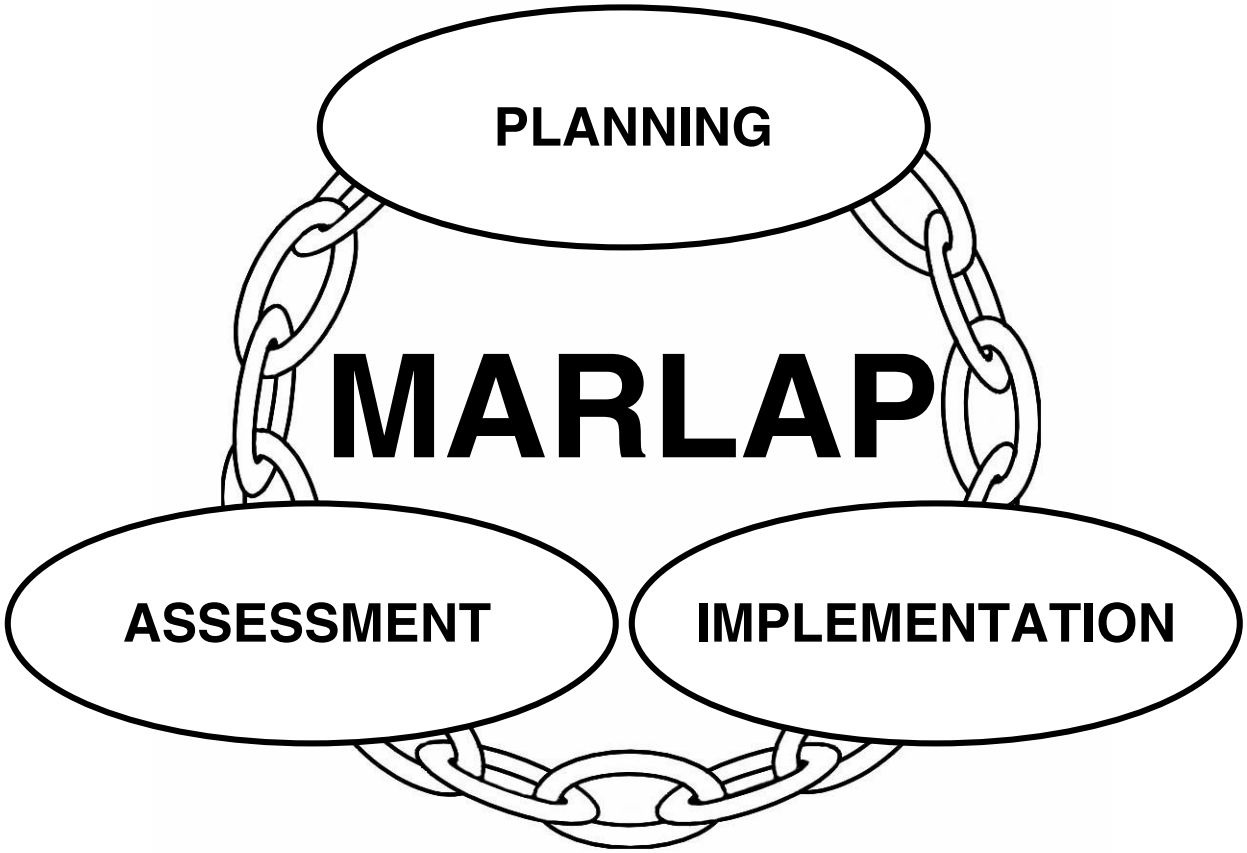
NUREG-1576
EPA 402-B-01-003
NTIS PB2001-106745

Multi-Agency Radiological Laboratory Analytical Protocols Manual



Draft for Public Comment

August 2001

ABSTRACT

The Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) manual provides guidance for the planning, implementation, and assessment of projects that require the laboratory analysis of radionuclides. MARLAP's basic goal is to provide guidance and a framework for project planners, managers, and laboratory personnel to ensure that radioanalytical laboratory data will meet a project's or program's data requirements. To attain this goal, the manual is intended to provide the guidance necessary for national consistency in the form of a performance-based approach for meeting a project's data requirements. The guidance in MARLAP is designed to help ensure the generation of radioanalytical data of known quality, appropriate for its intended use.

MARLAP was developed by a workgroup that included representatives from the U.S. Environmental Protection Agency (EPA), Department of Energy (DOE), Department of Defense (DOD), Nuclear Regulatory Commission (NRC), National Institute of Standards and Technology (NIST), U.S. Geological Survey (USGS), and U.S. Food and Drug Administration (FDA). State participation in the development of the manual involved contributions from representatives from the Commonwealth of Kentucky and the State of California. Contractors to EPA, DOE, and NRC, and members of the public, have been present during the open meetings of the MARLAP workgroup.

Examples of data collection activities that MARLAP supports include site characterization, site cleanup and compliance demonstration, decommissioning of nuclear facilities, remedial and removal actions, effluent monitoring of licensed facilities, environmental site monitoring, background studies, and waste management activities.

NOTICE

This draft manual being released for simultaneous public and peer review, and technical comments are solicited as described below. MARLAP has not been approved for use in part or in whole and should not be used, cited, or quoted except for the purposes of providing comments as requested by the agencies participating in its development.

MARLAP was developed by a workgroup that included representatives from the U.S. Environmental Protection Agency (EPA), Department of Energy (DOE), Department of Defense (DOD), Nuclear Regulatory Commission (NRC), National Institute of Standards and Technology (NIST), U.S. Geological Survey (USGS), and U.S. Food and Drug Administration (FDA). State participation in the development of the manual involved contributions from representatives from the Commonwealth of Kentucky and the State of California. Contractors to EPA, DOE, and NRC, and members of the public, have been present during the open meetings of the MARLAP workgroup.

Although Federal Government personnel are involved in the preparation of this document, the draft manual does not yet represent the official position of any participating agency. This review is a necessary step in the development of a multi-agency consensus manual. References within this manual to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement or recommendation by the United States Government.

Members of the public are invited and encouraged to submit comments to the following website http://www.eml.doe.gov/marlap/. Comments may also be submitted to *either*:

U.S. Environmental Protection Agency
ATTN: Air and Radiation Docket, Mail Stop 6102
Docket Number A-2001-16, Room M1500
401 M Street, SW
Washington, DC 20460

or

Chief, Rules and Directives Branch
Division of Administrative Services
Mail Stop T6D59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

All comments received will be reviewed by the entire MARLAP workgroup. Comments received by the date published in the *Federal Register Notice* announcing the availability of the document for public review will be considered. Comments received after that date will be considered if it is practical to do so, but no assurance can be given for consideration of late comments.

Copies of the draft MARLAP manual and all comments received may be examined or copied for a fee at the EPA Docket Room M1500, Docket Number A-2001-16, First Floor Waterside Mall, 401 M Street, SW, Washington, DC 20460; and the NRC Public Document Room, at U.S. Nuclear Regulatory Commission, Public Document Room, Washington, DC 20555. The document is also available through the National Technical Information Service (NTIS). The NTIS document number is PB2001-106745, and the NTIS Sales Desk can be reached between 8:30 a.m. and 6:00 p.m. Eastern Time, Monday through Friday at 1-800-553-6847; TDD (hearing impaired only) at (703) 487-4639.

In addition to providing comments on individual chapters and appendices, reviewers are also requested to address the following questions while reviewing the draft manual:

(1) Is the performance-based approach used in MARLAP for the planning, implementation, and assessment phases of projects technically sound, and is the approach reasonable in terms of ease of implementation by project managers and laboratories? Does the approach effectively link the three phases of a project, and is the guidance on quality control appropriate and supportive of a performance-based approach?

(2) Is the guidance on laboratory operations in Part II (Chapters 10-20) technically accurate and useful?

(3) Are the concepts covered under measurement statistics—specifically measurement uncertainty, detection and quantification capability—presented accurately and appropriately?

(4) Is the information understandable and presented in logical sequence? How can the presentation of material be modified to improve the manual?

(5) Does MARLAP provide benefits that are not currently available through other approaches? What are the costs associated with implementing the guidance in MARLAP in comparison with currently available alternatives?

Commentors are encouraged to use the website, http://www.eml.doe.gov/marlap, for their review. The website has detailed instructions on how to submit comments and has several

features that should aid the review process. Commentors also may submit written comments to either of the addresses listed on page IV of this Notice using the same general approach described in the MARLAP website. Comments should be accompanied by supporting details, rationale, or data. To ensure efficient and complete comment resolution, commentors are requested to reference the *page number* and the *line number* to which the comment refers. Comments corresponding to an entire chapter, section, or table should be referenced to the line number for the title of the chapter (always line number 1), section, or table. Comments on footnotes should be referenced to the line in the text where the footnote appears (footnotes do not have line numbers). Comments on figures should be referenced to the page on which the figure appears (figures do not have line numbers) and figure number. Comments on the entire manual should be referenced to the title page.

ACKNOWLEDGMENTS

The origin of the Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) manual can be traced to the recognition by a number of agencies for the need to have a nationally consistent approach to producing radioanalytical data that meet a program's or project's needs. A multi-agency workgroup was formed with representatives from the U.S. Environmental Protection Agency (EPA), Department of Energy (DOE), Nuclear Regulatory Commission (NRC), Department of Defense (DOD), U.S. Geological Survey (USGS), National Institute of Standards and Technology (NIST), and Food and Drug Administration (FDA) to develop guidance for the planning, implementation, and assessment of projects that require the laboratory analysis of radionuclides. Representatives from the Commonwealth of Kentucky and the State of California also contributed to the development of the manual.

Of particular importance to the workgroup is that the guidance needs to be both scientifically rigorous and flexible enough to be applied to a diversity of projects and programs. The draft MARLAP manual is the result of a cooperative effort with these goals in mind.

MARLAP would not have been possible without the workgroup members who contributed their time, talent, and efforts to develop this guidance document:

John Griggs*, EPA, Chair

EPA: H. Benjamin Hull
Marianne Lynch*
Keith McCroan*
Eric Reynolds
Jon Richards

DOE: Emile Boulos*
Carl Gogolak
Pam Greenlaw*
Catherine Klusek*
Stan Morton*
Colin Sanderson*
Stephanie Woolf*

DOD: CPT Andrew Scott (Army)
Ronald Swatski* (Army)
Jan Dunker (Army Corps of Engineers)
Troy Blanton (Navy)
CAPT David Farrand (Navy)
Dale Thomas (Air Force)

NRC: Rateb (Boby) Abu Eid
Tin Mo
George Powers

USGS: Ann Mullin*

NIST: Kenneth G.W. Inn*

FDA: Edmond Baratta

* These workgroup members also served as chapter chairs.

Special recognition is given to John Volpe, Commonwealth of Kentucky, and Penny Leinwander, State of California, for their contributions to the development of the MARLAP manual. The following Federal Agency contractors provided assistance in developing the MARLAP manual:

EPA: N. Jay Bassin (Environmental Management Support, Inc.)
Diane Dopkin (Environmental Management Support, Inc.)
U. Hans Behling (S. Cohen & Associates, Inc.)
Richard Blanchard (S. Cohen & Associates, Inc.)
Harry Chmelynski (S. Cohen & Associates, Inc.)
Scott Hay (S. Cohen & Associates, Inc.)
Patrick Kelly (S. Cohen & Associates, Inc.)
Robert Litman (S. Cohen & Associates, Inc.)
Charles (Chick) Phillips (S. Cohen & Associates, Inc.)
William Richardson III (S. Cohen & Associates, Inc.)
Steven Schaffer (S. Cohen & Associates, Inc.)

DOE: David McCurdy (Duke Engineering & Services)
John Maney (Environmental Measurements Assessments)
Stan Blacker (MACTEC, Inc.)
Pat Harrington (MACTEC, Inc.)
Mike Miller (MACTEC, Inc.)
Lisa Smith (Argonne National Laboratory)

NRC: Eric W. Abelquist (ORISE)
Dale Condra (ORISE)

The MARLAP Workgroup was greatly aided in the development of the manual by the contributions and support provided by the individuals listed below.

David Bottrell (DOE)
Lloyd Currie (NIST)
Mike Carter (EPA)
Mary Clark (EPA)
Ron Colle (NIST)
Mark Doehnert (EPA)
Steve Domotor (DOE)
Joan Fisk (EPA)
David Friedman (EPA)
LCDR Lino Fragoso (Navy)
Richard Graham (EPA)
Patricia Gowland (EPA)
Larry Jensen (EPA)
Jim Kotton (NRC)
Ed Messer (EPA)
Kevin Miller (DOE)
Jim Mitchell (EPA)
Colleen Petullo (EPA)
Steve Pia (EPA)
Phil Reed (NRC)
Cheryl Trottier (NRC)
John Warren (EPA)

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ACRONYMS AND ABBREVIATIONS

Note: Bracketed numbers following each definition represent the first chapter in which the acronym appears.

ADC . . . . . analog to digital convertor [18]
AEA . . . . . Atomic Energy Act [20]
AL . . . . . action level [C]
ANSI . . . . . American National Standards Institute [1]
AOAC . . . . . Association of Official Analytical Chemists [3]
APHA . . . . . American Public Health Association [6]
APS . . . . . analytical protocol specification [1]
ARARs . . . . . applicable or relevant and appropriate requirements (CERCLA/Superfund) [D]
ASL . . . . . analytical support laboratory [15]
ASQC . . . . . American Society for Quality Control [2]
ASTM . . . . . American Society for Testing and Materials [1]
ATD . . . . . alpha track detector [10]

BOA . . . . . basic ordering agreement [4]

CAA . . . . . Clean Air Act [20]
CBD . . . . . *Commerce Business Daily* [E]
CC . . . . . charcoal canisters [10]
CEDE . . . . . committed effective dose equivalent [2]
CERCLA . . . . Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund) [2]
CFM . . . . . cubic feet per minute [16]
CFR . . . . . *Code of Federal Regulations* [20]
CL . . . . . central line (of a control chart) [15]
CMPO . . . . . [octyl(phenyl)]-N,N-diisobutylcarbonylmethylphosphine oxide [14]
CMST . . . . . Characterization, Monitoring, and Sensor Technology Program (DOE) [A]
COC . . . . . chain of custody [2]
COR . . . . . contracting officer's representative [5]
cpm . . . . . counts per minute [12]
cps . . . . . counts per second [15]
CRM . . . . . continuous radon monitor [10]
CRM . . . . . certified reference material [18]
CWA . . . . . Clean Water Act [20]
CWLM . . . . . continuous working level monitor [10]

DAAP . . . . . diamylamylphosphonate [14]
DCGL . . . . . derived concentration guideline level [2]
DIN . . . . . di-isopropylnaphthalene [16]
DL . . . . . discrimination limit [C]
DoD . . . . . U.S. Department of Defense [1]
DOE . . . . . U.S. Department of Energy [1]
DOELAP . . . . DOE Lab Accreditation Program [18]
DOT . . . . . U.S. Department of Transportation [5]
DPM . . . . . disintegrations per minute [12]
DPPP . . . . . dipentylpentylphosphonate [14]
DQA . . . . . data quality assessment [1]
DQI . . . . . data quality indicators [3]
DQO . . . . . data quality objective [1]
DTPA . . . . . diethylene triamine penta-acetic acid [10]
DVB . . . . . divinylbenzene [14]

EDD . . . . . electronic data deliverables [17]
EDTA . . . . . ethylene diamine tetra acetic acid [10]
EGTA . . . . . ethyleneglycol bis(2-aminoethylether)-tetraacetate [14]
EPA . . . . . U.S. Environmental Protection Agency [1]
ERPRIMS . . . Environmental Resources Program Management System (U.S. Air Force) [17]
ESC . . . . . expedited site characterization [A]
eV . . . . . electron volts [15]

FAR . . . . . *Federal Acquisition Regulations* [E]
FDA . . . . . U.S. Food and Drug Administration [1]
FWHM . . . . . full width of a peak at half maximum [8]
FWTM . . . . . full width of a peak at tenth maximum [18]

GC . . . . . gas chromatography [14]
GLPC . . . . . gas-liquid phase chromatography [14]
GM . . . . . Geiger-Mueller detector [11]
GUM . . . . . *Guide to the Expression of Uncertainty in Measurement* [1]

HDBP . . . . . dibutylphosphoric acid [14]
HDEHP . . . . . bis(2-ethylhexyl) phosphoric acid [16]
HDEHP . . . . . diethylhexylphosphoric acid [14]

HDPE . . . . . high density polyethylene [10]
HPGe . . . . . high-purity germanium [semiconductor] [15]
HPLC . . . . . high-pressure liquid chromatography; high-performance liquid chromatography [14]
HTRW . . . . . hazardous, toxic and radioactive waste [10]

ICP-MS . . . . . inductively coupled plasma-mass spectroscopy [14]
IPPD . . . . . integrated product and process development [A]
ISO . . . . . International Organization for Standardization [1]
IUPAC . . . . . International Union of Pure and Applied Chemistry [1]

LAN . . . . . local area network [17]
LBGR . . . . . lower boundary of the gray region [B]
LCL . . . . . lower control limit [18]
LCS . . . . . laboratory control samples [3]
LDPE . . . . . low density polyethylene [10]
LEGe . . . . . low energy germanium [15]
LIMS . . . . . Laboratory Information Management System [17]
LLD . . . . . lower limit of detection [19]
LLRW . . . . . low-level radioactive waste [20]
LLRWPA . . . . Low Level Radioactive Waste Policy Act [20]
LOMI . . . . . low oxidation-state transition-metal ion [10]
LPC . . . . . liquid partition chromatography; liquid-phase chromatography [14]
LS . . . . . liquid scintillation [15]
LSC . . . . . liquid scintillation counting [15]
LWL . . . . . lower warning limit [18]

MAPEP . . . . . Mixed Analyte Performance Evaluation Program [DOE] [5]
MARSSIM . . . Multi-Agency Radiation Survey and Site Investigation Manual [1]
MCA . . . . . multichannel analyzer [15]
MDA . . . . . minimum detection analysis [15]; minimum detectable amount [7]
MDC . . . . . minimum detectable concentration [3]
MDL . . . . . method detection limit [19]
MDC . . . . . minimum detectable concentration [2]
MIBK . . . . . methyl isobutyl ketone [14]
MQC . . . . . minimum quantifiable concentration [3]
MQO . . . . . measurement quality objective [1]

MS . . . . . matrix spike [8]
MSD . . . . . matrix spike duplicate [8]
MVRM . . . . . method validation reference material [5]

NELAC . . . . . National Environmental Laboratory Accreditation Conference [5]
NESHAP . . . . National Emission Standards for Hazardous Air Pollutants [12]
NIST . . . . . National Institute of Standards and Technology [1]
NRC . . . . . U.S. Nuclear Regulatory Commission [1]
NRIP . . . . . NIST Radiochemistry Intercomparison Program [18]
NTA or NTTA nitrilotriacetate [14]
NTU . . . . . nephelometric turbidity units [10]
NVLAP . . . . . National Voluntary Laboratory Accreditation Program (NIST) [5]

OA . . . . . observational approach [A]
OFHC . . . . . oxygen-free high-conductivity [15]
OFPP . . . . . Office of Federal Procurement Policy [E]

PARCC . . . . . precision, accuracy, representativeness, completeness, and comparability [3]
PCB . . . . . polychlorinated biphenyl [20]
PDF . . . . . probability density function [19]
PE . . . . . performance evaluation [5]
PFA . . . . . perfluoroalcoholoxil™ [13]
PIC . . . . . pressurized ionization chamber [15]
PT . . . . . performance testing [5]
PTFE . . . . . polytetrafluoroethylene [12]
PUREX . . . . . plutonium uranium reduction extraction [14]
PVC . . . . . polyvinyl chloride [10]

QA . . . . . quality assurance [2]
QAP . . . . . Quality Assessment Program (DOE) [5]
QAPP . . . . . quality assurance project plan [1]
QC . . . . . quality control [1]

RCRA . . . . . Resource Conservation and Recovery Act [15]
REE . . . . . rare earth elements [13]
REGe . . . . . reverse-electrode germanium [semiconductor] [15]
RFP . . . . . request for proposals [5]

RFQ . . . . . request for quotations [E]
RMDC . . . . . required minimum detectable concentration [8]
ROI . . . . . regions of interest [17]
RPD . . . . . relative percent difference [7]
RPM . . . . . Remedial Project Manager [2]
RSD . . . . . relative standard deviation [19]
RSO . . . . . Radiation Safety Officer [11]

SA . . . . . spike activity [7]
SAFER . . . . . streamlined approach for environmental restoration (DOE) [2]
SAM . . . . . Site Assessment Manager [2]
SAP . . . . . sampling and analysis plan [1]
SI . . . . . international system of units [3]
SMO . . . . . sample management office [2]
SOP . . . . . standard operating procedure [4]
SOW . . . . . Statement of Work [1]
SQC . . . . . statistical quality control [15]
SR . . . . . unspiked sample result [7]
SRM . . . . . standard reference material [18]
SSR . . . . . spiked sample result [7]

TAT . . . . . turnaround time [7]
TBP . . . . . tributyl phosphate [14]
TC . . . . . to contain [glassware] [18]
TCLP . . . . . toxicity characteristic leaching procedure [13]
TD . . . . . to deliver [glassware] [18]
TEC . . . . . technical evaluation committee [5]
TEDE . . . . . total effective dose equivalent [2]
TES . . . . . technical evaluation sheet (USGS) [5]
TFM . . . . . tetrafluorometoxil™ [13]
TIOA . . . . . tri-iso-octylamine [14]
TLD . . . . . thermoluminescent dosimeter [10]
TOPO . . . . . trioctylphosphinic oxide [14]
TPO . . . . . Technical Project Officer [2]
TPP . . . . . technical project planning [2]
TPU . . . . . total propagated uncertainty [19]
TQM . . . . . Total Quality Management [A]

TRUEX . . . . . trans uranium extraction [14]
TSCA . . . . . Toxic Substances Control Act [20]
TSDF . . . . . treatment, storage, or disposal facility [20]
TTA . . . . . thenoyltrifluoroacetone [14]

UBGR . . . . . upper bound of the gray region [7]
UCL . . . . . upper control limit [18]
USGS . . . . . United States Geological Survey [1]
UWL . . . . . upper warning limit [18]

V . . . . . volts [15]

WCP . . . . . waste certification plan [20]

XtGe . . . . . extended-range germanium [semiconductor] [15]