLE MENU " (DOWN)

(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 1 : " RF1)
(IF RF1 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 2 : " RF2)
(IF RF2 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 3 : " RF3)
(IF RF3 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 4 : " RF4)
(IF RF4 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 5 : " RF5)
(IF RF5 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 6 : " RF6)
(IF RF6 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 7 : " RF7)
(IF RF7 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 8 : " RF8)
(IF RF8 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 9 : " RF9)
(IF RF9 = 2) (BRANCH D482)
(GETNUMBER "ENTER THE REFLECTION COEFFICIENT FOR CATEGORY 10 : " RF10)
(IF RF10 = 2) (BRANCH D482)

(GOTO) J18 " (END) (DOWN) (DOWN)
REPLACE " (RIGHT) RNDVSRID " " (RIGHT) RNCVRID " " (RIGHT) RNCRF1 " " (RIGHT) RNCRF11 " " (RIGHT) RNCRF12 " " (RIGHT) RNCRF13 " " (RIGHT) RNCRF14
SOURCE MENU
RETURN TO SOURCE MENU

{MENUBRANCH VAR}
GRID
Select cartesian or polar grid system

RECOMMENTS ~
{GOTO}COMMENTS ~

PROGRAM WILL ALLOW 5 GRIDDED RECEPTOR NETWORKS OF EITHER (OR BOTH) ~ (DOWN) (DOWN)
TYPES IN A SINGLE RUN, PLUS DISCRETE RECEPTORS OF EITHER TYPE. ~ (DOWN)

{MENU}BRANCH (GRID)

DISCRETE CARTESIAN
Select discrete receptor with cartesian coordinates

{GOTO}TABLE ~ (END) (DOWN) (DOWN) 'RE ~ (RIGHT) DISCART ~ (RIGHT) RNCXCOORD ~ (RIGHT) RNCYCOORD ~

{GET}NUMBER 'ENTER X COORDINATE OF RECEPTOR (IN METERS): 'XCOORD' ~ RNDXCOORD ~

{GET}NUMBER 'ENTER Y COORDINATE OF RECEPTOR (IN METERS): 'YCOORD' ~ RNDYCOORD ~

{RIGHT) RNCX ~ ' ' (GET) NUMBER 'ENTER RECEPTOR ELEVATION IF REQUIRED: 'XE) ~

{if XE=0) (branch B537) ~

{RIGHT)RNCX ~ (RIGHT) RNDX ~

{GET}NUMBER 'ENTER RECEPTOR FLAGPOLE HEIGHT IF REQUIRED: 'XE) ~ RNDX ~

{if XE=0) (branch B537) ~

{MENU}BRANCH RE

DISCRETE POLAR
Select discrete receptor with polar coordinates

{GOTO}TABLE ~ (END) (DOWN) (DOWN) 'RE ~ (RIGHT) DISPOLR ~ (RIGHT) RNCSRCID ~ (RIGHT) RNCDIST ~ (RIGHT) RNCDDIR ~

{GET}LABEL 'ENTER ALPHANUMERIC SOURCE ID TO DEFINE ORIGIN OF POLAR RECEPTOR LOCATION: 'SRCID) ~ RNDSRCID ~

{GET}NUMBER 'ENTER DISTANCE TO RECEPTOR (IN METERS): 'DIST) ~ RNDDIST ~

{GET}NUMBER 'ENTER DIRECTION TO RECEPTOR (IN DEGREES - CLOCKWISE FROM NORTH): 'DIR) ~ RNDDIR ~

{RIGHT) RNCX ~ ' ' (GET) NUMBER 'ENTER RECEPTOR ELEVATION (IF REQUIRED): 'XE) ~

{if XE=0) (branch B537) ~

{RIGHT)RNCX ~ (RIGHT) RNDX ~

{GET}NUMBER 'ENTER RECEPTOR FLAGPOLE HEIGHT IF REQUIRED: 'XE) ~ RNDX ~

{if XE=0) (branch B537) ~

{MENU}BRANCH RE

PLANT BOUNDARY
Defines receptor locations for plant boundary

{GOTO}TABLE ~ (END) (DOWN) (DOWN) 'RE ~ (RIGHT) BOUNDARY ~ (RIGHT) RNCSRCID ~ (RIGHT) RNCDDIST ~ (RIGHT) RNCDDIST1 ~

{RIGHT) RNCDDIST2 ~ (RIGHT) RNCDDIST3 ~ (RIGHT) RNCDDIST4 ~ (RIGHT) RNCDDIST5 ~ (RIGHT) RNCDDIST6 ~

{GET}LABEL 'ENTER ALPHANUMERIC SOURCE ID TO DEFINE ORIGIN OF POLAR RECEPTOR LOCATION: 'SRCID)

{GET}NUMBER 'ENTER 1ST DISTANCE TO RECEPTOR (IN METERS): 'DIST1) ~ RNDDDIST1 ~

{GET}NUMBER 'ENTER NEXT DISTANCE TO RECEPTOR (IN METERS): 'DIST2) ~ RNDDDIST2 ~

{GET}NUMBER 'ENTER NEXT DISTANCE TO RECEPTOR (IN METERS): 'DIST3) ~ RNDDDIST3 ~

{GET}NUMBER 'ENTER NEXT DISTANCE TO RECEPTOR (IN METERS): 'DIST4) ~ RNDDDIST4 ~

{GET}NUMBER 'ENTER NEXT DISTANCE TO RECEPTOR (IN METERS): 'DIST5) ~ RNDDDIST5 ~

{GET}NUMBER 'ENTER NEXT DISTANCE TO RECEPTOR (IN METERS): 'DIST6) ~ RNDDDIST6 ~

{GOTO}NUM ~ (EDIT) +1 ~
GRID

GRID CARTESIAN

Select Cartesian grid system

GRID POLAR

Select Polar coordinate system

QUIT

Return to main menu

GO TO TABLE ~ (END) (DOWN) (DOWN) "RE ~ " (RIGHT) FINISHED ~

MENUBRANCH FUNCTION
POLAR
Select POLAR coordinate grid system

(GOTO) TABLE ~ (END) (DOWN) (DOWN) "RE ~ (RIGHT) GRIDPCL ~ (RIGHT) RNCGRIDID ~ (RIGHT) STA ~

(GETLABEL "ENTER GRID ID (UP TO 8 ALPHANUMERIC CHARACTERS: "GRIDID)"

(MENU/BRANCH GRID2)

<table>
<thead>
<tr>
<th>INCREMENTS</th>
<th>X-POINTS</th>
<th>Y-POINTS</th>
<th>ELEVATIONS</th>
<th>FLAGPOLE</th>
<th>NEW NETWORK</th>
<th>END</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-POINTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Uniform grid network generated from X & Y increments

(GOTO) TABLE ~ (END) (DOWN) (DOWN) "RE ~ (RIGHT) GRIDPCL ~ (RIGHT) RNCGRIDID ~ (RIGHT) XY INC ~

/GRIDID "GRIDID2 ~ RNDGRIDID2 ~"

(RIGHT) RNCXINIT ~ (RIGHT) RNCXNUM ~ (RIGHT) RNCXDELTA ~ (RIGHT) RNCYINIT ~ (RIGHT) RNCYNUM ~ (RIGHT) RNCYDELTA ~

(GETNUMBER ENTER STARTING X LOCATION (IN METERS): "XINIT")

(GETNUMBER ENTER NUMBER OF X-AXIS RECEPTORS: "XNUM")

(GETNUMBER ENTER SPACING (IN METERS) BETWEEN X-AXIS RECEPTORS: "XDELTA")

(GETNUMBER ENTER STARTING Y LOCATION (IN METERS): "YINIT")

(GETNUMBER ENTER NUMBER OF Y-AXIS RECEPTORS: "YNUM")

(GETNUMBER ENTER SPACING (IN METERS) BETWEEN Y-AXIS RECEPTORS: "YDELTA")

/END

(MENU/BRANCH GRID2)

344
Y-POINTS
Grid network defined by series of discrete X & Y coordinates
(GOTO) TABLE ~ (END) (DOWN) (DOWN) RE ~ (RIGHT) GRIDCART ~ (RIGHT) RNCGRIDID2 ~ ~ (RIGHT) YPTS ~ (RIGHT) nqy ~ ~
/GRIDID ~ GRIDID2 ~ RNDGRIDID2 ~
(GETNUMBER 'ENTER FIRST Y COORDINATE (IN METERS): "GY) ~ RNDGy ~
(RIGHT) RNGY ~ ~ (GETNUMBER 'ENTER NEXT Y COORDINATE: "GY) ~ RNDGy ~
(getnumber 'Enter a 1 to continue with next Y coordinate or a 0 to quit , < <RISC2> > D565) ~
(if < <RISC2> > D565 = 0) (branch < <RISC2> > D562) ~
(branch D555)
(MENU BRANCH GRID2)

ELEVATIONS
Specify receptor elevations
(GOTO) TABLE ~ (END) (DOWN) (DOWN) RE ~ (RIGHT) GRIDCART ~ (RIGHT) RNCGRIDID2 ~ ~ (RIGHT) ELEV ~ (RIGHT) ncrw ~ ~ (right) nCEL ~ ~
/GRIDID ~ GRIDID2 ~ RNDGRIDID2 ~
(GETNUMBER 'ENTER ROW # FOR RECEP TORS (ROW = 1 IS SOUTHEST ROW): "row) ~ RNDrow ~
(GETNUMBER 'ENTER FIRST ELEVATION IN DESIGNATED ROW (IN METERS): "EL) ~ RNDCEL ~
(RIGHT) RNCCEL ~ ~ (GETNUMBER 'ENTER NEXT ELEVATION (IN METERS): "EL) ~ RNDCEL ~
(getnumber 'Enter a 1 to continue with next elevation in the row or a 0 to quit , < <RISC2> > E565) ~
(if < <RISC2> > E565 = 0) (branch < <RISC2> > E563) ~
(branch E555)
(MENU BRANCH GRID2)

FLAGPOLE
Specify flagpole receptor heights
(GOTO) TABLE ~ (END) (DOWN) (DOWN) RE ~ (RIGHT) GRIDCART ~ (RIGHT) RNCGRIDID2 ~ ~ (RIGHT) FLAG ~ (RIGHT) ncrw ~ ~ (right) nCFP ~ ~
/GRIDID ~ GRIDID2 ~ RNDGRIDID2 ~
(GETNUMBER 'ENTER ROW # FOR RECEP TORS (ROW = 1 IS SOUTHEST ROW): "row) ~ RNDrow ~
(GETNUMBER 'ENTER FIRST FLAGPOLE HEIGHT FOR DESIGNATED ROW (IN METERS): "fp) ~ RNDfp ~
(RIGHT) RNCFP ~ ~ (GETNUMBER 'ENTER NEXT FLAGPOLE HEIGHT (IN METERS): "FP) ~ RNDfp ~
(getnumber 'Enter a 1 to continue with next flagpole height in the row or a 0 to quit , < <RISC2> > F565) ~
(if < <RISC2> > F565 = 0) (branch < <RISC2> > F563) ~
(branch F555)
(MENU BRANCH GRID2)

NEW NETWORK
Specify new Grid network
(GOTO) TABLE ~ (END) (DOWN) (DOWN) RE ~ (RIGHT) GRIDCART ~ (RIGHT) RNCGRIDID2 ~ ~ (RIGHT) END ~
/GRIDID ~ GRIDID2 ~ RNDGRIDID2 ~
(MENU BRANCH GRID)

END
RETURN TO MAIN RECEPTOR MENU
(MENU BRANCH RE)
GAID3

ORIGIN

I DI$'r~CJlS

!Fcfyai.iI1oftb: Po'" ~*>dE

Spcfydillmc, b po. actwa'it

'J J>JSCRBTB DIll
!Fcfydic~1e

I OBNli~TIlD

a.

faBvAnQNS'

dRctialradillltrpo'" SpcfyGael'lleddftctiauadia. !Specify~eplOreh.tioat

~OPOl,.B
Spcfy fIIJPderecptorbeitba

INBW NBTWOK I BHD
Spcfy~wGiclaclWtrk

lUrrLRNTO MAIN

PTOR

~NU

(GOTO) TABLE-{ END}{DOWN} { D( GOTO) TABLE -{ END}{DOWN}{ 0« GOTO) TABLE -{ END}{DOWN}{ 0« GOTO) TABLE -(END}{DOWN{ GOTO) TABLE, END}{DOWN}{DOW{ GOTO) TABLE -{ END}{DOWN}{ DOWN {GOTO) TABLE-{ END} {O{ GOTO} TABLE -{ EN }{DOWN} ( DOW!'f"R

"lCGRfaD-GRIDlD2-~~R)DID2-

.cGRlaD-GRfDlD2-,R~GR)aD-GRIDfD2

{RIGHI') ~NfT- -{ RIGtn'),q GBTNUMBBR -eNTER DISTANCE 1l GETNUMBER"'ENTERF IRST DIRE (GETNUMBER "'ENTER NUMBE{GBTNlNBEIl-eNTER DIRBCI'ION T« OBTNUMBBR "ENTER DIRBCTION TO B( ME~RANCH GRIr.t

{ ~NUBRArcH Ra

{OETNUMBER "ENTER X OOORa ( RIGtn') ItNCRING - -{ OBTNUMBl RIOHIl ~DIR - - (OBTNUMBE (OBTNl.JMBER "ENTER STARTI{OBTNUoIBEIl"BNTERF IRST BLEVAT( OBTNUMBER "'ENTERF IRSTF LAG POLE t£lGHTF OR DeSIGNATED ARRAY (I N
{OBTNUMBE!R"'ENTER Y OOORDI (F !Dumber "&:ller.1 to ocotml.e with nc(F !Dumber 'EDler.1
~DXlNfT-,RN>YINfT-

{t.£NUBRAlCH GRID'

to ocotiDl.e with DC( OBTNUM8I3R "EHT'BR1NCRB(RIOHIl ~EV-

(ifNUM-~(trueb dS71) -

{if NUM-cHtrmcb cS77} (traDCb cS7l

(traDCb ~

{MENUBR.AN:HGRIO'

{NENlJBRAlCHGRID~

{MBNUBRAlCH GRID~

-{ GBTNUMBE{ RIGtm.RNCI3L - - (GETNUMBE!R "ENTER NEXTFLAGPOLE I£IGHT (IN NElmS):

(F!Dumber "&:lieU 1 toCODtiDl.e with Dell (F !Dumber '&ler.l to ooctinl.e With DeXl 0aaP* belahllD tb: rOll/or. 0 toqull -, NUM){if NUM-(4{ traDCb fS7tt {if NUM-(4{ traaeb G51tt {traDCb fS7-4

{traDCb 051-4

{MBNUBRAlCH GRID~

(MENUBRAH:H GRID~

OOIGIN
SpecifY crigin of the Polar network

{G01O}TABLE - {END} {OOWNHDOWN}''RE - {RKJHTIGRIDPOLR - {RKJHTI/RNCGRIDID2 - - {RIGHT}ORIGICGRIDID -GRIDID2 - /RNOORIDID2{RKJHT}/RNCXINIT - ,.., {RKJHT}/RNCYINIT - {GET~MBER ''ENTER X COORDINATE roR ORIGIN OF POLAR NETWORK: ",XINIT}{GET~MBER'ENTER Y COORDINATE roR ORIGINOF POLAR NETWORK: '\YINIT}/RNDXINIT - /RNDYINIT {~NUBRANrn

GRID3}

VJ
~
~

DISTANCES
SpecifY dis tances foc polar network

{GOlO}TABLE"" {END} {OOWNHDOWN}''RE - {RKJHTIGRIDPOLR - {RKJHT}/RNffiRIDID2 - - {RIGHT}Dlsr- {RKJHT}/RNCRING - /ffiRIDID -GRIDID2 -/RNOORIDID2{GETNUMBER ''ENTER DISTANCE 10 FIRST RING OF POLAR COORDINATES (IN METERS): ",RI~} -/RNDRING {RKiHT}IRNCRING - - {GETNUMBER 'ENTER DISTANCE 10 NEXT RING OF POLAR COORDINATES: ",RING} -IRNDRING ,..,
{GETLABEL "00 YOU WANfTO OONTINUE WfIH MOlHER RI~ (Y cr N)? ",NUM}{if NUM="N"}{lranchc577} {branch c573}
{MBNUBRANOI GRID3}

DlSCFETE DlA
SpecifY discrete direction radials fa polar netwcrk

{GOlO}TABLE - {END} {OOWNHDOWN}''RE - {RIGHTIGRIDPOLR - {RKJHTI/RNffiRIDID2 - - {RIGHT}DDIR - {RKiHT}/RNCDIR - /ffiRIDID -GRIDID2 -/RNOORIDID2 {GET~ MBER ''ENTER FIRST DIRECTION RADIAL IN DEGREES (110 360): ",DIR} -/RNDDIR {RKiHT}/RNCDIR - - {GETNUMBffi ''ENTER NEXT DIRECTION RADIAL IN DEGREES (1 10 360): ",oIR} -IRNDDIR {GETLABEL "00 YOU WISH 10 OONTINUE WIlH lHENEXT DIRECfDN RADIAL(Y cr N) ? ",NUM}{if NUM = "N"} {lranch d577} {branch d573}
{MBNUBRANOI GRID3}

,tUI>GRIDID2): -, ZJILNi} - ,RND2
LA~

-

~ND2FLAG

'


GENERATED DIR
Specify generated direction radii for polar network
(GOTO) TABLE ~ (END) (DOWN) (DOWN) "RE ~ (RIGHT) GRIDPOLR ~ (RIGHT) RNCGRIDL2 ~ ~
(RIGHT) GDIR ~ (RIGHT) RNCDIR ~ ~ (RIGHT) RNCDIR ~ ~ (RIGHT) RNCDIRINC ~ ~
/RGRIDID ~ GRIDID2 ~ RNDGRID2 ~
(GETNUMBER 'ENTER NUMBER OF DIRECTIONS USED TO DEFINE POLAR GRID: ', NUM) ~ /RNDNUM ~
(GETNUMBER 'ENTER STARTING DIRECTION OF THE POLAR GRID: ', DIRIN1) ~ /RNDDIRIN1 ~
(GETNUMBER 'ENTER INCREMENT (IN DEGREES) FOR DEFINING DIRECTIONS: ', DIRINC) ~ /RNDDIRINC ~
{MENU BRANCH GRID3}

ELEVATIONS
Specify receptor elevations
(GOTO) TABLE ~ (END) (DOWN) (DOWN) "RE ~ (RIGHT) GRIDPOLR ~ (RIGHT) RNCGRIDL2 ~ ~
/RGRIDID ~ GRIDID2 ~ RNDGRID2 ~
(GETNUMBER 'ENTER DIRECTION TO BE INPUT: ', DIR) ~ /RNDDIR ~
(GETNUMBER 'ENTER FIRST ELEVATION IN DESIGNATED RECEPTOR ARRAY (IN METERS): ', ZELEV) ~ /RNDZELEV ~
(RIGHT) RNCELEV ~ ~ (GETNUMBER 'ENTER NEXT ELEVATION (IN METERS): ', ZELEV) ~ /RNDZELEV ~
(GETLABEL 'DO YOU WISH TO CONTINUE WITH NEXT ELEVATION IN THE ARRAY (Y or N)? ', NUM) ~
{if NUM="N" } (branch G578) ~
(branch G574)
{MENU BRANCH GRID3}

FLAGPOLE
Specify flagpole receptor heights
(GOTO) TABLE ~ (END) (DOWN) (DOWN) "RE ~ (RIGHT) GRIDPOLR ~ (RIGHT) RNCGRIDL2 ~ ~
/RGRIDID ~ GRIDID2 ~ RNDGRID2 ~
(GETNUMBER 'ENTER DIRECTION TO BE INPUT: ', DIR) ~ /RNDDIR ~
(GETNUMBER 'ENTER FIRST FLAGPOLE HEIGHT FOR DESIGNATED ARRAY (IN METERS): ', ZFLAG) ~ /RNDZFLAG ~
(RIGHT) RNCELEG ~ ~ (GETNUMBER 'ENTER NEXT FLAGPOLE HEIGHT (IN METERS): ', ZFLAG) ~ /RNDZFLAG ~
(GETLABEL 'DO YOU WISH TO CONTINUE WITH NEXT FLAGPOLE HEIGHT IN ROW (Y or N)? ', NUM) ~
{if NUM="N" } (branch G578) ~
(branch G574)
{MENU BRANCH GRID3}

NEW NETWORK
Specify new Grid network
(GOTO) TABLE ~ (END) (DOWN) (DOWN) "RE ~ (RIGHT) GRIDPOLR ~ (RIGHT) RNCGRIDL2 ~ ~ (RIGHT) END ~
/RGRIDID ~ GRIDID2 ~ RNDGRID2 ~
{MENU BRANCH GRID}
FILENAME

<table>
<thead>
<tr>
<th>FILENAME</th>
<th>HEIGHT</th>
<th>STATION</th>
<th>PERIOD</th>
<th>DATA</th>
<th>RETURN</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFY FILENAME and format information for input file</td>
<td>SPECIFY LOCATION SPECIFY FILENAME and format information for input file</td>
<td>SPECIFY LOCATION SPECIFY FILENAME and format information for input file</td>
<td>SPECIFY LOCATION SPECIFY FILENAME and format information for input file</td>
<td>SPECIFY LOCATION SPECIFY FILENAME and format information for input file</td>
<td>SPECIFY LOCATION SPECIFY FILENAME and format information for input file</td>
</tr>
</tbody>
</table>

FILENAME

Specify filename and format information for input file

(QUIT)"TABLE " (END)"DOWN)" RE " (RIGHT)"GRIDPOLR " (RIGHT)"GRIDID2 " (RIGHT)"END " (RIGHT)"GRIDID2 " (RIGHT)"GRIDID2 "

(MENUBRANCH RE)

348
HEIGHT
Specify anemometer height above ground
(QUIT) TABLE ~(END) (DOWN) (DOWN) "ME ~(RIGHT) ANEM HGT ~(RIGHT) RNCZREF ~(RIGHT) RNCZRUNIT ~
(GETNUMBER "ENTER HEIGHT OF ANEMOMETER ABOVE GROUND IN METERS OR FEET: " ZREF ~
(GETLABEL "ENTER UNITS OF MEASURE ME FOR ANEMOMETER HEIGHT (METERS OR FEET): " ZRUNIT ~
(RNDZREF "RNDZRUNIT ~
(MENU BRANCH ME)

STATION
Specify meteorological station information
(QUIT) TABLE ~(END) (DOWN) (DOWN) "ME ~(RIGHT) RNCSTATION ~
(RIGHT) RNCSTANUM ~(RIGHT) RNCYEAR ~(RIGHT) RNCNAME ~(RIGHT) RNCXCOORD ~(RIGHT) RNCYCOORD ~
(MENU CALL DATA2)
(GETNUMBER "ENTER 5 DIGIT WBAN NUMBER FOR NWS STATIONS: " STANUM ~
(GETNUMBER "ENTER YEAR FOR WHICH DATA IS BEING PROCESSED (2 OR 4 DIGITS): " YEAR ~
(GETLABEL "ENTER NAME OF STATION (OPTIONAL - UP TO 40 CHARACTERS): " NAME ~
(GETNUMBER "ENTER X COORDINATE FOR LOCATION OF STATION (OPTIONAL): " XCOORD ~
(GETNUMBER "ENTER Y COORDINATE FOR LOCATION OF STATION (OPTIONAL): " YCOORD ~
(IF XCOORD = 0) (BLANK XCOORD)
(IF YCOORD = 0) (BLANK YCOORD)
(RNDSTATION "RNDSTANUM "RNDYEAR "RNDNAME "RNCXCOORD "RNCYCOORD ~
(MENU BRANCH ME)

PERIOD
Specify period within meteorological data file to process
(IF <<RISC2>> TERM = 1) (MENU BRANCH PERIOD)
(MENU BRANCH STARDAT)

DATA
Specifies data variations or adjustments
(MENU BRANCH DATA)

RETURN
Return to main function menu
(QUIT) TABLE ~(END) (DOWN) (DOWN) "ME ~(RIGHT) FINISHED ~
(MENU BRANCH FUNCTION)
BLANK
Specifies default format
(BLANK FORM)
/RNDMETFIL "-RNDFORM -"
(menubranch ME)

READ
Specify Fortran read format
{GETLABEL "INPUT FORTRAN "READ" FORMAT WITHIN( ) (SEE PG 3-53): "FORM"
/RNDMETFIL "-RNDFORM -"
(menubranch ME)

FREE
use free formatted READS
(LET FORM,FREE)
/RNDMETFIL "-RNDFORM -"
(menubranch ME)

UNIFORM
Use unformatted file
(LET FORM,UNFORM)
/RNDMETFIL "-RNDFORM -"
(menubranch ME)

CARD
use "Card image" data
(LET FORM,CARD)
/RNDMETFIL "-RNDFORM -"
(menubranch ME)

RETURN
Return to main ME menu
(menubranch ME)

<table>
<thead>
<tr>
<th>SUBRDATA</th>
<th>SUBRDATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifies value in one or organization</td>
<td>Specifies upper or integration</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>STATION</td>
<td>SUBRDATA</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**SURFDATA**
Specifies surface meteorological station
(let STATION.SURFDATA)  
(BRANCH D587)

**UAIRDATA**
Specifies upper air station  
(let STATION.UAIRDATA)  
(BRANCH D587)

**STARDATA**
Define STAR meteorological data summaries (OPTIONAL)  
(GOTO) TABLE ~ (END) (DOWN) (DOWN)'ME ~ (RIGHT) STARDATA ~  
(MENUCALL III)  
(MENU BRANCH ME)

**RETURN**
RETURN TO PREVIOUS MENU  
(MENU BRANCH ME)

**PERIOD1**
<table>
<thead>
<tr>
<th>START DATE</th>
<th>START HOUR</th>
<th>END DATE</th>
<th>END HOUR</th>
<th>DAY RANGE</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify start date for period</td>
<td>Specify start hour for period</td>
<td>Specify start date for period</td>
<td>Specify start hour for period</td>
<td>Specify start date for period</td>
<td>Specify start hour for period</td>
</tr>
</tbody>
</table>

**START DATE**
Specify start date for period  
(GOTO) TABLE ~ (END) (DOWN) (DOWN)'ME ~ (RIGHT) STARTEND ~ (RIGHT) RNCSTART ~  
(GETLABEL 'ENTER START DATE FOR PERIOD TO BE PROCESSED (YR MD DA): "START)  
(MENU BRANCH PERIOD1)

**START HOUR**
Specify start hour for period  
(GOTO) TABLE ~ (END) (END) (RIGHT) (RIGHT) RNCSTHR ~  
(GETLABEL 'ENTER START HOUR (1-24) FOR THE START DATE TO BE PROCESSED: "STHR)
END DATE

(GOTO) TABLE ~ (END) (DOWN) (END) (RIGHT) (RIGHT) RNCSTOP ~ ~

(QUIT)

END HOUR

(GOTO) TABLE ~ (END) (DOWN) (END) (RIGHT) (RIGHT) RNCSTHR ~ ~

(QUIT)

DAY RANGE

Specify day or range of days to process

(GOTO) TABLE ~ (END) (DOWN) (DOWN) "ME ~ (RIGHT) DAY RANGE ~ (RIGHT) RNC RANGE ~ ~

(GETLABEL "ENTER DAY (1 2 3 ETC) OR RANGE OF DAYS (1-5) : " RANGE ~

(MENUBRANCH ME)

QUIT

(MENUBRANCH ME)

DATA

WIND ALIGNMENT  WIND SPEED  EXONENTS  TEMP GRAD  LONG TERM DATA  RETURN

Adjust wind direction alignment

(WIND ALIGNMENT)

(GOTO) TABLE ~ (END) (DOWN) (DOWN) "ME ~ (RIGHT) WD ROTATE ~ (RIGHT) RNC R TANG ~ ~

(GETLABEL "ENTER VALUE TO BE SUBTRACTED FROM WIND DIRECTION MEASUREMENTS: " ROTANG ~

(RANDROTANG ~

(MENUBRANCH DATA)
WIND SPEED
Wind speed categories

(GOTO) TABLE ~ (END) (DOWN) (DOWN) "ME ~ (RIGHT) WINDCATS ~
(RIGHT) RNCWS1 ~ (RIGHT) RNCWS2 ~ (RIGHT) RNCWS3 ~ (RIGHT) RNCWS4 ~ (RIGHT) RNCWS5 ~
(GETNUMBER 'ENTER UPPER BOUNDARY WIND SPEED (M/S) FOR 1ST CATEGORY: ', WS1)
(GETNUMBER 'ENTER UPPER BOUNDARY WIND SPEED (M/S) FOR 2ND CATEGORY: ', WS2)
(GETNUMBER 'ENTER UPPER BOUNDARY WIND SPEED (M/S) FOR 3RD CATEGORY: ', WS3)
(GETNUMBER 'ENTER UPPER BOUNDARY WIND SPEED (M/S) FOR 4TH CATEGORY: ', WS4)
(GETNUMBER 'ENTER UPPER BOUNDARY WIND SPEED (M/S) FOR 5TH CATEGORY: ', WS5)
/RNDWS1 ~ /RNDWS2 ~ /RNDWS3 ~ /RNDWS4 ~ /RNDWS5 ~

{MENU BRANCH DATA}

EXONENTS
Specify wind profile exponents

(GOTO) TABLE ~ (END) (DOWN) (DOWN) "ME ~ (RIGHT) WINDPROF ~ (RIGHT) RNCSTAB ~
(RIGHT) RNCWP1 ~ (RIGHT) RNCWP2 ~ (RIGHT) RNCWP3 ~ (RIGHT) RNCWP4 ~ (RIGHT) RNCWP5 ~
(GETLABEL 'ENTER DESIGNATION (A-FOR 1-6) FOR STABILITY CATEGORY TO FOLLOW: ', STAB)
(GETNUMBER 'ENTER WIND PROFILE EXPONENT FOR 1ST CATEGORY: ', WP1)
(GETNUMBER 'ENTER WIND PROFILE EXPONENT FOR 2ND CATEGORY: ', WP2)
(GETNUMBER 'ENTER WIND PROFILE EXPONENT FOR 3RD CATEGORY: ', WP3)
(GETNUMBER 'ENTER WIND PROFILE EXPONENT FOR 4TH CATEGORY: ', WP4)
(GETNUMBER 'ENTER WIND PROFILE EXPONENT FOR 5TH CATEGORY: ', WP5)
(GETNUMBER 'ENTER WIND PROFILE EXPONENT FOR 6TH CATEGORY: ', WP6)

{MENU BRANCH DATA}

TEMP GRAD
Specify vert. potential temp gradients

(GOTO) TABLE ~ (END) (DOWN) (DOWN) "ME ~ (RIGHT) THETADZ ~ (RIGHT) RNCSTAB ~
(RIGHT) RNCDDT1 ~ (RIGHT) RNCDDT2 ~ (RIGHT) RNCDDT3 ~ (RIGHT) RNCDDT4 ~ (RIGHT) RNCDDT5 ~
(GETLABEL 'ENTER DESIGNATION (A-FOR 1-6) FOR STABILITY CATEGORY TO FOLLOW: ', DTDZ)
(GETNUMBER 'ENTER VERTICAL POTENTIAL TEMP GRADIENT FOR 1ST CATEGORY: ', DTDZ1)
(GETNUMBER 'ENTER VERTICAL POTENTIAL TEMP GRADIENT FOR 2ND CATEGORY: ', DTDZ2)
(GETNUMBER 'ENTER VERTICAL POTENTIAL TEMP GRADIENT FOR 3RD CATEGORY: ', DTDZ3)
(GETNUMBER 'ENTER VERTICAL POTENTIAL TEMP GRADIENT FOR 4TH CATEGORY: ', DTDZ4)
(GETNUMBER 'ENTER VERTICAL POTENTIAL TEMP GRADIENT FOR 5TH CATEGORY: ', DTDZ5)
(GETNUMBER 'ENTER VERTICAL POTENTIAL TEMP GRADIENT FOR 6TH CATEGORY: ', DTDZ6)
/RNDSTAB ~ /RNDDTD1 ~ /RNDDTD2 ~ /RNDDTD3 ~ /RNDDTD4 ~ /RNDDTD5 ~ /RNDDTD6 ~

{MENU BRANCH DATA}

LONG TERM DATA
Optional long term data adjustments

{MENU BRANCH DATA}
RETURN
Return to main ME menu
(menu branch ME)

DATA1

<table>
<thead>
<tr>
<th>WIND SPEED</th>
<th>AVERAGE TEMPS</th>
<th>MIXING HEIGHTS</th>
<th>RETURN</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFY MEDIAN WIND SPEED FOR EACH WIND-SPEED CATEGORY</td>
<td>SPECIFY AVERAGE AMBIENT TEMPERATURES FOR THE PERIOD TO BE AVERAGED (SPRING, FALL, ETC)</td>
<td>SPECIFY AVERAGE MIXING HEIGHTS FOR EACH STABILITY CATEGORY</td>
<td>RETURN TO MAIN ME MENU</td>
</tr>
</tbody>
</table>

(WIND SPEED)
Specify median Wind speed for each wind-speed category

(AVERAGE TEMPS)
Specify average ambient temperatures for the period to be averaged (Spring, Fall, etc)

(MIXING HEIGHTS)
Specify average mixing heights for each stability category

(Return to main ME menu)

(WINDSPEE)" (END) "(DOWN) ME " (RIGHT) "WINDCATS "
(RIGHT) "RCW1 " ~ (RIGHT) "RCW2 " ~ ~ (RIGHT) "RCW3 " ~ ~ (RIGHT) "RCW4 " ~ ~ (RIGHT) "RCW5 " ~ ~ (RIGHT) "RCW6 " ~
(GETNUMBER "ENTER MEDIAN WIND SPEED (MS) FOR 1ST CATEGORY: ",WS1"
(GETNUMBER "ENTER MEDIAN WIND SPEED (MS) FOR 2ND CATEGORY: ",WS2"
(GETNUMBER "ENTER MEDIAN WIND SPEED (MS) FOR 3RD CATEGORY: ",WS3"
(GETNUMBER "ENTER MEDIAN WIND SPEED (MS) FOR 4TH CATEGORY: ",WS4"
(GETNUMBER "ENTER MEDIAN WIND SPEED (MS) FOR 5TH CATEGORY: ",WS5"
(GETNUMBER "ENTER MEDIAN WIND SPEED (MS) FOR 6TH CATEGORY: ",WS6"
(RNDWS1) ~ (RNDWS2) ~ (RNDWS3) ~ (RNDWS4) ~ (RNDWS5) ~ (RNDWS6)
(MENUBRANCH DATA1)

(AVERAGE TEMPS)
Specify average ambient temperatures

(AVTEMPS)

(GETLABEL "ENTER KEYWORD FOR THE PERIOD TO BE AVERAGED (SPRING, FALL, ETC): ",AVEPER"
(GETNUMBER "ENTER THE AVERAGE AMBIENT TEMPERATURE FOR 1ST CATEGORY: ",TA1"
(GETNUMBER "ENTER THE AVERAGE AMBIENT TEMPERATURE FOR 2ND CATEGORY: ",TA2"
(GETNUMBER "ENTER THE AVERAGE AMBIENT TEMPERATURE FOR 3RD CATEGORY: ",TA3"
(GETNUMBER "ENTER THE AVERAGE AMBIENT TEMPERATURE FOR 4TH CATEGORY: ",TA4"
(GETNUMBER "ENTER THE AVERAGE AMBIENT TEMPERATURE FOR 5TH CATEGORY: ",TA5"
(GETNUMBER "ENTER THE AVERAGE AMBIENT TEMPERATURE FOR 6TH CATEGORY: ",TA6"
(RNDAVEPER) ~ (RNDTA1) ~ (RNDTA2) ~ (RNDTA3) ~ (RNDTA4) ~ (RNDTA5) ~ (RNDTA6)
(MENUBRANCH DATA1)
### MIXING HEIGHTS

Specify average values of mixing height

(GOTO) TABLE ~ (END) (DOWN) (DOWN) "ME " ~(RIGHT) "AVEMIXHT " ~(RIGHT) "RCNCAVEPER " ~(RIGHT) "RN CSTAB " ~(RIGHT) "RNCTA1 " ~(RIGHT) "RNCTA2 " ~(RIGHT) "RNCTA3 " ~(RIGHT) "RNCTA4 " ~(RIGHT) "RNCTA5 " ~(RIGHT) "RNCTA6 "

(GETLABEL "ENTER KEYWORD FOR THE PERIOD TO BE AVERAGED (SPRING, FALL, ETC): ") "AVEPER"

(GETLABEL "ENTER DESIGNATION (A FOR 1-6) DESIGNATION FOR STABILITY CATEGORY: ") "STAB"

(GETNUMBER "ENTER THE AVERAGE MIXING HEIGHTS (M) FOR 1ST CATEGORY: ") "TA1"

(GETNUMBER "ENTER THE AVERAGE MIXING HEIGHTS (M) FOR 2ND CATEGORY: ") "TA2"

(GETNUMBER "ENTER THE AVERAGE MIXING HEIGHTS (M) FOR 3RD CATEGORY: ") "TA3"

(GETNUMBER "ENTER THE AVERAGE MIXING HEIGHTS (M) FOR 4TH CATEGORY: ") "TA4"

(GETNUMBER "ENTER THE AVERAGE MIXING HEIGHTS (M) FOR 5TH CATEGORY: ") "TA5"

(GETNUMBER "ENTER THE AVERAGE MIXING HEIGHTS (M) FOR 6TH CATEGORY: ") "TA6"

RETURN

Return to main ME menu

(MENUBRANCH ME)

---

### PERIOD

Specify event period, data period and source group

(GOTO) TABLE ~(END) (DOWN) (DOWN) "EV " ~(RIGHT) "EVENTPER " ~(RIGHT) "RNCEVNAME " ~(RIGHT) "RNCAVEPER " ~(RIGHT) "RNCGRPID " ~(RIGHT) "RNCDATE "

(GETLABEL "ENTER EVENT NAME (ALPHANUMERIC STRING OF UP TO 8 CHARACTERS): ") "EVNAME"

(GETNUMBER "ENTER AVERAGING PERIOD FOR THE EVENT (IN HOURS): ") "AVEPER"

(GETLABEL "ENTER SOURCE GROUP ID ( MUST BE DEFINED ON PATHWAY): ") "GRPID"

(GETLABEL "ENTER DATE FOR ENDING HOUR OF EVENT (IN YYMMDDHH FORM): ") "DATE"

(RNDEVNAME " " RNDCAVEPER " " RNCGRPID " " RNNDATE "

(MENUBRANCH EV)

---

### CARTESIAN LOCATION

Specify event cartesian location information

(GOTO) TABLE ~(END) (DOWN) (DOWN) "EV " ~(RIGHT) "EVENTLOC " ~(RIGHT) "RNCEVNAME " ~(RIGHT) "RNCX " ~(RIGHT) "RNCY " ~(RIGHT) "RNCZELEV " ~(RIGHT) "RNCZFLAG "

(GETLABEL "ENTER EVENT NAME (ALPHANUMERIC STRING OF UP TO 8 CHARACTERS): ") "EVNAME"

(GETNUMBER "ENTER X-COORDINATE FOR EVENT LOCATION (IN METERS): ") "XR"
{GETNUMBER 'ENTER Y-COORDINATE FOR EVENT LOCATION (IN METERS): "YR}
/RNDEVNAME ~ /RNDXR ~ /RNDYR ~
(MENUBRANCH EV)

POLAR LOCATION
Specify event polar location information
(GOTO)TABLE ~ (END)~DOWN)~DOWN)~EV "(RIGHT)EVENTLOC ~(RIGHT)RNDEVNAME ~ ~(RIGHT)RNCX ~(RIGHT)RNCY ~(RIGHT)RNCZELEV ~(RIGHT)RNCZFLAG ~
(GETLABEL 'ENTER EVENT NAME (ALPHANUMERIC STRING OF UP TO 8 CHARACTERS): "EVNAME)
(GETNUMBER 'ENTER DISTANCE RANGE TO ORIGIN 0,0 FOR EVENT LOCATION (IN METERS): "XR)
(GETNUMBER 'ENTER RADIAL DIRECTION (DEGREES) FOR EVENT LOCATION: "YR)
/RNDEVNAME ~ /RNDXR ~ /RNDYR ~
(MENUBRANCH EV)

ELEVATION
Optional terrain elevation for event location
(GETNUMBER 'ENTER TERRAIN ELEVATION FOR EVENT LOCATION (IN METERS): "ZELEV)
/RNDEVNAME ~
(MENUBRANCH EV)

FLAGPOLE
Optional receptor height above ground for event location
(GETNUMBER 'ENTER RECEPCTOR HEIGHT FOR EVENT LOCATION (IN METERS): "Z FLAG)
/RNDEVNAME ~
(MENUBRANCH EV)

QUIT
RETURN TO MAIN FUNCTION MENU
(MENUBRANCH FUNCTION)

<table>
<thead>
<tr>
<th>TABULAR</th>
<th>SPECIAL PURPOSE</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select tabular output options</td>
<td>Select optional purpose output options</td>
<td>Return to location menu</td>
</tr>
<tr>
<td>IF &lt; &lt;RISC2&gt; &gt; TSM=1 (MENUBRANCH 0U1)</td>
<td>(GOTO)TABLE ~ (END)~DOWN)~DOWN &quot;OU&quot; ~(RIGHT)~FINISHED</td>
<td></td>
</tr>
<tr>
<td>MENUBRANCH 0U1</td>
<td>(MENUBRANCH 0U1)</td>
<td>(MENUBRANCH 0U4)</td>
</tr>
</tbody>
</table>

TABULAR
Select tabular output options
(IF < <RISC2> > TSM=1 (MENUBRANCH 0U1)
(MENUBRANCH 0U4)
SPECIAL PURPOSE
Select special purpose output options
(MENU/BRANCH OU3)

QUIT
Return to function menu
(GOTO) TABLE ~ (END) (DOWN) (DOWN) "OU ~ (RIGHT) FINISHED ~

(MENU/BRANCH function)

RECEPTOR TABLE
Specify output options for high value summary tables by receptor
(GOTO) TABLE ~ (END) (DOWN) (DOWN) "OU ~ (RIGHT) RECTABLE ~ (RIGHT) RNCAVEPER ~ ~
/RECOMMENTS ~ (GOTO) COMMENTS ~
THE SHORT TERM AVERAGING PERIOD IS THE PERIOD ~ (down) (down)
(i.e. 1, 3, 6, or 24 hrs OR MONTH) ~ (DOWN) (DOWN)
FOR WHICH THE RECEPTOR TABLE IS SELECTED. ~ (DOWN) (DOWN)
THE SECONDARY KEYWORDS "FIRST", "SECOND", "THIRD", "FOURTH", "FIFTH", "SIXTH" (OR "1ST", "2ND", "3RD" ETC) SPECIFY WHICH HIGH ~ (DOWN) (DOWN)
VALUES ARE TO BE SUMMARIZED BY RECEPTOR FOR THAT AVERAGING PERIOD. ~ (DOWN) (DOWN)
ENTERING THE KEYWORD "ALL" FOR THE SHORT TERM AVERAGING PERIOD. ~ (DOWN) (DOWN)
WILL APPLY THE SAME RECEPTOR TABLE OPTIONS TO ALL AVERAGING PERIODS ~
(GETLABEL "ENTER THE SHORT TERM AVERAGING PERIOD: "AVEPER)
/RNDAVEPER ~
(MENU/BRANCH OU2)

MAXIMUM VALUE TABLE
Specifies output options for overall maximum value summary tables
(GOTO) TABLE ~ (END) (DOWN) (DOWN) "OU ~ (RIGHT) MAXTABLE ~ (RIGHT) RNCAVEPER ~ (RIGHT) RNCMAXNUM ~ ~
/RECOMMENTS ~ (GOTO) COMMENTS ~
THE SHORT TERM AVERAGING PERIOD IS THE PERIOD ~ (down) (down)
(i.e. 1, 3, 6, or 24 hrs OR MONTH) ~ (DOWN) (DOWN)
FOR WHICH THE RECEPTOR TABLE IS SELECTED ~ (DOWN) (DOWN)
THE SECONDARY KEYWORD SPECIFIES THE NUMBER OF OVERALL MAXIMUM VALUES ~ (DOWN) (DOWN)
TO BE SUMMARIZED FOR EACH AVERAGING PERIOD. ~ (DOWN) (DOWN)
ENTERING THE KEYWORD "ALLAVE" FOR THE SHORT TERM AVERAGING PERIOD ~ (DOWN) (DOWN)
WILL APPLY THE SAME RECEPTOR TABLE OPTIONS TO ALL AVERAGING PERIODS ~
{GETLABEL "ENTER THE SHORT TERM AVERAGING PERIOD : ",AVEPER}
{GETNUMBER "ENTER THE NUMBER OF OVERALL MAXIMUM VALUES TO BE SUMMARIZED: ",MAXNUM}
{/ANDAVEPER}
{/MENUBRANCH OU1}

CONCURRENT VALUES
Options for tables of concurrent values - summarized by receptor daily
{GOTOTABLE ~ (END) (DOWN) (DOWN)"OU ~ (RIGHT)DAYTABLE ~
{/RECOMMENTS ~(GOTO)COMMENTS~
ENTERING THE KEYWORD "ALLAVE" FOR THE SHORT TERM AVERAGING PERIOD ~ (DOWN) (DOWN)
WILL APPLY THE SAME RECEPTOR TABLE OPTIONS TO ALL AVERAGING PERIODS ~
{/MENUBRANCH II}
{/MENUBRANCH OU1}

RETURN
Return to previous menu
{menubranch ou}

358

OU2

<table>
<thead>
<tr>
<th>FIRST</th>
<th>SECOND</th>
<th>THIRD</th>
<th>FOURTH</th>
<th>FIFTH</th>
<th>SIXTH</th>
<th>RETURN</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH VALUES TO BE SUMMARIES</td>
<td>HIGH VALUES TO BE SUMMARIES</td>
<td>HIGH VALUES TO BE SUMMARIES</td>
<td>HIGH VALUES TO BE SUMMARIES</td>
<td>HIGH VALUES TO BE SUMMARIES</td>
<td>RETURN TO PREVIOUS MENU</td>
<td></td>
</tr>
<tr>
<td>{GOTOTABLE} {END} (DOWN) (DOWN)</td>
<td>{END} (RIGHT) (RIGHT) FIRST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MENUBRANCH OU1</td>
<td>MENUBRANCH OU2</td>
<td>MENUBRANCH OU2</td>
<td>MENUBRANCH OU2</td>
<td>MENUBRANCH OU2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH VALUES TO BE SUMMARIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{GOTOTABLE} ~(END) (DOWN) (END) (RIGHT) (RIGHT) FIRST ~</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{MENUBRANCH OU2}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SECOND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH VALUES TO BE SUMMARIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{GOTOTABLE} ~(END) (DOWN) (END) (RIGHT) (RIGHT) SECOND ~</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{MENUBRANCH OU2}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>THIRD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH VALUES TO BE SUMMARIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{GOTOTABLE} ~(END) (DOWN) (END) (RIGHT) (RIGHT) THIRD ~</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>{MENUBRANCH OU2}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MAXIMUM VALUES

Produces files of all violations above a user-specified threshold

(GOTO) TABLE " (END) (DOWN) (DOWN) " (RIGHT) MAXFILE ~ " (RIGHT) RNCVEAPE ~ 
(RIGHT) RNCGRPID ~ " (RIGHT) RNC THRESH ~ " (RIGHT) RNC FORMAT ~ " (RIGHT) RNCFILNAM ~ " (RIGHT) (RIGHT) RNCFUNIT ~ 
\RECOMMENTS" (GOTO) \RECOMMENTS"

THE SHORT TERM AVERAGING PERIOD IS THE PERIOD " (down) (down)
  (i.e., 1, 8, or 24 hrs or month) " (DOWN) (DOWN)
FOR WHICH THE RECEPTOR TABLE IS SELECTED " (DOWN) (DOWN)
\GETLABEL \ENTER THE SHORT TERM AVERAGING PERIOD: " \AVEPER"
\GETLABEL \ENTER THE ID FOR THE SELECTED SOURCE (PG 3-78): " \GRPID"
\GETNUMBER \ENTER THE USER-SPECIFIED THRESHOLD VALUE: " \THRESH"
\GETLABEL \ENTER THE FILENAME WHERE THE RESULTS ARE TO BE WRITTEN: " \FILNAM"
\GETNUMBER \ENTER A 1 FOR OPTIONAL USER-SPECIFIED FORTRAN LOGICAL FILE UNIT " \NUM"
(if NUM=1) (BRANCH OU3)
  " \RNDAVEPE ~ \RDGRPID ~ \RNDTHRESH ~ \RNDFILNAM ~ \RNDUNIT ~ \MENUBRANCH OU3"
  \GETLABEL \ENTER SPECIFIED FORTRAN LOGICAL FILE UNIT: " \UNIT"
  " \RNDAVEPE ~ \RDGRPID ~ \RNDTHRESH ~ \RNDFILNAM ~ \RNDUNIT ~ \MENUBRANCH OU3"

POST PROCESSING

Produces files of concurrent (raw) results at each receptor

(GOTO) TABLE " (END) (DOWN) (DOWN) " (RIGHT) POSTFILE ~ " (RIGHT) RNCVEAPE ~ 
(RIGHT) RNCGRPID ~ " (RIGHT) RNC FORMAT ~ " (RIGHT) RNCFILNAM ~ " (RIGHT) (RIGHT) RNCFUNIT ~ 
\RECOMMENTS" (GOTO) \RECOMMENTS"

THE SHORT TERM AVERAGING PERIOD IS THE PERIOD " (down) (down)
  (i.e., 1, 8, or 24 hrs or month) " (DOWN) (DOWN)
FOR WHICH THE RECEPTOR TABLE IS SELECTED " (DOWN) (DOWN)
\GETLABEL \ENTER THE SHORT TERM AVERAGING PERIOD: " \AVEPER"
\GETLABEL \ENTER THE ID FOR THE SELECTED SOURCE (PG 3-78): " \GRPID"
\RECOMMENTS" (GOTO) \RECOMMENTS"
THE FORMAT PARAMETER SPECIFIES THE FORMAT OF THE POSTFILE OUTPUT. " (DOWN) (DOWN)
UNIFORM ~ INDICATES AN UNFORMATTED CONCENTRATION FILE " (DOWN) (DOWN)
PLOT ~ INDICATES A FORMATTED FILE OF RECEPTOR LOCATIONS AND CONCENTRATIONS " (DOWN) (DOWN)
SUITABLE FOR PLOTTING CONTOURS OF CONCURRENT VALUES" (DOWN)
\GETLABEL \ENTER EITHER UNIFORM OR PLOT FORMAT: " \FORMAT"
\GETLABEL \ENTER THE FILENAME WHERE THE RESULTS ARE TO BE WRITTEN: " \FILNAM"
\GETNUMBER \ENTER A 1 FOR OPTIONAL USER-SPECIFIED FORTRAN LOGICAL FILE UNIT " \NUM"
(if NUM=1) (BRANCH OU3)
  " \RNDAVEPE ~ \RDGRPID ~ \RNDFORMAT ~ \RNDFILNAM ~ \RNDUNIT ~ \MENUBRANCH OU3"
  \GETLABEL \ENTER SPECIFIED FORTRAN LOGICAL FILE UNIT: " \UNIT"
  " \RNDAVEPE ~ \RDGRPID ~ \RNDFORMAT ~ \RNDFILNAM ~ \RNDUNIT ~ \MENUBRANCH OU3"
PLOTE FILES

Produces files of design values to import into graphics packages

(GOTO) TABLE "(END) (DOWN) (DOWN) (DOWN) " (RIGHT) PLOTFILE " (RIGHT) /NCVEPER " (RIGHT) /NCGRPID " (RIGHT) /NCIVAL " (RIGHT) /NCFILNAM " (RIGHT) /RCUNIT " /RECOMMENTS " (GOTO) (COMMENTS)

THE SHORT TERM AVERAGING PERIOD IS THE PERIOD "(DOWN) "(DOWN)

(IF AVEPER = "PERIOD") (BRANCH (OUFILE)

/RECOMMENTS " (GOTO) (COMMENTS)

THE HVALUE SPECIFIES WHICH SHORT TERM HIGH VALUES ARE TO BE OUTPUT. "(DOWN) "(DOWN)

FIRST -- INDICATES THE FIRST HIGHEST VALUE AT EACH RECEPTOR "(DOWN) "(DOWN)

SECOND -- INDICATES THE SECOND HIGHEST VALUE AT EACH RECEPTOR etc "(DOWN) "(DOWN)

HVALUE IS NOT SPECIFIED FOR PERIOD SINCE THERE IS ONLY 1 VALUE "(DOWN)

(GETLABEL "ENTER HVALUE PARAMETER: ", HIVALU)

(GETLABEL "ENTER THE FILENAME WHERE THE results ARE TO BE WRITTEN: ", FILNAM)

(GETNUMBER "ENTER A 1 FOR OPTIONAL USER SPECIFIED FORTRAN LOGICAL FILE UNIT ", NUM) ~

(IF NUM = 1) (BRANCH (OU2)

"/RNDAVEPER /RNDCRPID /RNDHIVALU /RNDFILNAM /RNDFUNIT"

(MENUBRANCH OU3)

(GETLABEL "ENTER SPECIFIED FORTRAN LOGICAL FILE UNIT ", FUNIT) ~

"/RNDAVEPER /RNDCRPID /RNDHIVALU /RNDFILNAM /RNDFUNIT"

(MENUBRANCH OU3)

OUTCOME VALUE " /RNDFILNAM /RNDFUNIT"

(GOTO) TABLE " (END) "(DOWN) "(END) "(RIGHT) "(RIGHT) /NCFILNAM " (RIGHT) /RCUNIT " /RECOMMENTS " (GOTO) (COMMENTS)

RETURN

Return to previous menu

(MENUBRANCH OU)

/RECOMMENTS " (GOTO) (COMMENTS)"
RECEPTOR TABLE
Specify output options for high value summary tables by receptor

(GOTO) TABLE ~ (END) (DOWN) (DOWN) (DOWN) (DOWN) (RIGHT) RECTABLE ~
/RECOMMENTS ~ (GOTO) COMMENTS ~

THE SECONDARY KEYWORD "INDSRC" SPECIFIES THAT SUMMARIES OF " (DOWN) (DOWN)
INDIVIDUAL SOURCES FOR EACH RECEPTOR ARE TO BE OUTPUT. " (DOWN) (DOWN)
THE SECONDARY KEYWORD "SRCGRP" SPECIFIES THAT SUMMARIES OF " (DOWN) (DOWN)
GROUP VALUES FOR EACH RECEPTOR ARE TO BE PROVIDED. " (DOWN) (DOWN)
EITHER OR BOTH OPTIONS MAY BE USED IN A GIVEN RUN " (DOWN) (DOWN)
A COMPLETE SET OF SUMMARY TABLES IS OUTPUT FOR EACH "STAR" SUMMARY ~ (DOWN) (DOWN)

(MAXIMUM VALUE TABLE
Specifies output options for overall maximum value summary tables

(GOTO) TABLE ~ (END) (DOWN) (DOWN) (DOWN) (DOWN) (RIGHT) RECTABLE ~
/RECOMMENTS ~ (GOTO) COMMENTS ~

THE SECONDARY KEYWORD "INDSRC" SPECIFIES THAT SUMMARIES OF " (DOWN) (DOWN)
INDIVIDUAL SOURCES FOR EACH RECEPTOR ARE TO BE OUTPUT. " (DOWN) (DOWN)
THE SECONDARY KEYWORD "SRCGRP" SPECIFIES THAT SUMMARIES OF " (DOWN) (DOWN)
GROUP VALUES FOR EACH RECEPTOR ARE TO BE PROVIDED. " (DOWN) (DOWN)
EITHER OR BOTH OPTIONS MAY BE USED IN A GIVEN RUN " (DOWN) (DOWN)
A COMPLETE SET OF SUMMARY TABLES IS OUTPUT FOR EACH "STAR" SUMMARY ~ (DOWN) (DOWN)

(PLOT FILE
Produces files of design values to import into graphics packages

(GOTO) TABLE ~ (END) (DOWN) (DOWN) (DOWN) (DOWN) (RIGHT) RECTABLE ~
/RECOMMENTS ~ (GOTO) COMMENTS ~

(GETNUMBER "ENTER THE NUMBER OF MAXIMUM VALUES TO SUMMARIZE: " MAXNUM)

THE SECONDARY KEYWORD "INDSRC" SPECIFIES THAT SUMMARIES OF " (DOWN) (DOWN)
INDIVIDUAL SOURCES FOR EACH RECEPTOR ARE TO BE OUTPUT. " (DOWN) (DOWN)
THE SECONDARY KEYWORD "SRCGRP" SPECIFIES THAT SUMMARIES OF " (DOWN) (DOWN)
GROUP VALUES FOR EACH RECEPTOR ARE TO BE PROVIDED. " (DOWN) (DOWN)
EITHER OR BOTH OPTIONS MAY BE USED IN A GIVEN RUN ~ (DOWN) (DOWN)
A COMPLETE SET OF SUMMARY TABLES IS OUTPUT FOR EACH "STAR" SUMMARY ~ (DOWN) (DOWN)

(Return)
Return to previous menu

(RETURN)
INDSRC
Select summaries of individual sources for each receptor
(GOTO) TABLE ~ (END) (DOWN) (END) (RIGHT) IND SRC ~
{MENU BRANCH OU4}

SRCGRP
Select summaries of source group values for each receptor
(GOTO) TABLE ~ (END) (DOWN) (END) (RIGHT) SRCGRP ~
{MENU BRANCH OU4}

SOCONT
Determine contribution from each source to the maximum source group
(GOTO) TABLE ~ (END) (DOWN) (END) (RIGHT) SOCONT ~
{MENU BRANCH OU4}

FILOUT
/RECOMMENTS ~ (GOTO) (COMMENTS) (DOWN) ~
~ INCLUDE DOS PATH IN EACH FILENAME ~ (DOWN)
(GETLABEL "ENTER FILENAME FOR MODEL INPUT FILE: \"NU.M\"")
(GETLABEL "ENTER FILENAME FOR MODEL OUTPUT FILE: \"NUM\"")
(RETURN)

TBLOUT
(GOTO) TABLE ~
NAME
DESIGNATE MODEL INPUT & OUTPUT FILENAMES
{FILOUT2}
{MENUBRANCH FILE}

SAVE
SAVE PREPROCESSOR INFORMATION TO MODEL INPUT FILE
/RECOMMENTS ~ (GOTO) (COMMENTS) (DOWN) ~
INCLUDE DOS PATH IN EACH FILENAME ~ {DOWN}
{GETLABEL "ENTER FILENAME FOR PREPROCESSOR OUTPUT FILE: "NUM) ~
(GETLABEL "IS THIS A NEW (N) OR EXISTING (E) FILE? (ENTER N OR E): "NUM) ~
/NUM ~ <AIR >B060 ~ /NUM ~ <AIR >B013 ~ /NUM ~ <AIR >B016 ~
(TBLOUT)
(IF NUM1="N") (BRANCH FIOUT2)
(BRANCH FIOUT3)

IMPORT
IMPORT MODEL OUTPUT FILE FOR FURTHER PROCESSING
RECOMMENDS ~(GOTO) (COMMENTS) (DOWN) ~
MOVE CURSOR TO UPPER LEFT HAND CORNER OF AREA TO IMPORT FILE DATA ~(DOWN) (DOWN)
PRESS ENTER TO CONTINUE ~(HOME)
(RNCODATA) ~
RECOMMENDS ~(GOTO) (COMMENTS) (DOWN) ~
INCLUDE DOS PATH IN EACH FILENAME ~(DOWN)
(GETLABEL "ENTER FILENAME FOR MODEL OUTPUT FILE: .NUM1") ~
/NUM1 ~ < AIR > D32 ~
/FIT (ESC) (ESC)

RUN1
OPEN "C:\123R3\RUN.BAT",W)
(WRITELN "ECHO OFF")
(WRITELN "CDENVIR\RISC")
(IF < RISC2 )TERM=1) (BRANCH ISCST)
(ISCST)

ISCST
(WRITE "ISCST2 ")
(WRITE NUM)
(WRITE " ")
(WRITE NUM1)
(CLOSE)
(RETURN)

MODRUN
(FIOUT2)
(RUN1)
(SYSTEM RUN.BAT)
(RETURN)

SUBROUTINE 31)
(MENUBRANCH T)
(MENUBRANCH III)
### MONTHLY

Select specific months to average

(MENU BRANCH III)

### SEASONALY

Select specific seasons to average

(MENU BRANCH III)

### QUARTERLY

Select specific quarters to average

(MENU BRANCH III)

### SECONDARY-KEY

Select secondary averaging period

(MENU BRANCH III)

### RETURN

Return to main CO menu

(RETURN)

<table>
<thead>
<tr>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>MORE</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(JOITO table ~ (END) (DOWN) (END) [RIGHT] [RIGHT]
JAN ~)
FEB

(MENU_BRANCH)

MAR

(MENU_BRANCH)

APR

(MENU_BRANCH)

MAY

(MENU_BRANCH)

JUN

(MENU_BRANCH)

MORE

(MENU_BRANCH)
<table>
<thead>
<tr>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>JLI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JLI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JLI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JLI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**JUL**

```
(GOTO)table " {END} | {DOWN} | {END} | {RIGHT} | {RIGHT}
JUL ~
(GOTO)COMMENTS ~
(MENUBRANCH IIIII)
```

**AUG**

```
(GOTO)table " {END} | {DOWN} | {END} | {RIGHT} | {RIGHT}
AUG ~
(GOTO)COMMENTS ~
(MENUBRANCH IIIII)
```

**SEP**

```
(GOTO)table " {END} | {DOWN} | {END} | {RIGHT} | {RIGHT}
SEP ~
(GOTO)COMMENTS ~
(MENUBRANCH IIIII)
```

**OCT**

```
(GOTO)table " {END} | {DOWN} | {END} | {RIGHT} | {RIGHT}
OCT ~
(GOTO)COMMENTS ~
(MENUBRANCH IIIII)
```

**NOV**

```
(GOTO)table " {END} | {DOWN} | {END} | {RIGHT} | {RIGHT}
```
DEC

<table>
<thead>
<tr>
<th>WINTER</th>
<th>SPRING</th>
<th>SUMMER</th>
<th>FALL</th>
<th>QUIT</th>
</tr>
</thead>
</table>

SEASONAL SUMMARIES CAN NOT BE USED TOGETHER

NOV ~
(GOTO)COMMENTS ~
(MENUBRANCH IIIII)

DEC ~
(GOTO)COMMENTS ~
(MENUBRANCH IIIII)

QUIT
(MENUBRANCH III)

WINTER
(GOTO)COMMENTS ~
SEASONAL AND QUARTERLY SUMMARIES CAN NOT BE USED TOGETHER ~
(GOTO)table ~ (END) (DOWN) (END) (RIGHT) (RIGHT)
WINTER ~
(GOTO)COMMENTS ~
(MENUBRANCH IIII)

SPRING
(GOTO)COMMENTS ~
SEASONAL AND QUARTERLY SUMMARIES CAN NOT BE USED TOGETHER ~
(GOTO)table ~ (END) (DOWN) (END) (RIGHT) (RIGHT)
SPRING ~
(GOTO)COMMENTS ~
(MENUBRANCH IIII)
SUMMER

(GOTO) COMMENTS ~
SEASONAL AND QUARTERLY SUMMARIES CANNOT BE USED TOGETHER ~
(GOTO) Table ~ (END) (DOWN) (END) (RIGHT) (RIGHT)
SUMMER ~
(GOTO) COMMENTS ~
{MENUBRANCH IIII}

FALL

(GOTO) COMMENTS ~
SEASONAL AND QUARTERLY SUMMARIES CANNOT BE USED TOGETHER ~
(GOTO) Table ~ (END) (DOWN) (END) (RIGHT) (RIGHT)
FALL ~
(GOTO) COMMENTS ~
{MENUBRANCH IIII}

QUIT

{MENUBRANCH III}

<table>
<thead>
<tr>
<th>QUART1</th>
<th>QUART2</th>
<th>QUART3</th>
<th>QUART4</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST QUARTER</td>
<td>FIRST QUARTER</td>
<td>FIRST QUARTER</td>
<td>FIRST QUARTER</td>
<td>FIRST QUARTER</td>
</tr>
<tr>
<td>(GOTO) COMMENTS</td>
<td>(GOTO) COMMENTS</td>
<td>(GOTO) COMMENTS</td>
<td>(GOTO) COMMENTS</td>
<td>{MENUBRANCH III}</td>
</tr>
</tbody>
</table>
| SEASONAL AND QUARTERLY SUMMARIES CANNOT BE USED TOGETHER ~
(GOTO) Table ~ (END) (DOWN) (END) (RIGHT) (RIGHT)
<table>
<thead>
<tr>
<th>QUART1</th>
<th>QUART2</th>
<th>QUART3</th>
<th>QUART4</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GOTO) COMMENTS</td>
<td>(GOTO) COMMENTS</td>
<td>(GOTO) COMENTS</td>
<td>(GOTO) COMENTS</td>
<td>{MENUBRANCH III}</td>
</tr>
</tbody>
</table>
| SEASONAL AND QUARTERLY SUMMARIES CANNOT BE USED TOGETHER ~
(GOTO) Table ~ (END) (DOWN) (END) (RIGHT) (RIGHT)
<table>
<thead>
<tr>
<th>QUART1</th>
<th>QUART2</th>
<th>QUART3</th>
<th>QUART4</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GOTO) COMMENTS</td>
<td>(GOTO) COMMENTS</td>
<td>(GOTO) COMENTS</td>
<td>(GOTO) COMENTS</td>
<td>{MENUBRANCH III}</td>
</tr>
</tbody>
</table>
| SEASONAL AND QUARTERLY SUMMARIES CANNOT BE USED TOGETHER ~
(GOTO) Table ~ (END) (DOWN) (END) (RIGHT) (RIGHT)

QUIT
QUART2
(GOTO) COMMENTS
{MENUBRANCH IIIIII)

QUART3
FIRST QUARTER
(GOTO) COMMENTS
SEASONAL AND QUARTERLY SUMMARIES CAN NOT BE USED TOGETHER
(GOTO) table ~(END) (DOWN) (END) (RIGHT) (RIGHT)

QUART3
(GOTO) COMMENTS
{MENUBRANCH IIIIII)

QUART4
FIRST QUARTER
(GOTO) COMMENTS
SEASONAL AND QUARTERLY SUMMARIES CAN NOT BE USED TOGETHER
(GOTO) table ~(END) (DOWN) (END) (RIGHT) (RIGHT)

QUIT
{MENUBRANCH IIIIII)

<table>
<thead>
<tr>
<th>MONTH</th>
<th>SEASON</th>
<th>QUARTER</th>
<th>ANNUAL</th>
<th>PERIOD</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GOTO COMMENTS)</td>
<td>(GOTO COMMENTS)</td>
<td>(GOTO COMMENTS)</td>
<td>(GOTO COMMENTS)</td>
<td>(GOTO COMMENTS)</td>
<td>{MENUBRANCH III}</td>
</tr>
<tr>
<td>SEASONAL AND QUARTERLY SUMMARIES CAN NOT BE USED TOGETHER</td>
<td>(GOTO) table ~(END) (DOWN) (END) (RIGHT) (RIGHT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MODULE

(GOTO) COMMENTS
SEASONAL AND QUARTERLY SUMMARIES CAN NOT BE USED TOGETHER
(GOTO) table ~(END) (DOWN) (END) (RIGHT) (RIGHT)

MONTH
(GOTO) COMMENTS
{MENUBRANCH IIIIII)

SEASON
SEASONAL AND QUARTERLY SUMMARIES CAN NOT BE USED TOGETHER

QuARTER

SEASONAL AND QUARTERLY SUMMARIES CAN NOT BE USED TOGETHER

ANNUAL

PERIOD

QUIT
EMISSION RATES VARY SEASONALLY

(SEASON) (QUARTERLY) (MONTHLY) (ESTAB) (SPEED) (STAR) (ESTAR) (CONTINUE)

GOTO TABLE "END" (DOWN) (DOWN) "SO" (RIGHT)

EMISFACT "(RIGHT)" RNCESRCID "~" (RIGHT) SEASON "~" (RIGHT) RNCWINT "~" (RIGHT) RNCSPR "~" (RIGHT) RNCSUM "~" (RIGHT) RNCFALL "~"

/RECOMMENTS"

GOTO COMMENTS"

SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER ASUSED TO DENOTE LOCATION "(DOWN) (DOWN)

USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY. "(DOWN) (DOWN)

A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE IDS SEPARATED "(DOWN)

BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN IDS) "(DOWN)

(GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE: "(ESRCID)

/RECOMMENTS"

GOTO COMMENTS"

FOR THE LONG TERM MODEL "~" "(DOWN) (DOWN)

USER INPUTS 4 SEASONAL EMISSION FACTORS IN THE FOLLOWING ORDER: "(DOWN) (DOWN)

WINTER, SPRING, SUMMER, FALL "(DOWN)

(GETNUMBER "ENTER WINTER EMISSION FACTOR: "(WINT)

(GETNUMBER "ENTER SPRING EMISSION FACTOR: "(SPR)

(GETNUMBER "ENTER SUMMER EMISSION FACTOR: "(SUM)

(GETNUMBER "ENTER FALL EMISSION FACTOR: "(FALL)

/RECOMMENTS"

SEASONAL RANGES

(RNCESRCID) "RNCWINT" "RNCSPR" "RNCSUM" "RNCFALL"

(MENUBRANCH 0)
QUARTERLY
EMISSION RATES VARY QUARTERLY
(GOTO)TABLE " (END) (DOWN) (DOWN)"SO " (RIGHT)
EMISFACT " (RIGHT)/RNCSRCID " ~ (RIGHT)/QUARTR " (RIGHT)/RNCOQUART1 ~ ~ (RIGHT)/RNCOQUART2 ~ ~ (RIGHT)/RNCOQUART3 ~ ~ (RIGHT)/RNCOQUART4 ~ ~
/RECOMMENTS "
(GOTO)COMMENTS "
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION "(DOWN) (DOWN)
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY. "(DOWN) (DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED " (DOWN)
BY A DASH, i.e. STACK1 - STACK10. (NOTE NO SPACES BETWEEN ID'S) "(DOWN)
(GETLABEL 'ENTER SOURCE ID FOR SELECTED SOURCE: ',ESRCID)
/RECOMMENTS " (GOTO)COMMENTS "
FOR THE LONG TERM MODEL - - " (DOWN) (DOWN)
USER INPUTS 4 QUARTERLY EMISSION FACTORS IN THE FOLLOWING ORDER: "(DOWN) (DOWN)
1ST QUARTER, 2ND QUARTER, 3RD QUARTER, 4TH QUARTER " (DOWN)
(GETNUMBER 'ENTER 1ST QUARTER EMISSION FACTOR: ',QUART1)
(GETNUMBER 'ENTER 2ND QUARTER EMISSION FACTOR: ',QUART2)
(GETNUMBER 'ENTER 3RD QUARTER EMISSION FACTOR: ',QUART3)
(GETNUMBER 'ENTER 4TH QUARTER EMISSION FACTOR: ',QUART4)
RNCSRCID / RNCOQUART1 / RNCOQUART2 / RNCOQUART3 / RNCOQUART4
(MENU/BRANCH1 10)

MONTHLY
EMISSION RATES VARY MONTHLY
(GOTO)TABLE " (END) (DOWN) (DOWN)"SO " (RIGHT)
EMISFACT " (RIGHT)/RNCSRCID " ~ (RIGHT)/MONTH " (RIGHT)/RNCHN " (RIGHT)/RNCFEB " ~ (RIGHT)/RNCMAR " ~ (RIGHT)/RNCAPR " ~ (RIGHT)/RNCMAY " ~
(RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~ (RIGHT)/RNCHN " ~
/RECOMMENTS "
(GOTO)COMMENTS "
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION "(DOWN) (DOWN)
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY. "(DOWN) (DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED " (DOWN)
BY A DASH, i.e. STACK1 - STACK10. (NOTE NO SPACES BETWEEN ID'S) "(DOWN)
(GETLABEL 'ENTER SOURCE ID FOR SELECTED SOURCE: ',ESRCID)
/RECOMMENTS " (GOTO)COMMENTS "
FOR THE LONG TERM MODEL - - " (DOWN) (DOWN)
USER INPUTS 12 MONTHLY EMISSION FACTORS IN THE FOLLOWING ORDER: "(DOWN) (DOWN)
JAN, FEB, MAR, APR, MAY, JUNE, JULY, AUG, SEPT, OCT, NOV, DEC " (DOWN)
(GETNUMBER 'ENTER JANUARY EMISSION FACTOR: ',JAN)
(GETNUMBER 'ENTER FEBRUARY EMISSION FACTOR: ',FEB)
(GETNUMBER 'ENTER MARCH EMISSION FACTOR: ',MAR)
(GETNUMBER 'ENTER APRIL EMISSION FACTOR: ',APR)
(GETNUMBER 'ENTER MAY EMISSION FACTOR: ',MAY)
(GETNUMBER 'ENTER JUNE EMISSION FACTOR: ',JUNE)
(GETNUMBER 'ENTER JULY EMISSION FACTOR: ',JULY)
(GETNUMBER 'ENTER AUGUST EMISSION FACTOR: ',AUG)
(GETNUMBER "ENTER SEPTEMBER EMISSION FACTOR : ", SEPT)
(GETNUMBER "ENTER OCTOBER EMISSION FACTOR : ", OCT)
(GETNUMBER "ENTER NOVEMBER EMISSION FACTOR : ", NOV)
(GETNUMBER "ENTER DECEMBER EMISSION FACTOR : ", DEC)
/RNDESRCID "RNDJAN"/RNDREB "RNDMAR"/RNDAPR "RNDMAY"/RNDJUNE"/RNDJULY"/RNDJAN "RNDSEPT"/RNDNOV "RNDDEC"

(MENU BRANCH SO)

SSTAB
EMISSION RATES VARY BY SEASON & STABILITY
(GOTO) TABLE " (END) (DOWN) (DOWN) " (RIGHT)
EMISFACT " (RIGHT) RNCESRCID " (RIGHT) SSTAB " (RIGHT) RNCWINT " (RIGHT) RNCSPR " (RIGHT) RNCSUM " (RIGHT) RNCFALL " (RIGHT)
/RECOMMENTS "
(GOTO) COMMENTS "
SOURCE ID MAY BE THE SAME AS USED TO DENOTE LOCATION " (DOWN) (DOWN)
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY. " (DOWN) (DOWN)
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED " (DOWN)
BY A DASH. i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S) " (DOWN)
(GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE : ", ESRCID)
/RECOMMENTS " (GOTO) COMMENTS "
FOR THE LONG TERM MODEL - - " (DOWN) (DOWN)
USER INPUTS 4 SEASONAL EMISSION STABILITY FACTORS IN THE FOLLOWING ORDER. " (DOWN) (DOWN)
WINTER, SPRING, SUMMER, FALL " (DOWN)
(GETNUMBER "ENTER WINTER EMISSION STABILITY FACTOR : ", WINT)
(GETNUMBER "ENTER SPRING EMISSION STABILITY FACTOR : ", SPR)
(GETNUMBER "ENTER SUMMER EMISSION STABILITY FACTOR : ", SUM)
(GETNUMBER "ENTER FALL EMISSION STABILITY FACTOR : ", FALL)
/RNDESRCID "RNDWINT"/RNDSPR "RNDSUM"/RNDFALL "

(MENU BRANCH SO)

MEL
/RECOMMENTS " (GOTO) COMMENTS "
OPTIONAL FILE FORMATS " (DOWN) (DOWN) (DOWN)
BLANK - - Specifies the default ASCII format for "STAR" file. " (DOWN) (DOWN)
READ - - Specifies the Fortran READ format for an ASCII "STAR" file. " (DOWN) (DOWN)
FREE - - Specifies free-formatted READs for an ASCII "STAR" file. " (DOWN) (DOWN)
(DOWN) See Page 3-54 through 3-55 for details"

(MENU BRANCH MEL1)

<table>
<thead>
<tr>
<th>SPECIFIC FORMATS</th>
<th>READ FORMATS</th>
<th>FREE FORMATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLANK</td>
<td>READ</td>
<td>FREE</td>
</tr>
<tr>
<td>SPECIFIC FORMATS</td>
<td>READ FUNCTIONS</td>
<td>FREE FUNCTIONS</td>
</tr>
<tr>
<td>BLANK</td>
<td>READ FUNCTIONS</td>
<td>FREE FUNCTIONS</td>
</tr>
<tr>
<td>SPECIFIC FORMATS</td>
<td>READ FUNCTIONS</td>
<td>FREE FUNCTIONS</td>
</tr>
</tbody>
</table>
**BLANK**

Specifies default format

{BLANK FORM}

/RNDMETFIL "RNDFORM"  
{menubranch ME}

**READ**

Specify Fortran read format

(GETLABEL "INPUT FORTRAN 'READ' FORMAT WITHIN ( ) : "FORM)

/RNDMETFIL "RNDFORM"  
{menubranch ME}

**FREE**

Use free-formated READS

{LET FORM,FREE}

/RNDMETFIL "RNDFORM"  
{menubranch ME}

**RETURN**

Return to main ME menu

{menubranch ME}

**HTLT**

{GOTO}TABLE ~ (END) (DOWN) (DOWN)"SO " (RIGHT) BULDHGT " (RIGHT) RNCDSRCID " ~ (RIGHT) RNCNORTH " ~ (RIGHT) RNCENE " ~ (RIGHT) RNCNORN " ~ (RIGHT) RNC东北 " ~ (RIGHT) RNCSE " ~ (RIGHT) RNCNW " ~ (RIGHT) RNCWEST " ~ (RIGHT) RNCNNE " ~ (RIGHT) DSRICD2 " ~ (RIGHT) DSRICD2,9,17) {RECOMMENTS " (GOTO) COMMENTS "  
SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION ~ (DOWN) (DOWN)  
USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING HEIGHTS APPLY ~ (DOWN) (DOWN)  
A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED ~ (DOWN)  
BY A DASH, i.e. STACK1 - STACK10. (NOTE NO SPACES BETWEEN ID'S) ~ (DOWN)  
(GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE : "DSRICD)

{GOTO}TABLE ~ (END) (DOWN) (DOWN)"SO " (RIGHT) BULDHGT " (RIGHT) RNCDSRCID2 " ~ (RIGHT) RNCSE " ~ (RIGHT) RNCSE " ~ (RIGHT) RNCSSW " ~ (RIGHT) RNCNW " ~ (RIGHT) RNCWEST " ~ (RIGHT) DSRICD2 " ~ (RIGHT) DSRICD2,9,17) {RECOMMENTS " (GOTO) COMMENTS "  
FOR THE LONG TERM MODEL ~ -- " (DOWN) (DOWN)  
USER INPUTS 16 DIRECTION-SPECIFIC BUILDING HEIGHTS (IN METERS) ~ (DOWN) (DOWN)  
BEGINNING WITH THE NORTH FLOW VECTOR (WIND BLOWING TOWARD " (DOWN) (DOWN)  
THE NORTH) AND INCREMENITING BY 22.5 DEGREES ~ (DOWN) (DOWN)  
IN A CLOCKWISE DIRECTION (N - NE, NE, E-NE, EAST ETC) ~ (DOWN)
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR NORTH VECTOR:" "NORTH")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR N-NE VECTOR:" "NNE")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR NE VECTOR:" "NE")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR E-NE VECTOR:" "ENE")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR EAST VECTOR:" "EAST")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR E-SE VECTOR:" "ESE")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR SE VECTOR:" "SE")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR S-SE VECTOR:" "SSE")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR SOUTH VECTOR:" "SOUTH")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR S-SW VECTOR:" "SSW")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR SW VECTOR:" "SW")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR W-SW VECTOR:" "WSW")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR WEST VECTOR:" "WEST")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR W-NW VECTOR:" "WNW")
(GETNUMBER "ENTER BUILDING HEIGHT (METERS) FOR N-NW VECTOR:" "NNW")

{MENU} BRANCH DOWN

WIND

(GOTO) TABLE "END" (DOWN) (DOWN) "SO " "(RIGHT) BUILDWID " "(RIGHT) NCDSRCID " "(RIGHT) RNCHOR " "
(RIGHT) RNCHOR " "(RIGHT) RNCHORNG " "(RIGHT) RNCEAST " "(RIGHT) RNCESS " "
COMMENTS "(GOTO) COMMENTS"

SOURCE ID MAY BE THE SAME UNIQUE IDENTIFIER AS USED TO DENOTE LOCATION "(DOWN) (DOWN)

USER MAY SPECIFY A RANGE OF SOURCES FOR WHICH THE BUILDING WIDTHS APPLY. "(DOWN) (DOWN)

A RANGE OF SOURCES IS SPECIFIED BY ENTERING 2 SOURCE ID'S SEPARATED " (DOWN)

BY A DASH, i.e. STACK1-STACK10. (NOTE NO SPACES BETWEEN ID'S) " (DOWN)

(GETLABEL "ENTER SOURCE ID FOR SELECTED SOURCE:" "DSRCID"

(GOTO) TABLE "END" (DOWN) (DOWN) "SO " "(RIGHT) BUILDWID " "(RIGHT) NCDSRCID2 " "
(RIGHT) RNCESS " "(RIGHT) RNCESS " "(RIGHT) RNCESS " "(RIGHT) RNCESS " "(RIGHT) RNCESS " "
COMENTS DSRCID2,DSRCID,9,117) " RNDDSRCID2 "

(GOTO) TABLE "END" (DOWN) "SO " "(RIGHT) BUILDWID " "(RIGHT) RNCHOR " "
(RIGHT) RNCHOR " "(RIGHT) RNCHOR " "(RIGHT) RNCHOR " "(RIGHT) RNCHOR " "
COMENTS DSRCID2,DSRCID,9,117)

COMMENTS "(GOTO) COMMENTS"

FOR THE LONG TERM MODEL " " (DOWN) (DOWN)

USER INPUTS 16 DIRECTION-SPECIFIC BUILDING WIDTHS (IN Meters) " (DOWN) (DOWN)

BEGINNING WITH THE NORTH FLOW VECTOR (WIND BLOWING TOWARD "(DOWN) (DOWN)

THE NORTH AND INCREMENING BY 22.5 DEGREES " (DOWN) (DOWN)

IN A CLOCKWISE DIRECTION (N-NE, NE, E-NE, EAST ETC) " (DOWN)

(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR NORTH VECTOR:" "NORTH")

(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR N-NE VECTOR:" "NNE")

(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR NE VECTOR:" "NE")

(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR E-NE VECTOR:" "ENE")

(GETNUMBER "ENTER BUILDING WIDTH (METERS) FOR EAST VECTOR:" "EAST")
GETNUMBER 'ENTER SWITCH VALUE OF 0 OR 1 FOR SOUTH VECTOR : "SOUTH"
(GETNUMBER 'ENTER SWITCH VALUE OF 0 OR 1 FOR S-SW VECTOR : "SSW"
(GETNUMBER 'ENTER SWITCH VALUE OF 0 OR 1 FOR SW VECTOR : "SW"
(GETNUMBER 'ENTER SWITCH VALUE OF 0 OR 1 FOR W-SW VECTOR : "WSW"
(GETNUMBER 'ENTER SWITCH VALUE OF 0 OR 1 FOR WEST VECTOR : "WEST"
(GETNUMBER 'ENTER SWITCH VALUE OF 0 OR 1 FOR W-NW VECTOR : "WNW"
(GETNUMBER 'ENTER SWITCH VALUE OF 0 OR 1 FOR NW VECTOR : "NW"
(GETNUMBER 'ENTER SWITCH VALUE OF 0 OR 1 FOR N-NW VECTOR : "NNW"

{MENU_BRANCH_DOWN}
### LOAD

LOAD @RISK ADDIN
(ADDIN)SSD(EIS)
C:\RISK ~
QLRISK.PL ~
IQ ~
/WGRM ~
 {MENU BRANCH RISK}

### SELECT

SELECT VARIABLE FOR DISTRIBUTION FUNCTION

(ADDIN)SSD(EIS)
C:\RISK ~
QLRISK.PL ~
IQ ~
/WGRM ~
 {MENU BRANCH RISK}
OUTPUT
SELECT OUTPUT RANGE
(COM)
MOVE CURSOR TO UPPER LEFT CORNER OF OUTPUT RANGE AND PRESS ENTER ~ (DOWN)
(?) ~
(RNCOUT ~)
(DOWN) (DOWN) /RNCOU1 ~ ~
(DOWN) /RNCOU2 ~ ~
(DOWN) /RNCOU3 ~ ~
(DOWN) /RNCOU4 ~ ~
(DOWN) (DOWN) (DOWN) /RNCPST1 ~ "3HR MAX"
(RIGHT) /RNCPST2 ~ "3HR 2ND"
(RIGHT) /RNCPST3 ~ "24HR MAX"
(RIGHT) /RNCPST4 ~ "24HR 2ND"
(RIGHT) (RIGHT) (UP) /RNCAVG ~ "AVG 3HR" (DOWN) /MAX VALS ~ (UP)
(RIGHT) /RNCSTD ~ "STD 3HR" (DOWN) /MAX VALS ~ (UP)
(RIGHT) /RNVAR "VAR 3HR" (DOWN) /MAX VALS ~ (UP)
(RIGHT) (RIGHT) /RNCAVG ~ "AVG 24HR" (DOWN) /MAX VALS ~ (UP)
(RIGHT) /RNCS24 ~ "STD 24HR" (DOWN) /MAX VALS ~ (UP)
(RIGHT) /RNVAR "VAR 24HR" (DOWN) /MAX VALS ~ (UP)
(RIGHT) /RNCPROB ~ "3HR PROB" (DOWN) /MAX VALS ~ (UP)
(RIGHT) /RNCPROB ~ "24HR PROB" (DOWN) /MAX VALS ~
(COM)
(MENU BRANCH RISK)

COM
(RECOMMENDS ~
(GOTO) COMMENTS ~

ITERATIONS
SELECT NUMBER OF REALIZATIONS TO BE RUN
(COM)
(GETNUMBER "ENTER THE NUMBER OF REALIZATIONS TO BE RUN ",&NUM)
(MENU BRANCH RISK)

RUN
RUN SELECTED NUMBER OF ITERATIONS
(APPL) SSMOO1MOQ ~
(FOR NUM1,0,NUM1,1,NUM1,1)
VIEW
VIEW SELECTED OUTPUT RESULTS
{(MENU BRANCH VIEW)}

MAIN
RETURN TO MAIN RISC MENU
{/OBRISC2}

QUIT
QUIT MACRO -- RETURN TO NORMAL WORKSHEET MODE
{(QUIT)}

RUN
{(CALC)}
{(GOTO) TABLE ~}
{RNDOUTPUT ~.END} {DOWN} {RIGHT} {RIGHT} ~
{/PF(ESC) (ESC)}
{C:\ENVIR\SC\TEST1.INP}
~ C ~
{/PF(ESC) (ESC)}
{C:\ENVIR\SC\TEST1.INP}
~ RNDOUTPUT ~ OMNOUQ
AGQ RNDOUTPUT ~
{OPEN "C:\123\RUN.BAT";W}
{WRITELN "ECHO OFF"}
{WRITELN "C:\ENVIR\SC"}
{IF <"RISC2A">TERM="2"}{BRANCH ISCLT} ~
{(ISCLT)}
{SYSTEM RUN.BAT}
{(C)}

ISCLT
{(WRITE "ISCLT2 ")}
{(WRITE "C:\ENVIR\SC\TEST1.INP")}
{(WRITE "")}
{(WRITE ")")}
{(WRITE "C:\ENVIR\SC\TEST1.OUT")}
{(CLOSE)}

ISCLT
{(WRITE "ISCLT2 ")}
{WRITE "C:\ENVIR\SC\TEST\INP"}
{WRITE ""
{WRITE "C:\ENVIR\SC\TEST\OUT"
{CLOSE}

{OPEN "C:\ENVIR\SC\TEST\OUT";
{READLN OUT}
{IF OUT="*** THE SUMMARY OF HIGHEST 3-HR RESULTS ***"
{BRANCH A105
{FOR D1,0,8,1,READ
{READLN OUT2}
{READLN OUT}
{IF OUT="*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***"
{BRANCH A110
{FOR D1,0,8,1,READ1
{READLN OUT4}
{PARSE}
{APPEND}

READ
{READLN OUT1}

READ1
{READLN OUT3}

PARSE
{GOTO}OUT1 ~
\O{P/PC1
\(DOWN\)\(DOWN\)\(DOWN\)\(DOWN\) \(DOWN\) ~
\O{DOWN} ~ G
{GOTO}OUT1 ~ (UP) ~
\RE ~

APPEND
{GOTO}OUT1 ~ (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT)
\(RNC\)HIGH ~ ~
\(DOWN\)/\(RNC\)HIGH2 ~ ~
\(DOWN\)/\(RNC\)HIGH ~ ~
\(DOWN\)/\(RNC\)HIGH2 ~ ~
{APPENDBELOW POST1HIGH}
{APPENDBELOW POST2HIGH2}
{(APPENDBELOW POST3,2HIGH) {(APPENDBELOW POST4,2HIGH)

(STAT)
(GOTO) OUT ~
RE (BIGRIGHT) (DOWN) (DOWN) (DOWN) (DOWN) ~

STAT
(GOTO) 3AVG ~
(END) (DOWN) ~ (DOWN)
@AVG(POST1) ~
/RV ~ ~
(GOTO) 3STD ~
(END) (DOWN) ~ (DOWN)
@STD(POST1) ~
/RV ~ ~
(GOTO) 3VAR ~
(END) (DOWN) ~ (DOWN)
@VAR(POST1) ~
/RV ~ ~
(GOTO) 24AVG ~
(END) (DOWN) ~ (DOWN)
@AVG(POST3) ~
/RV ~ ~
(GOTO) 24STD ~
(END) (DOWN) ~ (DOWN)
@STD(POST3) ~
/RV ~ ~
(GOTO) 24VAR ~
(END) (DOWN) ~ (DOWN)
@VAR(POST3) ~
/RV ~ ~
(GOTO) POST1 ~ (END) (DOWN) RNCTEMP ~ ~
(GOTO) 3PROB ~ (END) (DOWN) ~ (DOWN)
/CTEMP ~ ~ /RNDTEMP ~
/RV ~ ~
(GOTO) POST3 ~ (END) (DOWN) RNCTEMP ~ ~
(GOTO) 24PROB ~ (END) (DOWN) ~ (DOWN)
/CTEMP ~ ~ /RNDTEMP ~
/RV ~ ~
/FSRISCOUT ~ R

<table>
<thead>
<tr>
<th>VIEW1</th>
<th>STATISTICS</th>
<th>GRAPHS</th>
<th>RETURN</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIEW STATISTICAL VIEWGRAPHS</td>
<td>RETURN TO PREVIOUS MENU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(GOTO) POST ~ (END) (DOWN) RNCTEMP ~ ~</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(GOTO) POST ~ (END) (DOWN) RNCTEMP ~ ~</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(GOTO) POST ~ (END) (DOWN) RNCTEMP ~ ~</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(GOTO) POST ~ (END) (DOWN) RNCTEMP ~ ~</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(GOTO) POST ~ (END) (DOWN) RNCTEMP ~ ~</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
STATISTICS

VIEW STATISTICAL ANALYSIS OF OUTPUT
(GOTO) POST1 " (END) (DOWN)
{DOWN} (DOWN) (DOWN) {RE/BIG/RIGHT} (END) {DOWN) " 
(RIGHT) STATISTICAL ANALYSIS OF MODEL OUTPUT " 
(LEFT) RNCSATS " " (DOWN) (DOWN) (DOWN)

MEAN (AVERAGE) VALUE OF 3 HR MAXIMUM VALUES
(RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) RNC AVG3 " 
(LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (DOWN) (DOWN)

STANDARD DEVIATION OF 3 HR MAXIMUM VALUES
(RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) RNC STD3 " 
(LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (DOWN) (DOWN)

POPULATION VARIANCE OF 3 HR MAXIMUM VALUES
(RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) RNC VAR3 " 
(LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (DOWN) (DOWN)

MEAN (AVERAGE) VALUE OF 24 HR MAXIMUM VALUES
(RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) RNC AVG24 "
(LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (DOWN) (DOWN)

STANDARD DEVIATION OF 24 HR MAXIMUM VALUES
(RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) RNC STD24 "
(LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (LEFT) (DOWN) (DOWN)

NUMBER OF MODEL ITERATIONS PERFORMED
(RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) RNC ITER " 
(LEFT) (LEFT) (LEFT) (LEFT) (DOWN) (DOWN)

PRESENT TO CONTINUE " (DOWN)
{GOTO} RNC AVG " (DOWN) "AVG " RND AVG " 
{GOTO} RNC STD " (DOWN) "STD " RND STD " 
{GOTO} RNC VAR " (DOWN) "VAR " RND VAR "
{GOTO} RND " " RND " 
{GOTO} RNDSTATS "

(MAIN MENU BRANCH VIEW)
<table>
<thead>
<tr>
<th>GRAPHS</th>
<th>3-MEAN</th>
<th>3-STD</th>
<th>3-PROB</th>
<th>24-MEAN</th>
<th>24-STD</th>
<th>24-VAR</th>
<th>RETURN</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-MEAN</td>
<td>GRAPH MEAN OF 3 HR MAXIMUM VALUES VS NUMBER OF ITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTF</td>
<td>MEAN OF 3 HOUR MAXIMUM VALUES VS NUMBER OF ITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TXITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TymeAN OF MAXIMUM CONCENTRATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q0G3H0Q3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-STD</td>
<td>GRAPH STANDARD DEVIATION OF 3 HR MAXIMUM VALUES VS NUMBER OF ITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTF</td>
<td>STANDARD DEVIATION OF 3 HR MAX VALUES VS NUMBER OF ITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TXITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TystNDAR DFERENCE OF MAXIMUM CONCENTRATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q0G8Q0Q3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-PROB</td>
<td>GRAPH 3 HR MAXIMUM VALUES VS PROBABILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTF</td>
<td>3-HOUR MAXIMUM VALUES VS PROBABILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TXPROBABILITY %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TymAXIMUM CONCENTRATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q0G8Q0Q3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-MEAN</td>
<td>GRAPH MEAN OF 24 HR MAXIMUM VALUES VS NUMBER OF ITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTF</td>
<td>MEAN OF 24 HR MAX VALUES VS NUMBER OF ITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TXITERATIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TymeAN OF MAXIMUM CONCENTRATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q0G8Q0Q3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
24 - STD
GRAPH STANDARD DEVIATION OF 24 HR MAXIMUM VALUES VS NUMBER OF ITERATIONS
/GRGTLA24STD "OTF
STANDARD DEVIATION OF 24 HR MAX VALUES VS NUMBER OF ITERATIONS ~
TXITERATIONS ~
TYSTANDARD DEVIATION OF MAXIMUM CONCENTRATION ~
OOGHOVO
{MENUBRANCH GRAPHS}

24 - PROB
GRAPH 24 HR MAXIMUM VALUES VS PROBABILITY
/GRGTXA24PROB ~ XPROB1 ~
OTF24 HOUR MAXIMUM VALUES VS PROBABILITY ~
TXPROBABILITY ~
TYMAXIMUM CONCENTRATION ~
OOGHOVO
{MENUBRANCH GRAPHS}

RETURN
RETURN TO PREVIOUS MENU
{MENUBRANCH VIEW1}
APPENDIX E

LIST OF PROGRAMMING CODE (MACROS)

FOR COGMOD
\A

HOME {DOWN}

MACRO REQUIRES 1 SCREEN AREA FOR COMMENTS AND HELP. ~ (DOWN) (DOWN)

MOVE CURSOR TO UPPER LEFT CORNER OF AREA TO BE RESERVED FOR COMMENTS ~ (DOWN) (DOWN)

PRESS ENTER TO CONTINUE ~ (HOME)

(?)/RNCCOMMENTS ~(PGDN)(up)(BIGRIGHT) ~

(HOME)/RE.(PGDN)(up)(BIGRIGHT) ~

(GOTO) COMMENTS ~(PGDN)/RNCOND ~

(RIGHT)/RNCCHORZ ~

(RIGHT)/RNCSAMP ~

(RIGHT)/RNCSAMP ~

(RIGHT)/RNCSAMP ~

(RIGHT)/RNCSAMP ~

(RIGHT)/RNCNUM1 ~

(RIGHT)/RNCNUMPTS ~

(GOTO) COMMENTS ~

WORKSHEET ASSUMES 3 VARIABLES ~ ~ ~ (DOWN) (DOWN)

A) DISTANCE FROM ORIGIN IN X DIRECTION ~ (DOWN) (DOWN)

B) DISTANCE FROM ORIGIN IN Y DIRECTION ~ (DOWN) (DOWN)

C) HYDRAULIC CONDUCTIVITY ~ (DOWN)

{MENUBRANCH FUNCTION}

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>DATA</th>
<th>STATPAC</th>
<th>COVAR</th>
<th>MOC</th>
<th>KRIGE</th>
<th>RUNMOD</th>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CREATE DATA RUN STATPAC FUn</td>
<td>RUN COVAR</td>
<td>RUN MOC</td>
<td>KRIGE DATA</td>
<td>RUN MULTIPLE CONDITIONAL SIMULATIONS OF MODEL</td>
<td>RETURN TO LOTUS WORKSHEET</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(GOTO) COMMENTS ~ SYSTEM STAT.BAT</td>
<td>(GOTO) COMMENTS ~ SYSTEM MOC.BAT</td>
<td>(GOTO) COMMENTS ~ SYSTEM COVAR.BAT</td>
<td>(BRANCH DATA)</td>
<td>(MENUBRANCH FUNCTION)</td>
<td>(MENUBRANCH FUNCTION)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(MENUBRANCH FUNCTION)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATA</th>
<th>STATPAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATE DATA FILES</td>
<td>RUN STATPAC FUNCTIONS INCLUDING SEMIVARIOGRAM EVAL</td>
</tr>
<tr>
<td>(GOTO) COMMENTS ~ SYSTEM STAT.BAT</td>
<td>(BRANCH DATA)</td>
</tr>
<tr>
<td>(MENUBRANCH FUNCTION)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COVAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN COVAR</td>
</tr>
<tr>
<td>(SYSTEM COVAR.BAT)</td>
</tr>
<tr>
<td>(MENUBRANCH FUNCTION)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KRIGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN MULTIPLE CONDITIONAL SIMULATIONS OF MODEL</td>
</tr>
<tr>
<td>(BRANCH KRIGE)</td>
</tr>
<tr>
<td>(MENUBRANCH FUNCTION)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RETURN TO LOTUS WORKSHEET</td>
</tr>
<tr>
<td>(QUIT)</td>
</tr>
</tbody>
</table>
COM
{GOTO}COMMENTS~
/RECOMMENTS~

DATA
{GETLABEL "DO YOU WISH TO RUN CONDITIONAL SIMULATION? (Y or N) ",COND}
{IF COND="Y"}{BRANCH DATA1}
{BRANCH DATA2}

DATA1
{COM}
STATPAC DATA WILL BE ENTERED DIRECTLY INTO THE STATPAC PROGRAM ~
"TERFIL" WHICH WILL PROMPT THE USER FOR THE NECESSARY INFORMATION.
FOR MORE INFORMATION ON "TERFIL" SEE STATPAC USER'S INFORMATION.
{GETLABEL "DO YOU WISH TO CREATE A RAW DATA FILE (Y or N)? ",NUM}
{IF NUM="N"}{BRANCH DAT1}
{OM}{DOWN}
{SYSTEM TER.BAT}
{DOWN}
TO VIEW THE INPUT DATA FILE ENTER A "Y"~
{GETLABEL "DO YOU WISH TO VIEW INPUT DATA FILE (Y or N)? ",NUM}
{IF NUM="Y"}{BRANCH VDATA}
{OM}{DOWN}
{GETLABEL "DO YOU WISH TO PERFORM BASIC STATISTICS ON THIS DATA NOW (Y or N)?",NUM}
{HOME}
{IF NUM="Y"}{BRANCH BASTAT}
{OM}{DOWN}
TO PERFORM SEMIVARIOGRAM ANALYSIS AT THIS POINT ENTER "Y"~
{GETLABEL "DO YOU WISH TO PERFORM SEMIVARIOGRAM ANALYSIS NOW (Y or N)?",NUM}
{IF NUM="Y"}{BRANCH SEMI}
{OM}{DOWN}
TO CREATE COVAR INPUT FILE NOW ENTER "Y"~
{GETLABEL "DO YOU WISH TO CREATE COVAR INPUT FILE NOW (Y or N)?",NUM1}
{IF NUM1="Y"}{BRANCH DATA2}
{OM}{DOWN}
{SYSTEM PREP.BAT}
{DOWN}
{MEUNBRANCH FUNCTION}

DATA2
{COM}{DOWN}
CREATE A DATA FILE OF X-Y COORDINATES FOR COVAR PROGRAM ~
THESE POINTS MUST MATCH THE GRID POINTS USED IN STATPAC KRIGE PROGRAM ~
THE SAMPLE VALUES USED TO CONDITION THE SIMULATION ALSO MUST BE AT MATCHING GRID POINTS. THIS IS IMPERATIVE FOR THE CONDITIONING TO WORK!

IF POINTS DO NOT COINCIDE -- RETURN TO INPUT DATA FOR STATPAC NOW. --

DO YOU WISH TO CONTINUE WITH COVAR GRID INPUT (Y or N)? 

HAS ASCII FILE OF RAW DATA ALREADY BEEN CREATED (Y or N)? 

INPUT RAW DATA POINTS FROM STATPAC TO COVAR PROGRAM

MOVE CURSOR TO UPPER LEFT CORNER OF RANGE FOR TABLE OF STATPAC VALUES

TO AVOID POTENTIAL RANGE OVERLAP (& LOSS OF DATA) -- PRESS ENTER TO CONTINUE

HAS ASCII FILE OF RAW DATA ALREADY BEEN CREATED (Y or N)?

INPUT RAW DATA POINTS FROM STATPAC TO COVAR PROGRAM

MOVE CURSOR TO UPPER LEFT CORNER OF RANGE FOR TABLE OF STATPAC VALUES

TO AVOID POTENTIAL RANGE OVERLAP (& LOSS OF DATA) -- PRESS ENTER TO CONTINUE

HAS ASCII FILE OF RAW DATA ALREADY BEEN CREATED (Y or N)?

INPUT RAW DATA POINTS FROM STATPAC TO COVAR PROGRAM

MOVE CURSOR TO UPPER LEFT CORNER OF RANGE FOR TABLE OF STATPAC VALUES

TO AVOID POTENTIAL RANGE OVERLAP (& LOSS OF DATA) -- PRESS ENTER TO CONTINUE

HAS ASCII FILE OF RAW DATA ALREADY BEEN CREATED (Y or N)?

INPUT RAW DATA POINTS FROM STATPAC TO COVAR PROGRAM

MOVE CURSOR TO UPPER LEFT CORNER OF RANGE FOR TABLE OF STATPAC VALUES

TO AVOID POTENTIAL RANGE OVERLAP (& LOSS OF DATA) -- PRESS ENTER TO CONTINUE

HAS ASCII FILE OF RAW DATA ALREADY BEEN CREATED (Y or N)?

INPUT RAW DATA POINTS FROM STATPAC TO COVAR PROGRAM

MOVE CURSOR TO UPPER LEFT CORNER OF RANGE FOR TABLE OF STATPAC VALUES

TO AVOID POTENTIAL RANGE OVERLAP (& LOSS OF DATA) -- PRESS ENTER TO CONTINUE

HAS ASCII FILE OF RAW DATA ALREADY BEEN Created (Y or N)?
DATA4

{GETNUMBER "ENTER THE MINIMUM HORIZONTAL (X) DISTANCE BETWEEN POINTS : ",HORIZ}
{GETNUMBER "ENTER THE MINIMUM VERTICAL (Y) DISTANCE BETWEEN POINTS : ",VERT}
{GOTO}TAB ~ {END} {DOWN} {DOWN} {DOWN}
/RNCXABLE3 ~
{GRID}
{MENUBRANCH FUNCTION}

GRID

/RNCX ~ {RIGHT}/RNCXY ~ {LEFT}
{GOTO}XY ~
/WCS13 ~ {GOTO}X ~
{GETNUMBER "ENTER X-COORDINATE OF 1ST GRID POINT ",X} ~
{EDIT}* .01 ~
{DOWN} + (X + HORIZ) * .01 ~
{FOR NUM,3,20,1,GRID1}
/RNDX ~
{GETNUMBER "ENTER Y-COORDINATE OF 1ST GRID POINT ",XY} ~
{GOTO}XY ~ {EDIT}* .01 ~ {DOWN} + XY ~
{FOR NUM,3,20,1,GRID2}
{GOTO}TABLE3 ~
/RNCXS ~ {END} {DOWN} ~
{FOR NUM,2,20,1,GRID3}
{FOR NUM,2,20,1,GRID4}
{TBL3OUT}
{GOTO}TABLE3 ~ /RNCTAB5 ~
/RVXYDAT ~
{COVRUN}
{GOTO}XY ~
/WCS9 ~

TBL3OUT

{GOTO}TABLE3 ~ /RFF2 ~ {END} {DOWN} {RIGHT} {RIGHT} ~
/RNCXYDAT ~ {END} {DOWN} {RIGHT} ~
{COM} {DOWN} ~
GRID1
(DOWN)+(UP)+HORZ*.01~

GRID2
(DOWN)
+XY~

GRID3
(GOTO)TABLE3~
(END)(DOWN)(DOWN)
/RVXS~~

GRID4
(GOTO)TABLE3~{RIGHT}
(END)(DOWN)/RNCX~~
(FOR NUM,1,20,1,GRID5)
/RNDX~

GRID5
(DOWN)
+X+VERT*.01~

COVRUN
(DATOUT1)
(SYSTEM RUN.BAT)

DATOUT1
/PF(ESC)(ESC)
C:\ENVIR\COVAR\COVAR.DAT
~RRXYDAT~OMNOUQ
AGQ/RNDXYDAT~
(RETURN)

DAT1
(COM)
(DOWN)
TO VIEW THE INPUT DATA FILE ENTER A "Y"~{HOME}
(GETLABEL "DO YOU WISH TO VIEW INPUT DATA FILE (Y or N)?",NUM)
(IF NUM="Y") {BRANCH VDATA}
(COM){DOWN}
DO YOU WISH TO PERFORM BASIC STATISTICS ON THIS DATA NOW (Y or N)?

HOME

IF NUM="Y" {BRANCH BASTAT}

COM {DOWN}

TO PERFORM SEMIVARIOGRAM ANALYSIS AT THIS POINT ENTER "Y" ~ HOME

GETLABEL "DO YOU WISH TO PERFORM SEMIVARIOGRAM ANALYSIS NOW (Y or N)?",NUM

IF NUM="Y" {BRANCH SEMI}

COM {DOWN}

TO CREATE COVAR INPUT FILE NOW ENTER "Y" ~ HOME

GETLABEL "DO YOU WISH TO CREATE COVAR INPUT FILE NOW (Y or N)?",NUM1

IF NUM1="Y" {BRANCH DATA2}

IF NUM="N" {BRANCH PREP}

MEUNBRANCH FUNCTION

VDATA

SYSTEM VDATA.BAT

COM

GETLABEL "DO YOU WISH TO CHANGE ANY INPUT DATA (Y or N)?",NUM

IF NUM="Y" {BRANCH FIX}

BRANCH A28

FIX

SYSTEM FIX.BAT

BRANCH A28

A28

COM {DOWN}

GETLABEL "DO YOU WISH TO PERFORM BASIC STATISTICS ON THIS DATA NOW (Y or N)?",NUM

HOME

IF NUM="Y" {BRANCH BASTAT}

COM {DOWN}

TO PERFORM SEMIVARIOGRAM ANALYSIS AT THIS POINT ENTER "Y" ~ HOME

GETLABEL "DO YOU WISH TO PERFORM SEMIVARIOGRAM ANALYSIS NOW (Y or N)?",NUM

IF NUM="Y" {BRANCH SEMI}

COM {DOWN}

TO CREATE COVAR INPUT FILE NOW ENTER "Y" ~ HOME

GETLABEL "DO YOU WISH TO CREATE COVAR INPUT FILE NOW (Y or N)?",NUM1

IF NUM1="Y" {BRANCH DATA2}

IF NUM="N" {BRANCH PREP}

MEUNBRANCH FUNCTION

BASTAT

SYSTEM BASTAT.BAT

BRANCH A30
A30

{COM} {DOWN}

TO PERFORM SEMIVARIOGRAM ANALYSIS AT THIS POINT ENTER "Y" - {HOME}

{GETLABEL "DO YOU WISH TO PERFORM SEMIVARIOGRAM ANALYSIS NOW (Y or N)?",NUM}

{IF NUM="Y"} {BRANCH SEMI}

{COM} {DOWN}

TO CREATE COVAR INPUT FILE NOW ENTER "Y" - {HOME}

{GETLABEL "DO YOU WISH TO CREATE COVAR INPUT FILE NOW (Y or N)?",NUM1}

{IF NUM1="Y"} {BRANCH DATA2}

{IF NUM1="N"} {BRANCH PREP}

{MEUNBRANCH FUNCTION}

SEMI

{PREP}

{SYSTEM VARIO.BAT}

{SYSTEM XVARIO.BAT}

{GETLABEL "DO YOU WISH TO RUN BASIC STATISTICS ON RESULTS (Y or N)?",NUM}

{IF NUM="Y"} {BRANCH BASTAT}

{RETURN}

PREP

{COM}

MOVE CURSOR TO UPPER LEFT HAND CORNER OF RANGE FOR TABLE OF INPUT VALUES -

{DOWN} {DOWN}

PRESS ENTER TO CONTINUE - {HOME}

{?} -

/RNC/ ABLE -

/COM/ THE ROOT NAME MUST INCLUDE DIRECTORY (IF DIFFERENT THAN PROGRAM) -

{DOWN} {DOWN}

AND MAY NOT INCLUDE THE EXTENSION (STP). - {DOWN}

{GETLABEL "ENTER ROOT NAME FOR THE STATPAC INPUT FILE: ",TABLE}

{GOTO} TABLE - {DOWN}/RNCNEXT - ~

{GOTO} COMMENTS -

{GETLABEL "ENTER ROOT NAME OF STATPAC OUTPUT FILE: ",NEXT}/RNDNEXT ~

{GOTO} TABLE - {END} {DOWN} {DOWN}/RNCNEXT - ~

{COM}

ASSUME Y-COORDINATE IS NORTH COORDINATE -- THEN THIS VALUE IS 2 - {DOWN} {DOWN}

IF Y IS NOT NORTH -- ENTER APPROPRIATE COLUMN VALUE FROM INPUT FILE. - {DOWN}

{GETLABEL "ENTER COLUMN NUMBER OF NORTH COORDINATE: ",NEXT}/RNDNEXT ~

{GOTO} TABLE - {END} {DOWN} {DOWN}/RNCNEXT - ~

{COM}

ASSUME X-COORDINATE IS EAST COORDINATE -- THEN THIS VALUE IS 1 - {DOWN} {DOWN}
IF X IS NOT EAST -- ENTER APPROPRIATE COLUMN VALUE FROM INPUT FILE. ~(DOWN)

(GETLABEL "ENTER COLUMN NUMBER OF EAST COORDINATE: ", NEXT) /RNDNEXT ~

(GOTO) TABLE ~(END) (DOWN) (DOWN) /RNCNEXT ~ ~

(LET NEXT, NO)
/RNDNEXT ~

(GOTO) TABLE ~/RNCOUT ~(END) (DOWN) (DOWN) (BIGRIGHT) ~

/PF (ESC) (ESC)
C:\ENVIR\STATPAK\PREP.FIL
~ RROUT ~ OMNOUQ
AGQ/RNDOUT ~
(System PREP.BAT)
(CTRL)

CTRL
(CTRL)

MOVE CURSOR TO UPPER LEFT HAND CORNER OF RANGE FOR TABLE OF CONTROL VALUES ~(DOWN) (DOWN)

PRES ENTER TO CONTINUE ~(HOME)

(?)

/RNCCRTL TAB ~ ~

(CTRL)

(DOWN) THE ROOT NAME MUST INCLUDE DIRECTORY (IF DIFFERENT THAN PROGRAM) ~(DOWN) (DOWN)

AND MAY NOT INCLUDE EXTENSION. ~(DOWN)

(GETLABEL "ENTER ROOT NAME FOR THE CONTROL FILE TO BE CREATED: ", CRTL TAB)

(GOTO) CRTL TAB ~(DOWN) /RNCNEXT ~ ~

(CTRL)

TITLE MAY BE ANY ALPHANUMERIC COMBINATION OF UP TO 79 CHARACTERS. ~(DOWN) (DOWN)

TITLE WILL BE INCLUDED AT THE TOP OF EACH PAGE OF OUTPUT FROM SS2DGAMH. ~(DOWN)

(GETLABEL "ENTER TITLE FOR VARIOGRAM RUN; ", NEXT) /RNDNEXT ~

(GOTO) CRTL TAB ~(END) (DOWN) (DOWN) /RNCNEXT ~ ~

(CTRL)

THE LOGARITHMIC CONVERSION OPTION CAN BE USED IF THE VARIABLE IS ~(DOWN) (DOWN)

LOGNORMALLY DISTRIBUTED. THE NORMAL RESPONSE IS "NO" ~(DOWN) (DOWN)

NOTE: THE STATPAC 2-D KRIGING PROGRAMS DO NOT SUPPORT LOGNORMAL KRIGING. ~(DOWN)

(GETLABEL "IS LOGARITHMIC CONVERSION WANTED (Y or N)? ", NEXT) /RNDNEXT ~

(GOTO) CRTL TAB ~(END) (DOWN) (DOWN) /RNCNEXT ~ ~

(LET NEXT, N)
/RNDNEXT ~

(GOTO) CRTL TAB ~(END) (DOWN) (DOWN) /RNCNEXT ~ ~

(CTRL)

MOMENT CENTER DISPLAY OPTION MAY BE USEFUL WHEN DATA POINTS ARE ~(DOWN) (DOWN)

HIGHLY CLUSTERED IN SPACE. IN THIS CASE THE MOMENT CENTER MAY BE ~(DOWN) (DOWN)

QUITE DIFFERENT FROM THE USUAL GAMMA (h) STATISTIC. IN DATA WHICH ~(DOWN) (DOWN)

EXHIBIT A RANDOM OR NICELY GRIDDED PATTERN, THE MOMENT CENTER ~(DOWN) (DOWN)

AND GAMMA (h) STATISTICS WILL BE VERY NEARLY THE SAME. ~(DOWN)

(GETLABEL "IS MOMENT CENTER DISPLAY OPTION WANTED (Y or N)? ", NEXT) /RNDNEXT ~
THE USUAL RESPONSE TO THE AUTOMATIC SCALING QUESTION IS Y FOR YES.

RELATIVE VARIOGRAMS ARE NOT USED WHEN DEALING WITH NORMALLY DISTRIBUTED DATA.

CLASS INTERVAL SHOULD BE LARGE ENOUGH TO INCLUDE AT LEAST 30 PAIRS OF POINTS IN THE FIRST DISTANCE CLASS. THIS MAY TAKE SOME TRIAL AND ERROR RUNS TO DETERMINE THE BEST VALUE.

DIRECTION (IN DECIMAL DEGREES) ALONG WHICH THE VARIOGRAM IS TO BE COMPUTED: 0 = EAST—WEST; 90 = NORTH—SOUTH; 45 = NORTHEAST—SOUTHWEST; -45 = NORTHWEST—SOUTHEAST. INTERMEDIATE DIRECTIONS ARE ALSO ALLOWED.

THE VARIOGRAM WINDOW ANGLE IS DETERMINED BY TRIAL AND ERROR. AN ALL-DIRECTION VARIOGRAM REQUIRES A WINDOW OF 90 DEGREES. WHEN A +90 DEGREE WINDOW IS SELECTED, IT MAKES LITTLE DIFFERENCE WHAT DIRECTION IS SPECIFIED.

THE USUAL RESPONSE TO SELECTING COORDINATES IS "N" FOR NO. THIS QUESTION REFERS TO WHETHER THE VARIOGRAM IS LIMITED TO SPECIFIED COORDINATE BOUNDS.
CTRL1

{GOTO}CTRLTAB~/RNCCTRLOUT~{END}{DOWN}~
{PF}{ESC}{ESC}
C:\ENVIR\STATPAK\CTRLFIL
~/RNCCTRLOUT~OMNOUQ
AGQ/RNCCTRLOUT~
{SYSTEM CTRL.BAT}

KRIGE

{COM}

{GETLABEL "HAS RAW DATA FILE BEEN CONVERTED (PREPROCESSED) FOR KRIGING (Y or N)? ",NUM}

{IF NUM="N"} {PREP}

{COM} ~ (DOWN) ~

THIS SERIES OF QUESTIONS WILL CREATE A CONTROL FILE FOR THE KRIGE ~ (DOWN) (DOWN)
SUBROUTINE - THEN RUN THE KRIGE SUBROUTINE 1 TIME ~ (DOWN) (DOWN)
MOVE CURSOR TO UPPER LEFT HAND CORNER OF RANGE FOR TABLE OF CONTROL VALUES ~ (DOWN) (DOWN)
PRESS ENTER TO CONTINUE ~ (HOME)

{?} ~
/RNCKRIGCTRL ~ ~

{COM}

{DOWN}THE ROOT NAME MUST INCLUDE DIRECTORY (IF DIFFERENT THAN PROGRAM) ~ (DOWN) (DOWN)
AND MAY NOT INCLUDE THE EXTENSION ~ (DOWN)

{GETLABEL "ENTER ROOT NAME FOR THE STATPAC DATA FILE TO BE KRIGED: ",KRIGCTRL}
{GOTO}KRIGCTRL~ (DOWN)/RNCNEXT ~ ~

{COM}

{IF NEXT="N"} {BRANCH A371}

/RNDNEXT ~ (GOTO) KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEXT ~ ~ (GOTO) COMMENTS ~

{GETLABEL "ENTER ROOT NAME FOR ASCII OUTPUT FILE: ",NEXT}

/RNDNEXT ~ (GOTO) KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEXT ~ ~

{COM} (DOWN)

THE ROOT NAME MUST INCLUDE DIRECTORY (IF DIFFERENT THAN PROGRAM) ~ (DOWN) (DOWN)
AND MAY NOT INCLUDE THE EXTENSION ~ (DOWN)

{GETLABEL "ENTER ROOT NAME FOR THE KRIGED STATPAC OUTPUT FILE: ",NEXT}/RNDNEXT ~
{GOTO}KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEXT ~ ~

{COM}

ENTER A "1" (one) FOR ORDINARY KRIGING OR ~ (DOWN) (DOWN)
A "2" (two) FOR UNIVERSAL KRIGING ~ (DOWN) (DOWN)
NORMALY THIS ANSWER WILL BE 1 ~ (DOWN)

{GETLABEL "ENTER A 1 FOR ORDINARY OR A 2 OR UNIVERSAL KRIGING: ",NEXT}/RNDNEXT ~
{GOTO}KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEXT ~ ~

{COM}

ENTER THE PARAMETERS DETERMINED FROM PREVIOUS VARIOGRAM ~ (DOWN) (DOWN)

{GETLABEL "ENTER THE NUGGET VALUE FOR VARIOGRAM: ",NEXT}/RNDNEXT ~
THE NUGGET IS CONSIDERED A VARIOGRAM FOR THIS PROGRAM.
THE NUMBER OF 'OTHER VARIOGRAMS' DOES NOT INCLUDE THE NUGGET.

{FOR NUM,1,END,1,VARI}

ENTER THE MAXIMUM DISTANCE FROM CENTROID FOR A HOLE TO BE INCLUDED FOR KRIGING.

ENTER THE MAXIMUM NUMBER OF HOLES TO BE USED WITHIN NEIGHBORHOOD.

ENTER THE NUMBER OF NORTH-SOUTH POINTS.

ENTER THE DISTANCE BETWEEN POINTS IN N-S DIRECTION.

ENTER THE NUMBER OF EAST-WEST POINTS.

ENTER THE DISTANCE BETWEEN POINTS IN E-W DIRECTION.

ENTER NORTHING OF SOUTHWEST CORNER OF GRID.

ENTER EASTING OF SOUTHWEST CORNER OF GRID.

ENTER COLUMN NUMBER OF THE NORTH COORDINATE.

ENTER COLUMN NUMBER OF THE EAST COORDINATE.

ENTER COLUMN NUMBER OF THE CONDUCTIVITY VALUE.

IS THE ERROR MEASURE OPTION WANTED (Y or N):
DO YOU WISH TO PRODUCE MAP OF KRIGED DATA (Y or N) ; **NUM**
( IF NUM="Y") {BRANCH KRIGMAP}
 {MENUBRANCH FUNCTION}

THE ROOT NAME MUST INCLUDE DIRECTORY (IF DIFFERENT THAN PROGRAM) ~ (DOWN) (DOWN)
AND MAY NOT INCLUDE THE EXTENSION ~ (DOWN)

ENTER THE ROOT NAME FOR THE KRIGED STATPAC OUTPUT FILE: **NEXT** /RNDNEXT ~

ENTER A "1" (one) FOR ORDINARY KRIGING OR ~ (DOWN) (DOWN)

A "2" (two) FOR UNIVERSAL KRIGING ~ (DOWN) (DOWN)

NORMALLY THIS ANSWER WILL BE 1

ENTER THE PARAMETERS DETERMINED FROM PREVIOUS VARIOGRAM ~ (DOWN) (DOWN)

THE NUGGET IS CONSIDERED A VARIOGRAM FOR THIS PROGRAM ~ (DOWN) (DOWN)
The number of "other vario gramm" does not include the Nugget ~ (DOWN)

ENTER THE NUMBER OF OTHER VARIOGRAMS (5 MAX) IN THE MODEL : **NEXT**
( FOR NUM,1,NEXT,1,VARI)

ENTER THE MAXIMUM DISTANCE FROM CENTROID FOR A HOLE TO BE ~ (DOWN) (DOWN)
INCLUDED FOR KRIGING ~ (DOWN)

ENTER THE MAXIMUM HOLE DISTANCE FROM THE CENTROID : **NEXT** /RNDNEXT ~

ENTER THE MAXIMUM NUMBER OF HOLES TO BE USED WITHIN NEIGHBORHOOD : **NEXT**
/RNDNEXT ~

ENTER THE NUMBER OF NORTH - SOUTH POINTS : **NEXT** /RNDNEXT ~

ENTER THE DISTANCE BETWEEN POINTS IN N -S DIRECTION : **NEXT** /RNDNEXT ~

ENTER THE NUMBER OF EAST - WEST POINTS : **NEXT** /RNDNEXT ~

401
{GETLABEL "ENTER THE DISTANCE BETWEEN POINTS IN E-W DIRECTION ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

{GETLABEL "ENTER NORTHING OF SOUTHWEST CORNER OF GRID ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

{GETLABEL "ENTER EASTING OF SOUTHWEST CORNER OF GRID ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

{GETLABEL "ENTER COLUMN NUMBER OF THE NORTH COORDINATE ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

{GETLABEL "ENTER COLUMN NUMBER OF THE EAST COORDINATE ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

{GETLABEL "ENTER COLUMN NUMBER OF THE CONDUCTIVITY VALUE ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

{GETLABEL "IS THE ERROR MEASURE OPTION WANTED (Y or N) ", NEXT)/RNDNEXT ~
(KRIGE1)

{GETLABEL "DO YOU WISH TO PRODUCE MAP OF KRIGED DATA (Y or N) ", NUM)
(IF NUM="Y") {BRANCH KRIGMAP}
(MENUBRANCH FUNCTION)

VAR1

(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

ENTER THE PARAMETERS DETERMINED FROM PREVIOUS VARIOGRAM ~ (DOWN) (DOWN)

TYPES OF VARIOGRAMS ~ ~ ENTER NUMBER ONLY ~ (DOWN) (DOWN)

1 - SPHERICAL ~ (DOWN)
2 - EXPONENTIAL ~ (DOWN)
3 - LINEAR ~ (DOWN)
4 - GAUSSIAN ~ (DOWN)
5 - CUBIC ~ (DOWN)

{GETLABEL "ENTER NUMBER (1 THRU 5) FOR VARIOGRAM TYPE ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

{GETLABEL "ENTER C - VALUE FROM VARIOGRAM ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

{GETLABEL "ENTER A - VALUE FROM VARIOGRAM ", NEXT)/RNDNEXT ~
(GOTO)KRIGCTRL ~ (END) (DOWN) (DOWN)/RNCNEX ~ ~
(COM)

ENTER THE NUMBER 1 (one) FOR ISOTROPIC OR 2 (two) FOR ANISOTROPIC ~ (DOWN) (DOWN)

VARIGRAM ~ (DOWN)
(GETLABEL "$VAR" VARIOGRAM ISOTROPIC (1) OR ANISOTROPIC (2) : "$VAR") (RETURN)

KRIGE1
(GOT0) Krigexl ~ /RNCKRIGOUT ~ (END) (DOWN) (RIGHT) ~
/PF (ESC) (ESC)
C:\ENVR\ST ATP AK\KRIGCTRL.FIL
~ RRKRIGOUT ~ OMNOUQ
AGQ/RNDRKRIGET ~
{FGERASE}
{SYSTEM KRIGE.BAT}
(RETURN) ~

KRIGMAP
{SYSTEM KRIGMAP.BAT}
(RETURN)

FGERASE
(COM)
(DOWN) (RIGHT) (RIGHT) (RIGHT) WARNING ~ (LEFT) (LEFT) (LEFT) (DOWN) (DOWN) (DOWN)
THE PROGRAM WILL AUTOMATICALLY ERASE ALL OLD KRIGE OUTPUT FILES ~ (DOWN)
UNLESS THE OPERATOR SAVES THEM MANUALLY TO ANOTHER DIRECTORY ~ (DOWN) (DOWN)
(GETLABEL "$VAR" DO YOU WANT TO SAVE YOUR EXISTING KRIGE OUTPUT
FILES (Y or N) "$VAR") (NUM)
{IF NUM="Y"} (FILSAV)
(COM)
(DOWN)
ANY REMAINING KRIGE OUTPUT FILES IN THE STATPAK SUBDIRECTORY ~ (DOWN) (DOWN)
(RIGHT) (RIGHT) WILL BE ERASED ~
(GETLABEL "$VAR" DO YOU WANT TO CONTINUE (Y or N) "$VAR") (NUM1)
{IF NUM1="$N"} (FUNCTION)
(RETURN)

FILSAV
/S

\X
(COM) /RE (BIGRIGHT) (BIGRIGHT) (END) (DOWN) ~
/RNR ~ /RNCOMMENTS ~ (PGDN) (up) (BIGRIGHT) ~
(PGDN) /RNCSAMP ~ ~
(RIGHT) /RNCHORZ ~ ~
(RIGHT) /RNCSAMP ~ ~
(DOWN) /RNCSAMP ~ ~

403
INPUT RAW DATA POINTS FROM STATPAC ~ (DOWN) (DOWN)
MOVE CURSOR TO UPPER LEFT CORNER OF RANGE FOR TABLE OF STATPAC VALUES ~ (DOWN)
(DOWN) TO AVOID POTENTIAL RANGE OVERLAP (& LOSS OF DATA!) ~ (DOWN) (DOWN)
NO DATA SHOULD BE BELOW SELECTED RANGE -- PRESS ENTER TO CONTINUE ~ (DOWN)
(?)
/RNCTAB ~ {PGDN} (PGDN) {PGDN} (PGDN) (PGDN) {PGDN} ~
(GETLABEL "HAS ASCII FILE OF RAW DATA ALREADY BEEN CREATED (Y or N)? " SAMP)
(IF SAMP="Y") {BRANCH A859}
(SYSTEM VDATA.BAT)
(GOTO)TAB ~
/FIT (ESC) (ESC) C:\ENVIR\STATPAK
TEST.DAT
~ (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) ~
(FOR NUM 1,1,(@COUNT(TAB)-4)/2,1,ERAS)
(GOTO)TAB ~ /RNDTAB ~
(DOWN) (DOWN) (DOWN) /RNCTAB ~
/DPRF ~ 1.(END) (DOWN) ~ O ~ G ~
(GOTO)TAB ~ (END) (DOWN) /RE ~
(GOTO)TAB ~ (UP) /RNCТАБ ~ (END) (DOWN) (RIGHT) ~
(GOTO)TAB ~ (UP) (UP) "X-COORD ~ (RIGHT) Y-COORD ~ (RIGHT) 'COND ~
(GOTO)TAB ~ /RNDTAB ~ (UP) /RNCTAB ~
(GOTO)TAB ~ (END) (DOWN) (DOWN) (DOWN) (DOWN)
/RNCТАБЕ3 ~
/FIT (ESC) (ESC)
C:\ENVIR\COVAR
COVAR.DAT
~ /DPRF ~ 1.(END) (DOWN) ~ O ~ G ~
(END) (DOWN) /RE ~
(UP) (END) (UP) /DSRD. (RIGHT) (END) (DOWN) ~ P ~ A ~ S (RIGHT) ~ A ~ G
(GOTO)TABLE3 ~ /RNDTABLE3 ~ (UP) /RNCTABLE3 ~
(GOTO)TAB ~ (UP) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) /RNCRIT ~ (RIGHT) (RIGHT) (RIGHT) (DOWN) ~
X ~ COOD ~ (RIGHT) Y ~ COOD ~ (RIGHT) 'COND ~ (LEFT) (LEFT) ~
(DOWN) /RNCRIT1 ~
(DOWN) (DOWN) /COND ~ /RNCOUTPUT ~ (DOWN) ~
(DOWN) /RNCOUTPUT1 ~ (GOTO)TAB ~
(GOTO)TAB ~ /RNCTAB ~ (END) (DOWN) ~
(COVCON)
(RISK)

A859
(GOTO)TAB ~
/FIT (ESC) (ESC) C:\ENVIR\STATPAK.

404
CONDITIONAL SIMULATION REQUIRES MULTIPLE ITERATIONS OF THE MODELS. THIS PROCESS ASSUMES THAT THE INITIAL SAMPLE DATA HAS BEEN ANALYZED AND SATISFACTORILY KRIGED. IT FURTHER ASSUMES THAT COVAR HAS BEEN RUN AND THE REQUIRED NUMBER OF COVAR REALIZATIONS SUCCESSFULLY COMPLETED. IF ANY OF THESE CONDITIONS HAVE NOT BEEN MET QUIT CONDITIONAL SIMULATION NOW (SELECT N) TO RETURN TO FUNCTION MENU (SELECT Y OR N)?
{IF NUM="N"} {MENU BRANCH FUNCTION}

{COM}

THE NUMBER OF ITERATIONS MUST BE \leq < NUMBER OF COVAR REALIZATIONS \quad \text{(DOWN)}

(GETNUMBER "ENTER THE NUMBER OF ITERATIONS FOR THE MODEL","NUM")

{SYSTEM NEWNAME.BAT}

{MOCVAL}

{INITOUT}

{HEADER}

{OUTPUT}

{FOR SAMP,1,NUM,1,ITER}

MOCVAL

{COM}

SOME PROGRAMS WILL NOT RUN PROPERLY IF THE TRANSMISSIVITY VALUES IN THE ARRAY ~

{DOWN}

HAVE TOO LARGE OF A RANGE. ~ \quad \text{(DOWN)} \quad \text{(DOWN)}

THE RANGE OF VALUES FOR VARIOUS CONSOLIDATED AND UNCONSOLIDATED STRATA ~

{DOWN}

IS AVAILABLE IN THE PROGRAM DOCUMENTATION AND VARIOUS OTHER SOURCES ~ \quad \text{(DOWN)} \quad \text{(DOWN)} \quad \text{(DOWN)}

THE DOCUMENTED VALUES WILL HAVE TO BE MODIFIED BY THE APPROPRIATE ~ \quad \text{(DOWN)}

MULTIPLIER TO DERIVE THE CORRECT RANGE OF ARRAY VALUES ~ \quad \text{(DOWN)}

ie : IF \quad .00001 \quad \text{K} > .00000001 \quad \& \quad \text{THE ARRAY MULTIPLIER IS} \quad .00000001 \quad \text{~ (DOWN)}

\quad \quad \quad \quad \text{THE DESIRED MAXIMUM VALUE WILL BE} \quad 1000 \quad \text{~ (DOWN)}

\quad \quad \quad \quad \quad \text{(WHICH MUST BE CHANGED TO 999 TO KEEP WITHIN THE 4 COLUMN FIELD)} \quad \text{~ (DOWN)}

\quad \quad \quad \quad \quad \text{AND} \quad \text{~ (DOWN)}

\quad \quad \quad \quad \quad \text{THE DESIRED MINIMUM VALUE WILL BE} \quad .1 \quad \text{~ (DOWN)} \quad \text{(DOWN)} \quad \text{(DOWN)}

NOTE: IT MAY BE NECESSARY TO DETERMINE THESE VALUES BY TRIAL AND ERROR ~

(GETNUMBER "ENTER MAXIMUM ALLOWABLE HYDRAULIC CONDUCTIVITY",MAXVAL) ~

(GETNUMBER "ENTER MINIMUM HYDRAULIC CONDUCTIVITY",MINVAL) ~

INITOUT

{GOTO} TABLE3 \quad \text{(END)} \quad \text{(DOWN)} \quad \text{(DOWN)} \quad \text{(DOWN)} \quad \text{(DOWN)} \quad \text{(DOWN)}

/RNCINIT \quad ~/FIT\{ESC\} \{ESC\}

C:\\ENVIR\STATPAK\

INIT.FGR

\quad \{PGDN\} \{DOWN\} \{DOWN\} \{DOWN\} \{DOWN\} \{DOWN\} \{DOWN\}

/DPREF \quad \text{- L(END) \quad \{DOWN\} \quad \text{- O~G}

/RNDINIT \quad ~/RNCINIT \quad \text{- (END) \quad \{DOWN\} \quad \text{/RE~}

HEADER

{GOTO} INIT \quad \{PGDN\} \{PGDN\} \{END\} \{DOWN\} \{DOWN\} \{DOWN\} \{DOWN\}

/RNCTABLE1 \quad \{GOTO\} \{TAB\} \quad ~/RNCTABX \quad \{END\} \{DOWN\} \quad \{END\}

\{LET \quad TABLE1, TESTS\}

{GOTO} TABLE1 \quad \{DOWN\} \quad \text{/RNCNEXT ~ ~}
{COM}
{LET NEXT, N:S}/RNDNEXT ~
{GOTO} TABLE 1~ (END) (DOWN) (DOWN) /RNCNEXT ~ ~
{COM}
{LET NEXT, N:S}/RNDNEXT ~
{GOTO} TABLE 1~ (END) (DOWN) (DOWN) /RNCNEXT ~ ~
{COM}
{LET NEXT, @COUNT(TABX):V} /GOTO} NEXT ~ (EDIT) {HOME} ~ /RNDNEXT ~
{GOTO} TABLE 1~ (END) (DOWN) (DOWN) /RNCNEXT ~ ~
{COM}
{LET NEXT, 3} /GOTO} NEXT ~ (EDIT) {HOME} ~ /RNDNEXT ~
{GOTO} TABLE 1~ (END) (DOWN) (DOWN) /RNCNEXT ~ ~
{LET NEXT, X–COORD:S} /RNDNEXT ~
{GOTO} TABLE 1~ (END) (DOWN) (DOWN) /RNCNEXT ~ ~
{LET NEXT, Y–COORD:S} /RNDNEXT ~
{GOTO} TABLE 1~ (END) (DOWN) (DOWN) /RNCNEXT ~ ~
{LET NEXT, CONDS} /RNDNEXT ~
{GOTO} TABLE 1~/RNCTABLE ~/ (END) (DOWN) (RIGHT) (RIGHT) (RIGHT) ~
{GOTO} TABLE 1~/ (END) (DOWN) (DOWN)
'SAMPLE'
~ (RIGHT) /RNCSMTP1 ~ (RIGHT) (RIGHT) /RNCSMTP ~ ~
{FOR NUM 1.1@COUNT(TABX)–1,1,LSAMPLE}
/CTAB~SMTP1 /RNCSMTP1 ~/RNCTAB~
{GOTO} TABLE 1~/PGDN (PGDN) (PGDN) (PGDN) /RNCOUT ~ ~
{DOWN} (DOWN) /RNCREADTAB ~ READTAB ~
{GOTO} J1 ~
REALIZATION NUMBER 1 ~
{RETURN}

SAMPLE
{GOTO} TABLE 1~/ (END) (DOWN) (DOWN) 'SAMPLE'

ITER
{NEWDAT}
{FIL1}
{SYSTEM TER.1.BAT}
{SYSTEM PREP.BAT}
{SYSTEM KRIGE.BAT}
{KRIGOUT}

NEWDAT
{COVOUT}
{GOTO} TAB~ (RIGHT) (RIGHT) (RIGHT) /RNCNEWD ~ (END) (DOWN) ~
/CNEWD ~ SMTP ~
/RNDNEWD ~
{GOTO} TABLE 1~/RNCTAB30 ~/ (END) (DOWN) (RIGHT) (RIGHT) (RIGHT) ~

407
FILI
/PF{ESC}{ESC}
C:\ENVIR\STATPAK\TESTQ,FIL
~ RRTAB30~ QMNOUQ
AGQ/RNDTAB30~

COVOUT
{OPEN "C:\ENVIR\COVAR\COVAR.OUT",R}
{GOTO}READTAB ~ /RNDREADTAB ~ /RNCREADTAB ~ ~
{BRANCH READ}
{STAT1}
{DATBAK}

READ
{READLN OUT}
{IF OUT=J1}{BRANCH RITE}
{READ}

RITE
{FOR NUMPTS,1,20,1,RITE1}
{FOR NUMPTS,1,3,1,RITE2}
{CLOSE}
{BRANCH A584}

RITE1
{READLN OUT}
{APPENDBELOW READTAB,OUT}

RITE2
{READLN OUT}
/COUT ~ J1 ~
/REOUT ~

A584
{STAT1}
{DATBAK}
STAT1
{GOTO}READTAB~{DOWN}~
/DPRFCL.{END} {DOWN} ~O~G~
{END} {DOWN} /RE~
{STATDAT}

STATDAT
{GOTO}TABLE3~{END} {RIGHT} {RIGHT} ~
/RNCTABO~ ~
{GOTO}READTAB~{DOWN} ~
/M.{END} {DOWN} ~TABO~
{FOR HORZ,2,20,1,STATDAT1} ~

STATDAT1
{GOTO}TABLE3~{END} {RIGHT} ~
{END} {DOWN} /DPRFCL{DOWN} /RNCTABO~ ~
{GOTO}READTAB~{DOWN} ~
{FOR VERT,2,HORZ,1,STEP} ~
/M.{END} {DOWN} ~TABO~

STEP
{RIGHT}

DATBAK
{GOTO}TABLE3~{UP} ~
X~COOD~ {RIGHT} Y~COOD~ {RIGHT} COND~ {LEFT} {LEFT} ~
/RNCINPUT~ .{END} {DOWN} {RIGHT} {RIGHT} ~
{GOTO}TAB~ {UP} ~
X~COOD~ {RIGHT} Y~COOD~ {RIGHT} {RIGHT} COND~
{GOTO}TAB ~
{FOR NUM,1,@COUNT(TAB),1,EXT} ~

EXT
/RNCONONEOUT~ {.RIGHT} ~{RIGHT} {RIGHT} {RIGHT} /RNCTWOOUT ~ ~
/ONEOUT ~ CRIT1 ~
/DQIINPUT ~ OUTPUT ~ CRIT ~ EQ ~
/OUTPUT1 ~ TWOOUT ~
{GOTO}ONEOUT ~ /RNDONEOUT ~ /RNDTWOOUT ~
{DOWN}

KRIGOUT
{GOTO}READTAB ~ {PGDN} {DOWN} {DOWN} {DOWN} {DOWN} {DOWN} ~

409
RNCKRIGO ~ /FIT (ESC) (ESC)
C:\ENVIR\STATPAK\TEST.FGR
~ (PGDN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN)
/DPRF ~ L (END) (DOWN) ~ O ~ G
/RNCKRIGC ~ (END) (DOWN) /WR

(IF SAMPL=1) (KRG1)
(GOTO) KRG1 ~ (RIGHT) (RIGHT) (RIGHT) (RIGHT)
/C .(END) (DOWN) ~ CONDI ~
(GOTO) KRG1 ~ /RE .(PGDN) (PGDN) (END) (DOWN) (END) (RIGHT) ~ /RNDKRG1 /RNDKRG1 ~
(GOTO) TABLE3 ~ (RIGHT) (RIGHT) /RNCCVAR1 ~ (END) (DOWN) ~
/CCOVAR1 ~ /RNDCCVAR1 ~

(INIT)
(ROUND)
(GOTO) CO ~ /RNCKRIGOUT ~ .(END) (END) (RIGHT) ~
/RNDCO ~

KRG1
(GOTO) KRG1 ~ (PGDN) (PGDN) (END) (DOWN) (DOWN) (DOWN) (DOWN) (DOWN) ~
/RNCCONDI ~ (UP) (UP) X - COORD ~ (RIGHT) Y - COORD ~ (RIGHT)
"INIT VAL ~ (RIGHT) KRI GE VAL ~ (RIGHT) COV VAL ~ (RIGHT) CONDI VALUE ~
(GOTO) INIT ~ (RIGHT) ~ (RIGHT)
/C .(END) (DOWN) (RIGHT) (RIGHT) ~ CONDI ~
(GOTO) CONDI ~ (END) (RIGHT) (RIGHT) /RNCCONDI1 ~ ~ (RIGHT) /RNCCONDI2 ~ ~

INIT
(GOTO) CONDI ~
/RNCCO ~ (END) (DOWN) ~
(GOTO) TAB ~ (UP) ~
/RNCP1 ~ (END) (DOWN) (RIGHT) (RIGHT) ~
/RFF0 ~ (END) ~
(GOTO) CO ~

(FOR NUM1,1,@COUNT(CO),1,EXT1)
/RNDINP1 ~

EXT1
/RNCONEOUt ~ (RIGHT) ~ (RIGHT) (RIGHT) (RIGHT) (RIGHT) (RIGHT) /RNC TWOOUT ~ ~
/CONEOUT ~ CRIT1 ~
/DQIINP1 ~ OOUTPUT ~ CCRIT = EQ ~
(IF OUTPUT1 > 0) /OOUTPUT1 ~ TWOOUT ~
(GOTO) ONEOUT /RNDONEOUT ~ /RNDTW OOUT ~

410
ROUND

(GOTO)CONDIT2 {RIGHT}{RIGHT}@IF(+{LEFT}<$MAXVAL,MAXVAL,
@IF(+{LEFT}<$MINVAL,$MINVAL,@IF(+{LEFT}>100,@ROUND(+{LEFT}),0),
@IF(+{LEFT}<10,@ROUND(+{LEFT}),@ROUND(+{LEFT}),@ROUND(+{LEFT})))) ~
/C {LEFT}{DOWN},{END}{DOWN}{RIGHT},{RIGHT} ~
VITA
Larry E. Lockwood
Candidate for the Degree of
Master of Science

Thesis: THE USE OF SPREADSHEET PLATFORMS TO DEVELOP STOCHASTIC ENVIRONMENTAL SIMULATORS

Major Field: Environmental Engineering

Biographical:

Personal Data: Born in Aberdeen, South Dakota, August 11, 1949, the son of the late Larry J. Lockwood and Jeanne Lockwood. Married to Kathleen Ann Lockwood.

Education: Graduated from Central High School, Aberdeen, South Dakota, in May 1967; received Bachelor of Science Degree in Geological Engineering from South Dakota School of Mines and Technology in January, 1972; Completed requirements for the Master of Science Degree at Oklahoma State University in May, 1995.

Professional Experience: Geophysical Engineer for Geophysical Services Inc. from 1972 to 1974; Production Engineer for El Paso Natural Gas Co. from 1974 to 1981; Drilling and Completion Engineer for Dyco Petroleum from 1981 to 1991; President of Lockwood Energy Limited from 1991 to 1992; Operations Engineer/Manager for Roseland Oil and Gas, Inc. from 1992 to 1994; Project Manager for Sound Environmental, Inc. from February to November, 1994; Independent Consulting from 1994 to present.