

NATIONAL RESEARCH COUNCIL

WATER SCIENCE AND TECHNOLOGY BOARD

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November 30, 1987

MEMORANDUM

TO: Agency Representatives

FROM: Wendy Melgin *Wendy Melgin*

SUBJECT: SUMMARY MINUTES - NOVEMBER 9-10, 1987 GROUND WATER MODELING ASSESSMENT COMMITTEE MEETING

I have enclosed the summary minutes from the November 9-10 committee meeting. For your information, the location of the January 14-16, 1988 meeting has been changed to the University of Florida in Gainesville. It is not necessary for you to attend this meeting since it is a writing workshop.

If you have any questions about the meeting or the committee, please contact me.

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SUMMARY MINUTES

COMMITTEE ON GROUND WATER MODELING ASSESSMENT

2nd Meeting
November 9-10, 1987
Washington, D.C.

ATTENDANCE

Committee Members

F. Schwartz, Chairman
C. Andrews
D. Freyberg
C. Kincaid
L. Konikow
C. McKee
D. McLaughlin
E. Quinn
P.S. Rao
B. Rittman
D. Runnells
P. van der Heijde
W. Walsh

Absent

J. Mercer

Staff

S. Parker, Director, WSTB
S. David, Staff Officer
W. Melgin, Staff Officer
C. Carstater, Staff Assistant
J. Aquilino, Administrative Assistant

Invited Guests

N. Brooks, CETS
D. Chery, U.S. Nuclear Regulatory Commission
S. Cordle, U.S. Environmental Protection Agency
I. May, U.S. Army Toxic and Hazardous Materials Agency

Monday, November 9, 1987

OPEN SESSION - 9:00 A.M.

Frank Schwartz began the meeting by stating the objective: to finalize the Table of Contents and identify and assign chapters of the report. A discussion of the issues follows.

Table of Contents (Outline)

It was decided to use the draft Table of Contents (outline) prepared by F. Schwartz, to discuss and prioritize the issues. It was agreed that all the issues submitted by committee members could not be addressed, therefore, the outline will be useful for grouping the issues. F. Schwartz explained the rationale for developing the outline. Comments on the outline and issues were solicited from around the table. Some of the concerns mentioned were:

- should chapter 3 (role of models in decision-making) be moved toward the beginning of the report to chapter 2?
- what is the educational aspect of the report?
- how will equations be used?
- need discussion on the field aspect, what can be measured?
- how will case studies be integrated into the report?
- address new developments in technology
- do not stress the negative aspect of using models, i.e. model misuse
- emphasize the multi-disciplinary nature of modeling
- include a list of questions for decision-makers
- should appendices be used? bibliography?

It was agreed that:

- case studies will be integrated throughout the report rather than be in a separate chapter
- a chapter on recommendations and guidelines will be added
- a discussion of QA/QC will be included
- an Executive Summary will be included
- a section on scientific trends will be added (where is the science going, what is the future?)

audience

There were some questions as to who the audience was. This was discussed at the Woods Hole meeting but was not resolved. F. Schwartz described the audience as a target group of users or consumers of models and regulators and lawyers making decisions from models. A question was brought up as to whether graduate students are considered as an audience. F. Schwartz explained that the report should not be technically difficult and full of equations. S. Parker reminded the committee that NRC reports generally have a multi-audience purpose and the report should cater to the agency user and practitioner but also include research issues. Also discussed was the structure of the report and whether it should have the look and feel of a textbook. No conclusions were reached, however, it was agreed that this would rectify itself once the outline for the report came together.

L. Konikow and D. McLaughlin developed outlines based on the above discussion and F. Schwartz's outline. F. Schwartz, D. McLaughlin and L. Konikow broke into a group and drafted a consensus outline, a combination of the three, to present to the full committee.

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CLOSED SESSION 1:00 - 2:00 PM

F. Schwartz explained the reason for a closed session to the committee, to enable the committee to freely discuss their concerns without the sponsors present. W. Walsh stated that his working paper on the legal issues of ground water is to be used for committee purposes only; any other purpose would require his permission. The committee discussed the topic brought up by N. Brooks on future trends in the science and decided to include it in the report.

D. McLaughlin presented the outline, developed by Schwartz, Konikow and McLaughlin, to the committee. He discussed the rationale and potential contents of each chapter. The committee decided against an annotated bibliography; a references cited will suffice. It was decided not to include a glossary since there are many sources of information available and the time spent on a glossary would be wasted. Concern about the educational needs and need to share experiences in modeling applications (technology transfer) was mentioned. P. van der Heijde would like to have QA/QC integrated throughout the report since it applies to all stages of modeling.

The committee agreed to the outline and the seven chapters identified. The outline seems balanced to cover both the research and scientific needs and the regulatory issues. It was agreed that chapter 6 - The Role of Models in Decision-Making - will be important in defining the report.

OPEN SESSION 2:15 PM

case histories

It was agreed to identify one or two case histories, to follow throughout the report, that have all of the elements of everything we need. Other case histories would then be used to illustrate specific points, such as a biological process. Potential case histories to follow throughout the report are 1) Hooker Chemical 2) Aldicarb 3) Idaho National Engineering Laboratory 4) Hanford 5) Rocky Mountain Arsenal. A case history is needed that addresses solute transport, the Hooker Chemical case may not do this, however, it may be useful since it involves litigation.

The committee attempted to expand each chapter of the outline. To start, the committee referred to B. Rittman's list of processes. There was much debate over the contents of the chapters; especially on weaving the case histories into the text, including equations and how to include them (boundary conditions, reaction terms) and addressing generic models.

The committee decided to continue the next day in small working groups assigned to each chapter.

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Tuesday, November 10, 1987

OPEN SESSION

The individual groups and chapter leaders were identified and the committee broke into their respective groups:

Chapter 1	WSTB Staff
Chapter 2	S. Rao (leader), B. Rittman, C. McKee, [D. Runnells]*
Chapter 3	L. Konikow (leader), J. Mercer, C. Andrews, C. Kincaid
Chapter 4	D. McLaughlin (leader), D. Freyberg, P. van der Heijde [C. Kincaid]
Chapter 5	F. Schwartz (leader), D. Runnells, [D. McLaughlin, B. Rittman, W. Walsh]
Chapter 6	W. Walsh (leader), E. Quinn, [S. Rao]

* name in [] denotes secondary group for those committee members

The groups were instructed to develop detailed outlines on their chapters to present to the committee after lunch. It was also suggested that writing assignments be made at this time within the groups. The committee then broke up and reconvened at 1 pm.

Each group presented a brief summary of potential topics for their chapter. Committee members were given outlines (that were developed in the groups) for chapters 2, 3, and 4 (Attachment I). The other groups will submit their outlines soon. Chapter leaders are responsible for furnishing the WSTB staff with the material.

Some of the topics suggested for Chapter 5 on Scientific, Engineering and Policy Trends are:

- supercomputers
- artificial intelligence
- modeling strongly hydrophobic compounds
- use of models for engineered clean-ups
- geochemical models with transport
- mathematical optimization research
- inconsistencies of monitoring and modeling
- new sampling techniques
- numerical methods

It was agreed that the chapter leaders would submit all material sent to them by their groups to the WSTB by the end of December (Attachment II).

S. Parker recommended that research topics be kept in mind throughout the writing of the report and be woven throughout the text. This is generally more effective than keeping them in one chapter.

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January Meeting in Florida, January 14-16

It was decided that at the minimum a very detailed outline should be completed before the meeting, however, it is hoped that some writing will be done. The purpose of the meeting will be a writing workshop. It was agreed that the meeting be extended to include Saturday morning (January 16th). The product of the meeting will be the first draft of the report.

The 4th committee meeting was scheduled for April 25-26, 1988. C. Kincaid suggested the Battelle center on the University of Washington campus in Seattle, WA as a possible meeting place. He will send information concerning the costs and facilities. Another option is the National Academy of Sciences' Beckman Center located in Irvine, CA. The location will be determined at the January meeting.

The meeting was adjourned at 3:30 p.m.

ATTACHMENT I

TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION

CHAPTER 2 - PHYSICAL, CHEMICAL AND BIOLOGICAL PROCESSES

- 2.1. Define the System of Interest
- 2.2 Approach and Scope for this Section
- 2.3 Comprehensive Listing of Relevant Processes (Rittman's List)
 - 1. transport
 - 2. abiotic transformations
 - 3. biotic transformations
- 2.4 Summary Table Showing Relative Significance of Important Processes for Specific Scenarios.

Demonstrate Processes Using 2-3 Case Studies.

CHAPTER 3 - MODEL FORMULATION

- 3.1 Classification of Models
 - 1. by type
 - 2. see flow chart
- 3.2 Classification of Models - By Process

<u>Process</u>	<u>Discussion Items</u>
A. Flow	A. Governing Equations
1. Saturated flow	1. Eqs. + layman explanation
2. Unsaturated flow	
3. Non-Darcian flow	
B. Transport	B. Parameters
1. Nonreactive	1. Spatial distribution
2. Reactive	2. Heterogeneity
	3. Anisotropy
	4. Model complexity vs. data reqs.
C. Multiphase	C. Boundary and Initial Conditions
	1. Constraints on results
D. Geochemistry	D. Solution Techniques
	1. Overview
	2. Strengths and weaknesses
	3. Numerical errors
E. Other	E. Problems
1. Land subsidence	1. limitations
2. Coupled	2. Data availability
3. Heat transport	3. Hysteresis
4. Geothermal	4. Sharp fronts
	5. Computer limitations
	6. Equilibrium chemistry
	F. Model Availability
- 3.3 Model Selection
- 3.4 Examples/Case Histories

CHAPTER 4 - MODEL APPLICATION

- 4.1 Conceptual Framework
 - 1. Spatial variability
 - 2. Uncertainty
 - 3. Assumes model given. . . .
- 4.2 Sampling and Data Collection
- 4.3 Input Estimation and Calibration
- 4.4 Issues of Model Structure
- 4.5 Model Validation and Accuracy Assessment
- 4.6 Decision-Making
 - 1. How does model affect decision?
 - 2. Acceptance criteria
- 4.7 Summary
 - 1. Efficient allocations of modeling resources

CHAPTER 5 - SCIENTIFIC, ENGINEERING AND POLICY TRENDS*

CHAPTER 6 - THE ROLE OF MODELS IN DECISION-MAKING*

CHAPTER 7 - RECOMMENDATIONS AND GUIDELINES*

BIBLIOGRAPHY

* do not have the expanded chapters

ATTACHMENT II

STUDY SCHEDULE
Committee on Ground Water Modeling Assessment

December 31, 1987	The chapter leaders should have all written material.
January 14-16, 1988	3rd committee meeting, Florida; writing workshop; produce first draft report.
February 16	Reworked written material to WSTB from chapter leaders.
April 1	2nd draft of report sent to committee members for comment.
April 25-26	4th committee meeting, review 2nd draft and discuss conclusions and recommendations.
May 23	3rd draft of report with conclusions and recommendations.
June 20	Comments and revisions from committee to staff.
July 11 (?)	5th committee meeting to discuss 3rd draft of report.
August 1	3rd draft report to editing and marketing.
August 15	Edited report back to staff, create 4th draft.
September 6	4th draft to Report Reviewers and committee.
October 7	Comments from Report Reviewers to staff
October 30	Report Review sign-off.
November 25	Final draft.
December 1	Final manuscript to print shop.
December 31, 1988	Report transmitted.