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

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**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

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**Preparation of Notices of Violation and Cessation Orders**

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**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

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<td>▼ Attorney/Peer Critique</td>
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<tr>
<td>▼ Legal Requirements</td>
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<th>Hearsay</th>
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<tr>
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<td>▼ Expert Testimony</td>
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<td>▼ Cross-Examination</td>
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<tr>
<td>▼ Discovery</td>
</tr>
</tbody>
</table>

### 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.

National Technical Training Program: (202) 208-2769
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 Vitae (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 start the course. Participants should have completed the Enforcement Procedures and Evidence Preparation and Testimony courses or equivalent training before taking this course.

**National Technical Training Program:** (202) 208-2769
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.

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<th>Introduction and Philosophy</th>
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<td>Impact Determination</td>
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<td>Art of Interviewing</td>
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<tr>
<td>▼ Data Collection</td>
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<td>◦ Data Collection and Compilation</td>
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<td>◦ Data Collection Exercise</td>
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<tr>
<td>▼ Borehole Camera</td>
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<tr>
<td>◦ Borehole Video Camera System</td>
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<tr>
<td>— Fracture Logging</td>
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<td>— Well Bore and Casing Integrity</td>
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<td>— Groundwater Information</td>
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<td>— Biological Activity</td>
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<td>▼ Mining Impacts</td>
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<td>◦ Uses with Other Instruments and Equipment</td>
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<td>▼ Data Analysis</td>
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<td>◦ Data Checking and Management</td>
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<td>◦ Overview of Statistical Methods</td>
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<td>◦ Display Techniques</td>
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<td>— Binomial and some Polynomial</td>
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<td>▼ Data Analysis Exercise 2</td>
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<tr>
<th>Blasting</th>
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<tr>
<td>▼ Impacts on Domestic Water Wells and Springs</td>
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<tr>
<td>▼ Case Studies (published and unpublished)</td>
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<tr>
<td>▼ Investigating Blasting Impacts</td>
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<tr>
<th>Report Preparation (Conclusions)</th>
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<tbody>
<tr>
<td>Preparation for Court</td>
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</table>

| ▼ 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.

National Technical Training Program: (202) 208-2769
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.

National Technical Training Program: (202) 208-2769
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-toe 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
Diamond $O_2, N_2, CO_2, CH_4, CO, NO_x, Rn$ 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.

National Technical Training Program: (202) 208-2769
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

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Passive Treatment of Net Alkaline Water</th>
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<tbody>
<tr>
<td>- Overview of Course</td>
<td>- Iron Oxidation Principles</td>
</tr>
<tr>
<td>- Overview of Passive Treatment</td>
<td>- Aerobic Wetlands</td>
</tr>
</tbody>
</table>

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

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

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<th>Permitting Hydrology Information</th>
<th>EXERCISES</th>
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<td>▼ Objectives of Course</td>
<td>Probable Hydrologic Consequences (PHC)</td>
</tr>
<tr>
<td>▼ Permitting Process</td>
<td>▼ Principle Element of PHC Baseline Quality and Quantity</td>
</tr>
<tr>
<td>▼ Hydrologic Cycle</td>
<td>▼ Overburden Analysis</td>
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<tr>
<td></td>
<td>▼ Conceptual Models (Effecting Surface and Groundwater)</td>
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<tr>
<td><strong>Overburden/Geology Information</strong></td>
<td>▼ Fly Ash/Biosolids for Reclamation</td>
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<tr>
<td>▼ Geologic Data Sources</td>
<td>▼ Best Management Practices</td>
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<td>▼ Structural Characteristics and Features</td>
<td><strong>Hydrologic Reclamation Plan (HRP)</strong></td>
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<tr>
<th>Backfill Materials Evaluation</th>
<th>▼ Acid/Alkaline Toxic Materials</th>
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<tbody>
<tr>
<td>▼ Baseline Information</td>
<td>▼ Alkaline Addition (Studies/Practices)</td>
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<tr>
<td>▼ Acid/Alkaline Mine Drainage</td>
<td>▼ Coal/Non-Coal Waste</td>
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<tr>
<td>▼ Acid-Base Accounting (Overburden)</td>
<td>▼ Erosion/Sediment Control (BMP)</td>
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<tr>
<td>▼ Overburden Sampling</td>
<td><strong>Material Damage Standards</strong></td>
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<table>
<thead>
<tr>
<th>Surface Water Information</th>
<th>▼ Examples of Material Damage</th>
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<tbody>
<tr>
<td>▼ Baseline Information (Quality/Quantity)</td>
<td>▼ Material Damage, Hydrologic Impact (Minor, Major &amp; Significant)</td>
</tr>
<tr>
<td>▼ Data Collections</td>
<td><strong>Cumulative Hydrologic Impact Assessment (CHIA)</strong></td>
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<tr>
<td>▼ Surface Water Quality Parameters (Analysis)</td>
<td>▼ Anticipated Mining Example</td>
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<tr>
<td>▼ Flow Measurement</td>
<td>▼ PHC vs CHIA?</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Groundwater Information</th>
<th><strong>WHO SHOULD ATTEND:</strong> Hydrologists, hydrogeologists, engineers, and others who review hydro sections of permits and area involved in preparation of hydrologic assessments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼ General Groundwater Terminology</td>
<td><strong>COMMENTS:</strong> This course does not present material applicable to inspectors of AML program activities and is not suitable for newly hired personnel.</td>
</tr>
<tr>
<td>▼ Groundwater Concepts</td>
<td>Students need to bring the following to class:</td>
</tr>
<tr>
<td>▼ Aquifer Properties</td>
<td>△ calculator</td>
</tr>
<tr>
<td>▼ Fracture System and Aquifer Properties/Testing</td>
<td><strong>National Technical Training Program:</strong> (202) 208-2769</td>
</tr>
<tr>
<td>▼ Groundwater Monitoring: Some Basics</td>
<td><strong>National Technical Training Program:</strong> (202) 208-2769</td>
</tr>
</tbody>
</table>
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

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.

National Technical Training Program: (202) 208-2769
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

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.

National Technical Training Program: (202) 208-2769
## Undergraduate 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

#### 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

#### 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

### 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

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<td>▼ Water Quality</td>
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<td>▼ Fish and Wildlife Habitat</td>
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<td>▼ Renewable Resources</td>
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<td>▼ Technical Criteria</td>
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<td>▼ Delineation Procedures</td>
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<table>
<thead>
<tr>
<th>Techniques for Recognizing Wetlands</th>
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<td>▼ Hydrophytic Vegetation</td>
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<tr>
<td>▼ Wetland Hydrology Indicators</td>
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<td>▼ Hydric Soils Identification</td>
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<th>Section 404 of the Clean Water Act</th>
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<td>▼ Coordination Procedures</td>
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<td>▼ Permitting Requirements</td>
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<th>Demonstrations and Practical Exercises</th>
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<tr>
<td>▼ Practice Using Delineation Manual</td>
</tr>
<tr>
<td>▼ Field Application of Recognition Techniques</td>
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</table>

**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