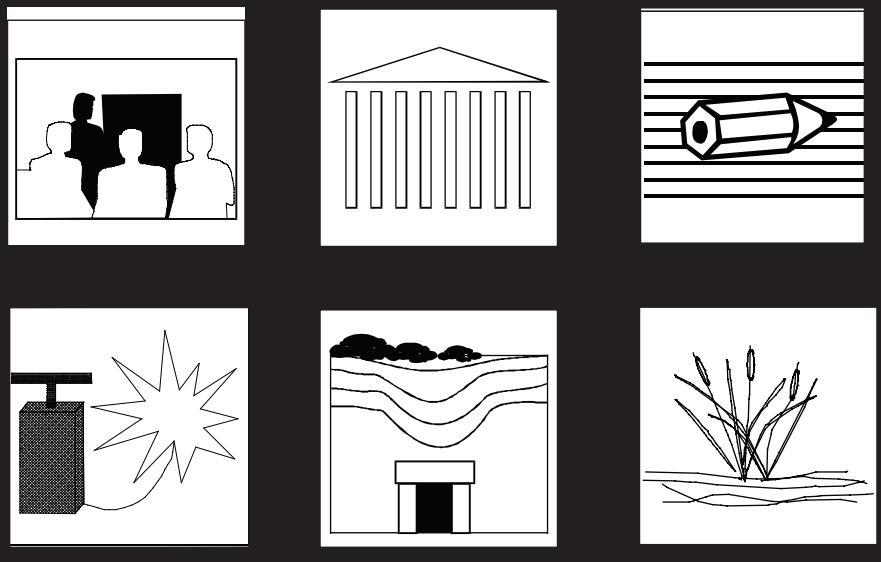
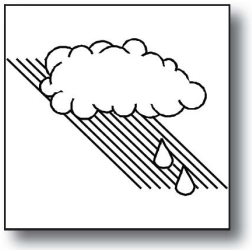
NATIONAL TECHNICAL TRAINING PROGRAM COURSE DESCRIPTIONS



U.S. Department of the Interior
Office of Surface Mining Reclamation & Enforcement
National Technical Training Program

Acid-Forming Materials: Fundamentals and Applications



This course is designed to provide participants with basic information on the characteristics of potentially acid-forming materials, their oxidation, production of acid-mine drainage/related aquatic toxic materials and extremely acid materials, and potential for mitigation of these impacts.

Duration: 4 days

TOPICS COVERED

Geology

- Fundamentals of Geology
- Role of Geology in Coal Mining Reclamation
- Depositional Environments
- Pyrite Formation
- Lithological Associations
- Geohydrology

Weathering and Soil-Forming Processes

- Acid-Forming Material Oxidative Processes
- Natural Disturbed Ecosystems

Acid Impacted Ecosystems

- Acid-Forming Material Impacts on Terrestrial Ecosystems
  - ◊ *Agriculture*
  - ◊ *Infrastructure Developments*
- Acid-Forming Material Impacts on Aquatic Resources/Ecosystems
  - ◊ *Fisheries*
  - ◊ *Irrigation and Related Agricultural*
  - ◊ *Uses of Water*

Sampling and Characterization Methodologies and Procedure

- Aquatic Resource Sampling and Characterization
- Sample Handling and Preparation for Terrestrial Ecosystem Characterization

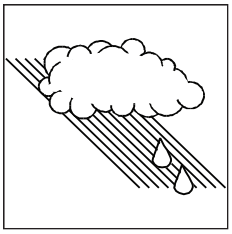
Planning and Mitigation Options

Mitigation of Acid Mine Drainage

WHO SHOULD ATTEND: Permitting specialists, inspectors and AML specialists.

Field Exercise: Hard hat, steel-toed boots, and safety glasses are required.

National Technical Training Program: (202) 208-2769



Acid-Forming Materials: Soils and Overburden

This course provides participants with information to upgrade their technical skills and current thinking in the critical aspects of acid-forming materials geology/ mineralogy and weathering, and its subsequent impacts on reclamation planning and mitigation of mine soils and plant systems.

Duration: 4 days (1 day for a field trip)

TOPICS COVERED

- Introduction and Objectives
- Soil Eco-System
- Glossary of Terms and References
- Geology and Weathering
- Acid Sulfate Soils and Soil Geochemistry
- Root Growth and Root Zone
- Soils and Overburden Sampling and Characterization
- Reclamation Planning and AFM Prevention: Soil Substitution and Supplements
- Acid-Forming Materials Mitigation: Neutralization and Lime Requirements
- Field Trip

WHO SHOULD ATTEND: Permitting Specialists, Inspectors, and AML Specialists.

COMMENTS: We recommend completion of the Acid-Forming Materials: Fundamentals and Applications course as a pre-requisite. A basic understanding of chemistry is very helpful.

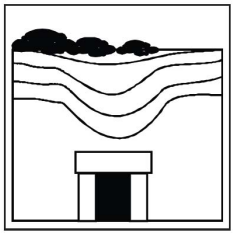
Students need to bring the following to class:

- calculator

Field Exercise: Steel-toed boots are required.

National Technical Training Program: (202) 208-2769

AML Design Workshop: Dangerous Highwalls



This is a field-oriented course to assist AML field staff in the selection and design of reclamation methods. Course material will cover several abatement methods such as backfilling and grading, benching, barriers and netting.

Duration: 4 days

TOPICS COVERED

This field-oriented workshop requires intensive interaction, relying on active student participation and the sharing of their AML reclamation design experience. Students will be required to develop conceptual designs, plans and specifications, and construction cost estimates.

- Introduction and Overview
- Definition of Terms
- Identification of Hazards
- Identify Reclamation Methods
- Site Characterization
- Develop a Site Map
- Develop Viable Reclamation Alternatives With the Pros and Cons Associated With Each
- Develop Final Design Including Bid Specifications, Plans/Drawing and Bid Items
  - *General Description of Work*
  - *Mobilization and Site Preparation*
  - *Construction Materials and Equipment*
  - *Site Restoration*
- Demobilization
- Method of Measurement and Payment
- Develop Cost Estimates

WHO SHOULD ATTEND: AML personnel (designers, project managers, engineers, geologists and inspectors).

COMMENTS: Students are encouraged to bring the following to class:

- Calculator
- Laptop computer (optional)
- Plans and specs of a reclamation method (hard copy and disk in Word) that student has developed or constructed
- Up to five digital images or photos of the above reclamation method

Be prepared to discuss the pros and cons of this reclamation method.

Field Exercise: Field boots and rain gear are required.

National Technical Training Program: (202) 208-2769

AML Design Workshop: Dangerous Openings

This is a field-oriented course to assist AML field staff in the selection and design of reclamation methods for vertical shafts, audits, and other mine openings. Course material will cover several abatement methods such as backfilling, plugs (concrete and polyurethane foam), and structural barriers (caps and grates).

Duration: 4 days

TOPICS COVERED

This field-oriented workshop requires intensive interaction, relying on active student participation and the sharing of their AML reclamation design experience. Students will be required to develop conceptual designs, plans and specifications, and construction cost estimates.

- Introduction and Overview
- Definition of Terms
- Identification of Hazards
- Identify Reclamation Methods
- Site Characterization
- Develop a Site Map
- Develop Viable Reclamation Alternatives With the Pros and Cons Associated With Each
- Develop Final Design, including Bid Specifications, Plans/Drawing and Bid Items
  - *General Description of Work*
  - *Mobilization and Site Preparation*
  - *Construction Materials and Equipment*
  - *Site Restoration*
- Demobilization
- Method of Measurement and Payment
- Develop Cost Estimates

WHO SHOULD ATTEND: AML personnel (designers, project managers, engineers, geologist and inspectors).

COMMENTS: Students are encouraged to bring the following to class:

- Calculator
- Laptop computer (optional)
- Plans and specs of a reclamation method (hard copy and disk in Word) that student has developed or constructed
- Up to five digital images or photos of the above reclamation method

Be prepared to discuss the pros and cons of this reclamation method.

Field Exercise: Field boots and rain gear are required.

National Technical Training Program: (202) 208-2769

AML Design Workshop: Fires

This is a field-oriented course to assist AML field staff in the selection and design of reclamation methods for both underground and refuse fires. Course material will cover several abatement methods such as excavation and extinguishment, isolation and cutoff trenches, surface covers, and injection of foaming mud.

Duration: 4 days

TOPICS COVERED

This field-oriented workshop requires intensive interaction, relying on active student participation and the sharing of their AML reclamation design experience. Students will be required to develop conceptual designs, plans and specifications, and construction cost estimates.

- Introduction and Overview
- Definition of Terms
- Identification of Hazards
- Identify Reclamation Methods
- Site Characterization
- Develop a Site Map
- Develop Viable Reclamation Alternatives With the Pros and Cons Associated With Each.
- Develop Final Design, Including Bid Specifications, Plans/Drawing and Bid Items
  - *General Description of Work*
  - *Mobilization and Site Preparation*
  - *Construction Materials and Equipment*
  - *Site Restoration*
- Demobilization
- Method of Measurement and Payment
- Develop Cost Estimates

WHO SHOULD ATTEND: AML personnel (designers, project managers, engineers, geologists and inspectors).

COMMENTS: Students are encouraged to bring the following to class:

- Calculator
- Laptop computer (optional)
- Plans and specs of a reclamation method (hard copy and disk in Word) that student has developed or constructed
- Up to five digital images or photos of the above reclamation method

Be prepared to discuss the pros and cons of this reclamation method.

Field Exercise: Field boots and rain gear are required.

National Technical Training Program: (202) 208-2769

AML Design Workshop: Landslides

This is a field-oriented course to assist AML field staff in the selection and design of reclamation methods. Course material will cover several abatement methods such as buttresses, excavation, and retaining structures.

Duration: 4 days

TOPICS COVERED

This field-oriented workshop requires intensive interaction, relying on active student participation and the sharing of their AML reclamation design experience. Students will be required to develop conceptual designs, plans and specifications, and construction cost estimates.

- Introduction and Overview
- Definition of Terms
- Identification of Hazards
- Identify Reclamation Methods
- Site Characterization
- Develop a Site Map
- Develop Viable Reclamation Alternatives With the Pros and Cons Associated With Each
- Develop Final Design Including Bid Specifications, Plans/Drawing and Bid Items
  - *General Description of Work*
  - *Mobilization and Site Preparation*
  - *Construction Materials and Equipment*
  - *Site Restoration*
- Demobilization
- Method of Measurement and Payment
- Develop Cost Estimates

WHO SHOULD ATTEND: AML personnel (designers, project managers, engineers, geologists and inspectors)

COMMENTS: Students are encouraged to bring the following to class:

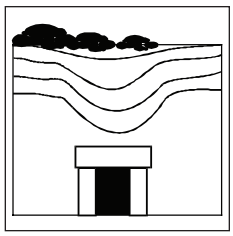
- Calculator
- Laptop computer (optional)
- Plans and specs of a reclamation method (hard copy and disk in Word) that student has developed or constructed
- Up to five digital images or photos of the above reclamation method

Be prepared to discuss the pros and cons of this reclamation method.

Field Exercise: Field boots and rain gear are required.

National Technical Training Program: (202) 208-2769

AML Design Workshop: Subsidence



This is a field-oriented course to assist AML field staff in the selection and design of reclamation methods. Course material will cover several abatement methods such as grouting, flushing, pneumatic and hydraulic stowing, and column supports.

Duration: 4 days

TOPICS COVERED

This field-oriented workshop requires intensive interaction, relying on active student participation and the sharing of their AML reclamation design experience. Students will be required to develop conceptual designs, plans and specifications, and construction cost estimates.

- Agenda
- Introduction and Overview
- Definition of Terms
- Identification of Hazards
- Identify Reclamation Methods
- Site Characterization
- Develop a Site Map
- Develop Viable Reclamation Alternatives With the Pros and Cons Associated With Each
- Develop Final Design Including Bid Specifications, Plans/Drawing and Bid Items
  - *General Description of Work*
  - *Mobilization and Site Preparation*
  - *Construction Materials and Equipment*
  - *Site Restoration*
- Demobilization
- Method of Measurement and Payment
- Develop Cost Estimates

WHO SHOULD ATTEND: AML personnel (designers, project managers, engineers, geologists and inspectors). It is recommended that participants complete the AML Drilling and Grouting class prior to taking this course.

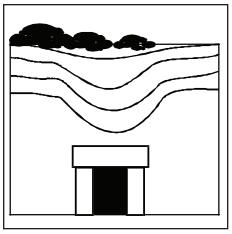
COMMENTS: Students are encouraged to bring the following to class:

- Calculator
- Laptop computer (optional)
- Plans and specs of a reclamation method (hard copy and disk in Word) that student has developed or constructed
- Up to five digital images or photos of the above reclamation method

Be prepared to discuss the pros and cons of this reclamation method.

Field Exercise: Field boots and rain gear are required.

National Technical Training Program: (202) 208-2769



AML Drilling and Grouting

This is a classroom-oriented course designed to allow AML staff to evaluate when commitment of expenditures for drilling is appropriate in response to mine subsidence complaints, and to evaluate situations where commitment of expenditures for grouting is appropriate in response to mine subsidence complaints.

Duration: 4 days

TOPICS COVERED

This classroom-oriented course provides participants with exposure to the methods and approaches utilized for drilling and grouting for the purpose of subsidence remediation across varying geological and geographical regions. The majority of the course is devoted to drilling for investigation, the design process, and construction methods for drilling and grouting projects. There is also discussion on the monitoring of structures and contracting. Within these topics, funding and geology are inherent themes that are addressed throughout the training.

Definition of Terms

- Review of Basics
- Drilling/Investigation for Design
- Design Process for Drilling and Grouting
- Pre- and Post-Construction Monitoring
- Construction Methodologies for Drilling and Grouting
- Contracting

WHO SHOULD ATTEND: AML technical personnel including project designers and managers, engineers, geologists and inspectors.

COMMENTS: A series of case studies and classroom exercises are incorporated into this training. Each student is requested to bring an example case study/ project to be used for illustration and/or discussion during class.

Field Exercise: None.

National Technical Training Program: (202) 208-2769

AML Realty

This course provides participants with detailed information and practical experience necessary to comply with realty aspects of the Surface Mining Control and Reclamation Act and other appropriate laws, regulations, and executive orders.

Duration: 3 days

TOPICS COVERED

Eligibility

- Legal and Legislative Authority

Scope of Work

- Property Conditions
- Encumbrances
- Site Plans and Specifications

Title Examination and Rights of Entry

- Courthouse Research and Ownership Information
- Special Agreement Rights of Entry
- Dealing With Incidental Coal
- Police Powers
- Landowner Contacts

Appraisals and Liens

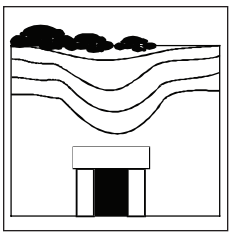
- Determining When an Appraisal is Appropriate
- Lien-Waiver Process
- Landowner Involvement

Documentation

WHO SHOULD ATTEND: Federal and State AML staff who have contact with landowners, especially those responsible for obtaining access to private, corporate, and public lands on projects.

Field Exercise: None.

National Technical Training Program: (202) 208-2769



AML Reclamation Projects

This course provides participants with information about the principles of abandoned mine land project development and the "rule of thumb" for the **onsite** administration and inspection of construction projects.

Duration: 3½ days

TOPICS COVERED

Project Development

- Historic Overview
- Project Identification
  - ◊ *Problem Type*
  - ◊ *Site Characteristics*
  - ◊ *Scope of Work*
- Design Development
  - ◊ *Reclamation Methods (pros & cons)*
  - ◊ *Land Use Considerations*
  - ◊ *Scheduling*
  - ◊ *Preparation of Specifications*

Project Administration

- Pre-bid Meeting
- Pre-construction Meeting
- Construction Inspection
  - ◊ *Role of Inspector*
  - ◊ *Government gets its money worth*
  - ◊ *Protect Public Interest*
  - ◊ *Require Full Performance*
  - ◊ *Keep work on schedule*
  - ◊ *Contractor receives payment*
  - ◊ *Contractor fulfilled Obligations*
  - ◊ *Know Contract Administration*
  - ◊ *Product of High Quality*
  - ◊ *Not Job Superintendent*
  - ◊ *Not Agency of Landowner*
- Inspection Requirements
- Reporting and Recording
- Final Inspection
- Post Construction Monitoring
- Basic Map Reading

Safety

- Construction Safety
- Video

AML Hazards

- Abandoned Structures/Equipment

Field Exercises

- AML Site Investigation
- Active Construction Site
- Post Reclamation Maintenance

WHO SHOULD ATTEND: AML reclamation projects specialists and Bond forfeiture project specialists.

Field Exercise: Hard hat, hard-toed boots, and appropriate field attire are required.

National Technical Training Program: (202) 208-2769

Applied Engineering Principles

This course provides participants with knowledge of basic principles and "rules of thumb" that will enable them to read and use engineering plans and maps to conduct onsite inspections of structures and understand other engineering aspects of reclamation.

Duration: 4 days

TOPICS COVERED

The Engineering Process

Earth Materials

- Introduction to Soil and Rock Engineering
- Soil Characterization
- Materials Strength
- Permeability and Pore Pressure
- Surcharge Loads, Settlement, and Consolidation
- Density of Soil and Compaction
- Durability
- Coal Waste
- Field Exploration/Sampling/Logging

Slope Stability

- Principles
- Illustrations/Terminology
- Exercises
- Problems

Water Management

- Hydrology
- Erosion
- Hydrolics
- Sediment Basins
- Other Drainage Control Structures
- Inspection of Earth Dams

Engineering Field Work

- Map and Plan Reading
- Measuring Techniques
- Field Methods

Field Exercise

Roads

Mining Equipment

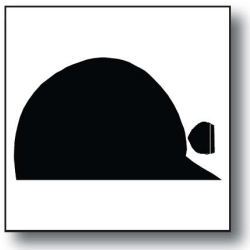
WHO SHOULD ATTEND: Inspectors and permit, bonding, assessment, and abandoned mine land program specialists. Also for individuals who need an understanding of, but have not had completed academic or other training in engineering disciplines. At least six months experience on a regulatory program staff is recommended.

COMMENTS: Students need to bring the following to class:

- Scientific Calculator

Field Exercise: Field boots and rain gear are required.

National Technical Training Program: (202) 208-2769



Basic Inspection Workbook

This self-study course provides new inspectors with an introduction to the inspection and enforcement aspects of regulatory programs. The workbook is designed for use in conjunction with applicable regulatory program requirements.

TOPICS COVERED

Overview of Surface Mining Activities

- Sequence of Surface Mining Activities
- Surface Mining Equipment
- Regional Characteristics of Surface Mines
- Surface Mining Techniques

Inspection Responsibilities

- Preparation for an Inspection
- Inspection Procedures

Enforcement Responsibilities

- Enforcement Actions
- Alternative Enforcement Techniques
- Penalty Assessments
- Appeals and Hearings

Materials Handling and Storage

- Removal of Vegetation
- Soil Handling Procedure
- Removal and Storage of the Overburden
- Special Categories of Mining

Hydrologic Standards

- Surface Water Hydrology
- Inspection of Drainage Control Structures
- Other Surface Water Concerns
- Groundwater Hydrology
- Acid-Mine Drainage
- Monitoring and Water Rights
- Water Sampling Procedures

Blasting Standards

- Types of Explosives
- Public Safety
- Control of Adverse Effects
- Citizen Complaints
- Blasting Records
- On-Site Inspections

Reclamation

- Backfilling and Grading
- Replacement of Topsoil
- Revegetation
- Bond Release

Surface Effects of Underground Mining

- Differences Between Surface and Underground Operations
- Methods of Underground Mining
- Inspector Responsibilities

WHO SHOULD ATTEND: New inspectors with less than six months of surface mining experience.

COMMENTS: No in-class sessions are held for this self-study course. Please call (202) 208-2769 to obtain copies of the workbook.

National Technical Training Program: (202) 208-2769

Blasting and Inspection

This course provides training for inspectors to understand the basic principles of blasting and environmental effects. Focus will be on compliance with regulations and blast-site inspections.

Duration: 3 days

TOPICS COVERED

Introduction and Blasting Overview

Blasting

- Explosives Characteristics
- Initiation Systems
- Blast Design
- Blast Records and Inspection

Adverse Effects

- Vibrations and Blasting Seismographs
- Blast Waveform Interpretation
- Ground Vibration Limits
- Airblast Limits
- Flyrock Limits

Performance Standards

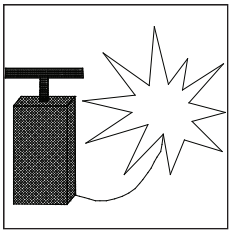
- Warning Signals and Blasting Schedules
- Preblast Survey
- Permit Blast Plans
- Inspector Safety
- Mine Site Inspection

WHO SHOULD ATTEND: Inspectors, permit staff, entry-level personnel wanting blasting training and experienced personnel wanting refresher training.

COMMENTS: Students need to bring the following to class:

- Calculator
- Problematic Blast Logs

National Technical Training Program: (202) 208-2769



Advanced Blasting: Investigation and Analysis of Adverse Effects

This course provides advanced blasting training for regulatory personnel who evaluate the adverse effects of blasting. It focuses on gathering and analyzing information that will assist in resolving citizen complaints from ground vibrations, air blast, flyrock, and fumes.

Duration: 3½ days

TOPICS COVERED

Introduction

- Why We Review Citizen Complaints

Blast Log Review

- Terminology
- Cross-Tabulating Data Fields
- Blast Log in Compliance with Regulations
- Calculate Scaled Distance and Maximum Charge Weight
- Signs of Elevated Ground Vibration, Air Blast and Flyrock

Review of Ground Vibration and Air Blast Standards

- Plotting Square-Root Scale Distance, Cube-Root Scale Distance
- Regression Analysis
- Spatial Relationships
- Accuracy of Measurements
- Blast Log Evaluation Program as a Guide
- Signature Blasts
- Frequency Determination

Structure Response

- Terminology of Houses
- Statistics of the Research
- Response Characteristics
- Strains
- Response Measurement
- Natural Frequency Determination

Field Exercise

- Seismic Array
- Structure Response

Damage Evaluation

- Pre-Blast and Post-Blast Surveys
- List of Available Tools and Techniques
- Not Blast Damage
- Environmental Causes of Damage
- Guide for Conducting Damage Assessments
- Vibration-Related Damages
- Documentation of Damage
- Situations When No Investigation Necessary

Public Relations/Customer Service

Safety Area and Warning Signals

Fumes

- Nitrogen Monoxide and Carbon Monoxide

Legal Issues

WHO SHOULD ATTEND: Regulatory personnel who have taken the Blasting and Inspection course within the last five years and/or whose principal job is Blasting Specialist.

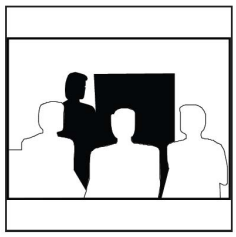
COMMENTS: Students need to bring the following to class:

- Scientific calculator
- Engineering scale
- Seismograph, if available
- Problematic blast logs or seismic records
- Photos of alleged damages

Field Exercise: Hard hat and steel-toed boots are required.

National Technical Training Program: (202) 208-2769

Coalfield Communications: How to Get It Right!



The purpose of this course is to prepare and enhance the skills of staff that deal with the public. This course is an interactive forum which provides attendees with information to improve State, Tribal and Federal SMCRA Programs through effective communication by sharing successful and bad experiences. Topics covered include 1) Building trust through effective communication; 2) Conducting effective public meetings; 3) Pro-active and re-active interaction with news media and; 4) Outreach. Class exercises are designed to maximize opportunities for student practice as communication skills are best learned through doing.

Duration: 3 days

TOPICS COVERED

Building Trust Through Effective Communication

- Words, Tone and Body Language
- Improving Listening Skills
- Building an Effective Response

Conducting Effective Public Meetings

- Key Aspects of Public Meeting
- Meeting Nightmares
- Why Have Meetings?
- All Meetings Are Not the Same
- Planning Effective Meetings

Media Relations

- What Makes News?
- Laying the Groundwork
- Responding to Press Inquiries

Extending the Reach: Outreach Session

- How Outreach Can Help You
- Some Tools of the Trade
- Using the WEB
- How to be a Good Ambassador and Connecting with Communities
- Show and Tell

Crisis Communication Exercise

- True-to-Life Worst-Case Scenario
- Learning from Mistakes

WHO SHOULD ATTEND: Staff who has contact with the public and/or media.

COMMENTS: Students should be prepared to interact and participate in class discussions and exercises. Please bring examples of your office's outreach materials and personal experiences to share with the class.

National Technical Training Program: (202) 208-2769

Enforcement Procedures

This course provides an overview of the legal and practical aspects of the inspector's job, with a focus on preparing for and participating in administrative hearings.

Duration: 3 days

TOPICS COVERED

Responsibilities of Inspectors

- Conducting Inspections
- Professional Attitudes/Judgment

Preparing for Inspections

- Permit Review
- Equipment/Supply Checklist
- Writing Reports

Enforcement Actions

- Inspection
- Administrative Review/Hearings
- Penalty Assessment

Alternative Enforcement Actions

- Individual Civil Penalty
- Injunction
- Criminal Action
- Permit Denial and the Applicator/Violator System

Potential Liability of Inspectors

- General Liability
- Sovereign/Governmental Immunity
- Conflict of Interest

Administrative & Judicial Proceedings

- Administrative Hearings
- Judicial Review
- Rules of Evidence
- Service
- Attorney-Inspector Relationship

Preparation of Notices of Violation and Cessation Orders

Administrative Law

Mock Inspection and Enforcement Action

- Development of Evidence
- Preparation of Testimony

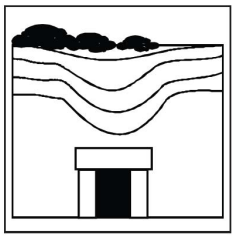
Mock Administrative Proceeding

- Giving Testimony
- Interpreting Evidence
- Cross-examination
- Hearing Analysis

WHO SHOULD ATTEND: Inspectors and assessment specialists; permit reviewers, bonding specialists, program managers, new attorneys, and others who need an understanding of the enforcement program.

COMMENTS: At least six months on a regulatory program staff is recommended.

National Technical Training Program: (202) 208-2769



Erosion and Sediment Control

This course provides field inspectors and permit reviewers with a view of Theory and concepts related to soil erosion and sediment control processes Special emphasis is given to identifying potential problems in the permit application and under field conditions. Remedial measures for soil erosion and sediment control are discussed.

Duration: 3 days

TOPICS COVERED

General Introduction

- Course Objectives
- Solicits class-identified problems
  (a) Written and given to instructors

Applicable Regulation and Performance Standards

- Example of Erosion Control Plan

Problems in the Permit Application

- Evaluating data submitted
- Field verification of field problems
- Students identify problems seen in field
- Data problems with Natural Resources
- Case studies (**good, bad, and ugly**)

Problems in the Field

- Tie permit data to field problems
- Structure suited to task
- Structure perform under various condition
- Always focus on "worst case scenario"

Concepts of Soil Erosion

- Define erosion and sedimentation
- Natural and man made factors affecting erosion
- Slope shape affect erosion
- Use of erosion equations
- Operations considerations to minimize erosion

Techniques, Structures and Products For Reducing Soil Erosion

- Commonly used erosion structures
- Commonly used erosion products

Final Contour, Suitable Rooting Medium and Final Grading

- Geomorphic Design
- Establish a productive rooting medium
- Role of compaction in runoff
- FRA (Forestry Reclamation Approach) role in sediment control

Concepts of Stream Flow, Velocity and Scour Components

- Characteristics of stream flow and how they change

Techniques, Structures and Products to Control Stream/Channel Erosion

- Use of vegetation
- Product applications; structures installation and maintenance

The Dynamics of Water and Sediment Movement in a Pond

- Water circulation in pond varies
- Sediment pond considerations

Sediment Control and Sediment Ponds

Best Management Practices (BMP)

Field Trip

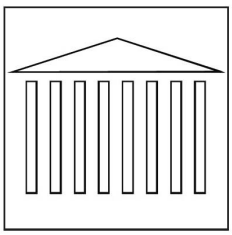
- Evaluation of erosion control practices, products and structures

WHO SHOULD ATTEND: Field inspectors, AML field personnel and permit reviewers

COMMENTS: Suggest having taken the Soil and Revegetation course prior to taking this course.

National Technical Training Program: (202) 208-2769

Evidence Preparation and Testimony



This course provides participants with detailed information concerning the legal aspects of evidence, the proper procedures for interviewing, specific evidence-development and management techniques, and practical experience in cross-examination testimony.

Duration: 3 days

TOPICS COVERED

Evidence Management

- Graphic Evidence Techniques
- Photographic Evidence techniques
- Sketching
- Documents

Legal Overview of Evidence

- Types
- Legal Requirements

Hearsay

- Direct Examination
- Expert Testimony
- Cross-Examination
- Discovery

Interviewing

- Principles of Interviewing

Testimony

- Presentation of Evidence
- Hearsay Rules
- Cross-Examination Testimony
- Attorney/Peer Critique

WHO SHOULD ATTEND: Inspectors, inspector supervisors, AML and technical staff who wish to refine their skills in preparing evidence and giving expert testimony.

COMMENTS: Participants should have completed the **Enforcement Procedures** course or equivalent training prior to taking this course.

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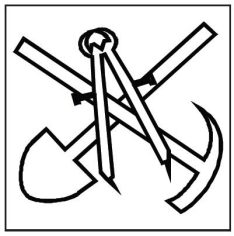


Excess Spoil Handling and Disposal in Steep-Slope Topography

This course provides participants with a basic understanding of approved spoil handling, backfilling, grading, compaction, and spoil-disposal practices with an emphasis on Eastern steep-slope mining and valley-fill construction. Typical design and construction practices are presented to provide an understanding of the relationship between permit requirements and on-the-ground performance.

Duration: 2½ days

TOPICS COVERED

- Historical Perspective
- Geologic Principles
- Foundation Preparation and Internal Drainage Control
- Slope Stability
- Mining Methods
- Identification of Landslide Topography
- Earthwork Calculations
- Drainage Control
- Inspection of Slope Stability
- Permit Review and Interpretation
- Field Review
- Remedial Measures
- Field Instability & Erosion and Flooding
- Role of Vegetation Cover
  - *Forestry Reclamation Approach (FRA)*
  - *Low Compaction Grading*
  - *Loosening Compacted Soils*

WHO SHOULD ATTEND: Primarily inspectors, permitting specialists, and bonding specialists who need to learn more about Eastern steep-slope mining. Attendees should have at least six months surface mining experience.

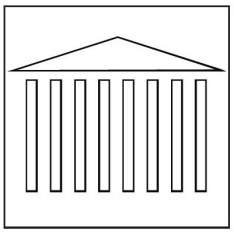
COMMENTS: We recommend that participants have previously taken the **Applied Engineering Principles** course and either the **Permitting Hydrology** or **Surface and Groundwater Hydrology** courses.

Students need to bring the following to class:

- Calculator

National Technical Training Program: (202) 208-2769

Expert Witness



This course provides participants with training on the scope of their role as a potential expert witness and gives practical experience in preparing for and presenting real-life expert testimony.

Duration: 3 days

TOPICS COVERED

Legal Basis for Expert Testimony

Why Expert Witnesses?

- What is Special About Being an Expert Witness?

Experts' Qualifications and Curriculum Vitaes (CVs)

- Who is an Expert Witness?
- Making of an Expert

Pretrial Activities of the Expert

- Being an Expert
- Pretrial Preparation and Discovery
- Testifying for the Other Side

Direct and Cross Examination of Experts

- Direct Examination and Expert Opinion
- Cross-Examination

Being a "Good" Expert Witness

Mock Hearing

WHO SHOULD ATTEND: AML and regulatory technical personnel who may be called on to present expert testimony in the context of SMCRA civil litigation and administrative hearings.

COMMENTS: All participants are required to submit to the National Technical Training Office a report based on expert technical opinion that they have prepared in conjunction with work-related responsibilities and their CVs three weeks to the start the course. Participants should have completed the **Enforcement Procedures** and **Evidence Preparation and Testimony** courses or equivalent training before taking this course.

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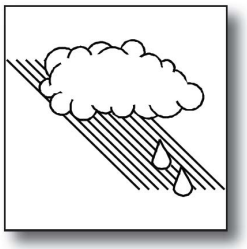


Forensic Hydrologic Investigation

This course provides training on how to conduct a hydrologic autopsy relating to mine problems including but not limited to: dewatering or contamination of aquifers, wells, streams, springs, pond/lakes, problems associated with increased amount of water from mine flooding, and other hydrologic problems associated with mining activities.

Duration: 3½ days

TOPICS COVERED

A number of case studies will be given for the student to discuss and examine as to cause of problem, effect of the problem and what action can be taken to eliminate or minimize the problem. Each case will identify the tools, methods and other measure taken to arrive at a logical conclusion of the problem and the remediation.

Introduction and Philosophy

Impact Determination

Art of Interviewing

- Data Collection
  - ◊ *Data Collection and Compilation*
  - ◊ *Data Collection Exercise*
- Borehole Camera
  - ◊ *Borehole Video Camera System*
    - — *Fracture Logging*
    - — *Well Bore and Casing Integrity*
    - — *Groundwater Information*
    - — *Biological Activity*
- Mining Impacts
  - ◊ *Uses with Other Instruments and Equipment*
- Data Analysis
  - ◊ *Data Checking and Management*
  - ◊ *Overview of Statistical Methods*
  - ◊ *Display Techniques*
    - — *Binomial and some Polynomial*
- Data Analysis Exercise 2

Blasting

- Impacts on Domestic Water Wells and Springs
- Case Studies (published and unpublished)
- Investigating Blasting Impacts

Report Preparation (Conclusions)

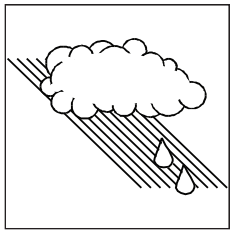
Preparation for Court

- Water Replacement
  - ◊ *Can Problem be fixed?*
  - ◊ *Treatment*
  - ◊ *Developing a New Source*
  - ◊ *Problem Remediation*

WHO SHOULD ATTEND: This course is geared mainly for geologists, hydrologists, and possibly inspectors who conduct hydrologic investigations on surface and groundwater problems related to coal mining activities.

National Technical Training Program: (202) 208-2769

Geology and Geochemistry of Acid-Forming Materials



This course is designed to provide participants with specific information, presented in a highly interactive manner, on analyzing and examining how geology and mineralogy influence water quality. A detailed discussion is presented on acid and alkaline weathering processes. Participants will be introduced to overburden drilling, sampling, and characterization. Participants will be given a variety of strategy and implementation lab methods and interpretations for overburden: static and leaching tests. Participants will use inquiry, problem-solving, and feedback methodologies for previous mining as a prediction tool, mine drainage prevention, and treatment techniques.

Duration: 4 Days

TOPICS COVERED

Geological and Mineralogical Influences on Water Quality

- Examine and define geologic controls on the formation of pyrite and carbonate minerals.
- Assess geologic controls on mineralogy that influence mine drainage chemistry.

Acid and Alkaline Weathering Processes

- Interpret and illustrate chemistry of pyrite weathering.
- Interpret and illustrate chemistry of carbonate mineral weathering.
- Interpret and illustrate other weathering processes (silicates, cation exchange).

Sampling and Characterization of Overburden Materials

- Employ and calculate sampling strategy.
- Identify types of sampling and their advantages and disadvantages (air rotary, core, highwall).
- Class exercises (construction of theison polygons, etc.)

Laboratory Methods for Overburden Analysis

- Acid base accounting
- Leaching (kinetic) tests

Acid Drainage and Water Chemistry

- Fundamental principles and measurements
- Other ions common to mine drainage

Prevention Methods

- Special handling
- Water management

Geochemical Tests for Mine Drainage Prediction

Mitigation of Acid-Forming Materials

WHO SHOULD ATTEND: Permitting specialists, inspectors, and AML specialists. This course is designed for individuals who have had advanced high school chemistry or a basic college chemistry course. At least six months' experience on a regulatory or reclamation program staff is recommended.

Field Exercise: Hard hat, steel-toed boots, and safety glasses are required.

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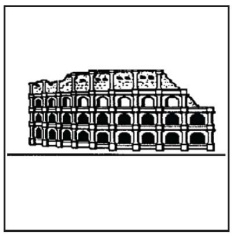

Historical and Archaeological Resources

This course provides participants with information about the process for considering historic and archaeological resources during the permitting process.

Duration: 3 days

TOPICS COVERED

Course Overview and Laying the Groundwork

Overview of Laws and Regulations

Focusing on the National Historic Preservation Act (NHPA)

- Definitions
- Section 106 Overview
- Roles and Responsibilities

Section 106 Process

- Identify/Evaluate Historic Properties
- Assess and Resolve Adverse Effects
- Preservation Agreements

National Environmental Policy Act (NEPA) and Section 106

Emergencies and Discoveries

SMCRA Relationship to Section 106—State Program Considerations

Considerations of Burials and Cemeteries

- Surface Mining Control and Reclamation Act (SMCRA) Definition
- Native American Graves Protection and Repatriation Act (NAGPRA) Considerations
- State Laws and Regulations

Native American Consultations

Other Legislation

WHO SHOULD ATTEND: AML, permitting and State program oversight staff, NEPA coordinators, program managers and inspectors whose jobs are directly related to this topic and who have not previously taken this course or those who took this course prior to 2000.

Field Exercise: Field clothes and appropriate shoes or boots are recommended.

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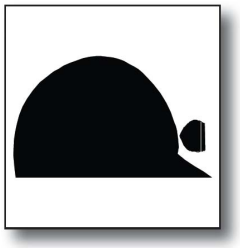


Introduction to SMCRA Inspections

This course provides training for new inspectors and AML staff in methods and technologies applicable to the mining and reclamation process. The course teaches skills that are applicable to the inspection process, including the creation of documentation that supports authorities.

Duration: 4 days

TOPICS COVERED

- Documentation/Documentation Technology
- Maps/Interpretation
- Mine Plan Review
- Hydrologic Balance Protection
- Mining Methods
- Topsoil Handling/Prime Farmland
- Blasting and Inspection
- Revegetation Success
- Post Mining Land Use
- Conflict Resolution
- Mine Safety
- Inspection Reports
- Field Exercise at Mine Site

WHO SHOULD ATTEND: Inspectors and AML staff who have up to three years of surface mining experience or those who interface with them (e.g., auditors, program specialists, and support or bonding personnel)

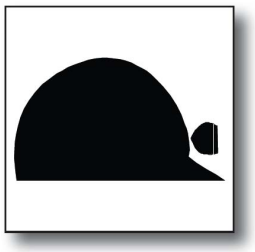
COMMENTS: Students need to bring the following to class:

- calculator

FIELD EXERCISE: Hard hat, steel-toed boots, and safety glasses are required.

National Technical Training Program: (202) 208-2769

Mine Gas Safety and Investigation



This course will provide information on gases commonly produced from active and abandoned mines that may pose a threat to the safety, health and well being of government personnel and the public. Discussions will focus on the terms, characteristics, techniques, tools and equipment available to identify gases. The physiological impacts of each gas will be presented so that personnel may identify, at the earliest possible moment, the potential for dangerous environments. We will identify the mining and non-mining sources of stray gases and explore the natural and manmade pathways that lead to spaces that may be occupied by people. We will discuss case studies and encourage participants to bring their own cases to discuss and share with the class the problems with investigations and mitigations in this complex subject. The course will include a short field exercise to demonstrate equipment and investigation techniques.

Duration: 2 Days

TOPICS COVERED

Introduction to Gases

- Physical Properties of Gases
- Physiological/Human Impacts
- Gas Characteristics and Thresholds
  - ◊ *O_2, N_2, CO_2, CH_4, CO, NO_x, Rn and H_2S*

Equipment and Analytical Tools

Sources

Pathways

Investigation Techniques

Mitigation

Case Histories

WHO SHOULD ATTEND: Individuals with duties that involve field visits where dangerous gases may be encountered on active or abandoned mine sites.

COMMENTS: Students should bring a calculator, clothing appropriate for the field exercise.

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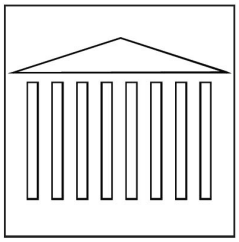

NEPA Procedures

This course provides training for State and Federal staff involved in AML projects or Federal mine plan and Federal permit review in the procedures for complying with and drafting environmental documents required by the National Environmental Policy Act (NEPA) and other appropriate environmental laws, regulations, and executive orders.

Duration: 3 days

TOPICS COVERED

- NEPA History and Procedures
- Documents and Terminology
- Environmental Assessments (EA)/Categorical Exclusion (CX)
- The NEPA Process (AML and Regulatory Compliance)
- Public Involvement
- Resource Values
- Native American Values and Sacred Sites
- Hazardous Waste, Environmental Justice
- Consultation/Coordination

WHO SHOULD ATTEND: AML staff or permit review staff who have at least six months of experience with NEPA procedures or OSMRE/State regulatory staff who work directly with NEPA implementation on Federal permits.

COMMENTS: Please indicate on the nomination form if you are not an AML program employee and why you feel this course is necessary.

National Technical Training Program: (202) 208-2769

Passive Treatment: Theory and Application Workshop

This course provides information and exercises that are highly interactive and can be used to evaluate the characteristics of coal mine drainage and guide the selection and application of various passive treatment technologies designed to mitigate the impacts of discharges.

Duration: 3.5 days

TOPICS COVERED

Introduction

- Overview of Course
- Overview of Passive Treatment

Passive Treatment Problem Analysis

- Restoration Goals
- Passive versus Active Treatment
- Site Characterization and Basic Data Requirements
- Water Quality Assessment
- Water Quantity Assessment

The Geochemistry of Passive Treatment

- Acidity
- Solubility
- Metals (Fe, Al, Mn)
- Hydrolysis
- Precipitation
- Carbonate Chemistry

Passive Treatment of Net Acidic Water

- Anoxic Limestone Drains
- Vertical Flow Ponds
- Other Treatment Technologies

Passive Treatment of Net Alkaline Water

- Iron Oxidation Principles
- Aerobic Wetlands

Post Construction Monitoring and Evaluation

- Performance Evaluation
- Case Studies and Lessons Learned

In addition to classroom instruction, the course contains a one-day field trip to an existing passive treatment facility for discussion and in order to evaluate system performance. The course also allows student teams to apply knowledge gained through the course, in developing solutions for an actual mine drainage problem. Students are encouraged to bring case studies for presentation and discussion.

WHO SHOULD ATTEND: Permitting Specialists and Inspectors; AML Project Designers and Inspectors; Persons developing, designing, reviewing, or evaluating mine drainage passive treatment systems.

COMMENTS: We recommend completion of the **Acid-Forming Materials: Fundamentals and Applications** course and an AMDTreat course as a pre-requisite. A basic understanding of chemistry is very helpful.

Field Exercise: No special protective equipment is required as you will not be in active work areas. However, expect tall grass and uneven rocky ground often in bright, hot sunlight, and dress accordingly.

National Technical Training Program: (202) 208-2769

Permitting Hydrology

This course will emphasize reviewing probable hydrologic consequences determinations, defining material damage, and preparing cumulative hydrologic impact assessments.

Duration: 3½ days

TOPICS COVERED

Permitting Hydrology Information

- Objectives of Course
- Permitting Process
- Hydrologic Cycle

Overburden/Geology Information

- Geologic Data Sources
- Structural Characteristics and Features

Backfill Materials Evaluation

- Baseline Information
- Acid/Alkaline Mine Drainage
- Acid-Base Accounting (Overburden)
- Overburden Sampling

Surface Water Information

- Baseline Information (Quality/Quantity)
- Data Collections
- Surface Water Quality Parameters (Analysis)
- Flow Measurement

Groundwater Information

- General Groundwater Terminology
- Groundwater Concepts
- Aquifer Properties
- Fracture System and Aquifer Properties/Testing
- Groundwater Monitoring: Some Basics
- Permit Review Basics

Hydrologic Baseline Data

- Data Checking
- Acid/Alkaline Mine Drainage, Oil & Gas Well Brine
- Quality Assurance/Quality Control
- Extraction Methods
- Water Sampling

EXERCISES

Probable Hydrologic Consequences (PHC)

- Principle Element of PHC Baseline Quality and Quantity
- Overburden Analysis
- Conceptual Models (Effecting Surface and Groundwater)
- Fly Ash/Biosolids for Reclamation
- Best Management Practices

Hydrologic Reclamation Plan (HRP)

- Acid/Alkaline Toxic Materials
- Alkaline Addition (Studies/Practices)
- Coal/Non-Coal Waste
- Erosion/Sediment Control (BMP)

Material Damage Standards

- Examples of Material Damage
- Material Damage, Hydrologic Impact (Minor, Major & Significant)

Cumulative Hydrologic Impact Assessment (CHIA)

- Anticipated Mining Example
- PHC vs CHIA?

WHO SHOULD ATTEND: Hydrologists, hydro-geologists, engineers, and others who review hydro sections of permits and area involved in preparation of hydrologic assessments.

COMMENTS: This course does not present material applicable to inspectors of AML program activities and is not suitable for newly hired personnel.

Students need to bring the following to class:

- calculator

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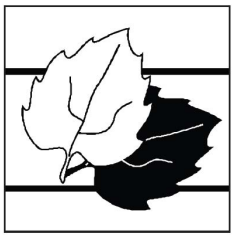

Soils and Revegetation

This course provides information that will help participants recognize the existence of soil or plant problems. This course does not apply to areas to be returned to forest land. The course will focus on soils and vegetation in four phases of mining and reclamation including pre-mining inventory, planning, operational considerations, and reclamation.

Duration: 4 days

TOPICS COVERED

Describing Soil

- Soil Characteristics

Soil Survey

- SCS Manual (Components/Definitions)
- Profile (Monolith) (If Available)

Soil Sampling and Analysis

- Importance of Sampling and Testing Methods
- Interpretation of Soil Test
- Physical Properties of Soil

Plant Identification

- Vegetative Life Forms
- A Strategy for Plant Identification
- Problems in Plant Identification
- Identifying Characteristics in Reclamation Plant

Evaluating Vegetation Success

- Purpose/Methods/Parameters

Soil Environment

- Plant-Soil Environment
- Soil Environment
- Impacts of Mining

Practices to Enhance Forest Development

- Natural Changes in Plant Community

Species Selection

- Criteria for Species Selection
  - ◊ *Revegetation Goals*
  - ◊ *Site Conditions*
  - ◊ *Plant Adaptations and Availability*

Soil Handling

- Soil Removal/Storage
- Soil Reconstruction
- Prime Farmland Soils
- Erosion Control

Soil Amendments

- Soil Fertility/Liming
- Fertilizer Rate Exercise

Seedbed Preparation

- Root Zone Penetration
- Seedbed Preparation
- Seedling/Mulching
- Vegetation Management

Woody Plant Establishment

- Woody Species/Reclamation
- Methods of Establishment
- Assuring a Successful Planting
- Problems in Planting Woody Plants

Vegetation Success (Field Exercise)

WHO SHOULD ATTEND: Inspectors, program and AML staff.

COMMENTS: Students need to bring the following to class:

- ∆ calculator

Field Exercise: Hard hat, steel-toed boots, and safety glasses are required.

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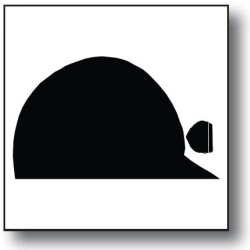
Subsidence



This course provides participants with information to enhance their scientific knowledge and technical skills in predicting subsidence, identifying methods to protect against or minimize damages caused by subsidence, and understanding the surface effects and impacts caused by longwall and room-and-pillar underground mining methods.

Duration: 3 days

TOPICS COVERED

Introduction

- Overview of Course
- Statistics on Longwall Numbers and Production
- Longwall Mining
- Room-and-Pillar Mining with Retreat Mining

Mechanics of Subsidence

- Mechanics of Overburden Movement
- Zones of Movement
- Factors Controlling the Height of Caved and Fractured Zones
- Planned Versus Unplanned Subsidence
- Relationship Between Subsidence and Percent Extraction
- Longitudinal and Transverse Profile

Parameters that Characterize Subsidence

- Angle of Draw
- Angle of Break
- Angle of Critical Deformation
- Inflection Point
- Radius (r) and Angle (B) of Major Influence
- Maximum Subsidence and Subsidence Factor
- Types of Subsidence Troughs (critical, sub-critical, sup-critical)
- Relationship Between Subsidence Factor and Percent Hardrock
- Relationship Between Subsidence Factor and Width/Depth Ratio
- Multiple Panels
- Time Effects
- Dynamic Surface Movement
- Other

Subsidence Prediction Methods

- Subsidence Development Prediction System (SDPS)
- Comprehensive and Integrated Subsidence Prediction Model (CISPM)
- National Coal Board Method (NCB)
- Penn State University (PSU) Model
- Beulah Model
- Other Models

Requirement of Energy Policy Act (EPACT) 92

Surface Structural Damage/Prediction

Damage To Renewable Resources

Damage To Water and Aquifers

Theories on Mitigation Measures

Methods To Minimize or Prevent Subsidence Damage

- How to Conduct Subsidence Damage Investigations
- Engineering Tools Available for Documentations

Subsidence Monitoring—Layout of Monuments

Design of Mine Pillars

- Pillar Load
- Pillar Strength Using Four Formulas Applied in the United States
- Pillar Strength After Flooding
- Pillar Design for Multi-Seam Conditions
- Abutment Pressure During Retreat Mining
- Pillar Strength for Weak Floor/Roof
- Pillar Strength for New Mines and Abandoned Mines
- Designing Pillars Using SDPS

Case Studies and Problem Exercises

WHO SHOULD ATTEND: Mining engineers, geologists, hydrogeologists, mine inspectors, mine permit reviewers, regulatory personnel, program managers, and attorneys dealing with subsidence cases.

National Technical Training Program: (202) 208-2769

Surface and Groundwater Hydrology

This course provides participants with information on the basic effects of surface coal mine operations on surface and groundwater hydrology.

Duration: 3½ days

TOPICS COVERED

Introduction and Basic Concepts

- Introduction
  - ◊ *News Articles (Water Shortage)*
  - ◊ *Water in the Forest (Video)*
  - ◊ *Movement of Water in Nature*
  - ◊ *Hydrographs (Examples & Exercise)*

Control of Water and Sediment

- Overview
- Sediment Ponds
  - ◊ *Work as a Sediment Control*
  - ◊ *Pond Design Factors*

Slides Presentation

- Surface Water Example

Groundwater Hydrology

- Groundwater System
  - ◊ *Movement of Groundwater*
  - ◊ *Groundwater Chemistry*
  - ◊ *Class Problem*

Effect of Mining on Groundwater

- Physical Effects of Mining
- Conceptual Models

Example Case: Mining Effect On Groundwater

- Actual Case

Acid Mine Drainage

- AMD Process
  - ◊ *Oxygen Pathway of AMD*
  - ◊ *AMD Ferric Iron Pathway*
- AMD Prevention
- AMD Treatment
- Passive Treatment Systems

Slides/Equipment Demo

Surface/Groundwater Monitoring

- Objectives
- Baseline Data (pre, active & post)
- Representative Samples
- Measuring Techniques
- Groundwater Monitoring (Wells)
- Surface Water Measurements
- Flow Quantity Measurements
- Monitoring Wells (Installation)

Data Interpretation (QA/QC)

- Introduction
- Review of Sample Data
- Complete Analysis
- Quality Assurance (QA) Quality Control (QC)
- Graphical Methods of Sample Analysis
- Class Problem

WHO SHOULD ATTEND: Inspectors, permit bonding, assessment and AML program specialists, others who may need a basic course. Recommend six months minimum experience on the job.

Field Exercise: Hard hat, steel-toed boots and safety glasses are required.

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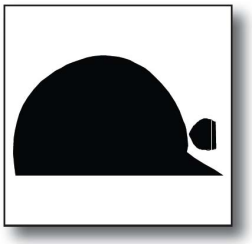


Underground Mining Technology

This course provides basic information on the types of underground coal mining and on how to identify the surface effects of underground mining.

Duration: 4 days

TOPICS COVERED

Introduction to Underground Mining

- Course Overview and Evaluation
  - ◊ *Coal Facts and Geology*
- Underground Mining Methods
  - ◊ *Access: Drift, Slope and Shaft*
  - ◊ *Room-and-Pillar Mining*
  - ◊ *Mining System/Development Mining*
  - ◊ *Auger and Highwall Mining*
  - ◊ *Longwall Mining*
  - ◊ *Mining Terms*
  - ◊ *Layout*
  - ◊ *Logistics*

Introduction to Mine Maps

- Topographic Map Review
  - ◊ *Underground Mine Maps*
  - ◊ *Topographic/Underground Map Correlation*

Surface Effects of Underground Mining

- Environmental Effects and Controls
  - ◊ *Subsidence*
  - ◊ *Hydrology*
  - ◊ *Mine Fires*
  - ◊ *Mine Gases*
  - ◊ *Coal Waste Handling*

Field Exercise

- Underground Mine Features
  - ◊ *Mine Development*
  - ◊ *Mine Equipment Operation*
  - ◊ *Ventilation and Roof Control Systems*
  - ◊ *Transport System*
  - ◊ *Power Supply*
  - ◊ *Water Handling System*
- Surface Features
  - ◊ *Subsidence*
  - ◊ *Coal Preparation*
  - ◊ *Water Treatment (Acid-Mine Drainage)*
  - ◊ *Waste Handling*

WHO SHOULD ATTEND: Inspectors, permit, bonding, assessment, and AML program specialists; program managers; and other staff who may need a basic or refresher course. At least six months experience on a program staff is recommended.

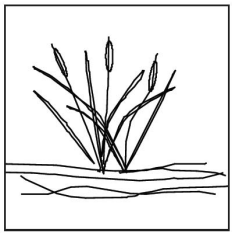
COMMENTS: All participants must complete the underground exercise unless a waiver is granted prior to the start of the course session. A request for a waiver with appropriate justification may be submitted in writing to the Chief, National Technical Training Program.

FIELD EXERCISE: Hard hat with light mount, steel-toed boots, safety glasses, coveralls, leg bands, and miner's belt are required.

National Technical Training Program: (202) 208-2769

Wetlands Awareness

This course familiarizes regulatory and AML field personnel with identification of wetlands, along with requirements and procedures for wetland protection.



Duration: 2½ days

TOPICS COVERED

Different Kinds of Wetlands

- Wetland Classification

Environmental Functions and Values

- Hydrologic Balance
- Water Quality
- Fish and Wildlife Habitat
- Renewable Resources

Jurisdictional Wetlands

- Definition
- Technical Criteria
- Delineation Procedures

Techniques for Recognizing Wetlands

- Hydrophytic Vegetation
- Wetland Hydrology Indicators
- Hydric Soils Identification

U.S. Army Corps of Engineers

Section 404 of the Clean Water Act

- Coordination Procedures
- Permitting Requirements

Demonstrations and Practical Exercises

- Practice Using Delineation Manual
- Field Application of Recognition Techniques

WHO SHOULD ATTEND: This is a basic course for AML and regulatory field personnel with a natural sciences background who are involved in mine-site inspection and permit review. No previous knowledge of wetlands is necessary

COMMENTS: This course does not cover acid-mine drainage treatment systems.

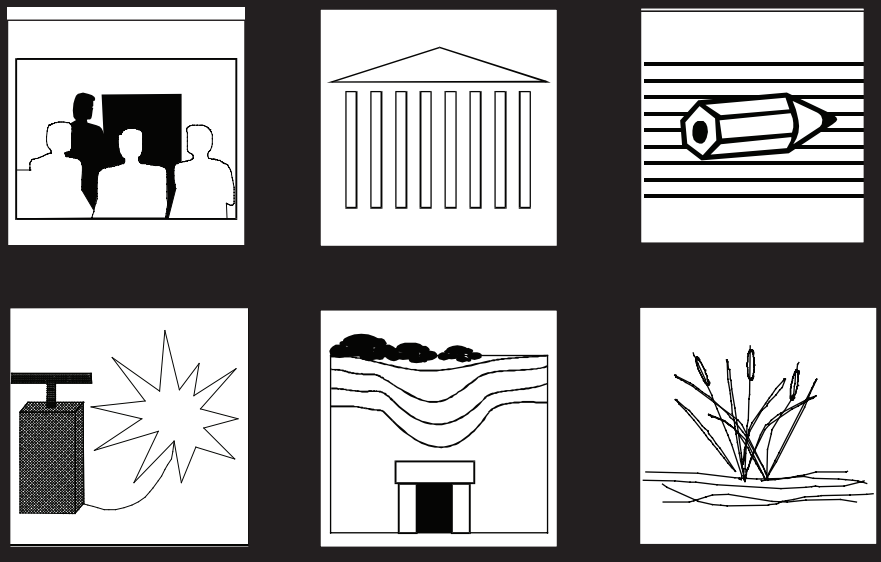
Students need to bring the following to class:

- calculator

Field Exercise: Field boots and rain gear are required.

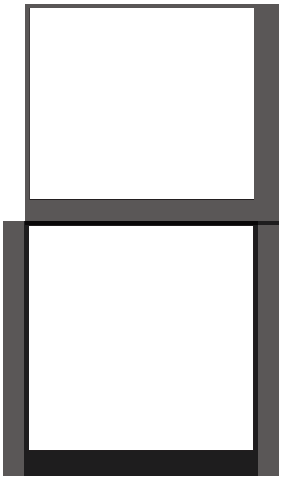
National Technical Training Program: (202) 208-2769

TECHNICAL INNOVATION AND PROFESSIONAL SERVICES COURSE DESCRIPTIONS



U.S. Department of the Interior
Office of Surface Mining Reclamation & Enforcement
National Technical Training Program

ARCGIS Spatial Analyst for Mining and Reclamation



This course explores how the ArcGIS Spatial Analyst extension uses raster and vector data in an integrated environment. This course teaches the basic raster concepts and shows how to create, run and edit spatial models. It focuses on problems that are best solved in a raster environment such as Approximate Original Contour topographic analysis, view-shed modeling, and reclaimed slopes hydrologic analysis.

Duration: 3 days
Course Code: GSA

TOPICS COVERED

Basic Concepts

- Raster Concepts
- Spatial Analyst Interface
- Querying Raster Themes
- Advanced Raster Display

Raster Structure Themes

- Creating Raster Datasets
- Raster Storage and Management
- Raster Projection
- Importing and Exporting Raster Datasets

Surface Analyses

- Calculating Density
- Interpolation Methods
- Interpolating
- Contours and Hillshading
- Visibility Analysis

Map Algebra Functions

- Writing Expressions
- Expression Syntax

Distance Measurements

- Euclidean Distance
- Cost Distance

Surface Hydrology

- Identifying Watershed Basins
- Surface Runoff Characteristics

WHO SHOULD ATTEND: Regulatory or AML scientist with degrees in geology, soil science, hydrology, civil or mining engineering, or related natural sciences.

COURSE PRE-REQUISITES: Students must have taken the **Introduction to GIS for Mining and Reclamation I** class and be very familiar with GIS concepts. **Class size is limited to 12-17 students, depending on location.**

ArcGIS Pro for Mining and Reclamation 200

This course is designed to help existing GIS users in the SMCRA community learn a new ESRI GIS software called ArcGIS Pro and transition to Pro from ArcGIS Desktop (Map/Catalog). The course covers new functionality, user interface, and beginner to intermediate uses as applied to the SMCRA community and GIS workflows. Some advanced topics may be briefly covered or discussed based on overall student skill levels, interest, and time.

Duration: 3 days
Course Code: GEP

TOPICS COVERED

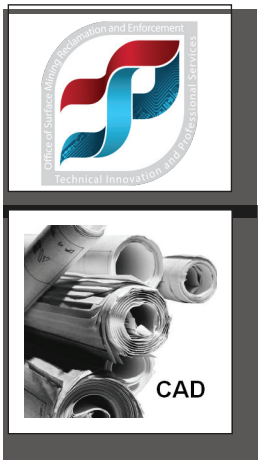
Course Objective:

- Provide SMCRA practitioners new Esri functionality and user interface, as well as beginner to intermediate SMCRA and GIS workflow applications.

Who Should Attend: Regulatory or AML scientists with degrees in geology, ecology, soil science, hydrology, civil or mining engineering, or related natural sciences who desire to learn more skills in the use of the Esri GIS software.

COURSE PRE-REQUISITES: Students must be familiar with basic GIS concepts and applications, and preferably taken TIPS' "Introduction to GIS for Mining and Reclamation" class. This course does not cover the fundamentals of GIS concepts. **Class size is limited to 12–17 students.**

CAD 100:
AutoCAD Essentials – Online Self Study



CAD 100 is for the occasional CAD user who may need to open and work within CAD drawings on a very basic level. Lessons cover navigation, selection, and plotting. CAD 100 is available online only.

This course is administered online in the Training Virtual Campus. Registration is open year-round; please inform your TIPS Training Contact or the TIPS Training Program Lead for registration.

Duration: Self Study
Course Code: VECE

TOPICS COVERED

- Creating drawings
- Selecting objects
- Layer properties and control
- Importing and exporting data
- Paper space and plotting

COURSE PRE-REQUISITES: None

CAD 101: AutoCAD for Permitting and Reclamation

This course covers the fundamentals of AutoCAD and provides exposure to other AutoCAD and Carlson Mining products.

Duration: 3 days
Course Code: ECA

TOPICS COVERED

- Review file utilities and layer management
- Define drawing templates and the drawing environment
- Identify various configuration and customization settings
- Examine blocks, feature attributes, drawing tools, hatching, text types, and editing tools
- Perform property changes
- Discuss the CUI and Tool Palettes
- Import and export files
- Discuss plotting and paper space
- Briefly review additional AutoCAD and Carlson Mining products

WHO SHOULD ATTEND: Regulatory or AML scientists with a degree in reclamation, geology, soil science, hydrology, civil or mining engineering, or related natural sciences.

COURSE PRE-REQUISITES: Basic understanding of the Windows operating system and knowledge of maps and drafting concepts are required. **Class size is limited to 12-17 students, depending on location**.

CAD 200: AutoCAD Map 3D with Raster Design

AutoCAD Map 3D is an automated mapping tool used to create, maintain, and communicate mapping and GIS information while using the AutoCAD drawing environment. Map 3D features GIS topology combined seamlessly with AutoCAD. This software contains all AutoCAD functionality and adds features specifically designed for the mapping professional. The student will learn to scan maps, vectorize and clean the mapping data, correlate to other tabular data, and incorporate it into a GIS.

Duration: 3 days
Course Code: EAM

TOPICS COVERED

- Define GIS
- Utilize drawing sets, source drawings, and external data
- Perform drawing queries
- Identify and define object data
- Define and edit global coordinate systems
- Perform coordinate transformations
- Import and export map files
- Perform image editing (cleaning)
- Explain and perform rubber sheeting
- Discuss and use external databases
- Identify important steps to scanning mine maps and manipulating images
- Geo-reference imported mine maps and quality control
- Digitize and vectorize images
- Perform attribute data tagging
- Practice cleaning and building topology
- Verify feature mapping
- Practice exporting data to ESRI format
- Determine and discuss need for metadata

WHO SHOULD ATTEND: Regulatory or AML scientists with degrees in reclamation, geology, soil science, hydrology, civil or mining engineering, or related natural sciences.

COURSE PRE-REQUISITES: Prospective students need to have basic CAD skills, or completion of CAD 101: AutoCAD for Permitting and Reclamation. Basic AutoCAD skills will not be covered in this course. **Class size limited to 12 -17 students, depending on location.**

CAD 201: Carlson Mining Site Design for Permitting and Reclamation

Carlson Mining is a design software for engineering, surveying, reclamation and mining professionals. AuoCAD serves as its graphics engine and drawing editor. Carlson Mining is an extension of AutoCAD that adds commands and enhancements for earthmoving and engineering.

Duration: 3 days
Course Code: ESC

TOPICS COVERED

- Review Carlson configuration and modules
- Define drawings and setup options
- Import and Export Points
- Use Carlson Design Tools such as breaklines, contouring, and 3D polylines
- Work with site designs; 3D slope lines, grids, volumes, and contours
- Work with cross-sections and profiles, create, draw, section design, volumes, and create contours from section files

WHO SHOULD ATTEND: Regulatory or AML scientists with degrees in civil or mining engineering, geology, or related disciplines.

COURSE PRE-REQUISITES: Prospective students must have taken introductory course CAD 101: AutoCAD for Permitting and Reclamation or have a working knowledge of AutoCAD. Basic AutoCAD skills will not be covered in this course. **Class size limited to 12–17 students, depending on location.**

CAD 300: Bridging the CAD and GIS Gap in the SMCRA Workflow

The purpose of this course is to assist personnel in integrating both CAD and GIS processes into SMCRA workflows. Students will review the basic foundation of GIS and CAD, identify similarities and differences, update and maintain permit data, and manipulate spatial data and database connectivity. Exercises will include use of Title IV and V data to show mechanisms of interoperability between CAD and GIS.

Duration: 3 days
Course Code: EBG

TOPICS COVERED

- Similarities and Differences in CAD and GIS
- Common Data Misconceptions
- Updating/Maintaining Permit Data
- Manipulating Spatial Data in CAD
- CAD Object Data
- FDO Connections
- SQL and SDE Databases
- Spatial Analysis

WHO SHOULD ATTEND: Regulatory or AML scientists with degrees in reclamation, geology, soil science, hydrology, civil or mining engineering, or related natural sciences.

COURSE PRE-REQUISITES: Prospective students should have attended CAD 201: Carlson Mining Site Design for Permitting and Reclamation or have a working knowledge of AutoCAD. Basic AutoCAD skills will not be covered in this course. **Class size is limited to 12-17 students, depending on location.**

CAD 301: Carlson Mining Field, Hydrology, and Natural Regrade for Permitting and Reclamation

This course will teach practicing Carlson Mining users advanced topics that have not been covered in the introductory CAD 201: Carlson Mining Site Design for Permitting and Reclamation. Students will round out their skills and learn new tools and techniques that will increase their design quality, efficiency, and productivity.

Duration: 3 days
Course Code: EAS

TOPICS COVERED

- Overview of Modules
- Survey Module Review
- Survey Module and Field to Finish
- Field Module Configuration
- Alignment in the Field
- GIS Tools in Carlson
- Hydrology Module and Watershed Menu
- Runoff and Watershed Analysis
- Design of Hydrologic Structures
- Geomorphic Reclamation Principles
- Natural Regrade Module

WHO SHOULD ATTEND: Regulatory or AML scientists with degrees in reclamation, geology, soil science, hydrology, civil or mining engineering, or related natural sciences.

COURSE PRE-REQUISITES: Prospective students should have attended CAD 201: Carlson Mining Site Design for Permitting and Reclamation or have a working knowledge of AutoCAD. Basic AutoCAD skills will not be covered in this course. **Class size is limited to 12-17 students, depending on location.**

Collector 200

This course will expand on basic navigation, photo, and geospatial field data collection application training provided in the "Mobile Devices for SMCRA" course. Students will learn more advanced capabilities of the Esri Collector App as well as administrative and user settings in ArcGIS Online that affect web map and feature layer functionality. We will focus on techniques to optimize the end user experience in the field, including creation of domains, tile packages, and 3D metadata.

Duration: 2 days
Course Code: GEC

TOPICS COVERED

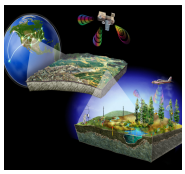
Course Objective:

- Provide SMCRA practitioners more advanced skills in the use of Esri Collector Spatial Data Mapping.

Who Should Attend: Regulatory or AML scientists with degrees in geology, ecology, soil science, hydrology, civil or mining engineering, or related natural sciences who desire to learn more advanced skills in the use of the Esri Collector App.

COURSE PRE-REQUISITES: Students must have taken the "Mobile Devices for SMCRA" class or equivalent coursework to qualify for this class. **Class size is limited to 12–17 students.**

Concepts of Remote Sensing (Online Self-Study)



This course provides an introduction to the concepts and principles underlying the science of Remote Sensing.

Duration: Self-Study
Course Code: VRRS

TOPICS COVERED

- Basics of electromagnetic energy (EM) and the properties of light, how EM energy interacts with the atmosphere and various targets on the earth.
- Spectral response patterns and the mechanisms of absorption, transmission, and reflection will be addressed.
- How sensors record energy, and about the four types of resolution; spatial, spectral, radiometric, and temporal.
- Image analysis techniques of restoration, enhancement, and transformation will be introduced with a few examples of remote sensing applications.

WHO SHOULD ATTEND: Course is designed for beginners.

COURSE PRE-REQUISITES: None but some knowledge of elementary physical science could be helpful.

Esri ArcGIS Online

These course offerings are designed to help GIS users in the SMCRA community have access to additional Esri ArcGIS learning opportunities.

Duration: Self-Study
Course Code: VGEG

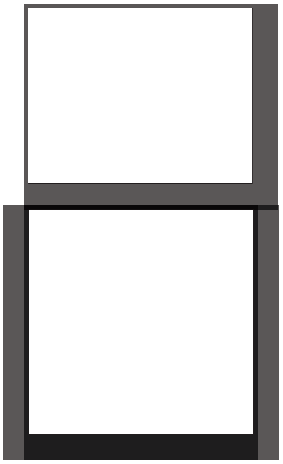
TOPICS COVERED

Course Objective:

- Provide SMCRA practitioners with additional Esri ArcGIS courses.

COURSE PRE-REQUISITES: Students must request an Esri account and obtain approval to gain access to Esri ArcGIS Online courses.

Galena Slope Stability Analysis – Online



Slope Analysis software is used for performing stability analyses of backfills, road embankments, pond embankments, landslides, or natural slopes. These slopes occur on reclaimed lands and active mine sites. The software models the factor of safety of these features using the Simplified Bishop, Spencer, and Sarma methods of analysis. The course includes a review of slope stability principles before using the software. The course is intended only for engineers or geology professionals with a slope stability background.

This course is administered online in the Training Virtual Campus and is available during scheduled times throughout the year. Please follow the TIPS scheduling and registration procedures to enroll. Contact your TIPS Training Contact or the TIPS Training Program Lead with questions.

Duration: Six-week Period
Course Code: VEGA

TOPICS COVERED

Soil Mechanics Theory

- Basic Principles of Soil and Rock Testing
- Soil Failure Mechanisms
- Soil Properties
- The Role of Water

The Stability Analysis

- Determining Appropriate Strength Parameters
- The Bishop Circular Analysis
- Use of Stability Charts
  - *Estimating Factors of Safety*
  - *Determining Critical Failure Surfaces*
- Spencer Method
- Sarma Method

Soils Laboratory Methods Video

Use of the Software

- Fundamentals of the Program
- Data Entry
  - *Embankment Geometry*
  - *Delineation of Soil Types*
  - *Use of Phreatic Surface or Pore Pressure Ratio*
  - *Strength Parameters*
  - *Tension Crack Data*
  - *Seismic Coefficients for Dynamic Loads*
  - *Fluid Unit Weight for Impoundments*
- Selection of Analytical Method
  - *Modified Bishop Method for Circular Failure*
  - *Spencer Method for Circular and Non-Circular Failure*
  - *Sarma Method for Non-Circular Failure*
- Running the Stability Analysis
  - *Selecting Method of Search for Minimum Factor of Safety (Critical Failure Surface)*
- Interpreting Results
  - *Evaluating Shallow vs Deep*
  - *Failure Surfaces*
- Efficient/Effective Use of the Model—When enough is enough
  - *Guarding Against Manipulation of the Model to Get Acceptable Factors of Safety*
  - *Use of Realistic Input Parameters*

Output

- Reports
- Base Maps
- Contour Maps
- Perspectives and Block Diagrams
- Cross-sections and Fence Diagrams

The Workflow Manager™

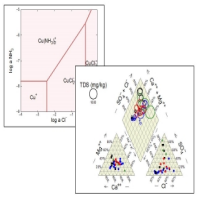
Some Applications

- Structure
- Cut and Fill Volumes
- Reserve Calculations
- Slope Analysis

WHO SHOULD ATTEND: Regulatory or AML scientists with degrees in geology, civil or mining engineering, engineering geology, geological engineering, soil science or experience in geotechnical construction or slope stability remediation. Nominees should be responsible for inspecting or designing corrections for slope failures, or reviewing factor of safety calculations for permit applications.

COURSE PRE-REQUISITES: None. **Class size limited to 12–17 students.**

Geochemist Workbench



This course is aimed at providing attendees with an understanding of how to use Geochemist Workbench to model mine drainage chemistry and treatment. The workshop is focused on the practical application of modeling and will use data collected from various coal mine discharges and treatment systems.

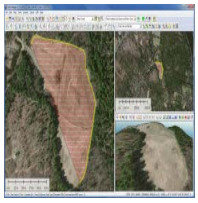
Duration: 3 days
Course Code: GWB

TOPICS COVERED

- Creating activity and Eh/pH diagrams to identify solubility controls on mine drainage
- Developing strategies to constrain a model to produce usable "real-world" results
- Modeling chemical consumption, treatment pH, and effluent chemistry for NaOH, CaO, Ca(OH)2, CaCO3, and Na2CO3 treatment systems and predicting the treatment costs (both active and passive treatment systems)
- Analyzing the effect of exsolving CO2 (decarbonation step) prior to alkali dosing. The effect on chemical consumption, mineral precipitation, and treatment costs will be analyzed
- Using a model to develop a comprehensive watershed restoration strategy to achieve in-stream restoration goals for abandoned mine land scenarios
- Modeling heterogeneous and homogenous ferrous iron oxidation to size ferrous reactor tanks and passive treatment

COURSE PRE-REQUISITES: Attendees should have an understanding of geochemistry and prior experience with mine drainage is desired, but not necessary. **Class size limited to 12–17 students.**

Global Mapper for Mining and Reclamation



This course provides users instruction on basic and advanced usage of Global Mapper as it pertains to mining and reclamation. Students will be introduced to the GIS, CAD, mobile computing and remote sensing functionality of Global Mapper, as well as basic understanding of each discipline to assist them in analysis. Students will work with various forms of geospatial data to generate end products.

Duration: 3 days
Course Code: GGM

TOPICS COVERED

Course Objective

- Provide students a clear understanding of use of geospatial data in Global Mapper

WHO SHOULD ATTEND: All disciplines that work with geospatial data.

COURSE PRE-REQUISITES: None. **Class size limited to 12-17 students, depending on location.**

HEC-RAS

This course provides an overview of HEC-RAS modeling capabilities and shows each attendee how to use the model as a permitting/evaluation tool in flooding investigations. The course covers the most common uses of HEC-RAS, such as water surface profiles, floodplain delineation, and the effects of bridges and culverts in the floodplain. Hands-on exercises allow participants to enter/edit flow and geometric data, perform flow simulations, develop water surface profiles, and generate reports and graphics.

Duration: 3 days
Course Code: HER

TOPICS COVERED

- Introduction to Open Channel Hydraulics and Flooding, and HEC-RAS Overview
- Basic Steps in Developing a Hydraulic Model Using HEC-RAS
  - *Starting a new project*
  - *Entering geometric data*
  - *Entering steady flow data and boundary conditions*
  - *Perform calculations*
  - *View and print results*
- Water Surface Profile Simulation with Bridges and Culverts
- Stable Channel Design
- Floodplain Encroachment Analysis Using HEC-RAS
- Floodplain Mapping
- Importing GIS Data into HEC-RAS
- Others

COURSE PRE-REQUISITES: Undergraduate degree (or equivalent experience) and basic computer skills are highly recommended. **Class size limited to 12-17 students, depending on location.**

Introduction to AqQA – Online Self Study

This course will demonstrate how easy it is to use AqQA for water analysis, consistency checking, and plotting. Participants will be able to create Piper diagram, Stiff diagram, Ternary, and eight other plot types; check water analysis for internal consistency; and manage water data in a spreadsheet.

This course is administered online in the Training Virtual Campus. Registration is open year-round; please inform your TIPS Training Contact or the TIPS Training Program Lead for registration.

Duration: Self Study
Course Code: VAQQ

TOPICS COVERED

The student is directed to work through "A Guided Tour of AqQA"—the first 12 pages of *A User's Guide to RockWare® Aq·QA®*. Building upon skills introduced in the guided tour, the online course presents two exercises that use coal-field water-monitoring data.

Exercise 1—Creating an AqQA datasheet by manually entering information from a laboratory report for a single water-sampling event.

Required actions include:

- Changing units of measurements
- Selecting analytes from the AqQA library
- Creating new analytes
- Checking ion balance
- Generating Piper and Stiff diagrams

Exercise 2—Importing water-monitoring data from an Excel workbook.

Required actions include:

- Finding and correcting errors in the dataset
- Mixing water from two monitoring stations
- Displaying multiple samples on a single diagram
- Checking the state of carbonate mineral saturation
- Setting thresholds for flagging measured values that could be of concern

COURSE PRE-REQUISITES: None

Introduction to earthVision 2D and 3D Modeling

This course provides an introduction to earthVision using actual data from an abandoned mine drainage site in north central Pennsylvania that was later permitted for new mining. Using 2D and 3D data, the class will learn to build structure and acid-base accounting models to assess site conditions and make a "permitting" decision. Class topics include: data import, validation, editing; 2D and 3D modeling; and volume calculation. ***Course is certified for 24 Professional Development Hours.***

earthVision has application to many other situations in the mining industry (e.g., soils, materials handling, highly accurate cut-and- ill volumes mine pool modeling). Contact TIPS to discuss your special needs and the possibility of a tailored on-site training class.

Duration: 3 full days
Course Code: GSM

TOPICS COVERED

Import data

- Horizon (stratigraphy) and property data from spreadsheets
- Linework and data from CAD and GIS
- Elevation models from DEMs and grids
- Data "exploration" in 3D viewer
- Image files

Introduce 2D gridding using topography

- Discuss 2D gridding (how "grids" differ, what makes a good grid, gridding controls, etc.)
- Create 2D contour map of grid and explore in 3D viewer
- Introduce Graphic Editor and Grid Editing
- QC grid - Use formula processor and EDA for QA/QC and explore tools to improve model
- Segue to Workflow Manager

Introduce Workflow Manager by building and validating multi-layer horizon/structure/ models using depositional and stratigraphic controls.

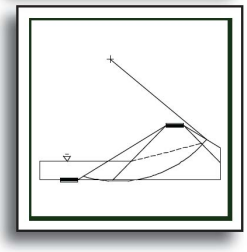
Introduce 3D gridding for Property Modeling

- 3D View of property data within structure model for visualization, QC, and editing
- Discuss property grids and gridding parameters
- Calculate single property model with default settings; examine and QC
- Discuss property features and distribution characteristics
- Adjust parameters, remodel, and QC
- Model additional properties and QC

Volumetrics

- Discuss EV volumetrics; introduce types and methods
- Calculate Bulk Rock Volumes of layers and areas of interest
- Calculate property volume for single property with layer and area controls
- QC volumes - compare Volumetric results among methods
- Discuss individual property volumes and their implications

COURSE PRE-REQUISITES: Experience and/or education (preferably in the Regulatory/AML fields) with geologic, geochemical, soil, materials volumes, or hydrologic conditions that affect mining and reclamation. Familiarity with spreadsheets, mapping, and GIS software will enhance the learning experience. **Class size limited to 12-17 students, depending on location**.



Introduction to GIS for Mining and Reclamation I

This course is an introduction to the basics of ArcGIS Desktop software. This course is designed around mining and reclamation examples and exercises. The various types of GIS data and how they are used in Desktop will be covered. Techniques for using the features of this software to generate high quality maps and analyzing selected data sets are taught. Specific training areas will be ArcCatalog, ArcMap & ArcToolbox.

Duration: 3 days
Course Code: GAD

TOPICS COVERED

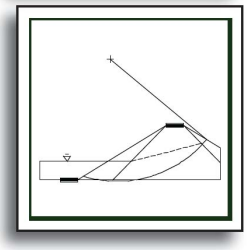
The course will provide a basic understanding of ArcGIS and include:

- A basic understanding of various ArcGIS screens and functions
- A basic understanding of coordinate systems, datums, and projections
- Locating and adding baseline data from online sources (e.g., imagery, topography)
- Importing external data (Excel tables, CAD drawings, GPS points)
- Digitizing and georeferencing spatial data
- Performing basic data analysis using ArcGIS tools (editing, clip, buffer, selection)
- Properly displaying the data through the use of symbology, transparency, etc.
- Designing and printing maps for publication

WHO SHOULD ATTEND: Regulatory or AML staff with degrees in geology, soil science, hydrology, civil or mining engineering, or related natural sciences with little or no experience with GIS.

COURSE PRE-REQUISITES: Familiarity with GIS or mapping concepts is helpful. **Class size limited to 12–17 students, depending on location.**

Introduction to GIS for Mining and Reclamation I – Online



This course is an introduction to the basics of the ArcGIS Desktop software. The course is designed around mining and reclamation examples and exercises. Techniques for using the features of this software to generate high quality maps and analyzing selected data sets are taught. Specific training areas will be ArcCatalog, ArcMap, and ArcToolbox.

Students will learn to recognize various file types and differences between formats, e.g., Raster vs. Vector, Shapefile, Aerial photos/Satellite images, DRG's, DOQQ's, GPS and CAD layers. Students will learn what coordinate systems, datum's, and projections are and why understanding them is vital to working with spatial data. Extraction of CAD layers into the GIS, modifying attributes of shapefiles, geo-rectification and scanning will be covered. Introduction to various mobile computing software and hardware that TIPS supports and how it relates to the permitting process workflow will be examined.

This course is administered online in the Training Virtual Campus and is available during scheduled times throughout the year. Please follow the standard TIPS scheduling and registration procedures to enroll. Contact your TIPS Training Contact or the TIPS Training Program Lead with questions.

Duration: 5-week Period
Course Code: VGAD

TOPICS COVERED

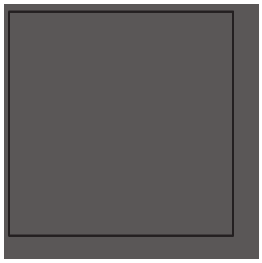
The course will provide a basic understanding of ArcGIS and include:

- A basic understanding of various ArcGIS screens and functions
- A basic understanding of coordinate systems, datums, and projections
- Locating and adding baseline data from online sources (e.g., imagery, topography)
- Importing external data (Excel tables, CAD drawings, GPS points)
- Digitizing and georeferencing spatial data
- Performing basic data analysis using ArcGIS tools (editing, clip, buffer, selection)
- Properly displaying the data through the use of symbology, transparency, etc.
- Designing and printing maps for publication

WHO SHOULD ATTEND: Regulatory or AML staff with degrees in geology, soil science, hydrology, civil or mining engineering, or related natural sciences with little or no experience with GIS.

COURSE PRE-REQUISITES: Familiarity with GIS or mapping concepts is helpful. **Class size limited to 12–17 students.**

Mobile Devices for SMCRA: Introduction to Mobile Devices as a Utility for SMCRA Related Business Practices



Android/iOS/Windows based devices loaded with a tool set of applications (APPs) that can be used to navigate, take notes/pictures, and utilize geospatial data in the field. This course provides an introduction to Android, iOS, and Windows devices as a utility for SMCRA related business practices. Through lectures and classroom/field exercises, students learn about tools, menus, GPS, and geospatial data capabilities that come with Android/iOS/Windows devices. The course emphasizes best practice principles and considerations for common field tasks utilizing a number of Android/iOS/Windows APPs.

Duration: 3 days
Course Code: GMD

TOPICS COVERED

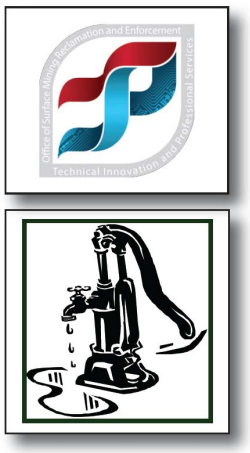
Course Objectives:

- Provide an introduction to Android/iOS/Windows devices as a utility for SMCRA related tasks.
- Explore tools, menus, GPS, and geospatial data capabilities that comes with Android/iOS/Windows devices.
- Recommend best practice principles and considerations for common filed tasks utilizing a number of apps for Android/iOS/Windows.

WHO SHOULD ATTEND: Inspectors, Hydrologist, Soil scientist, Biologist, Mining Engineers, Reclamation specialist, Geospatial staff, and Other field staff.

COURSE PRE-REQUISITES: Familiarity with Android, iOS, and/or Windows tablets and/or smart phones. **Class size is limited to 12–17 students, depending on location.**

- Android/iOS/Windows devices
- Applications (APPs)
- Understanding basic GIS/GPS
- Relative GPS accuracy of Android/iOS/Windows devices
- How to prepare a project (download/upload)
- How to navigate
- How to collect data
- How to display data
- How to edit data
- How to leverage data with ArcGIS/AutoCAD



Modeling and Analysis with Groundwater Vistas

This hands-on course will review the underlying assumptions, theories, and practical utilization of numerical flow models. The fundamental underpinnings of the course revolve around conceptually modeling ground-water flow and the application of the Groundwater Vistas software. Students will work examples applying this software to coal mining and reclamation related analysis.

Duration: 3 full days
Course Code: HGV

TOPICS COVERED

Review of Scientific Theory

- Geology Aquifer, Aquitard, Aquiclude
  - *Confined, Unconfined, Porosity*
  - *Fractures and Structures Permeability*
- Basic Ground—Water Hydrology
  - *Darcy's Law, Hydrologic Balance*
  - *Equilibrium Versus Nonequilibrium*
  - *Homogeneous Versus Heterogeneous*
  - *Anisotropic Versus Isotropic*
  - *De-pressurizing*
- Basic Modeling
  - *Numerical modeling, Types of models*
  - *Inverse versus forward modeling*
  - *Transient versus equilibrium*

Groundwater Vistas Software Use

- Types of Numerical Models/Solutions
- Finite Difference, Finite Element
- Diffusion Equation, Grids, Layers
- Initial Conditions, Dimensionality
- Space Discretization, Boundary Conditions
- Water Budget Error, Error Criteria
- Steady—State Case Analysis
  - *Site Description, Conceptual Model*
  - *Building the Model, Run Model*
  - *Calibration, Sensitivity Analysis*
  - *Model Adjustment*
  - *Model Output Analysis, Interpreting Results Validation*

Reviewing Permitting Information done by Models

- Model Representation of Groundwater Systems
- Input Parameter Estimation
- Real World Coal Mining Case Study

WHO SHOULD ATTEND: Regulatory or AML scientists with degrees or college credit in hydrology, or current experience in ground-water hydrology, with six months to one year of experience with SMCRA.

COURSE PRE-REQUISITES: Prospective students should possess a working knowledge of terminology including hydraulic conductivity, storativity, transmissivity, and Darcy's law. Prospective students should have also successfully completed the NTTP course Quantitative Hydrogeology. **Class size is limited to 12–17 students, depending on location.**

SDPS: Surface Deformation Prediction System – Online Self Study

SDPS is a nationally-validated prediction program developed for OSMRE to quantify anticipated subsidence deformations and strains from underground longwall and high-extraction room and pillar mining operations. This course gives students a predictive tool to assist in evaluating the effects of subsidence.

This course is administered online in the Training Virtual Campus. Registration is open year-round; please inform your TIPS Training Contact or the TIPS Training Program Lead for registration.

Duration: Self Study
Course Code: VESD

TOPICS COVERED

Review of Subsidence Mechanisms And Theories

- Overview of Subsidence Parameters

Software Overview

- Configuration Options
- File Conventions

Required Field and Input Parameters Prediction of Surface Deformations

- Data Collection
- Maximum Subsidence Factor
- Location of the Inflection Point
- Angle of Principal Influence
- Horizontal Strain Coefficient
- Limitations of Empirical Parameters

Software Modules

- Profile Function
  - *Angle of Draw*
  - *Subsidence Profile*
- Influence Function
  - *Input Data*
  - *Mine Plan*
  - *Prediction Points*
  - *Empirical Parameters*
  - *Calculation Options*
- Graphing Module
  - *2-D*
  - *3-D*
- Pillar Stability
  - *Conventional Pillar Stability*
  - *Analysis of Longwall Pillar Stability (ALPS)*
  - *Analysis of Retreat Mining Pillar Stability (ARMPS)*

Data Import and Export

- Importing Mine Plan through AutoCAD
- Importing Prediction Points through AutoCAD
- Exporting Subsidence Profiles to AutoCAD

Exercises with AutoCAD

Plotting and Printing

Peripheral Hardware

WHO SHOULD ATTEND: For engineers and/or geologists who work with subsidence prediction.

COURSE PRE-REQUISITES: None

SEDCAD Applications and Extensions for Mine Permitting and Reclamation

This course covers a broad review of the basic hydrologic concepts and assumptions, defines the input parameters for watershed modeling and design of sediment control structures utilizing SEDCAD for mine permitting and reclamation. The participants will learn how to use SEDCAD to model peak flow, runoff volume, design erosion and sediment control structures and to evaluate permit applications. In addition, the course will cover utilizing SEDCAD to evaluate peak flow in preparation of Cumulative Hydrologic Impact Assessments. An introduction to the Revised Universal Soil Loss Equation will also be covered. Students will work example problems applying this software to model watersheds, analyze peak flow and design sediment basins, channels, culverts, silt fence and other drainage control structures.

Duration: 3 days
Course Code: HSA

TOPICS COVERED

At the end of this course, students will be able to:

- Design and evaluate sediment and drainage control structures
- Predict the effectiveness of sediment basins
- Apply RUSLE to calculate sediment load
- Calculate peak flow and runoff volume; develop peak flow hydrograph and sedimentgraph
- Perform watershed modeling including structure networking and Muskingum routing
- Evaluate hydrology and sedimentology input parameters
- Generate and review final report

WHO SHOULD ATTEND: regulatory or AML scientists with degrees in hydrology, civil or mining engineering, or soil scientists who design or review designs of diversions, sediment control structures, and impoundments, with six months to one year of experience with SMCRA.

COURSE PRE-REQUISITES: Students should have some knowledge of surface water hydrologic principles and computer experience. Completion of the NTTP courses “Applied Engineering Principles” and Surface and Groundwater Hydrology would be helpful. **Class size is limited to 12–17 students, depending on location.**

Testing and Analysis of Aquifer Characteristics with AQTESOLV

This hands-on course will review the underlying assumptions and theories of aquifer characterization and the practical utilization of analytical ground-water models. The course will provide an introduction to the use of AQTESOLV including analysis of confined, unconfined, leaky, and fractured aquifers. Students will work examples applying this software to coal mining and reclamation-related examples using pump test, slug test, drawdown and recovery data.

Duration: 3 days
Course Code: HAA

TOPICS COVERED

- Basic Ground-Water Hydrology:
  - *Aquifer Types, Confining Layers, Darcy's Law, Fracture Flow, Hydraulic Head, Well Completions, Theis Equation, Pumping Tests, Slug Tests, Recovery Tests, Forward Solution*
- Aquifer Characteristics:
  - *Hydraulic Conductivity, Transmissivity, Storativity, Intrinsic Permeability, Specific Storage, Specific Yield*
- Ground-Water Modeling:
  - *Physical, Conceptual, Analytical, Numerical, Inverse vs. Forward, Transient vs. Equilibrium*

AQTESOLV

- Slug Tests, Extensive Suite of Test Solutions for Slug Pumping Tests
- Determination of Well Bore Storage, Boundary Effects
- Automatic and Manual Curve Matching
- Diagnostic Plots
- Data Sensitivity Analysis
- Statistical Evaluations of Data

Reviewing Permit Information Obtained with Models

- Model Representation of the Ground-Water System Using Various Test Solutions
- Realistic Input Parameters
- Coal Mine Case Study Examples

WHO SHOULD ATTEND: Regulatory and AML scientists with degrees or college credit in hydrology or current experience in ground-water hydrology with 6 months to 1 year of experience with SMCRA.

COURSE PRE-REQUISITES: Prospective students should possess a working knowledge of ground-water terminology and concepts including hydraulic conductivity, storativity, transmissivity, and Darcy's law. Prospective students should have also successfully completed the NTTP course Quantitative Hydrogeology. **Class size limited to 12–17 students, depending on location.**