

## COURSE OUTLINE

### MAJOR SAMPLING ERRORS

- Definitions and calculations of sampling errors
- Causes and mitigation of sampling errors

### SAMPLING TOOLS

- Selection and use of sampling tools
- How certain sampling tools cause bias

### BASIC STATISTICS FOR SAMPLING ACTIVITIES

- Confidence intervals and levels
- The importance of statistics in sampling
- Calculations for averages and proportions
- The importance of random sample selection

### FIELD QUALITY CONTROL

- Interpreting field quality control
- The correct way to take splits and replicates
- Outliers and resampling
- Recognizing sampling problems in data

### DATA QUALITY OBJECTIVES

- Defining data objectives
- The three most important questions when designing sampling plans

### SAMPLING PLAN DESIGN

- Sampling for cleanup levels, hot spots, average property
- Grab vs. composite samples
- Simple random, stratified, or systematic
- Critical elements of a sampling plan design
- Cost effective sampling plans

### SAMPLING VARIOUS MEDIA

- Soil, water, containerized liquids, waste, powders, particulates

## WHO SHOULD ATTEND / WHAT YOU WILL LEARN

*Everyone involved in sampling activities or those using data from sampling events to make decisions will benefit from this course.*

*Including, but not limited to:*

**PROJECT MANAGERS - FIELD SAMPLERS  
QA/QC PROFESSIONALS - SAMPLING PLAN DESIGNERS  
ATTORNEYS - CHEMISTS - ENGINEERS  
GUIDANCE DOCUMENT DEVELOPERS - MANAGERS  
REGULATORS - ENVIRONMENTAL COORDINATORS**

*During this course topics to be covered include:*

- **Where sampling errors originate and how to mitigate them**
- **How to design sampling plans to achieve project goals**
- **Sample representativeness - what it really means**
- **How lab subsampling can impact error**
- **How to sample heterogeneous materials**
- **How to determine whether you have a sampling problem**
- **How to make your sampling defensible**
- **How to take the fewest samples to meet your objective**

## ABOUT THE INSTRUCTOR

Charles Ramsey has a BA in Chemistry from the University of Denver and a MS in Environmental Science from the Colorado School of Mines. He is founder and President of EnviroStat, Inc., a company providing specialized training in the areas of field (bulk) sampling, laboratory subsampling, statistics and quality control. A recognized expert in the areas of sampling and statistics, Mr. Ramsey has been presenting courses for nearly a decade and has served as an expert witness in numerous court cases. He was also the manager of environmental compliance for Coors Brewing Company's Glass Business Unit.

Mr. Ramsey's experience includes seven years with the National Enforcement Investigations Center (NEIC) of USEPA. The NEIC is the EPA's principal source of expertise involving civil and criminal litigation support for complex investigations having national and/or significant regional environmental impact. While with the EPA, Mr. Ramsey provided sampling and statistical expertise on all major environmental regulations for the NEIC and a variety of other organizations including the Department of Justice, FBI, State Attorneys General, regional EPA offices, state environmental departments and non-governmental organizations. Project management experience includes:

- **DESIGNED SAMPLING PLANS -**
- **DEVELOPED PROJECT SPECIFIC QA/QC -**
- **PERFORMED AND DIRECTED SAMPLING ACTIVITIES -**
- **DEVELOPED IN-HOUSE SAMPLING AND SUBSAMPLING PROCEDURES -**
- **PERFORMED LABORATORY ANALYSIS -**
- **STATISTICALLY EVALUATED DATA DETERMINING WHETHER PROJECT GOALS WERE ACHIEVED -**

# YOUR DECISIONS ARE ONLY AS GOOD AS YOUR SAMPLES

## OTHER COURSES OFFERED BY ENVIROSTAT, INC.

SAMPLING FOR ENVIRONMENTAL DECISION MAKING,  
SAMPLING FOR ANALYTICAL LABORATORIES,  
BASIC STATISTICAL CONCEPTS AND DATA INTERPRETATION,  
SAMPLING FOR PROCESS AND QUALITY CONTROL

In-house courses can be customized to meet any client/project objectives. Some courses are offered as open registration; visit the web site for details.

## CONTACT / FURTHER INFORMATION

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