

RCRA Waste Management

Planning,
Implementation,
and Assessment
of Sampling
Activities



William M. Cosgrove, Michael P. Neill,
and Katharine H. Hastie, editors



RCRA Waste Management:

Planning, Implementation, and Assessment of Sampling Activities

Prepared by
**Committee D-34 on
Waste Management**

**William M. Cosgrove,
Michael P. Neill, and
Katharine H. Hastie, Editors**

ASTM Stock Number: MNL42



ASTM
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Printed in the U.S.A

Library of Congress Cataloging-in-Publication Data

RCRA waste management : planning, implementation, and assessment of sampling activities / prepared by Committee D-34 on Waste Management ; William M. Cosgrove, Michael P. Neill, Katharine H. Hastie, editors.

p. cm.—(ASTM manual ; 42)

“ASTM stock number: MNL42.”

Includes bibliographical references and index.

ISBN 0-8031-2085-0

1. Hazardous wastes—Analysis—Handbooks, manuals, etc. 2. Hazardous wastes—United States—Management—Handbooks, manuals, etc. I. Cosgrove, William M., 1956- II. Neill, Michael P., 1962- III. Hastie, Katharine H., 1973- IV. ASTM Committee D-34 on Waste Management. V. ASTM manual series ; MNL 42.

TD1032 .R37 2000
628.4'2—dc21

00-028895

Copyright © 2000 AMERICAN SOCIETY FOR TESTING AND MATERIALS, West Conshohocken, PA. All rights reserved. This material may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media, without the written consent of the publisher.

Photocopy Rights

Authorization of photocopy items for internal, personal, or educational classroom use, or the internal, personal, or educational classroom use of specific clients, is granted by the American Society for Testing and Materials (ASTM) provided that the appropriate fee is paid to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923; Tel: 508-750-8400; online: <http://www.copyright.com/>.

NOTE: This manual does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this manual to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Foreword

THIS PUBLICATION, *RCRA Waste Management: Planning, Implementation, and Assessment of Sampling Activities*, was sponsored by Committee D-34 on Waste Management. The editors were William M. Cosgrove, Michael P. Neill, and Katharine H. Hastie. This is Manual 42 in ASTM's manual series.

Preface

THIS MANUAL, *RCRA Waste Management: Planning, Implementation, and Assessment of Sampling Activities*, was prepared by William M. Cosgrove, Michael P. Neill, and Katharine H. Hastie under the direction of ASTM's Committee D-34 on Waste Management. The purpose of the manual is to make available to practitioners a basic reference regarding the development of a sampling strategy to meet the objectives of projects associated with common RCRA waste management activities. It is intended to be a companion document to EPA's SW-846, the guidance manual for planning and conducting sampling activities under RCRA. The planning (data quality objectives), implementation (sampling and analysis), and assessment (data quality assessment) phases are discussed in this manual for a variety of waste management scenarios. This manual provides a summary of the step-by-step process for completing a sampling investigation associated with a data collection activity for waste identification purposes under RCRA. As a basis, many of the ASTM standards and guides developed by Committee D-34 are referenced as well as others from committees such as D-18 on Soil and Rock and D-19 on Water. Guidance documents from sources outside ASTM such as the U.S. Environmental Protection Agency (EPA) are also included where appropriate, as well as helpful textbooks and technical manuals. This manual uses a practical "waste pile" example to illustrate the planning, implementation, and assessment process. The authors encourage the readers to consult the references listed at the end of each chapter and appropriate experts in the areas of sample collection and handling, sample analysis, and statistical methods for data assessment.

Contents

Chapter 1—Introduction	1
References	1
 Chapter 2—Sampling for Waste Management Activities:	
Planning Phase	2
Introduction	2
Data Quality Objectives (DQOs)	2
DQO Steps	3
Step 1—Stating the Problem	3
Step 2—Identifying Possible Decisions	3
Step 3—Identifying Inputs to Decisions	4
Step 4—Defining Boundaries	5
Step 5—Developing Decision Rules	5
Step 6—Specifying Limits on Decision Errors	6
Step 7—Optimizing Data Collection and Design	6
Sampling Designs	9
Authoritative Sampling Designs	9
Probabilistic (Statistical) Sampling Designs	14
Summary	15
References	15
 Chapter 3—Sampling for Waste Management Activities:	
Implementation Phase	16
Introduction	16
Data Collection	16
Project Preparations	16
Selection of Sampling Equipment	18
Field Activities	19
Sampling Waste Units	23
Post Sampling Activities	25
Field Documentation	28
Technical Assessments	32
References	32
 Chapter 4—Sampling for Waste Management Activities:	
Data Assessment Phase	33
Introduction	33
Overview of Data Quality Assessment	33
DQA and the Data Life Cycle	33
Overview of the Five Steps of the DQA Process	33

Step 1—Review the DQOs and the Sampling Design	33
Step 2—Prepare Data for Statistical Analysis	34
Step 3—Conduct Preliminary Analysis of the Data and Check Statistical Assumptions	34
Step 4—Select and Perform Statistical Tests	35
Step 5—Draw Conclusions and Report Results	36
Summary	36
References	37
Appendix A: Confidence Intervals and Hypothesis Tests	41
Appendix B: Q/A/G-4 Chapter 6: Specify Tolerable Limits on Decision Errors	45
Appendix C: Waste Pile Example	53
Introduction	55
Planning Phase	55
Implementation Phase	60
Assessment Phase	60
For Case 1—Authoritative Sampling Design	61
For Case 2A (Normal Data Distribution)	61
For Case 2B (Non-Normal Data Distribution)	64
For Case 3—Systematic Grid Without Compositing Sampling Design	65
For Case 4—Systematic Grid with Compositing Sampling Design	66
For Case 5—Stratified Random Sampling Design	67
References	67
Appendix D: Statistical Tables	69
Index	75

About the editors

William M. Cosgrove is a science advisor to EPA's Director, Science and Ecosystem Support Division (SESD) in Athens, GA. SEDS provides field, analytical, and quality assurance support to the Region 4 enforcement and permitting programs. Mr. Cosgrove has served as a technical authority for the RCRA program while conducting numerous field investigations for the civil and criminal enforcement programs and he has assisted in the development and instruction of RCRA training courses.

Mr. Cosgrove has a B.S. in Environmental Health Science from the University of Georgia, Athens, GA and an M.S. in Environmental Systems Engineering from Clemson University, Clemson, SC. He serves on the adjunct faculty at the University of Georgia, and is active with the Water Environment Federation and ASTM.

Michael P. Neill is an Environmental Scientist at the U.S. EPA in Athens, GA. He serves as senior project leader in the hazardous waste section's team of field investigation specialists, responsible for enforcement actions and other investigations involving RCRA.

Prior to joining EPA in Athens, Mr. Neill was an On-Scene Coordinator for the U.S. EPA in Edison, NJ directing CERCLA removal actions at metal plating facilities, asbestos dumps, solvent recovery sites and chemical manufacturing plants.

Mr. Neill received his B.S. in Geology from Virginia Tech, Blacksburg, VA and his M.S. in Environmental Sciences from Rutgers University, New Brunswick, NJ.

Katharine Hastie is currently employed as a consultant at Booz Allen & Hamilton, Inc. One of her primary responsibilities at Booz Allen involves supporting the U.S. EPA, Region 9 with program management for RCRA permitting and enforcement. Previously, she worked in the EPA, Region 4 RCRA Enforcement Program conducting field investigations in support of criminal and civil enforcement activities. Additionally, she served as an instructor in the Region 4 hazardous waste training program.

Ms. Hastie received her B.S. in Physics from University of the South, Sewanee, TN and her M.S. in Environmental Engineering from Clemson University, Clemson, SC.

ISBN 0-8031-2085-0