PROGRAM

OSM MID-CONTINENT REGION TECHNOLOGY TRANSFER & TECHNICAL ASSISTANCE WORKSHOP

Alabama

March 27 & 28, 2007

8:00 AM	**Introductions and Program** (20 minutes) *Linda Williamson, BFO, Birmingham, Alabama* *Kimery Vories, MCR, OSM, Alton, Illinois*
	Overview of TIPS Activities (20 Minutes) *Min Kim TIPS AL Service Manager MCR, OSM, Alton, Illinois*
Technology	**Transfer/Training/Applied Science** (25 Minutes) *Kimery Vories, MCR, OSM, Alton, Illinois*
	Geospatial Initiatives (30 Minutes) *Min Kim & Len Meier, MCR, OSM, Alton, Illinois*
9:50 AM	**Break**
10:20 AM	**MCR Technical Assistance Capability** (10 Minutes) *Len Meier, MCR, OSM, Alton, Illinois*
	AMD Passive Treatment Technology (20 minutes) *Paul Behum, MCR, OSM, Alton, Illinois*
Hydrology	**Technical Assistance in Alabama/Iowa** *(20 minutes)* *Debbie Dale, MCR, OSM, Alton, Illinois*
	Soils Technical Assistance (15 Minutes) *Larry Emmons, MCR, OSM, Alton, Illinois*
11:50 AM	ADJOURN

TECHNOLOGY TRANSFER & ASSISTANCE

March 28, 2007

1:00 PM	**Mobile Computing** (20 Minutes) *Min Kim, MCR, OSM, Alton, Illinois*
	Using Mobile Computing Technologies and Assessment Indices to aid in Stream and Wetland Delineations. A Case Study: The Quail Farm II AML Project in Kansas (20 Minutes) *Len Meier, MCR, OSM, Alton, Illinois*
	AMD Abatement with Steel Slag: Geochemical Implications (20 minutes) *Paul Behum, MCR, OSM, Alton, Illinois*
	Bore Hole Camera Applications for Hydrology (20 Minutes) *Debbie Dale, MCR, OSM, Alton, Illinois*
2:40 PM	**Break**
3:10 PM	**USFWS Rulemaking on the Indiana Bat** (20 Minutes) *Kimery Vories, MCR, OSM, Alton, Illinois*
OSM/EPA	**Rulemaking on CCBs** (20 Minutes) *Kimery Vories, MCR, OSM, Alton, Illinois*
	MCR Technology Transfer Team (15 Minutes) *Len Meier, MCR, OSM, Alton, Illinois*
	Discussion Session: What are the TDT needs in Alabama and how can MCR be more responsive in meeting your technology needs?
4:30 PM	**ADJOURN**

Technical Innovation and Professional Services
TIPS

Technical

Software
Hardware

Innovation

Training

Applied
Sciences

Professional

Technical
Assistance

Services

TIPS Topics

- Organization
- Strategic Plan
- Software Status
- Training Program Status
- New Frontiers

TIPS National Team

Office	Name	Title	Office	Name	Title
Denver	Mike Benavides	Computer Specialist	Denver	Bob Welsh	Geologist
	Tonya Blackburn	Technology Coordinator		Al Wilhelm	Mining Engineer
	Billie Clark	Chief, Technology Management Division	Alton	Paul Behum	Hydrologist
	Paul Clark	Technology Coordinator		Debbie Dale	Hydrologist
	Veronika Eskova	eTraining/Website		Kale Horton	Natural Resource Specialist
	Karyn Evans	Training Coordinator		Bill Joseph	Manager
	Janine Ferarese	Geographer		Min Kim	GIS Specialist
	Mary Greene	Hydrologist		Len Meier	Manager
	Lou Hamm	Chief, TIPS Technology Transfer Branch		Stefanie Self	Civil Engineer
	Bill Kannawin	Computer Specialist	Pittsburgh	Mike Dunn	Geologist
	Duane Matt	Technology Coordinator		Lisa Chavel	Civil Engineer
	Cathy McNish	Computer Specialist		Tom Mastrorocco	Physical Scientist
	Greg Morlock	Physical Scientist		Susan Stoyek	Computer Specialist
	Dianne Osborne	Remote Sensing Spec		Lois Uranowski	Civil Engineer
	Dan Rivers	IT Manager		Bill Winters	Hydrologist
	Bruce Swartz	IT Specialist	Knoxville	Bill Card	Biological Scientist
	Dawn Trudeau	Administrative Support Specialist		Jo Gault	Technical Assistant
	Steve Trujillo	Program Analyst		Daniel Lewis	IT Specialist
	Jessica Villanueva	Administrative Assistant	Big Stone Gap	Harry Morris	Computer Specialist

Customers

- 43 Customer Sites
  - States
  - Tribes
  - OSM Offices

- Customer Support
  - Software and Hardware Technical Assistance (see www.tips.osmre.gov)
  - Service Managers

TIPS Organizational Happenings

- Revitalized TIPS Service Manager Workgroup
- Each OSM region has clearly identified all personnel Involved in TIPS Support
- Began using DOI Learn to register for TIPS and NTTP Classes
- New opportunity to receive Continuing Education Credits through George Mason U on TIPS and NTTP classes
- MCR TIPS Coordinator – Bill Joseph
- Mobile computing-major deployment->FY06, FY07: budget dependent

Strategic Plan

Approved June 7, 2005

- **Goal 1-Promote and support the use of scientific and engineering tools to achieve the requirements of SMCRA**
  - Objective 1.1: Provide the electronic tools needed by States, Tribes, and OSM offices.
  - Objective 1.2: Provide assistance needed by States, Tribes, and OSM offices.
- ***Goal 2-Operate an effective training program***
  - Objective 2.1: Provide SMCRA-centered instructor-led training in the use of TIPS tools.
  - Objective 2.2: Provide e-training in the use of TIPS tools.

26 Core Software Packages

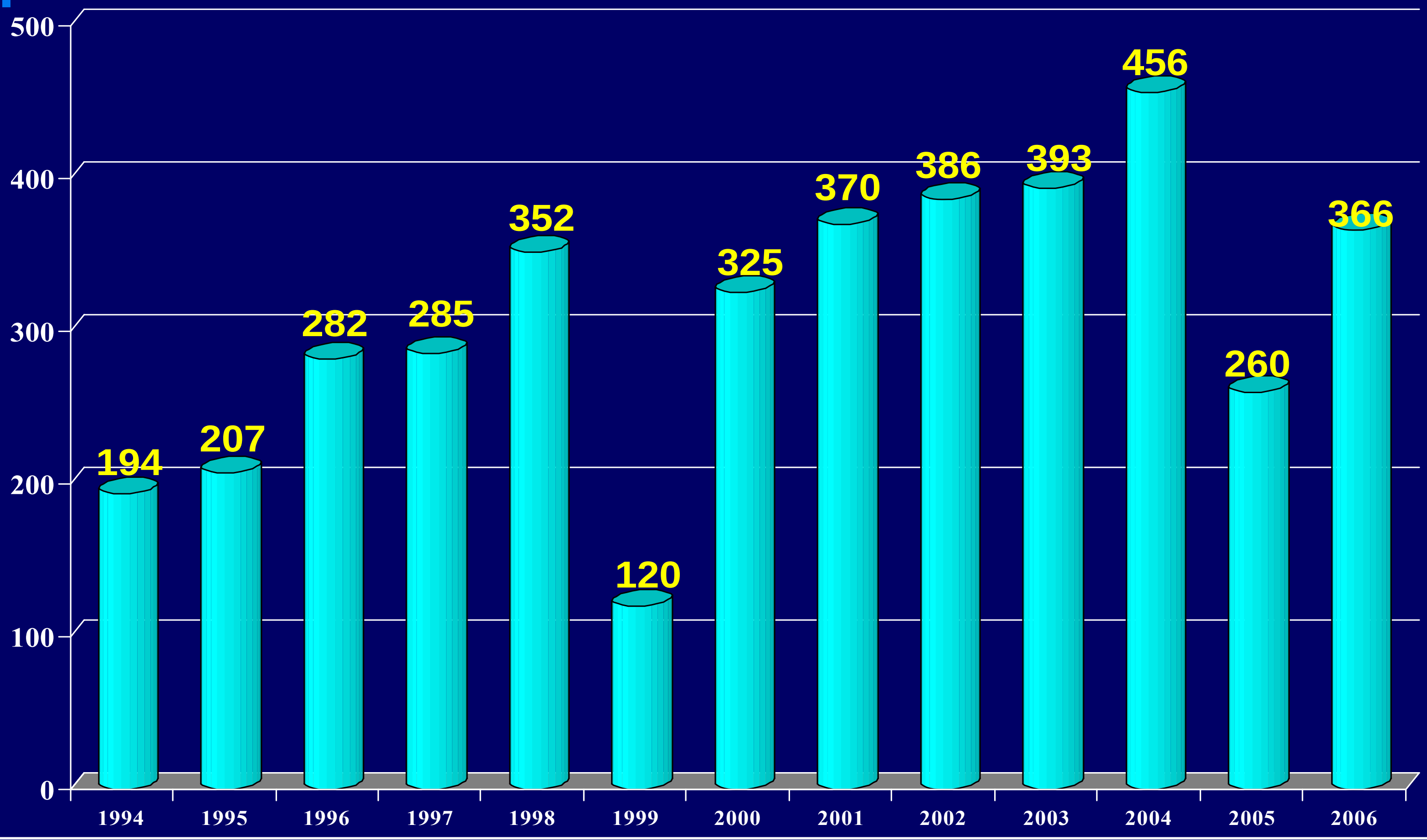
- AMD Pollution Abatement Cost Estimation
- Data Base Management
- Geographic Information System (GIS)
- Global Positioning Systems (GPS)
- Geologic Modeling
- Mapping / Site Design
- Statistical Analysis
- Surface and Ground Water Modeling
- Slope Stability Analysis
- Water Quality Analysis

Software Deployments-2007

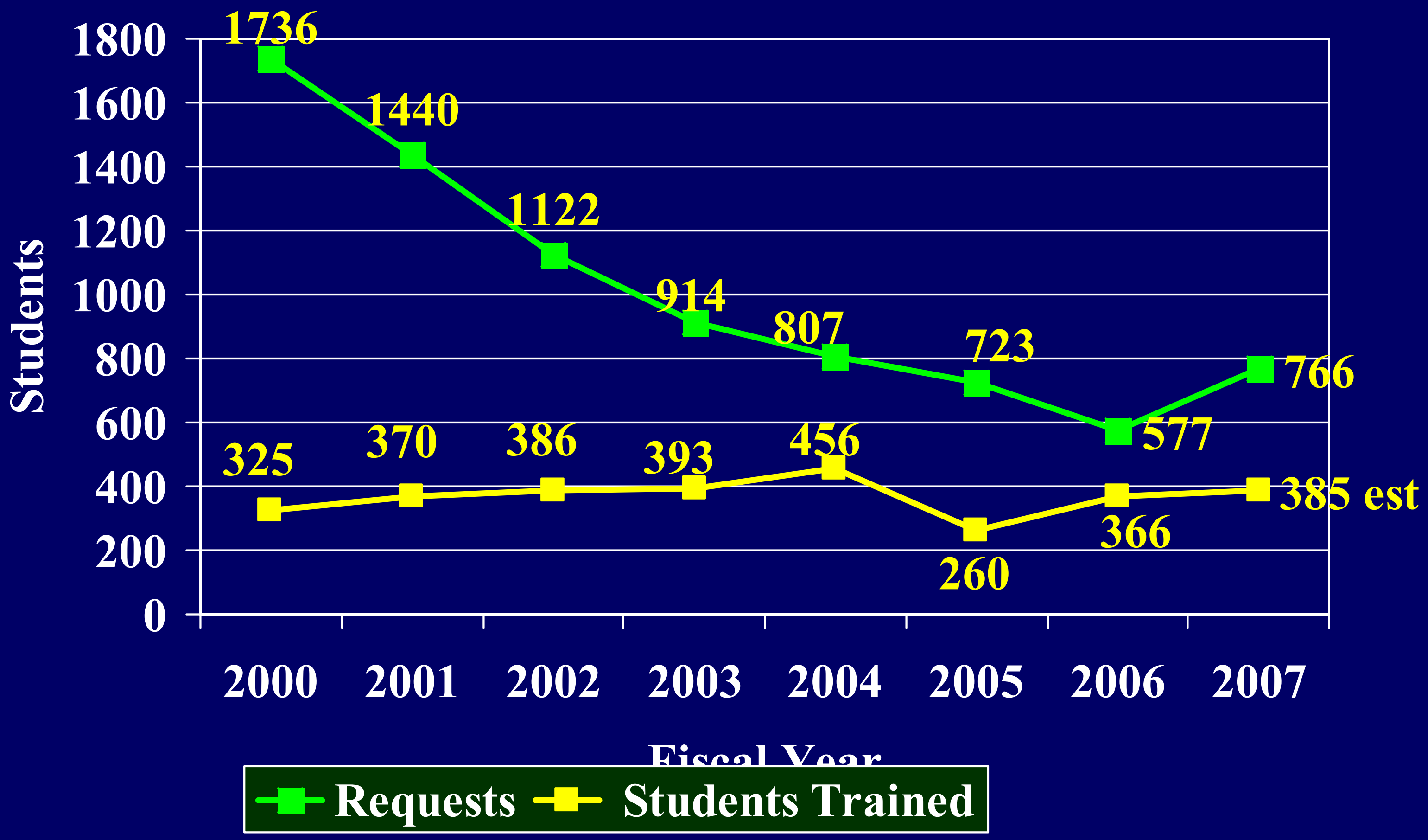
- January 2007 – Completed
  - ArcGIS 9.2, GMS v6.0, Galena v4.02 and AMDTreat v4.0
- Spring/Summer 2007 – Planning
  - Aqtesolve, Autodesk products, Image Analysis for ArcGIS, Stereo Analyst for ArcGIS

Training Program

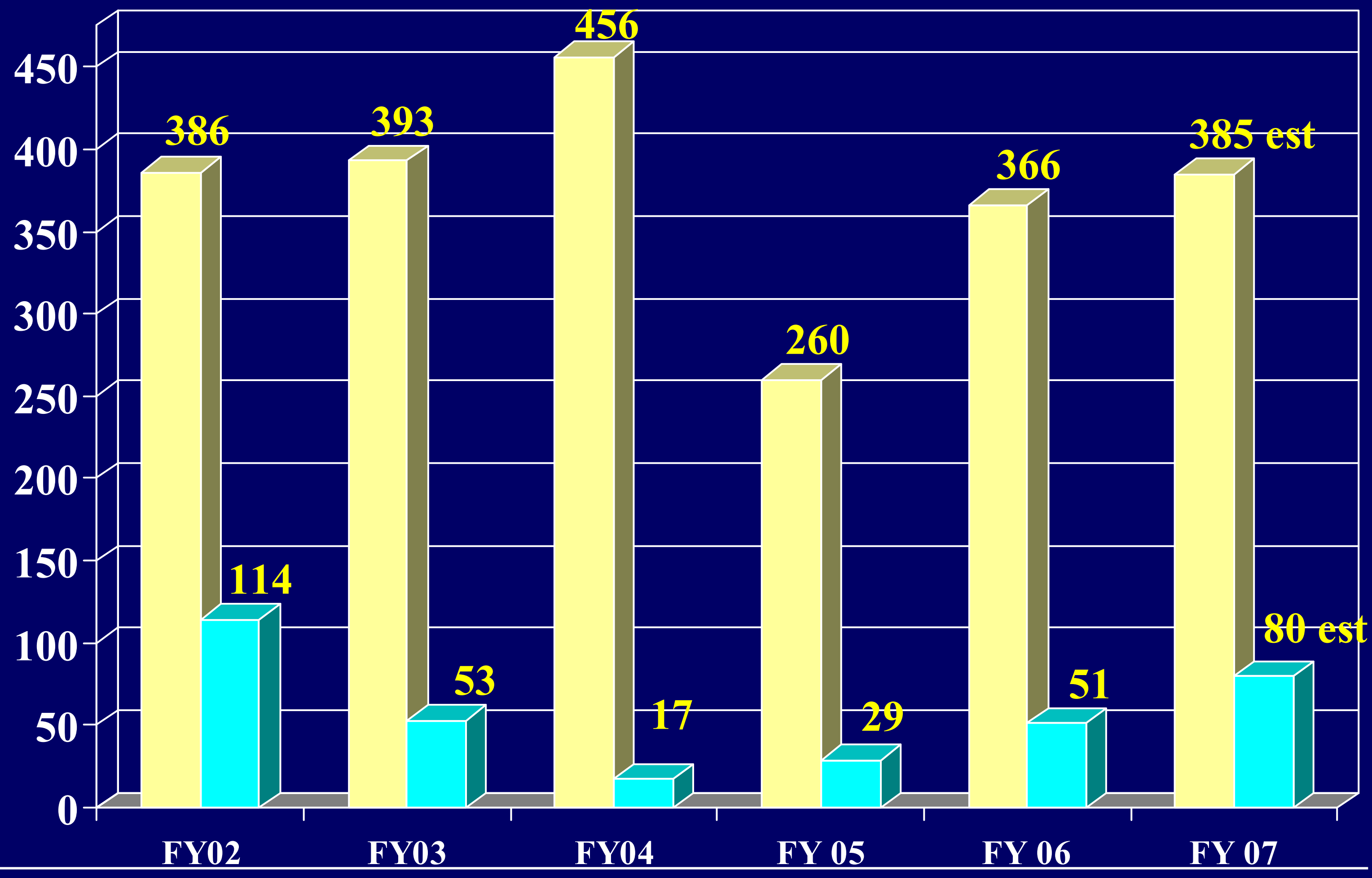
Classroom Student Count



Training Requests vs. Needs Met
(Classroom Students)



Instructor-Trained and e-Trained Students



Course Instructors

- **FY 2005**
  - 42 Total Instructors
  - 27 OSM
  - 15 State
- **FY 2006**
  - 66 Total Instructors
  - 32 OSM
  - 34 State

FY 2007 Courses

- **Instructor-led**
  - 17 GIS/GPS/Mobile Computing courses
  - 6 CAD courses
  - 6 hydrology courses
  - 8 engineering/geology/statistics courses

- **Student-Paced E-Training**
  - BLEP and Galena Slope Stability on-line training
  - 44 ESRI E-Training Courses and Workshops

FY 2005/2006 Courses

- Updated:
  - AutoCAD Map
  - CAD Applications
  - SurvCADD
  - ERDAS
  - ARCGIS Spatial Analyst
- 8 new courses: CAD, Mobile Computing/GPS, Remote Sensing, and Hydrology
- New Underground Mine Mapping/GIS class
- Offering 22 ESRI Virtual Campus courses and 22 workshops in FY 2005
- Developing 5 CAD e-Training courses

TIPS

Remote Sensing Program

Remote Sensing Program

Image Data Acquisition

Coordination, consultation, needs assessment;

Technology Transfer

Formal training; informal workshops;

Technical Support

Project support and technology transfer;

Innovation

Prototypical testing of remote sensing technologies;

Remote Sensing Program

Partnerships

USGS

USFS

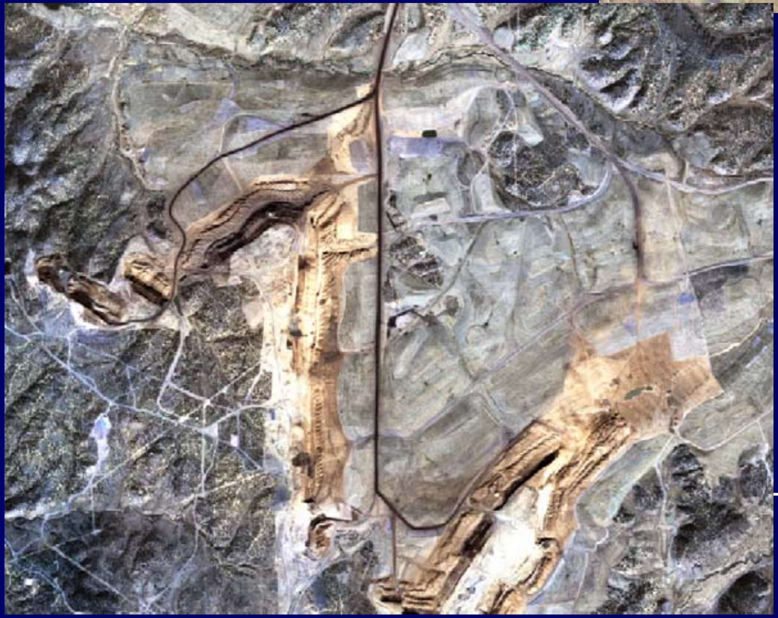
USDA

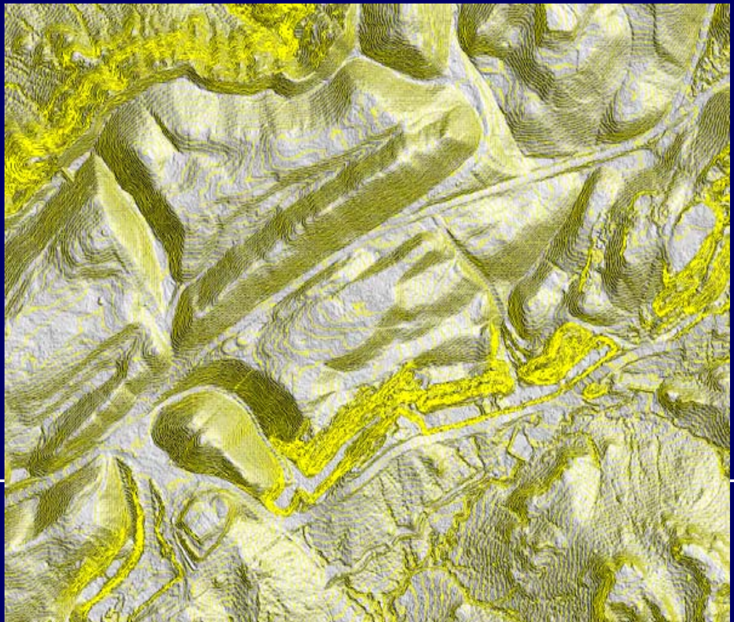
Image Data Acquisition

Aerial Photography

Satellite Imagery

LiDAR





High Point Mountain, Tennessee
Landslide Occurrence

SPOT Imagery 01/18/05

SPOT Imagery 02/22/05

Partners. . .

Technology Innovation

Future Investigations

Use of Unmanned Aerial Vehicles (UAV) to detect coal seam fires at night.

Advanced Image Segmentation Classification software is being investigated to conduct wetland mapping.

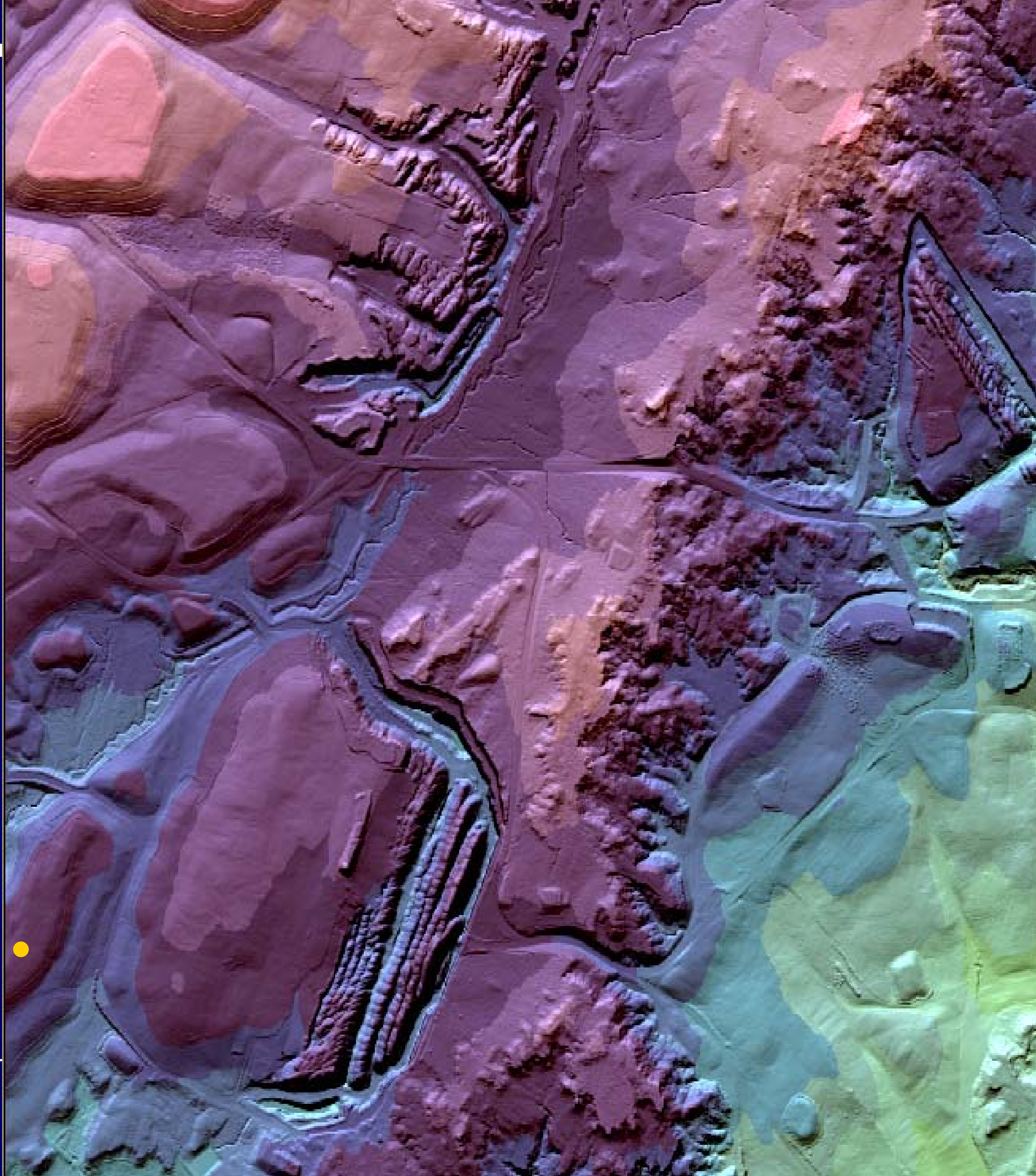
National Assets are being investigated to inventory AMD sites in PA, provide detailed topographic mapping in AK, and detect coal seam fires in ND.

TIPS Website

- TIPS URL is http://www.tips.osmre.gov/
- TIPS Training Program
  http://www.tips.osmre.gov/TrainingProgram.htm
- TIPS Software/Hardware Support
  http://www.tips.osmre.gov/SoftwareHardware.htm
- Research and Development
  http://www.tips.osmre.gov/R&D.htm
- Technical Assistance
  http://www.tips.osmre.gov/TechAssist.htm

Thank You

We need your input and assistance. . .



TECHNOLOGY TRANSFER AT OSM

2007 Members

- John Craynon OSM-HDQ
- Sarah Donnelly OSM-NTTP
- Billie Clark OSM-TIPS
- Erv Barchenger OSM-CLT Representative
- Lois Uranowski OSM-AR
- Duane Matt OSM-WR
- Kimery Vories OSM-MCR (Team Leader)
- Greg Conrad IMCC
- Dave Berry WEIB

WHAT IS TECHNOLOGY TRANSFER?

- Programs that ensure that the most current and valid scientific & technical information is developed and made available to the industry, States, Tribes, and OSM.

WHAT IS THIS TECHNOLOGY TRANSFER EFFORT?

OSM/State activities that lead to identification, testing and communication of:

- Better mining and reclamation practices,
- More efficient permitting, inspection or bond release methodologies,
- More effective AML reclamation practices,
- Use of state-of-the-art tools and technologies to increase efficiencies.

TECHNOLOGY TRANSFER COMPONENTS

- **REGIONAL TECH TRANSFER TEAM**
- **NATIONAL TECH TRANSFER TEAM**
- **TECHNICAL INTERACTIVE FORUMS**
- **STEERING COMMITTEES**
- **REGIONAL WORKSHOPS**
- **APPLIED SCIENCE PROJECTS**
- **PUBLICATIONS**
- **INTERAGENCY COOPERATION**
- **INTERNET WEBSITES**
- **TECHNOLOGY TRANSFER CD**
- **EXHIBITS**

MCR STEERING COMMITTEES

- COAL COMBUSTION BY-PRODUCTS
- BAT CONSERVATION AND MINING
- REFORESTATION
- PRIME FARMLAND RESTORATION

MCR NATIONAL FORUMS

DATE	EVENT TITLE	PART	VAL
1996	CCB & MINING/SIU	168	
1999	REFORESTATION	160	3.5
2000	BAT CONSERVATION & MINING	118	3.4
2000	CCB & MINING/NETL	140	3.4
2002	BAT GATE DESIGN	95	3.7
2002	CCB & WESTERN MINING	129	3.3
2002	MARKET-BASED REFORESTATION	114	2.6
2004	STATE REGULATION OF CCB PLACED AT MINES	175	3.5
2004	INDIANA BAT & COAL MINING	154	91%
2005	REGULATION, RISK, & RECLAMATION WITH CCBS	73	88%
2006	FGD AT COAL MINES & RESPONSE TO NAS CCB REPORT	124	100%

SIUC COAL RESEARCH CENTER

PUBLICATONS

- FORUM PROCEEDINGS 14
- BOY SCOUT HANDBOOK
- NUMEROUS TECHNICAL PAPERS IN SUPPORT OF FORUMS

CD PRODUCTION

- MCR MOVIE CD
  - OVER 400 DISTRIBUTED SINCE DEVELOPMENT IN 2002
- MCR TECHNOLOGY TRANSFER CD
  - OVER 7,768 DISTRIBUTED SINCE DEVELOPMENT IN 2000
  - GLOBAL REQUESTS FROM AT LEAST 12 COUNTRIES

Office of Surface Mining

Mid-Continent Region

Alton, IL – http://www.mcrcc.osmre.gov

Technology Transfer – Electronic Distribution CD

(Version 1.00 - Published February 2006)

Main Menu

COAL COMBUSTION BY-PRODUCTS (CCB)

- CCB Forum 2005
- CCB Forum 2004
- CCB UK Panel 2003
- CCB Forum 2002
- CCB Placement 2001
- CCB Forum 2000
- CCB Forum 1996

BAT CONSERVATION

- Indiana Bat & Coal Mining 2004
- Bat Gate Design 2002
- Bat Forum 2000

PRIME FARMLAND

- Prime Farmland Forum 1998
- Prime Farmland Workshop

REFORESTATION

- Market Based Reforestation 2002
- Reforestation Forum 1999
- Tree Planting Handbook

WATER QUALITY

- Acid Mine Drainage
- Stream Corridor
- Hydrology PHC/CHIA

MISC. INFORMATION

- MCRCC Web Site
- MCRCC Papers
- Old Ben Scout Handbook
- Copperbelly Water Snake


United States
Department of the Interior
OFFICE OF
SURFACE MINING

MCR WEBSITES

- CCB INFORMATION NETWORK
- REFORESTATION INITIATIVE
- BAT CONSERVATION AND MINING
- MCR HOME PAGE
- NATIONAL TECHNOLOGY TRANSFER WEBSITE COMING SUMMER 2007

INTERAGENCY COOPERATION

- ACAA/UNIVERSITY OF KENTUCKY 2005 WORLD ASH FORUM NATIONAL & TECHNICAL STR COMM
- DOE COMBUSTION BY-PRODUCTS RECYCLING CONSORTIUM NATIONAL STR COMM
- EPA/OSM CCB & MINING RULEMAKING INVESTIGATON
- IMCC/EPA/OSM CCB RULEMAKING

FUTURE EVENTS

- 2007-INDIANA BAT RECOVERY PLAN WORKSHOP: 2007???
- 2007- ILLINOIS AMD WORKSHOP SEPTEMBER 11-13, 2007

APPLIED SCIENCE PROGRAM

OFFICE OF SURFACE MINING:

TECHNOLOGY TRANSFER

THE OLDEN DAYS

- The DOI Bureau of Mines (BOM) conducted research on issues associated with mine productivity; miners health and safety; and mine reclamation.
- In 1995, the BOM was abolished.
- With it, most government funded research associated with mining ended.

THE MIDDLE YEARS
1995-2004

OSM REGIONS FUNDED SELECTED PROJECTS WHICH HAD DIRECT APPLICATIONS TO MINE REGULATION UNDER SMCRA

PRE-05 MCR PROJECTS

- 1998 COPPERBELLY WATERSNAKE - PURDUE UNIVERSITY
- 1999 PRIME FARMLAND - SIUC
- 2001 INDIANA REFORESTATION - SIUC & PURDUE UNIVERSITY

THE REBIRTH OF SCIENCE FUNDING

- In 2005 Congress authorized OSM to initiate a program to select and fund applied science proposals that would result in improved protection of the public and environment by advancing improved technology development and transfer related to coal mining and reclamation.
- Applied Science Projects must have the potential to make a difference on the ground rather than Research which may inform us but not change how we do business!

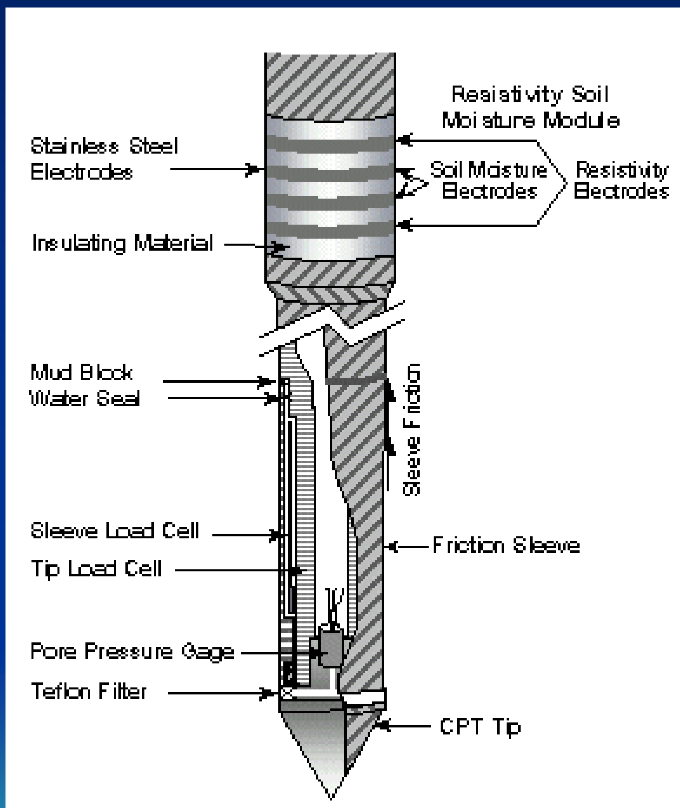
2005 – THE PROCESS

- OSM solicited proposals primarily from universities and other organizations.
- Projects were reviewed by the Regional and National Technology Transfer Teams (OSM/State).
- 12 projects funded.

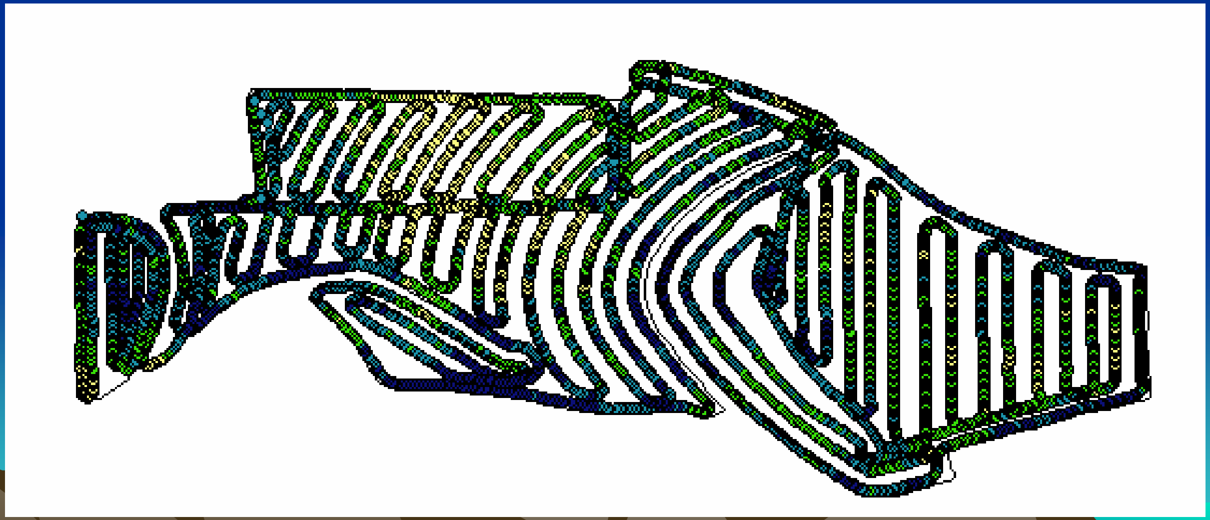
2005 PROJECTS

- 1 HDQ (AMD),
- 8 AR (MINE POOLS, MOUNTAIN TOP REMOVAL, REFORESTATION, CCBs, GIS, and SUBSIDENCE
- 1 MCR CROP LAND CAPABILITY
- 2 WR VEGETATION DIVERSITY, COAL MINING EDUCATION

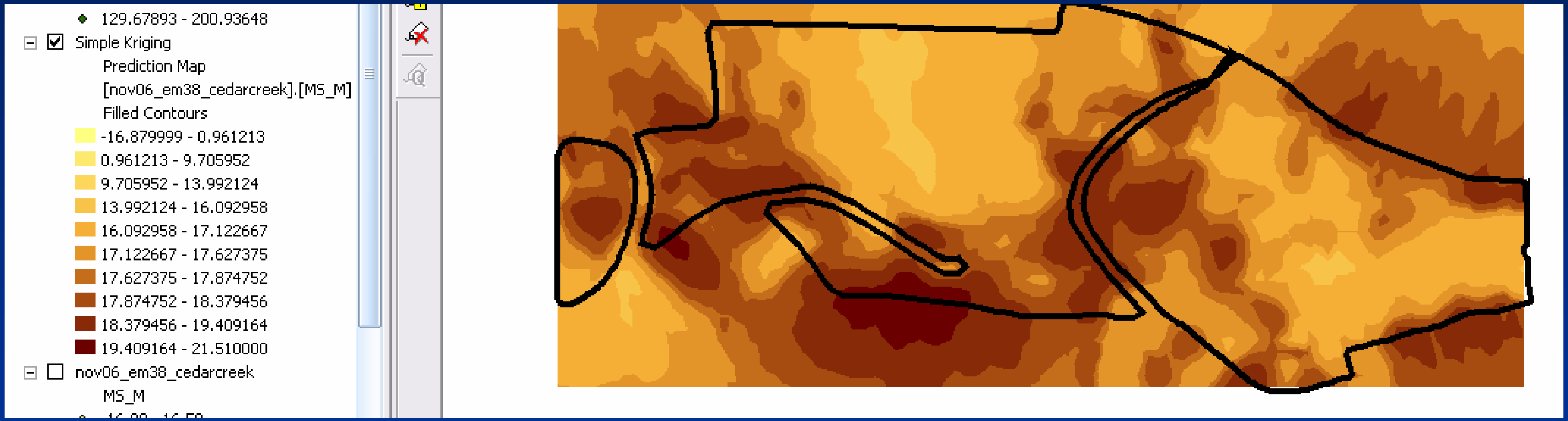
UI Digital Cone Penetrometer

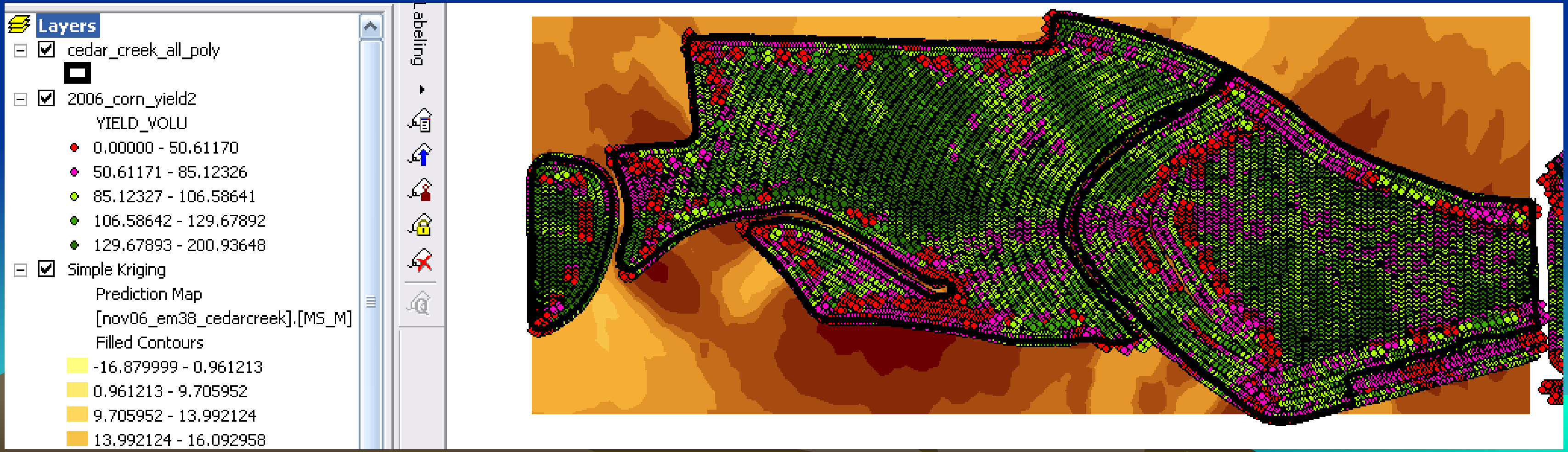


UI Infra Red of Cropland & Field Sampling Pattern



UI Soil Conductivity Values & Crop Yield





2006 REQUEST FOR PROPOSALS

- The Request for Proposals (IFB612104) for OSM's 2006 Applied Science Projects was released December 19, 2005 and closed March 31, 2006.
- 60 projects were received.
- MCR mailed over 160 copies of the RFP to contacts within the mid continent States.
- 12 Projects funded.

2006 Projects

- 1 HDQ Robotic Underground Surveys
- 5 AR Wildlife, Reforestation, AMD, & PHC/CHIA
- 3 MCR AMD and Cropland Capability
- 3 WR Reforestation, establishing shrublands, and vegetation diversity

2005 Projects to Watch

- **Field Procedure to Evaluate Reforestation Potential** (Sweigard)
- **Geospatial Technologies For Regulatory Oversight** (Wilkes U)
- **System to Evaluate Prime Farmland Reclamation Success Based on Spatial Soil Properties** (Dunker)

2006 Projects to Watch

- **Evaluation of BMP Efficiencies in Reducing TDS Loads from Mining (Kern)**
- **Mine Land Reclamation and American Chestnut Restoration** (McCarthy)
- **Development of a Rapid Geomorphic Assessment Technique to Support the CHIA/PHC Process** (Schwartz)
- **Sulfate-reducing bioreactor cell (SRBC) technology on low-flow, metal-rich acid seeps in the Midwest** (Branam).
- **Improved Static Test Prediction of Acid Generation Potential** (McWhinney)

2007 Proposals

- The Solicitation went out 12/15/06 and closed 3/2/07. 29 proposals were received.
- 20 AR, 5 MCR, 4 WR
- Regional Review due April 27
- National Review complete May 31
- Begin Awarding Funds July 1

Website availability

- Applied science list of proposals, with PIs, funding, institutions, objectives, final reports, and OSM technical contacts available on the applied science page at www.mcrcc.osmre.gov

OFFICE OF SURFACE MINING

NATIONAL TECHNICAL TRAINING PROGRAM

November 12, 2006

Instructor Training Course



AML Design Workshops Course Objectives

- Identification of Hazards
- Identify Reclamation Methods
- Site Characterization; Develop Site Map
- Develop Viable Reclamation Alternatives
  (pros and cons)
- Develop Final Design including Bid Specifications, Plans/Drawings and Bid Items
- Demobilization
- Methods of Measurement and Payment
- Develop Cost Estimates

AML Design Workshop
Subsidence

Student Notebook

U.S. Department of the Interior Office of Surface Mining

AML Design Workshop
Dangerous Openings

Student Notebook

U.S. Department of the Interior Office of Surface Mining

AML Design Workshop
Landslides

Student Notebook

U.S. Department of the Interior Office of Surface Mining

UNDERGROUND MINING TECHNOLOGY

TAUGHT BY: MINING ENGINEERS, GEOLOGISTS

- **INTRODUCTION TO UNDERGROUND MINING**
  - Production
  - Geological
  - Coal Characteristics

- **MINE MAPS**
  - Topographical Maps
  - Topo/Underground Map Correlation

- **SURFACE EFFECTS**
  - Environmental Effects and Controls
    - Subsidence, Hydrology, Mine Fires, Mine Gases, Coal Waste Handling

- **FIELD EXERCISE**

Underground Mining Technology Class

ADVANCED BLASTING
Investigation & Analysis of Adverse Effects of Blasting

Taught By: **OSM and State Blasting Experts**

Instruction On:

- Adverse Effects of Blasting
  - Ground Vibrations
  - Air Blasts
  - Fly Rock
  - Fumes
  - Dust
- Blasting Log Analysis
- Structure Response
- Damage Assessment
- Citizen Complaints
- Community Reactions

Detonation

PROGRAM EVALUATION

- Student-In Class Evaluations

- Follow-up Evaluations:
  - Students & Supervisors

- Course Modifications

Do Students Do Their Jobs Better?

- At Class, students are asked:
  -- How useful will this course be to you in your current position?

- 3 Months later, students and supervisors are asked if:
  – Job Performance has improved as a result of taking the class
  – If attending the class changes the way employees perform their work
  – If work has not been performed, was the course useful for another reason

Improved Job Performance

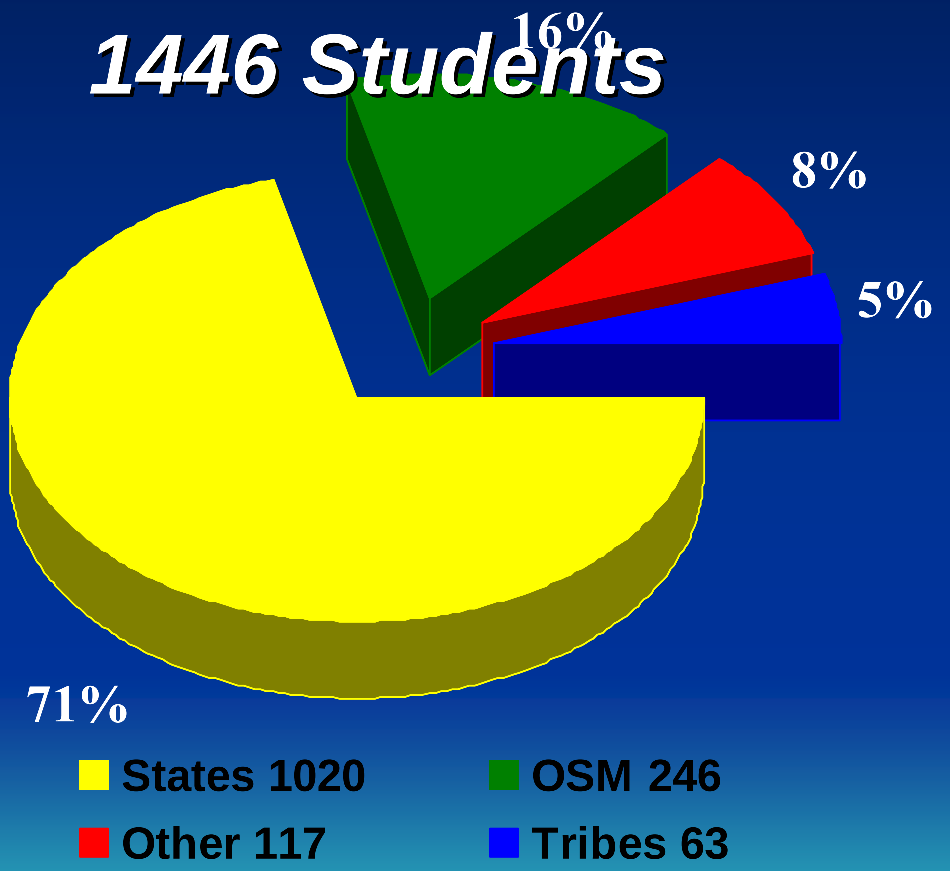
- Better Upfront Thinking
- Improved Confidence on the Job
- Improved Overall Knowledge
- Direct Application of Knowledge
- Improved Skills and Competence
- New Procedures
- Better communication with operators and community
- Cross-Training

CLIENTELE & SCHEDULING

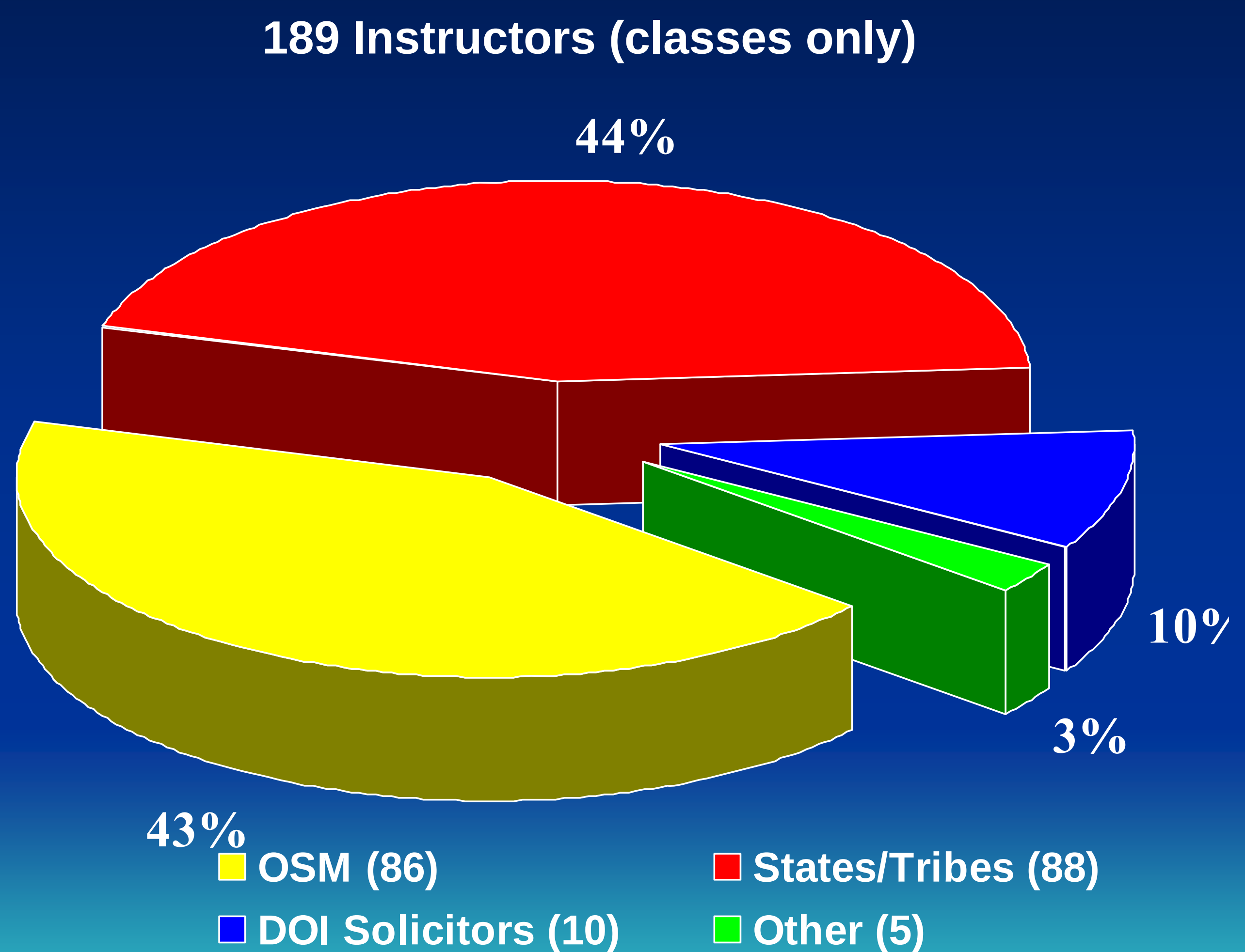
- 48 Technical Courses
- 50 Sessions Per Year
- Held Nationwide
- Near Home Office
- Near Mine Sites
- 1 – 3 ½ Days

FY 2006 Program Attendance

1446 Students



FY 2006 Program Instructors



FY 2007 Plans

- SMCRA Oral History & Video
- ITC (1-2 sessions)
- Pilot Master Instructor Forum
- Develop Reforestation Course
- On-Line Registration through LMS
- Make course references and other materials available on-line

OSM Geospatial Initiatives

2006-2007

National Coal Mine Geospatial Data Committee

- Improve use of geospatial data for SMCRA operations,
- Improve OSM TIPS services in support of State geospatial and CAD needs
- Improve technology transfer related to geospatial data
- Develop data layers of national significance in partnership with States

Activities

- Conducted survey of all state SMCRA programs regarding geospatial data – Spring 2006.
- National meeting with State Geospatial data stewards – June 26, 2006.
  - Spatial Data Standards ASTM Task Group (Surface mine permit boundaries and underground mine boundaries)
  - Infrastructure Team
  - Planning Committee for National Meeting
  - Technical Support Group
- Offer ArcSDE training for State and staff - 2007
- Begin identifying the next layers for data standards

OSM MID-CONTINENT

GEOSPATIAL STRATEGY

2006-2007

MISSION

- Improve MCR and State program access to GIS data relevant to coal mining and reclamation,
- Facilitate public access to selected coal mine data layers of national significance by utilizing a geospatial data clearinghouse concept for coal mining related GIS data.

GOALS

- Develop and maintain regional geospatial database based on ArcSDE and SQL Server.
- Develop an Internet Mapping Service (ArcGIS Server) to provide remote access to selected mining related GIS data
- Incorporate ArcIMS into mobile computing technology so users can view/download necessary GIS data from the field.
- Integrate AutoDesk MapGuide with SQL Server and ArcSDE to prototype CAD data serving capabilities of the various software platforms.

GOALS - Continued

- Develop a georeferenced digital mine map library for coal mines in the Mid-Continent States.
- Develop a system to update changes in mine features and other GIS layers in timely manner.
- Develop a training class for current and potential customers on how to view, download and use geospatial data through MCR geospatial data clearinghouse.

Benefits

- Establish and maintain partnerships with state and local government, academia, public interest groups, and other federal agencies in developing nation wide geospatial data layers for coal mining and reclamation.
- Leverage State and OSM geospatial resources by increasing communication between GIS professionals, sharing ideas and successes, and increasing GIS technology transfer between SMCRA organizations.
- Improve accessibility and utilization of geospatial data by MCR state programs by housing selected data for states without data serving capacity, providing links to relevant data housed on other servers and providing technical assistance and training as necessary.

ArcGIS Demo

MCR ArcSDE/SQL

GIS Server

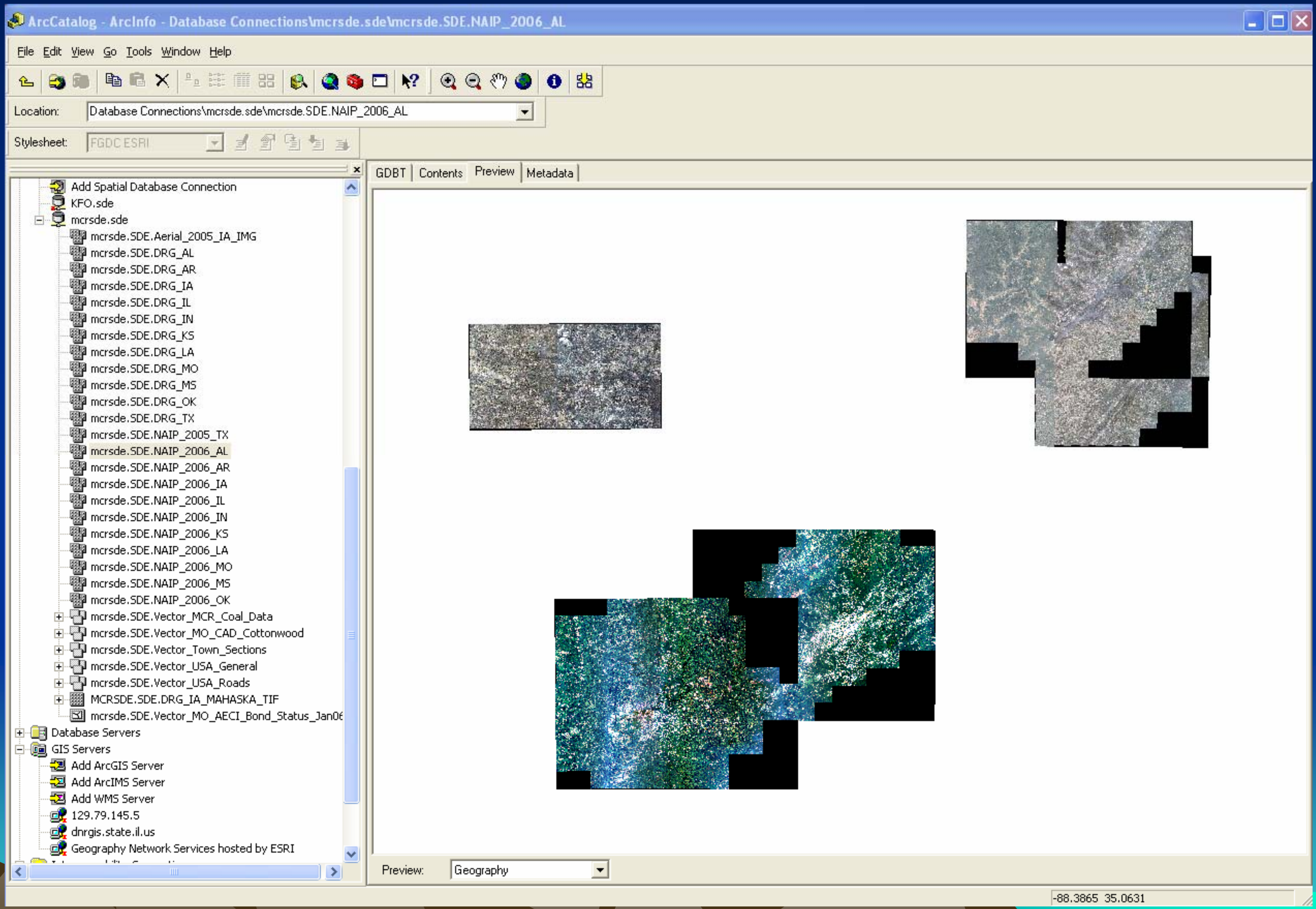
ArcSDE

- ArcSDE is a server software product used to access massively large multiuser geographic databases stored in relational database management systems (RDBMSs).
- It is an integrated part of ArcGIS and a core element of any enterprise GIS solution. Its primary role is to act as the GIS gateway to spatial data stored in a RDBMS (SQL).

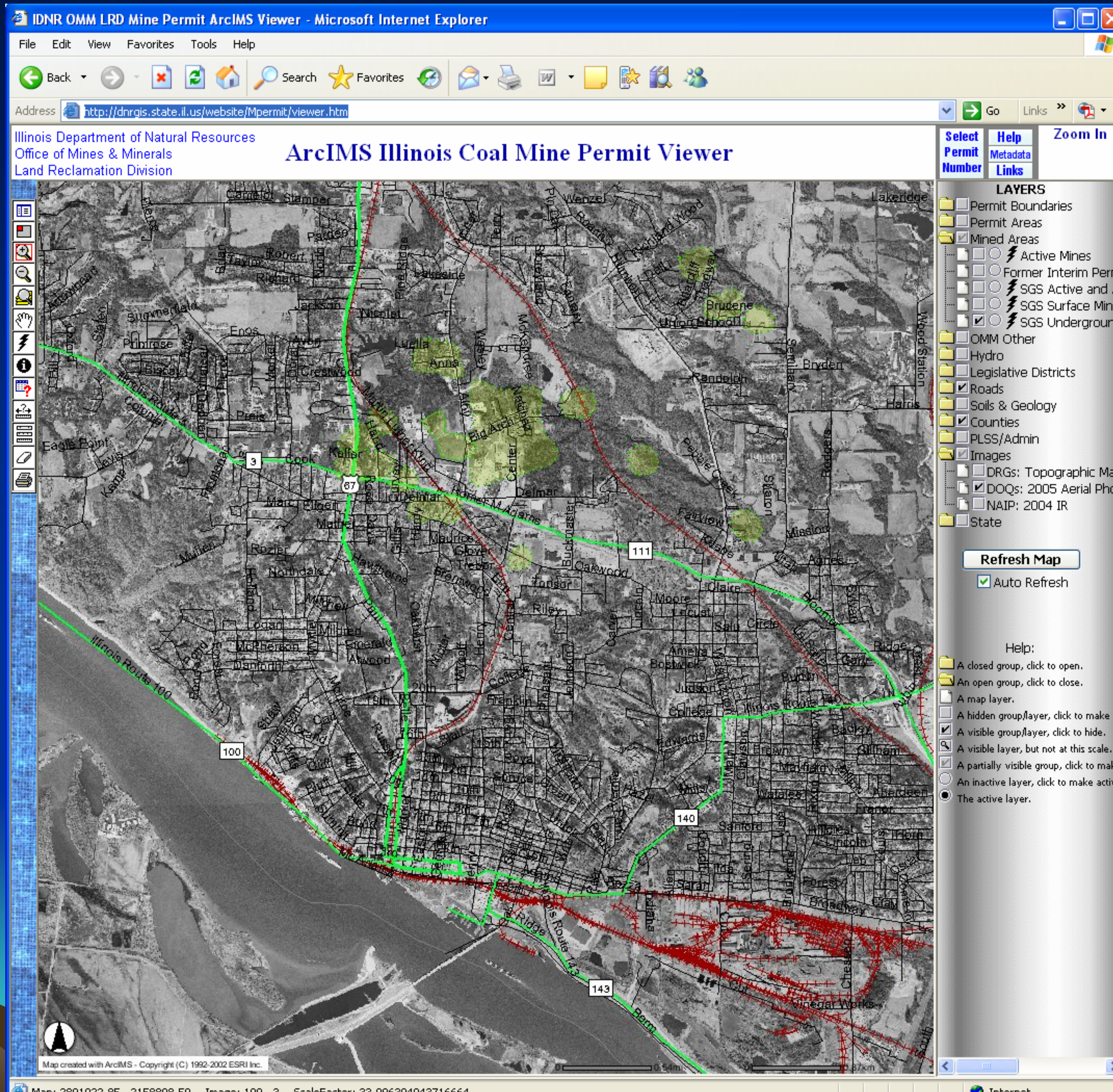
GIS Layers

- Vector data
  - Title IV and V sites, geologic sample locations, NPDES, AMD treatment facilities, OSM/State water sample locations…
  - Streams, roads…
  - CHIA area, coalfield bndy, permit bndy, section lines, county bndy…
  - CAD drawings (landuse, bond status…)
- Raster data
  - Aerial images (NAIP)
  - USGS quadrangle maps (DRG)
  - Scanned mine maps (permit, operation, reclamation…)
- Digital elevation models (DEM)
- Survey data

Data Structure (as of 3/21/07)



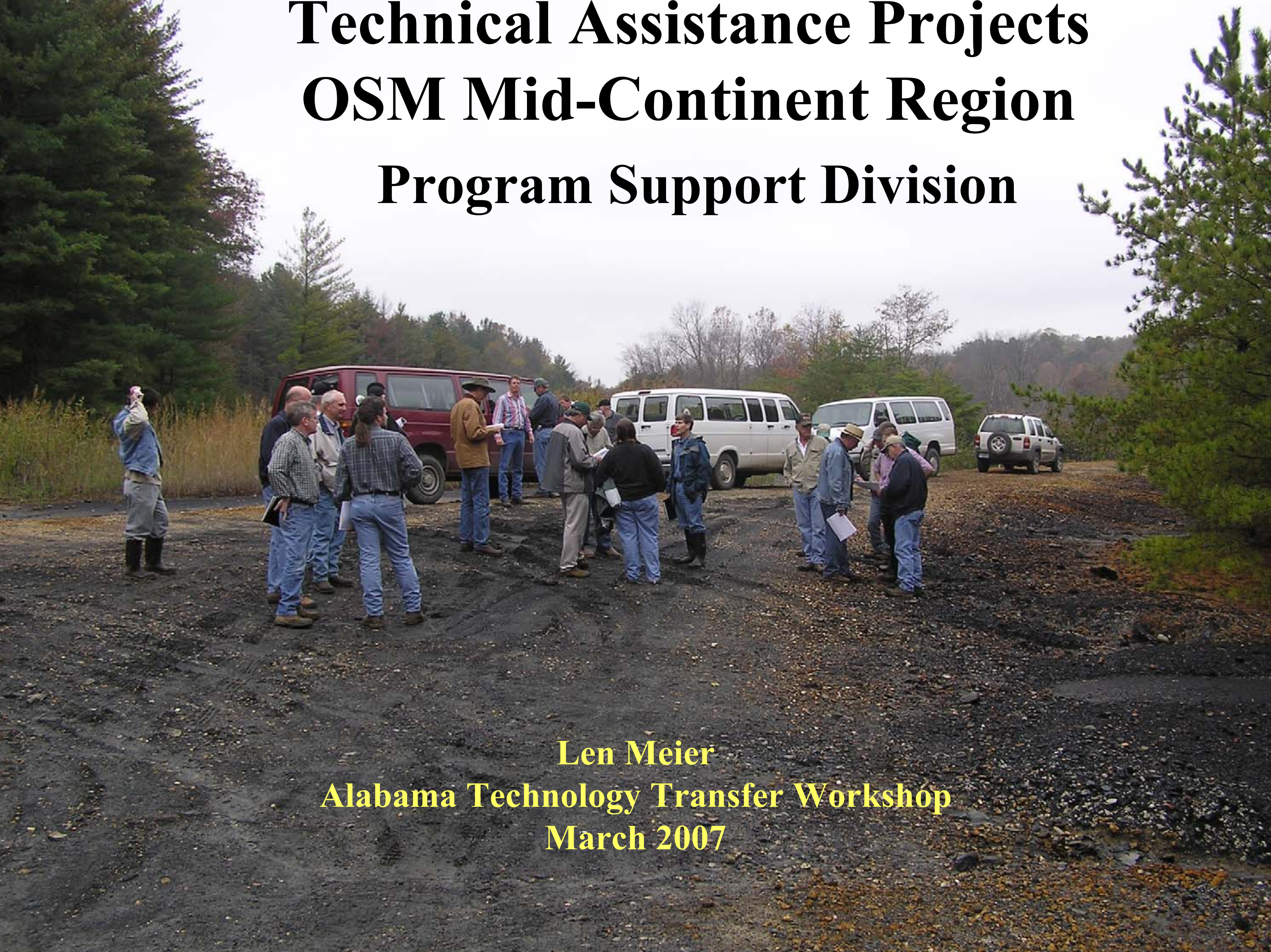
ArcGIS Server



Help Needed

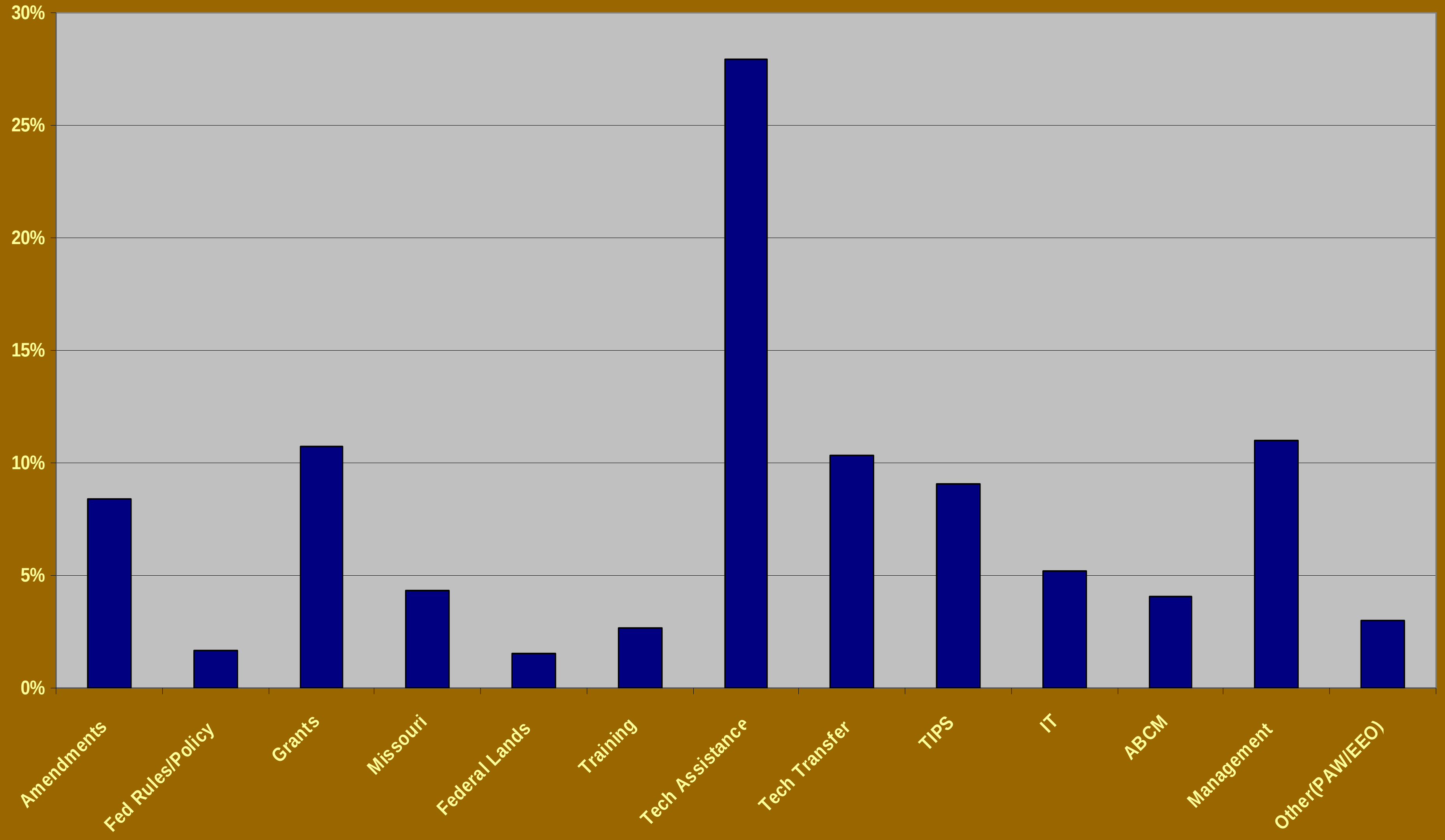
- Create and maintain a two way communication between OSM/MCR IT/GIS and the State IT/GIS staff on GIS needs.
- Share archived historical mine related paper and digital maps.

Technical Assistance Projects
OSM Mid-Continent Region
Program Support Division



Len Meier
Alabama Technology Transfer Workshop
March 2007

FY 2006 Percentages of PSD Time Usage



Technical Assistance to State Programs

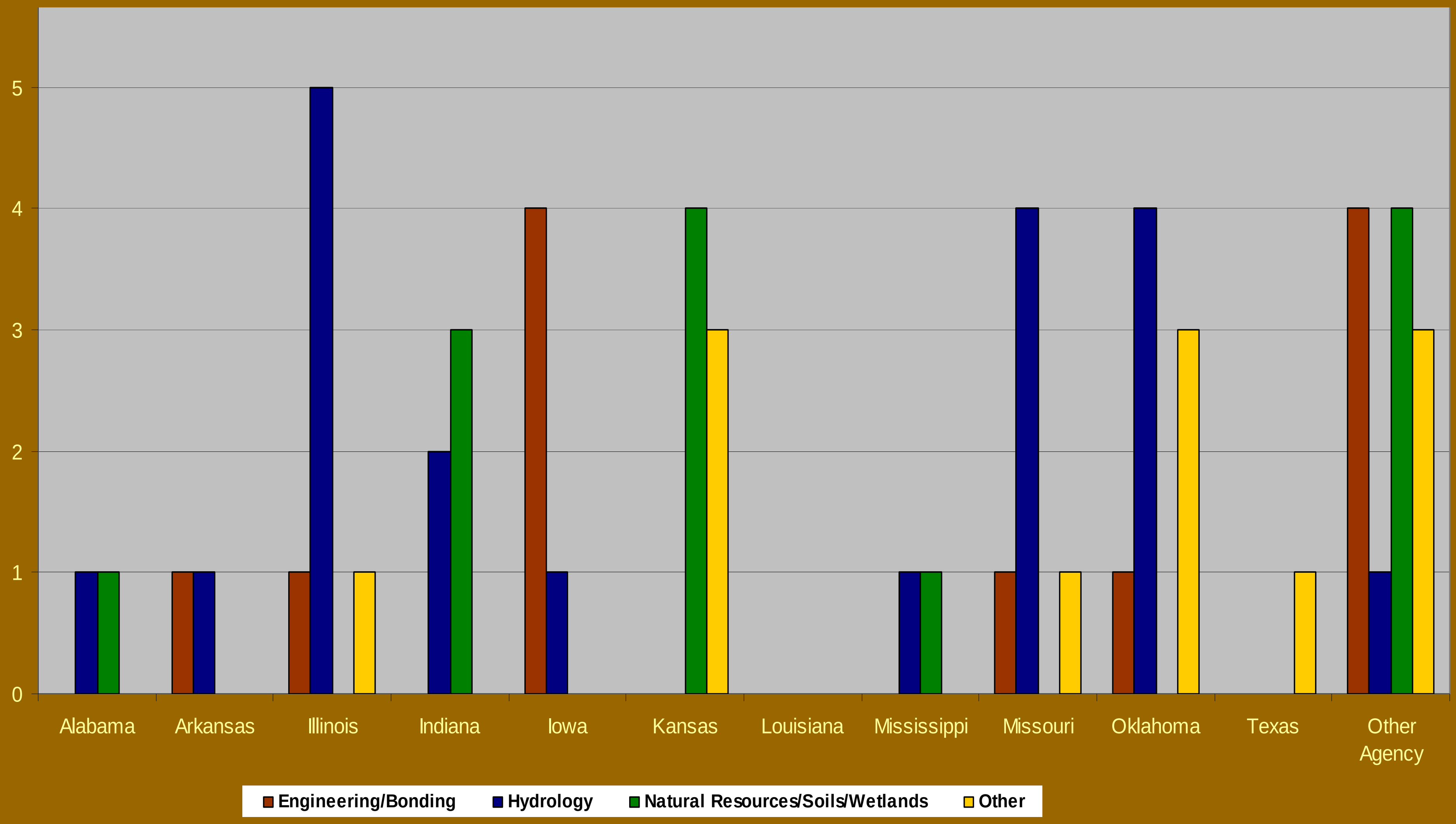
To:

Field Offices

OSM Headquarters

State Programs

FY 2006 MCR/PSD Technical Assistance Projects by State



Geospatial Technologies

- Spatial Databases (ArcSDE)
- Mobile Computing
- Electronic Permitting
- Remote Sensing – Satellite, Aerial, Thermal Camera,

Hydrology

- AMD Remediation – Passive and Active Treatment
- Well Investigations, Well Pumping – medium to low flow capabilities
- Down Hole Camera (AML Features, Well Completion, Well Characteristics)
- PHC/CHIA (Large Watershed Modeling)

Engineering

- Spatial Data Collection: RTK, Total Station, GPS (meter, sub-meter, sub-foot)
- Subsidence
- Design - Natural Landforms and Automated Re-design
- Landform Stability
- Blast Monitoring
- Gas Monitoring

Natural Resources

- Wetland Delineation (404 permit assistance)
- Wildlife Habitat Assessment
- Aquatic (Benthic) Water Monitoring (AMD, stream health, stream quality)
- Habitat Use (Indiana Bat Study)
- Endangered Species (Recovery Plans)
- Soil Substitution Assistance and Studies
- Prime Farmland Productivity

Applied Science

- AFM/TFM Characterization
- PHC/CHIA (Large Watershed Modeling)
- CCB Characterization and Placement
- Biological Indicators
- Prime Farmland Productivity (Spatial Analysis)
- Soil Substitution Techniques

Thank You for
your dedication,
professionalism
and hard work!

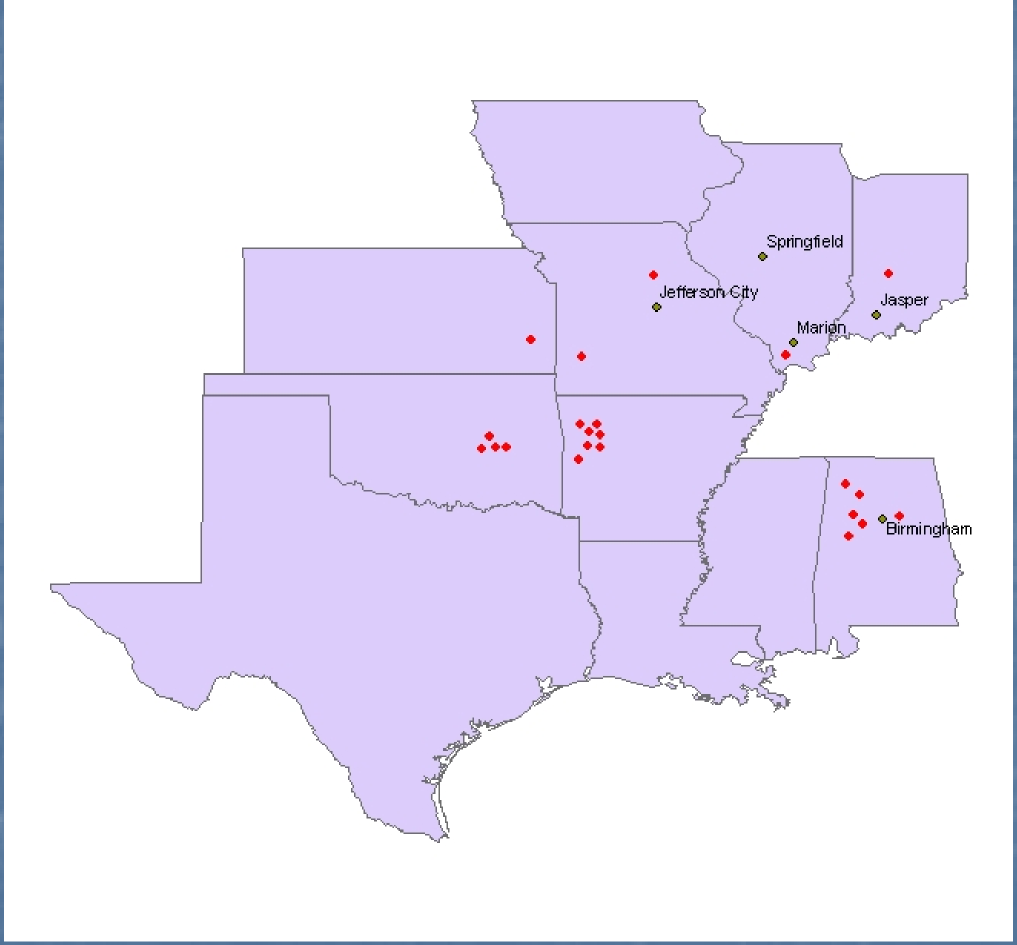
MCR AMD PASSIVE TREATMENT DESIGN AND CLEAN STREAMS ACTIVITIES

Paul T. Behum

March 1, 2007

OVERVIEW

- Classes and Workshops
  - Birmingham, Ala.
  - Springfield, Ill.
  - Marion, Ill.
  - Jasper, Ind.
  - Jefferson City, Mo.
  - NTTP Class
- Evaluation of Clean Streams projects
- Treatment design
- AMD Inventory



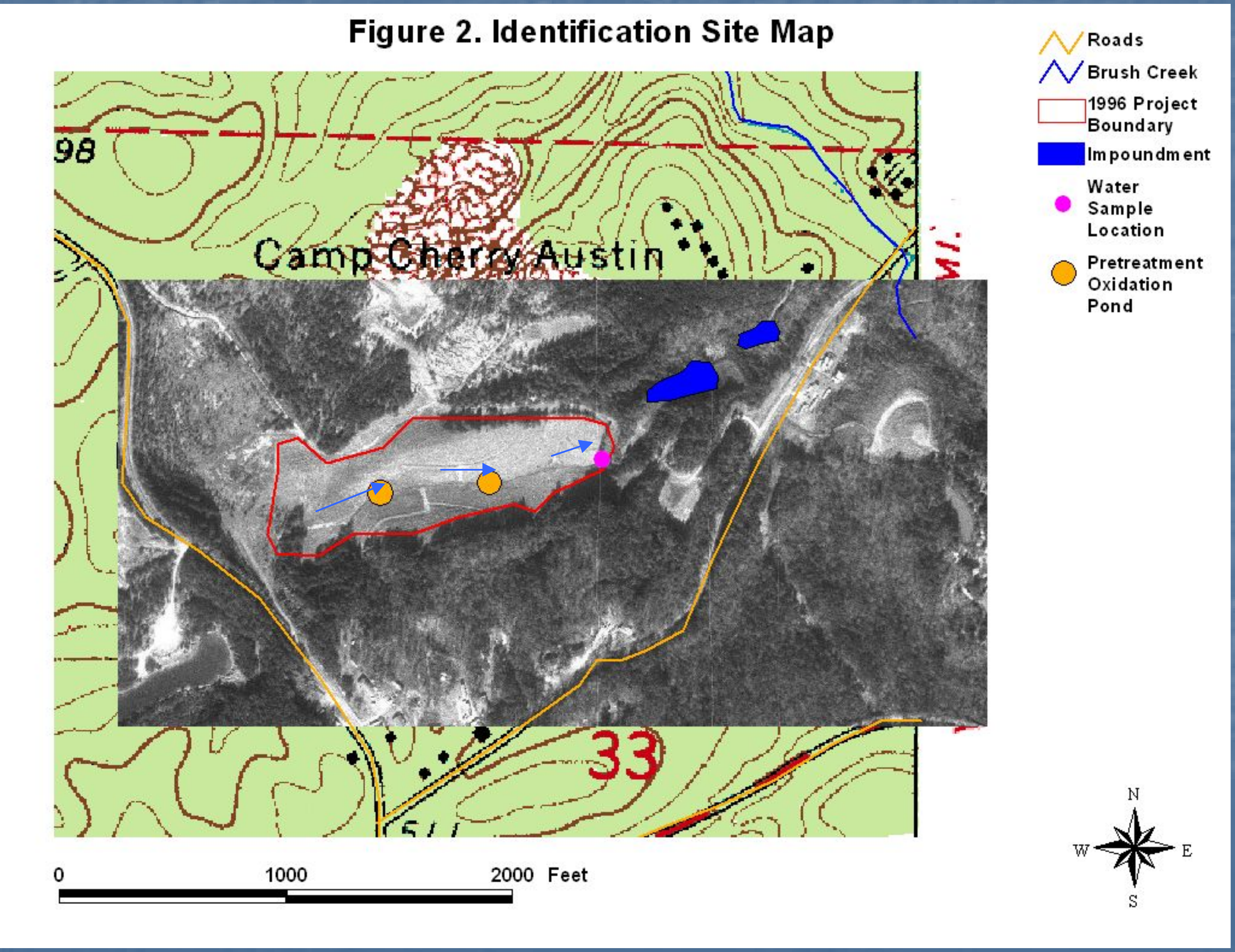
Passive Treatment Design Projects:

- Camp Cherry Austin, Ala.
- Old Bevier Wetlands Rehabilitation, Mo.
- Otter Creek AMD Treatment Redesign. Mo.
- Enos Gob Passive Treatment System, Ind.
- LeBosquet Passive Treatment System, Okla.
- Rock Island No. 7 Mine Pool Seep, Okla.
- Tab Simco West, Carbondale, Illinois
- Herbert Project, Iowa
- No 6 Mine Discharge, Arkansas

Evaluation of Five Clean Streams Project in Alabama

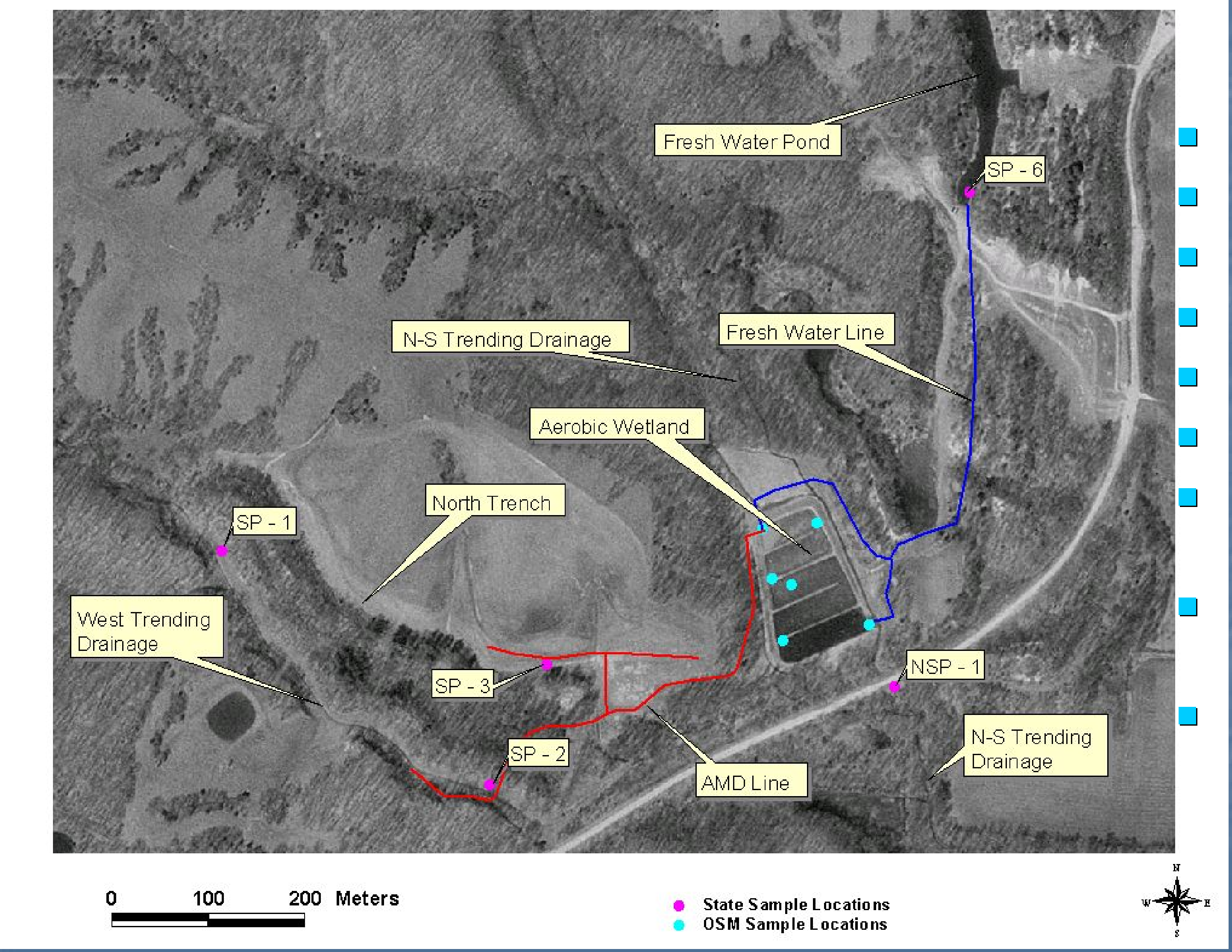
- Acmar Washer (2000)
- Barney (2002)
- Cane Creek (1998)
- Hurricane Creek (2002)
- Peabody Washer (2003)

Camp Cherry Austin, Brookwood, Ala.



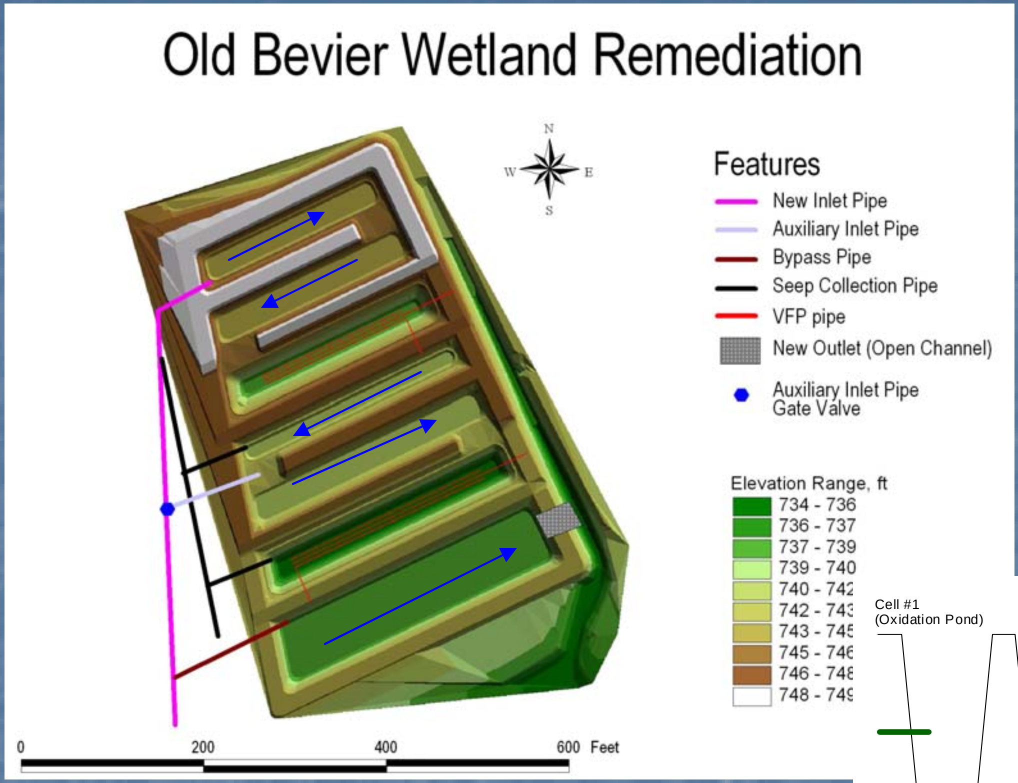
- Flow = 50 gpm
- pH = 3.2
- DO = 7.0 mg/L
- T. Fe = 220 mg/L
- T. Al = 12.7 mg/L
- T. Mn = 25.8 mg/L
- Sulfate = 500 mg/L
- Net Acidity = 550 mg/L

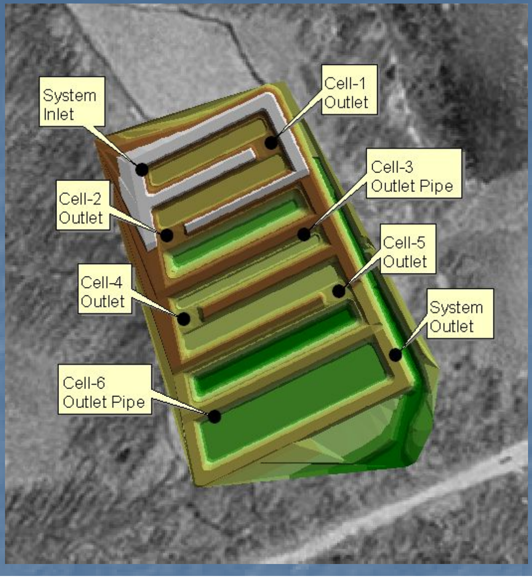
Old Bevier Treatment Wetlands, Mo.

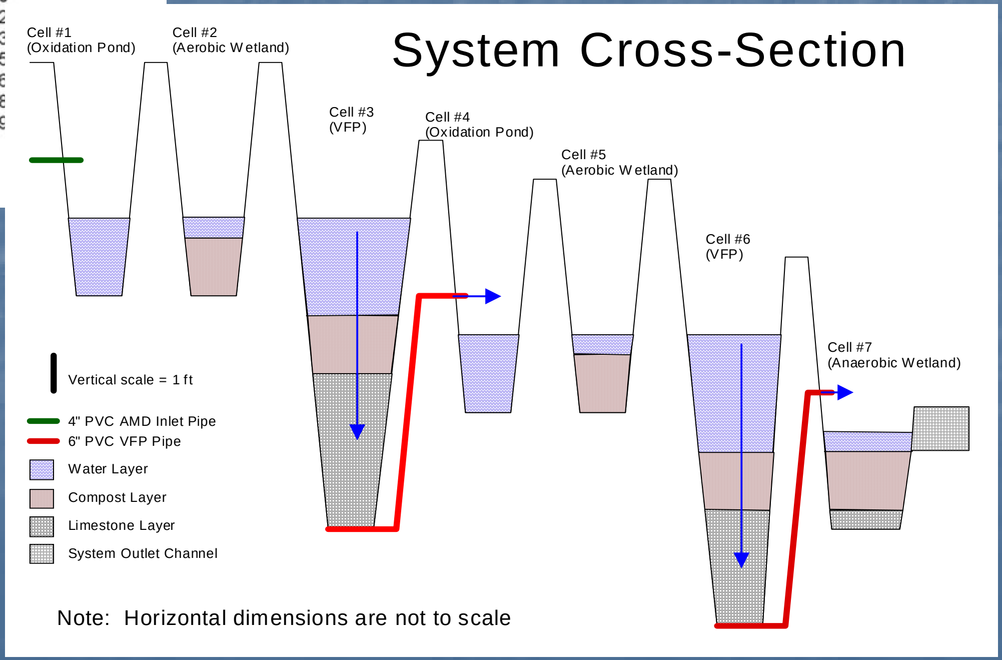


- Flow = 30 gpm
- pH = 5.8
- DO = 0.48 mg/L
- T. Fe = 450 mg/L
- T. Al = 0.4 mg/L
- T. Mn = 15 mg/L
- Sulfate = 3400 mg/L
- Alkalinity = 180 mg/L
- Net Acidity = 580 mg/L

OLD BEVIER-PHASE II

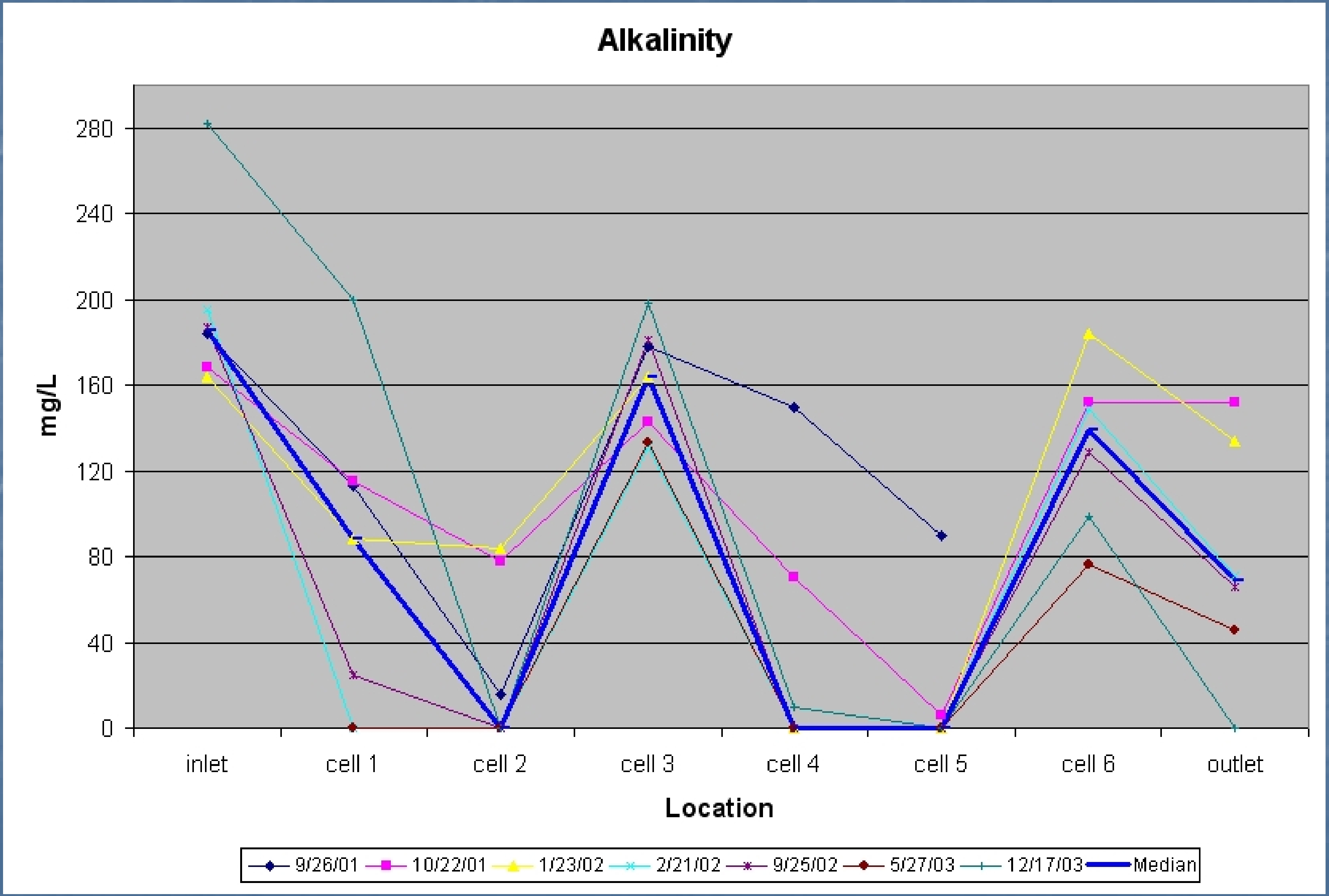




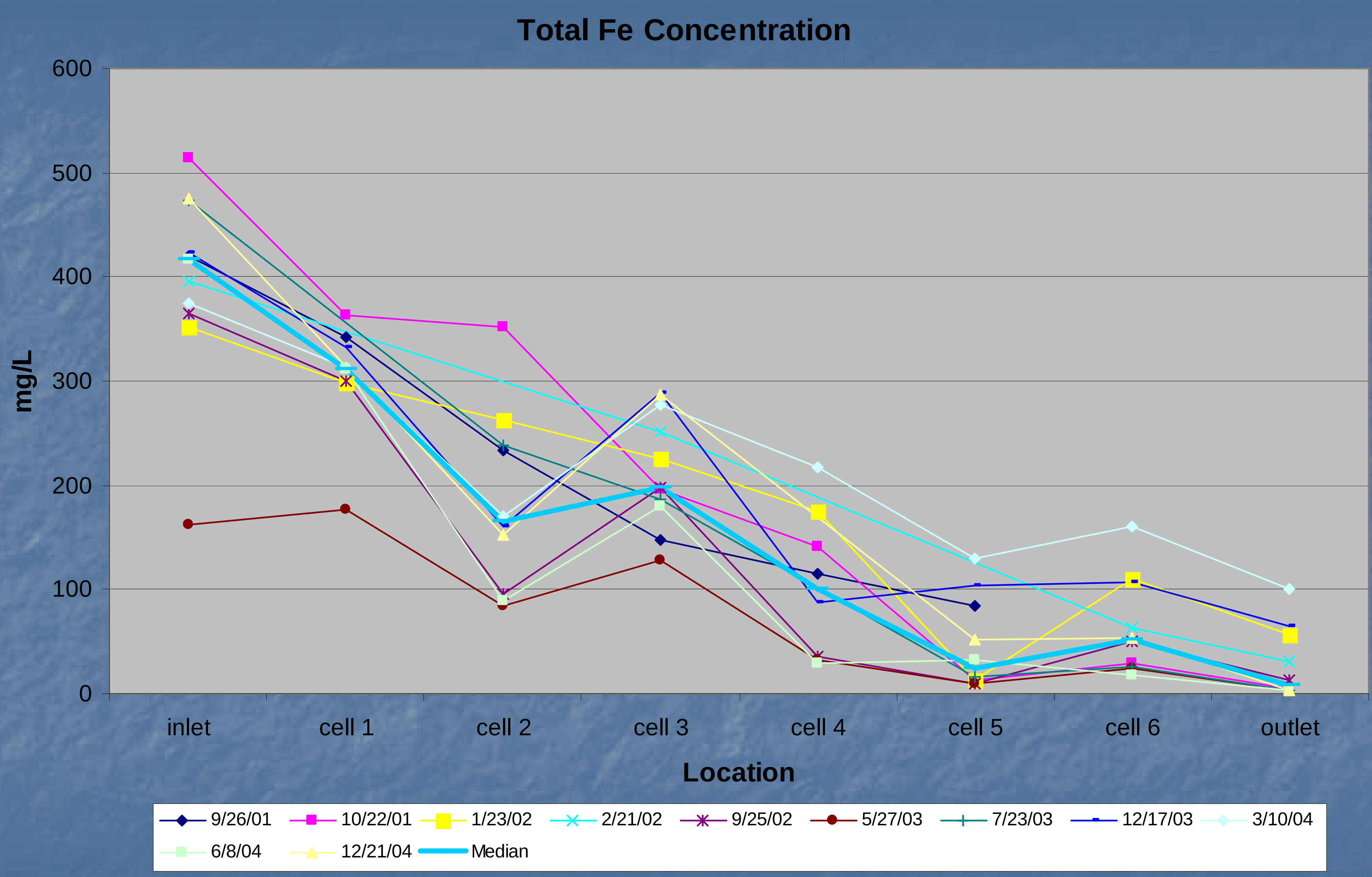


Vertical Flow Pond Under Construction

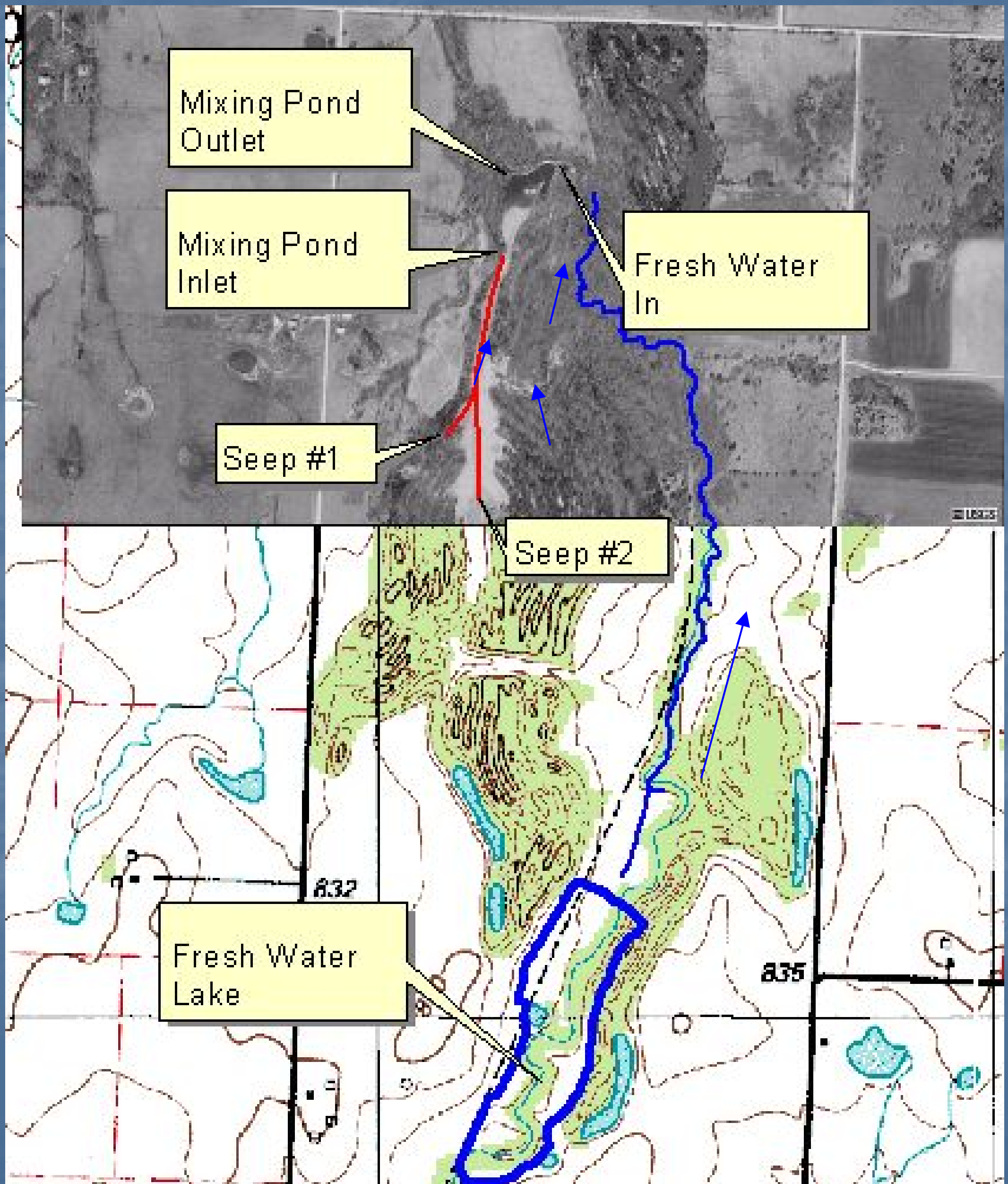
Incremental Alkalinity Addition



Completed Aerobic Wetland


Total Fe Concentration
600
500
400
300
200
100
0
mg/L
inlet
cell 1
cell 2
cell 3
cell 4
cell 5
cell 6
outlet
Location
9/26/01
10/22/01
1/23/02
2/21/02
9/25/02
5/27/03
7/23/03
12/17/03
3/10/04
6/8/04
12/21/04
Median

Otter Creek AMD Discharges, Mo.



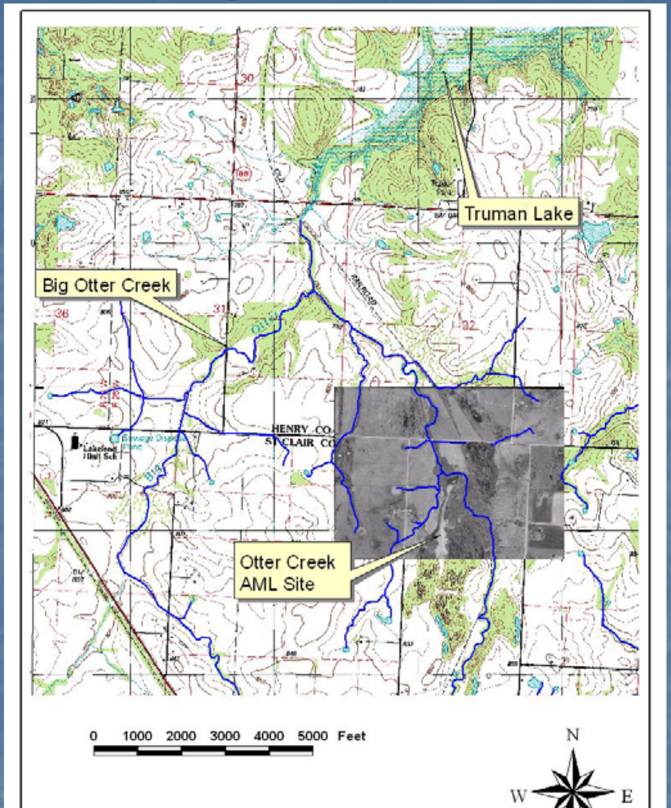


Figure 1. Site Map.

- Flow = 15 gpm
- pH = 2.6
- DO = 4 ~ 8 mg/L
- T. Fe = 45 mg/L
- T. Al = 78 mg/L
- T. Mn = 32 mg/L
- Sulfate = 1340 mg/L
- Net Acidity = 712 mg/L

Enos Gob Passive Treatment System Design, Indiana

- South Fork of the Patoka River has been severely impacted by AMD.
- MCR assisted INDOR - hydrologic study and AMD passive treatment design in the Spring 2004.

Aerobic Wetland Construction: December, 2004

Vertical Flow Pond Construction: June, 2005

Completed Vertical Flow Pond : June, 2006

Oklahoma Clean Streams Activity

MCR design assistance

to OCC:

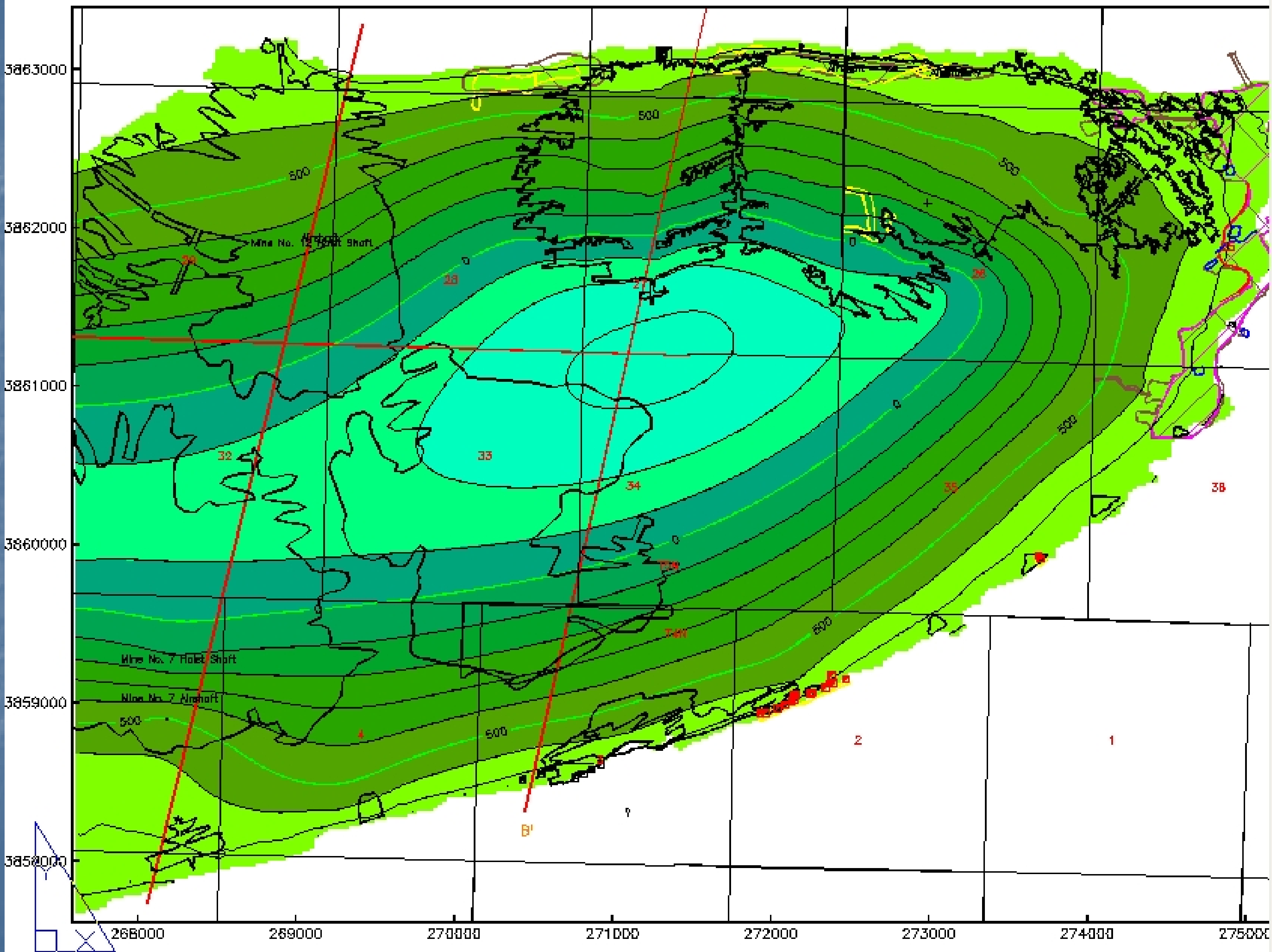
Le Bosquet (Brannon) Project- 2003/2004: Anoxic Limestone

Drain (ALD) Construction

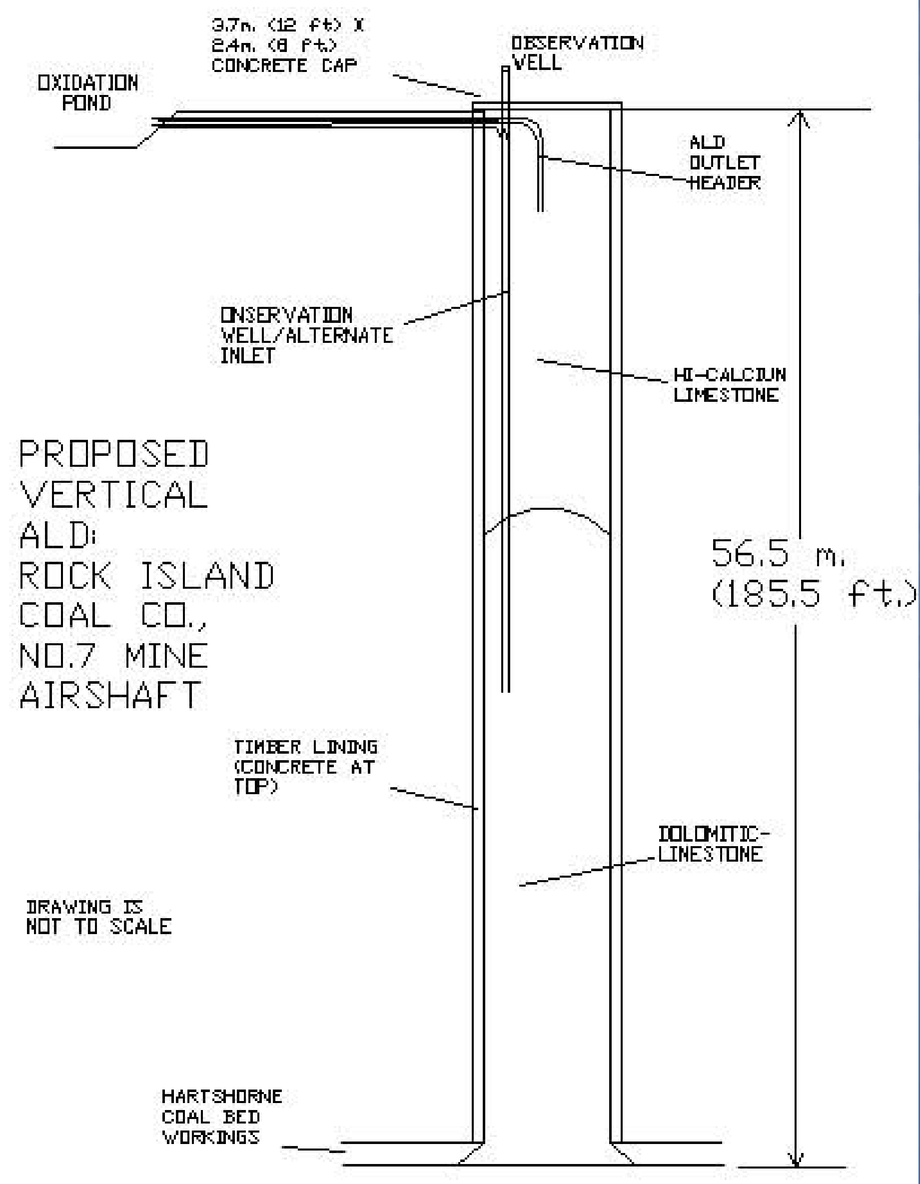
LeBosquet: ALD Outlet and Oxidation Pond

LeBosquet Anaerobic Treatment Wetland

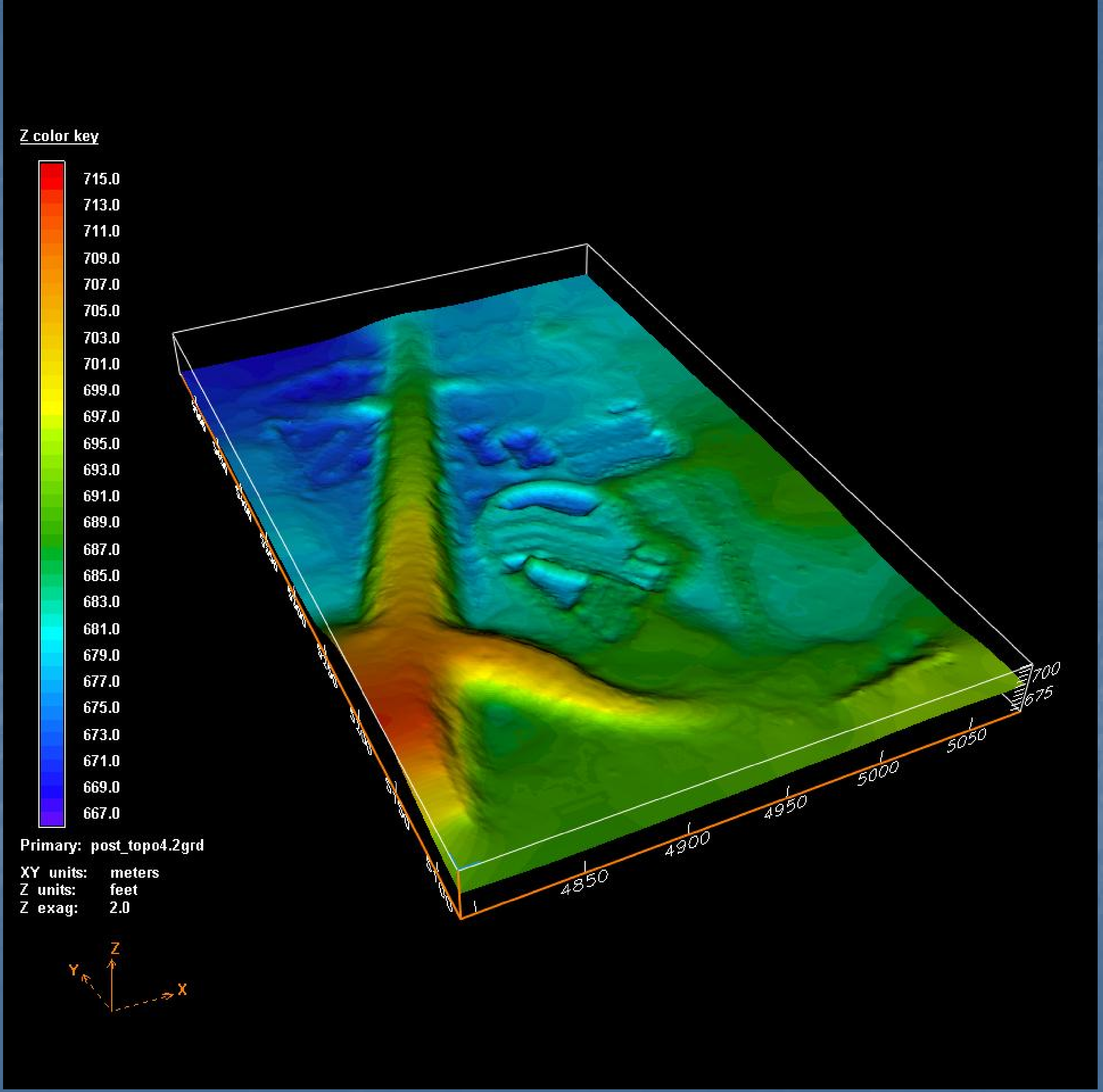
Isopach Map of the Base of the Hartshorne Coal Bed



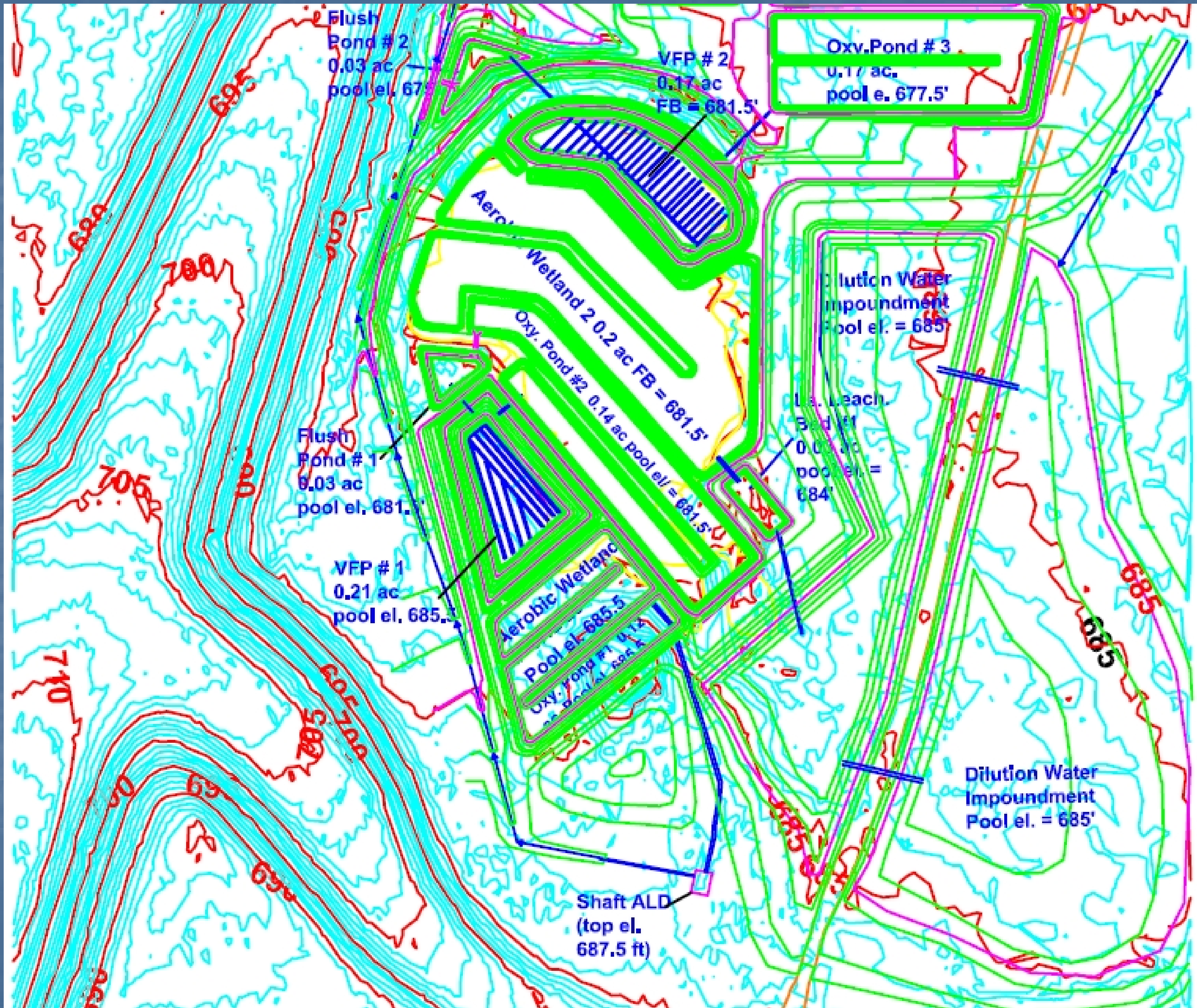
Rock Island No. 7 Discharge: Okla. - MCR Design Assistance: Wet Seal/Vertical ALD/VFP x2



LIDAR Data used by MCR/OCC to Develop Design of a Passive Treatment System



OSM CAD design



Rock Isl. No. 7 ALD Construction: Spring, 2005

Rock Isl. No. 7 VFP: 2006 Drought

Rock Island No. 7 Airshaft Discharge - Oxidation Pond 2 : Spring, 2007

Newer Projects:

- Tab-Simco Site, Carbondale, Illinois
- Herbert Site, Oskaloosa, Iowa
- No. 6 Mine Discharge, Arkansas
- Camp Cherry Austin Phase II, Ala.
- Blackfoot Mine, Pike Co. Indiana

TAB-SIMCO AML SITE, Illinois

- Abandoned underground mine pool discharge polluted water into Sycamore Creek (severely effecting a 2.5-mile reach).
- MCR IL-DNR and jointly evaluate the potential to perform land reclamation and passive treatment AMD remediation.

Tab Simco Mine Seep

Tab Simco 11-acre Kill Zone

Tab Simco Phase 1 Reclamation (2005): Backfill Recharge Areas Between Spoil Ridges

No. 6 Mine Discharge, Arkansas

No. 6 Mine Discharge, Arkansas

Figure 1. Camp Cherry Austin Project Site Location Map.

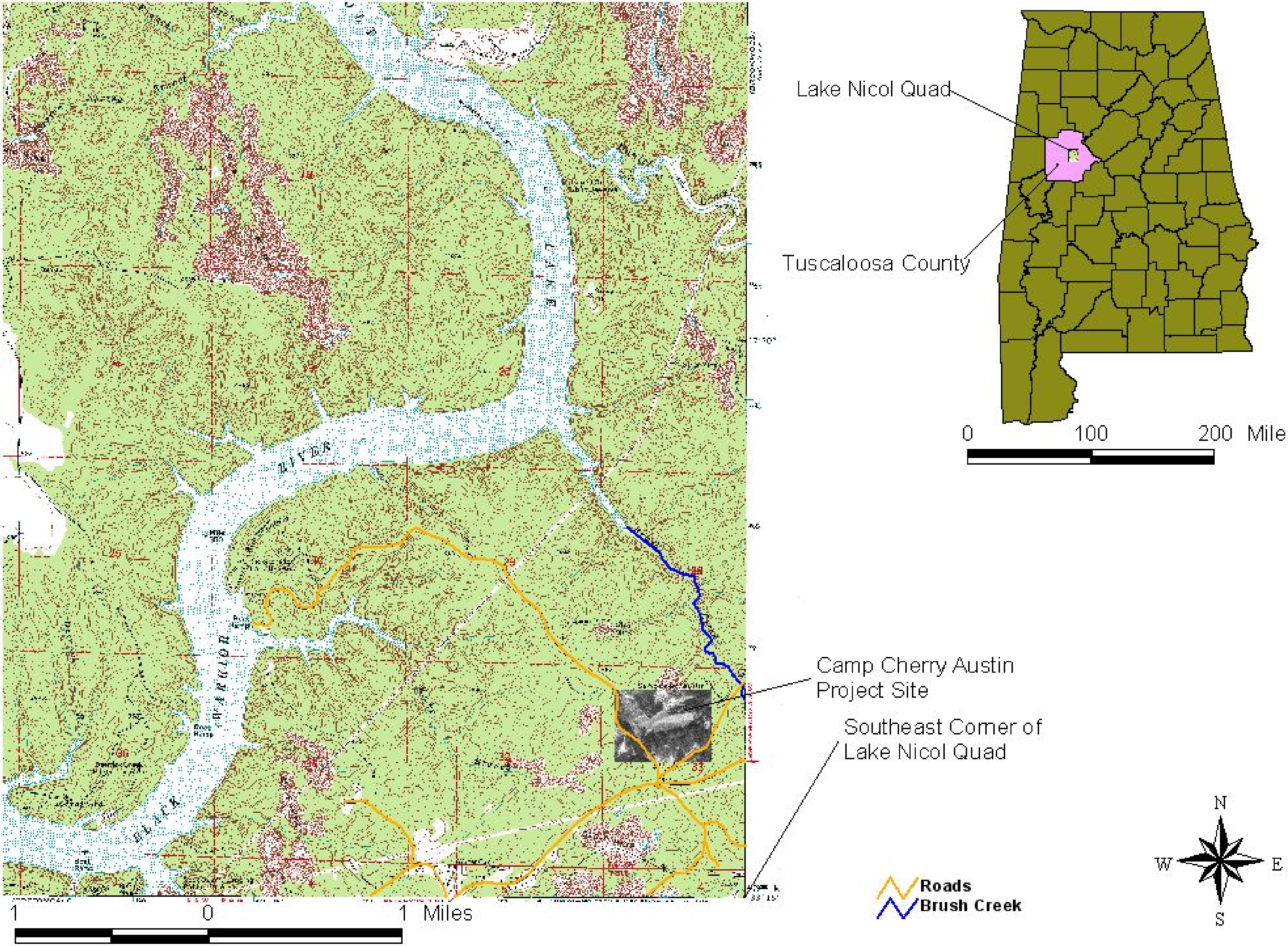


Figure 2. Identification Site Map

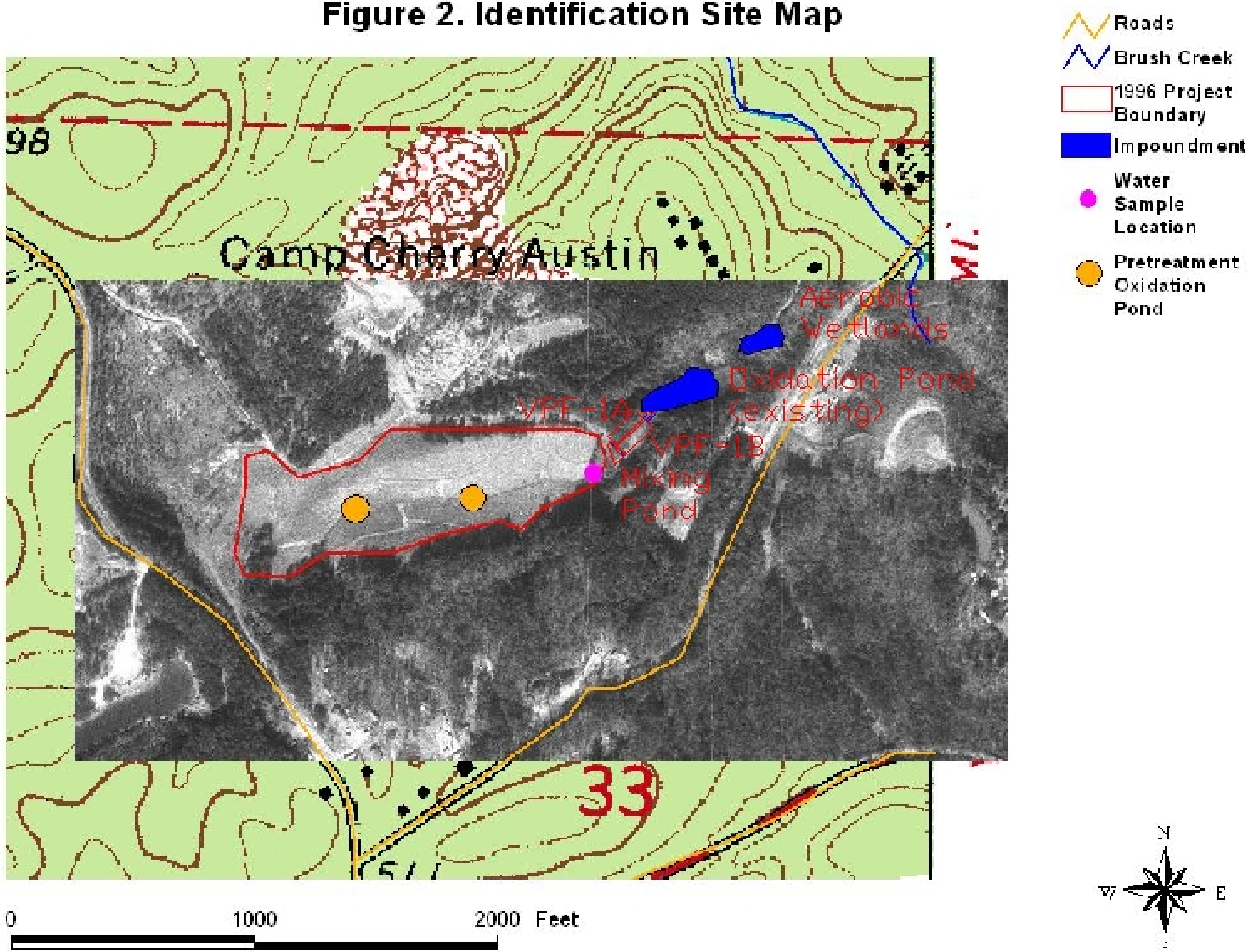


Figure 3. Iron coated limestone based main drainage way.

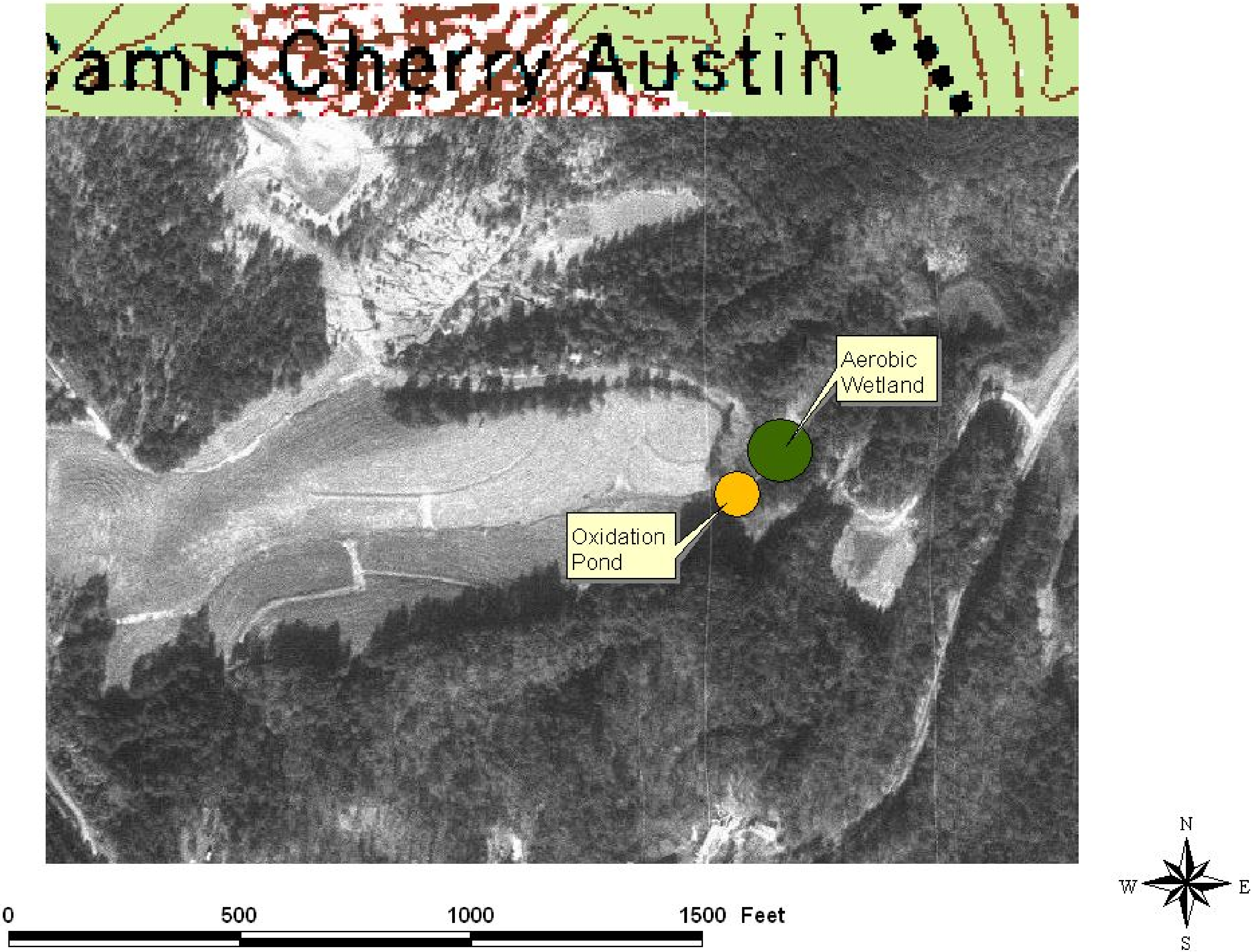
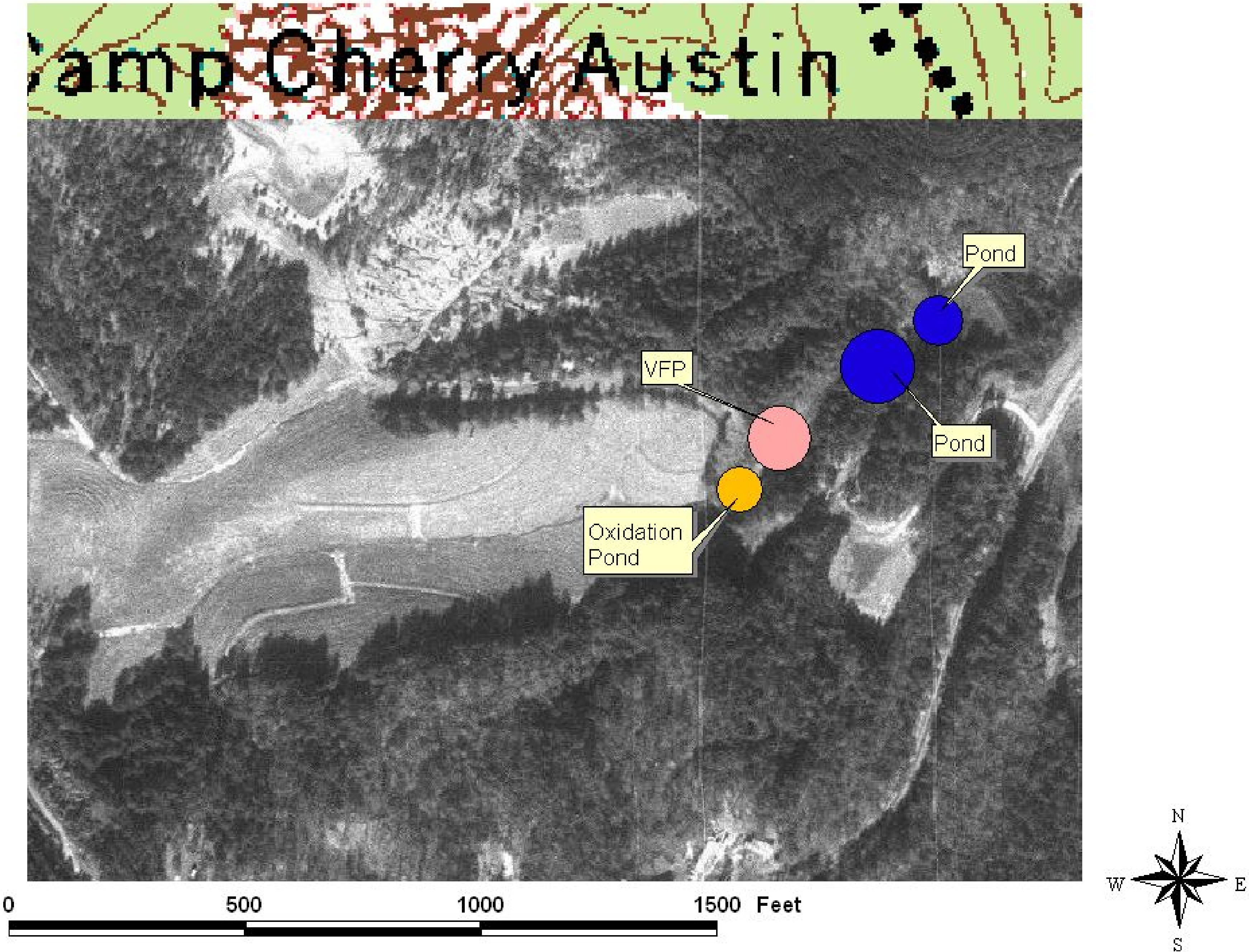

Camp Cherry Austin
Aerobic Wetland
Oxidation Pond
0
500
1000
1500 Feet
N
W
E
S

Figure 5. Vertical Flow Pond (VFP) - Option 2.



Blackfoot Site, Indiana:
Large discharge from mine spoil.

Blackfoot Site AML Land Reclamation

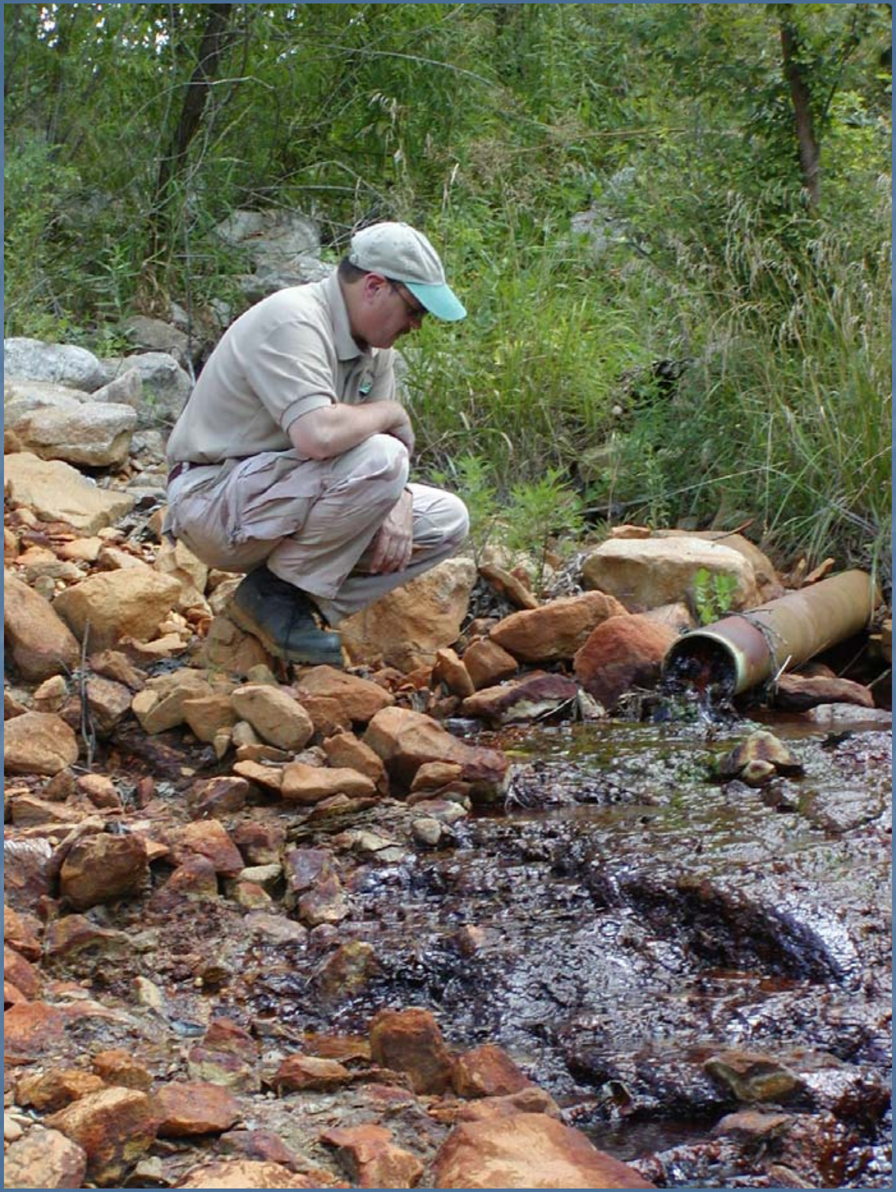
AMD Inventory Activities

- Oklahoma Clean Streams Activity

  Review: Red Oak CSI: 2000

  (CCB Injection/ Two Stage VFP System)
- Arkansas Regulatory Site Inventory
- Sugar Creek, MO USGS-MCR Study

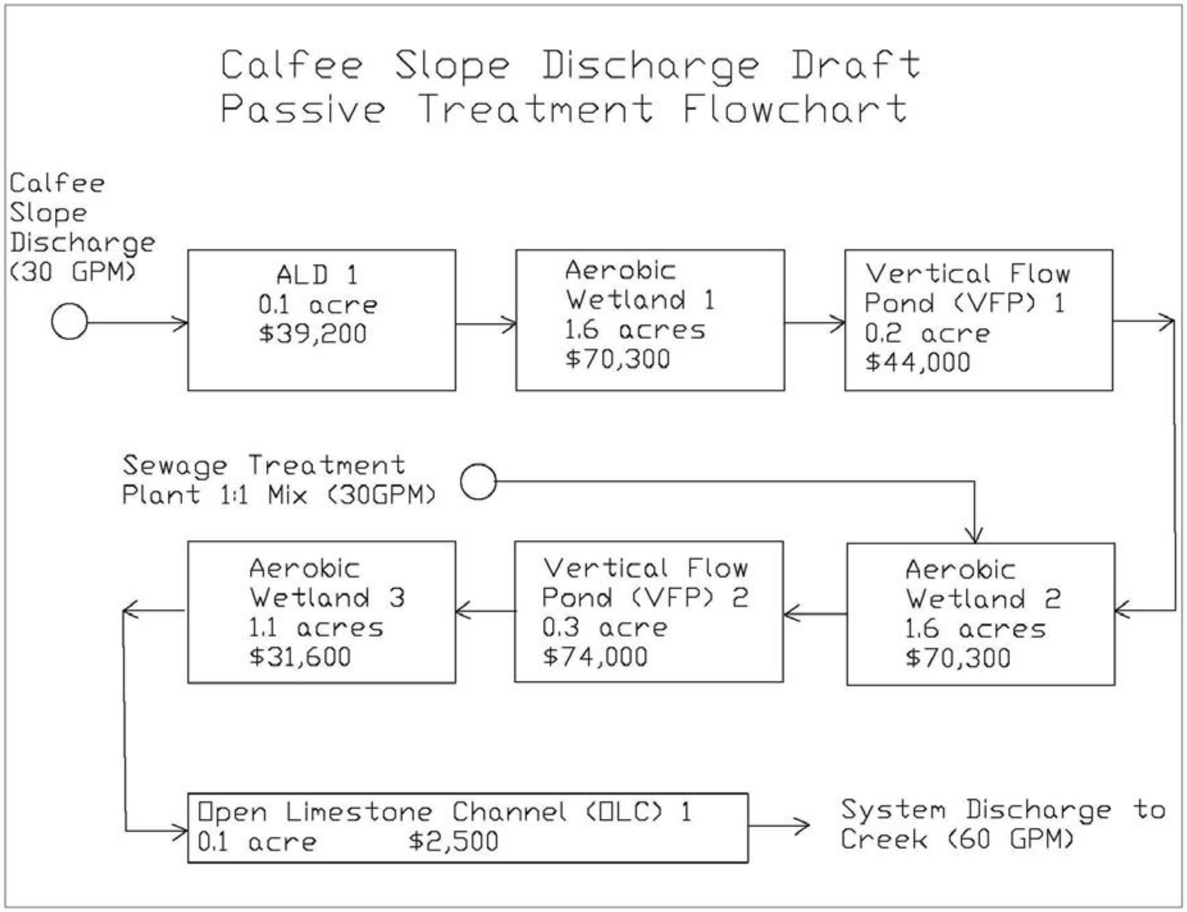
Sugar Creek, MO USGS-MCR Study



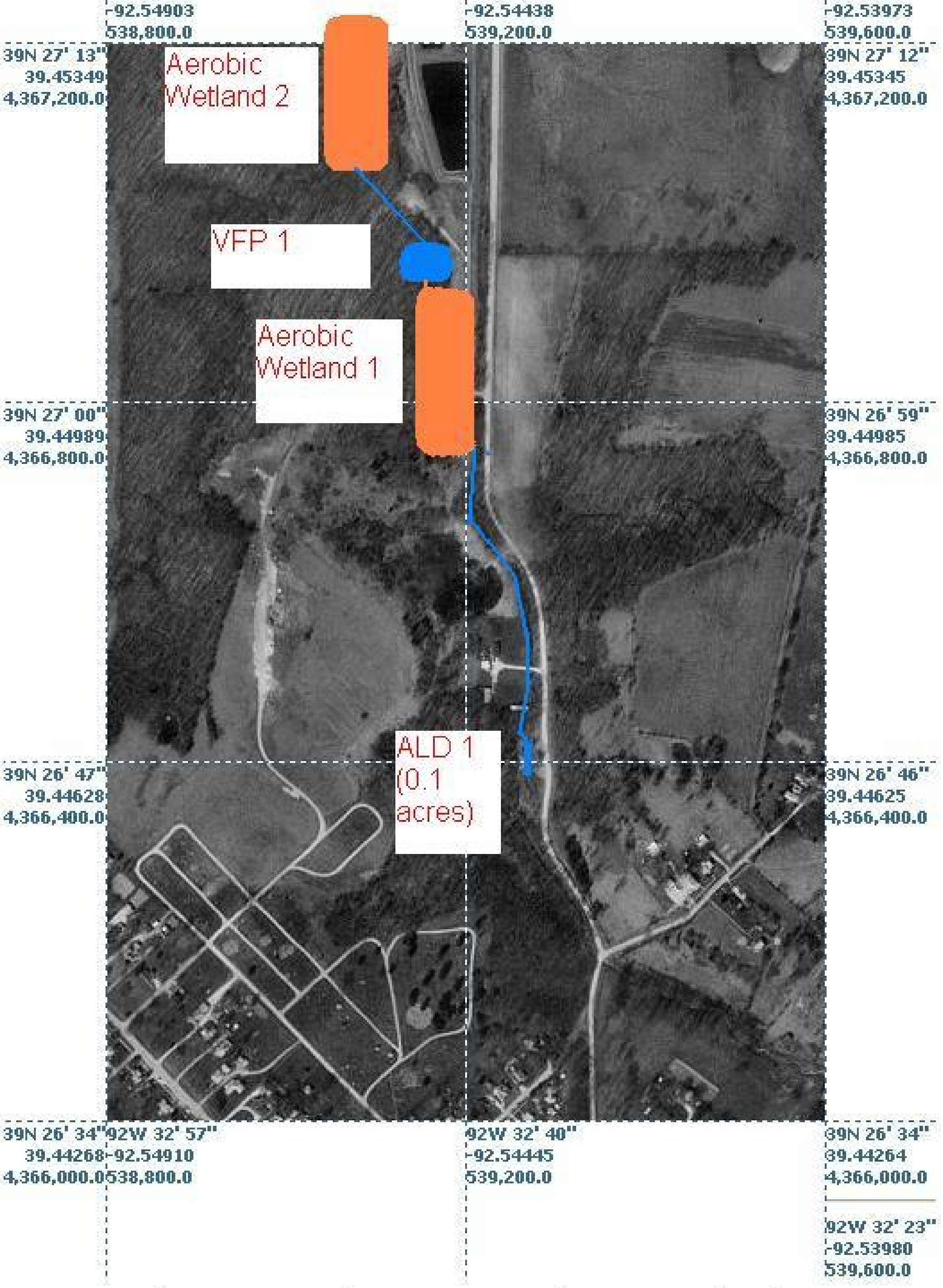
Sugar Creek, MO USGS-MCR Study

- Support the state of Missouri’s development of a Total Maximum Daily Load (TMDL) assessment
- Support AML/Clean Streams Initiative remediation efforts .
- Demonstrate TIPS freeware program *AMDTreat* http://amd.osmre.gov/tt2/download.htm).

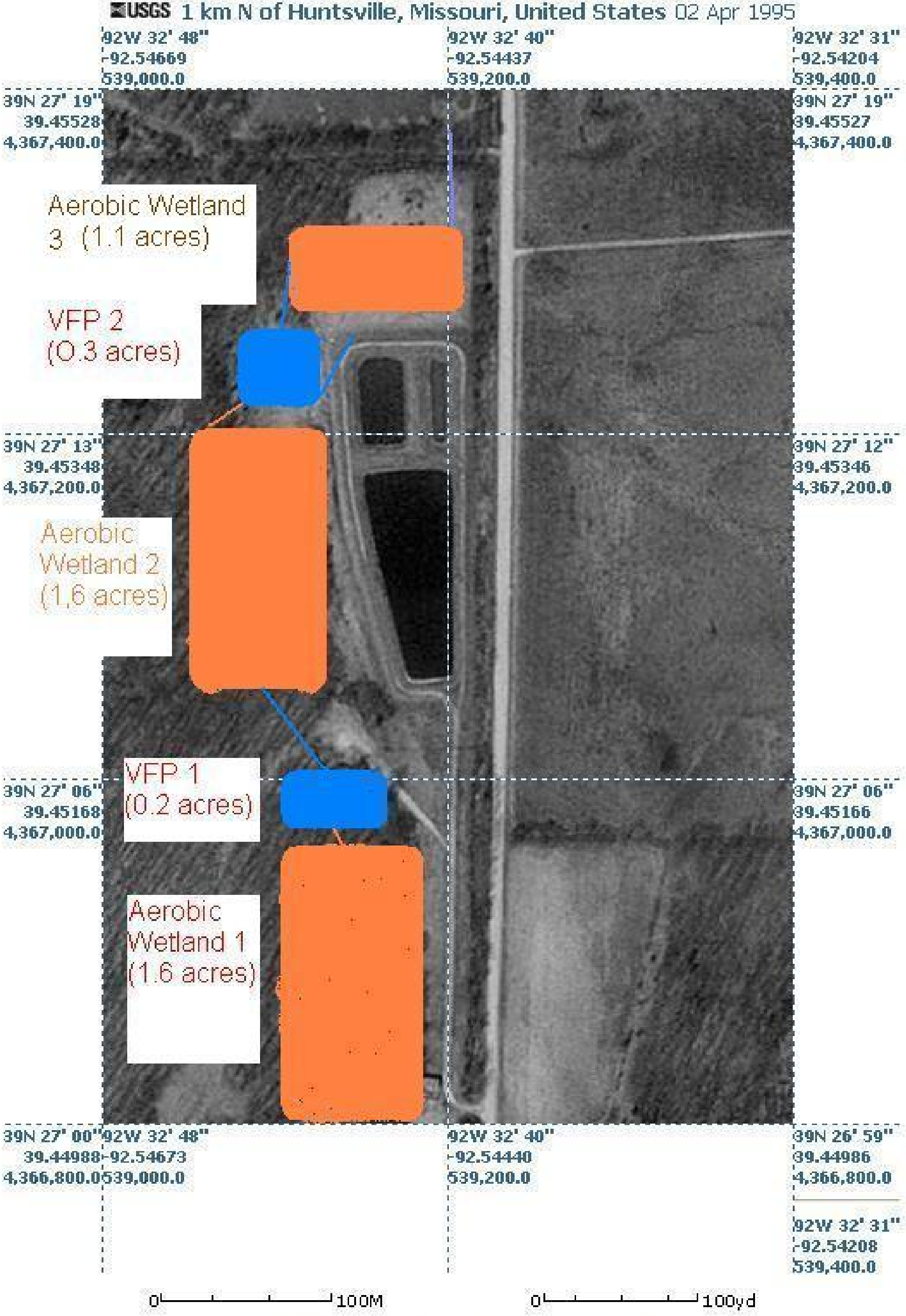
AMDTreat Used to Estimate Costs



Calfee Slope Discharge: ALD, VFP and Aerobic Wetlands

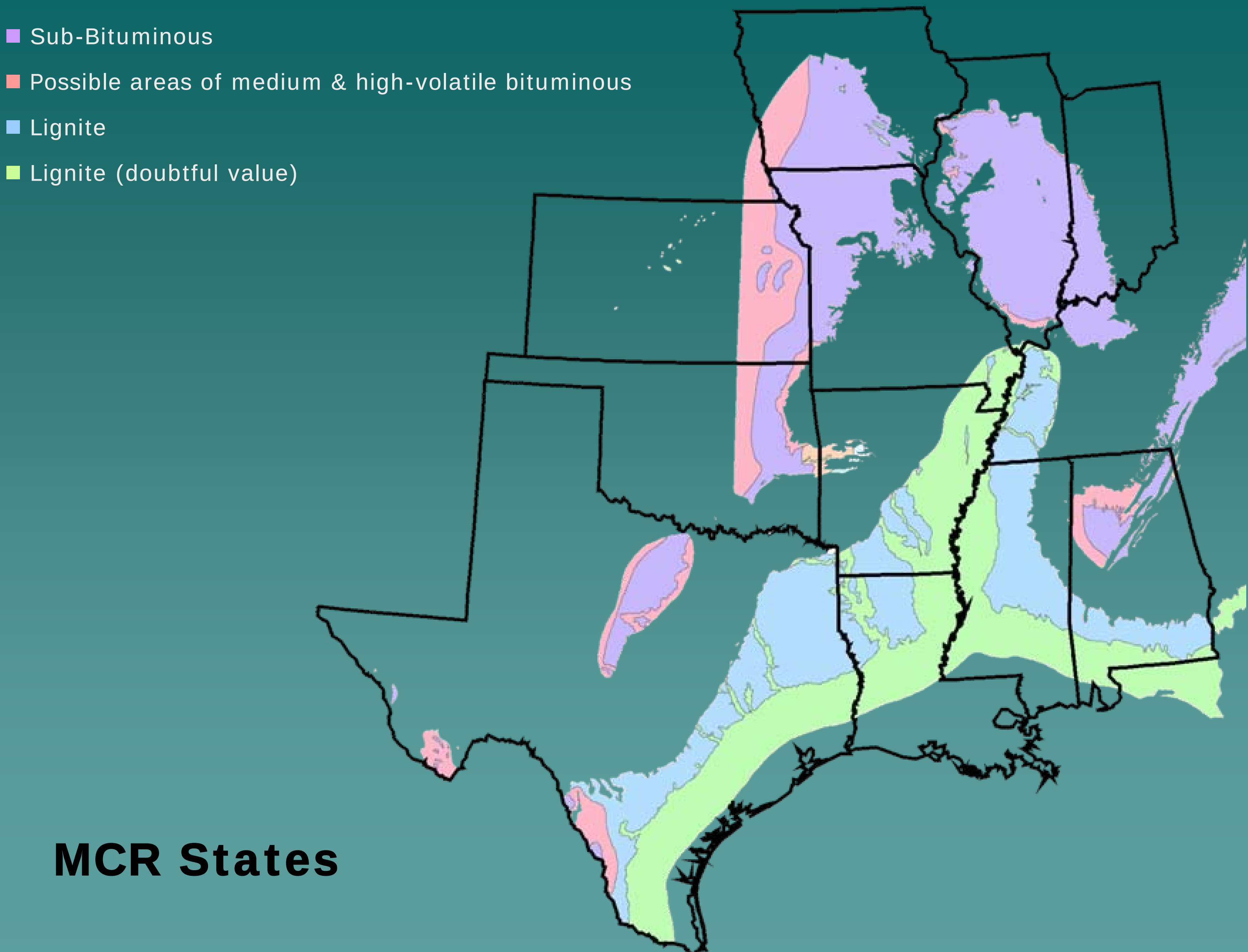


Calfee Slope Discharge: Commingle Waste Water Treatment Plant Discharge



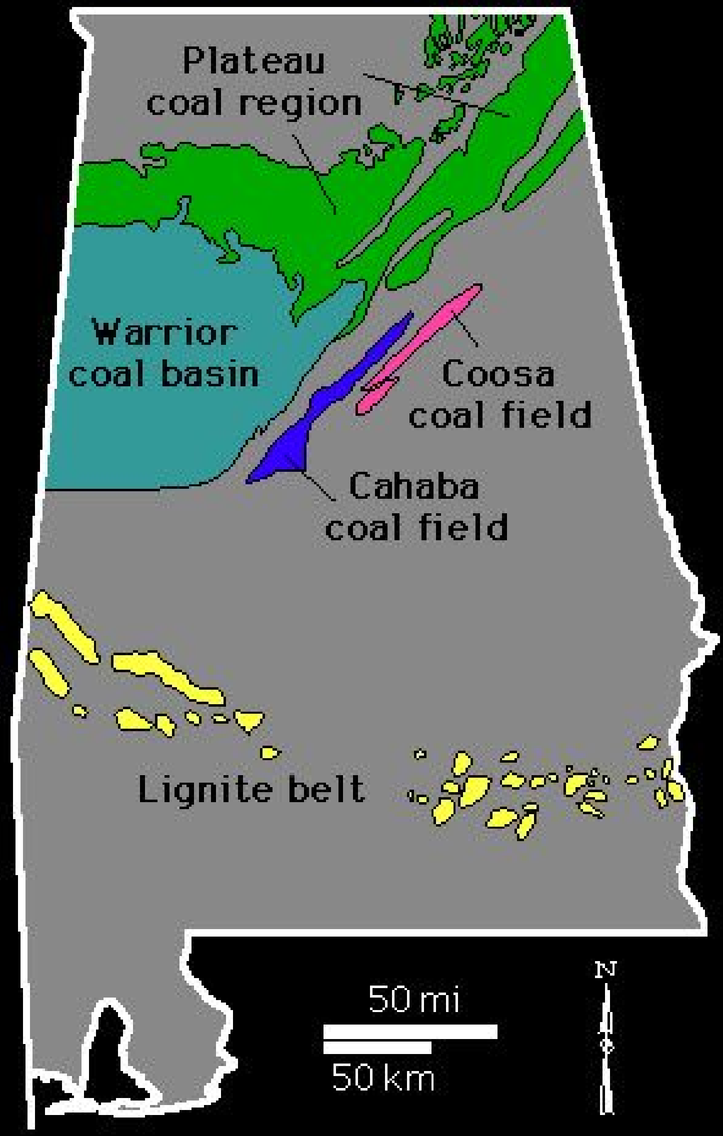
Technical Assistance - Alabama

Deborah A. Dale, Hydrogeologist
U. S. Dept. of the Interior
Office of Surface Mining
MCR – Alton, IL


Sub-Bituminous
Possible areas of medium & high-volatile bituminous
Lignite
Lignite (doubtful value)

MCR States

COAL FIELDS OF ALABAMA



Alabama Coal Mining

- Regulated by the Alabama Surface Mining Commission (ASMC)

Alabama was granted primacy in 1982

Surface Mining Commission

Alabama Coal Mining

- At present: 188 inspectable units
- 57 active mine sites (48 surface and 9 underground
- Underground mine depth can reach 2,000 ft
- 2006 – 19.3 million tons of coal

Alabama’s Permanent Program

- The ASMC currently employs 26 people
- Facing an ~40% reduction in work force within the next 5 yrs
- New geo/hydro staff member – Christa Marks

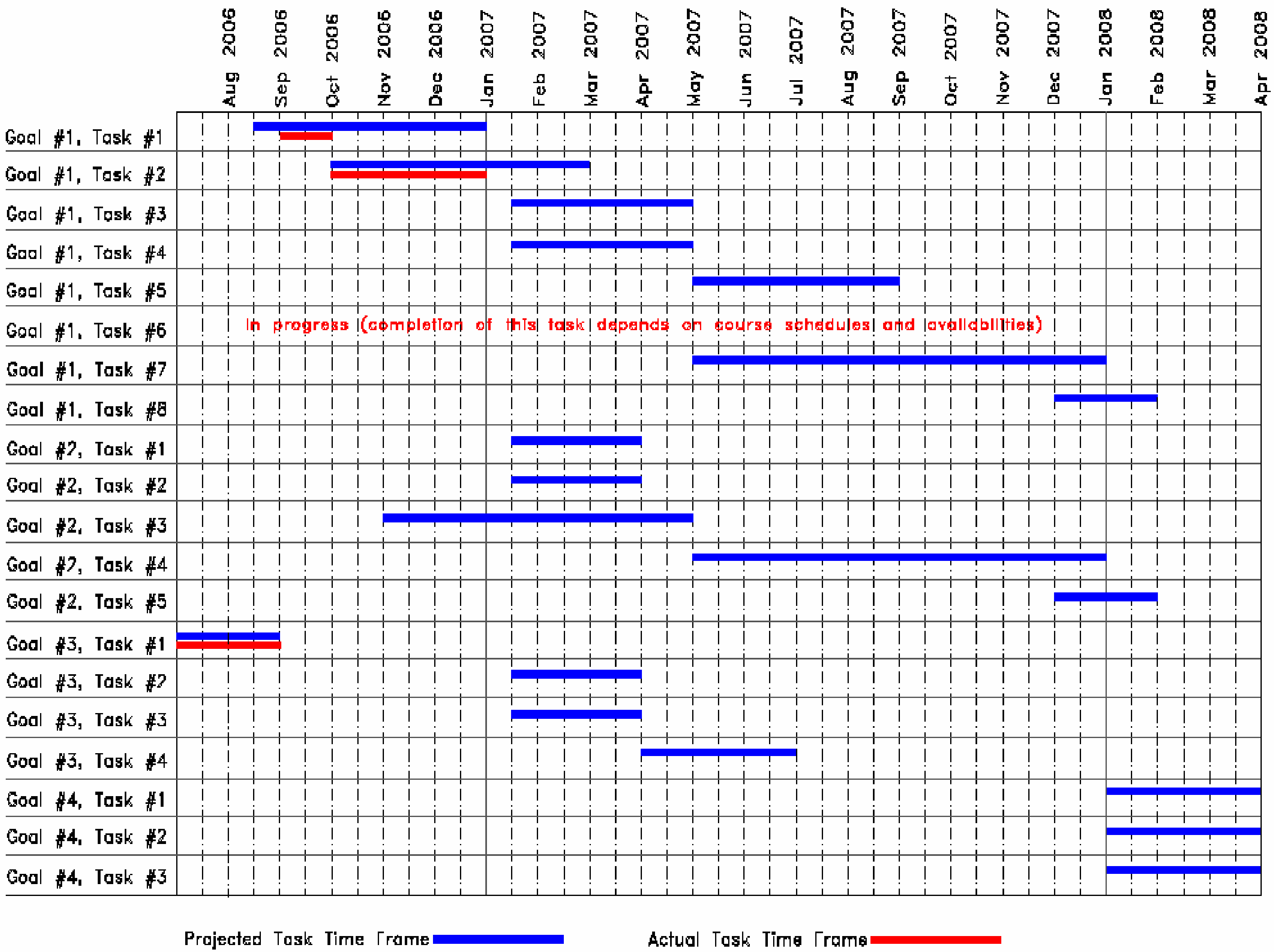
Technical Assistance - Alabama

- Permit review assistance:
  - Geology
  - Overburden sampling and ABA info
  - Hydrology
  - PHC
- CHIA
- PHA

Alabama Surface Mining Commission

PHC/CHIA Workplan

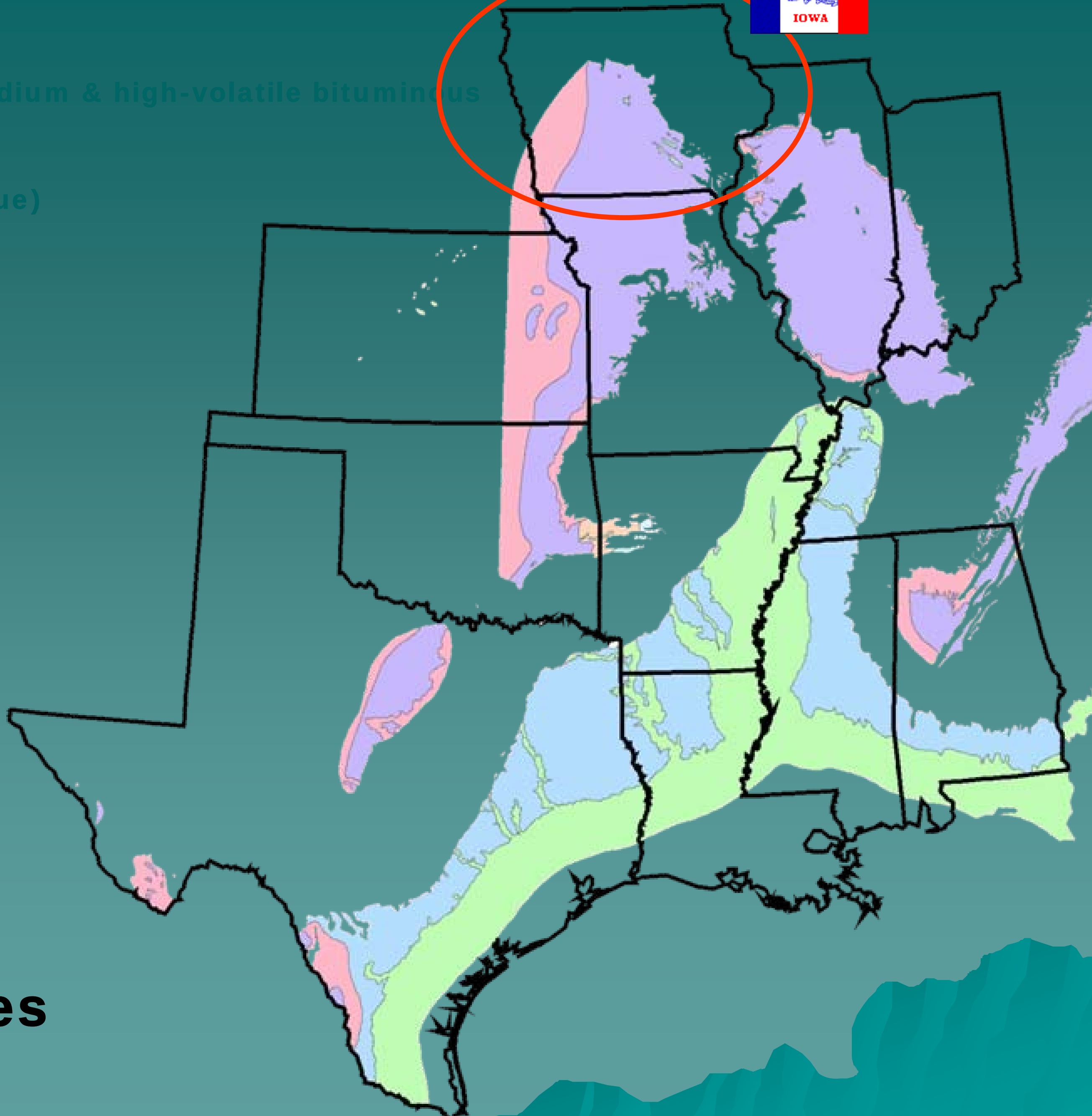
January 08, 2007



Site
Passive Treatment System

Deborah A. Dale, Hydrogeologist
U. S. Dept. of the Interior
Office of Surface Mining
MCR – Alton, IL

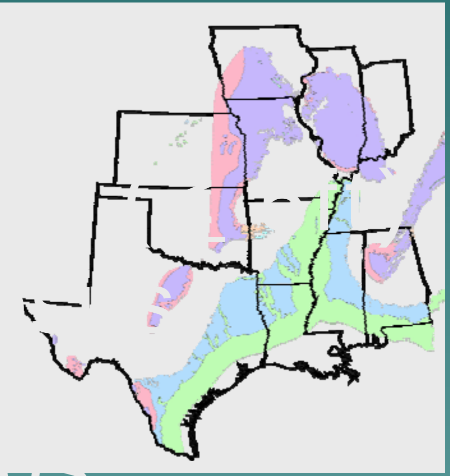
- Sub-Bituminous
- Possible areas of medium & high-volatile bituminous
- Lignite
- Lignite (doubtful value)



MCR States

Iowa Coal Mining

- Coal-bearing regions cover ~18,500 sq miles (1/3 of Iowa)
- Coal seams typically th covered by glacial depo
- Coal first mined in 1840s
- 1870 – 1920 coal mining grew rapidly (surface and underground)



Ottumwa Coal Palace (1890)

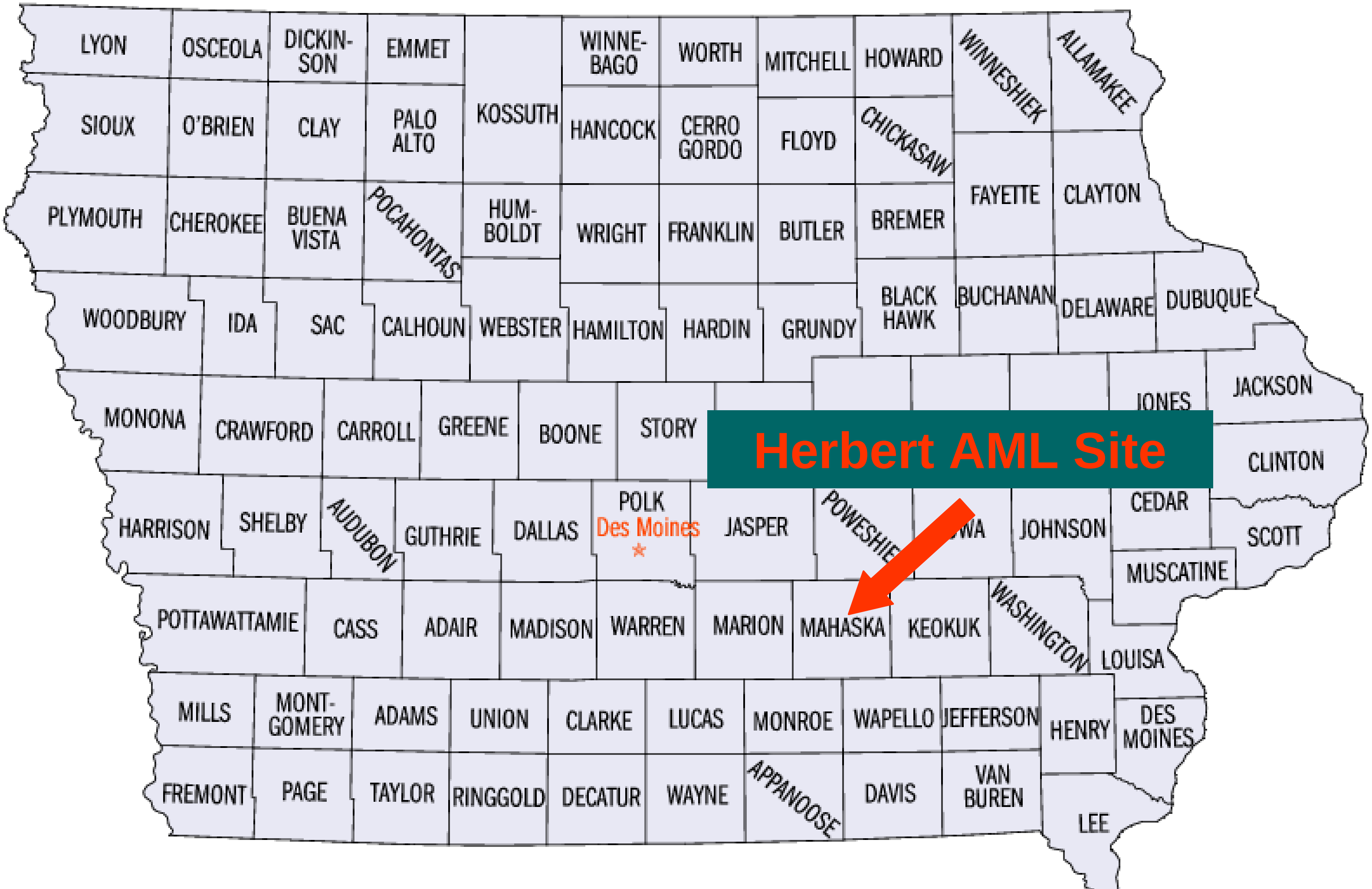
Iowa Coal Mining

- By 1917-1918 annual coal production peaked at 9.3 MT
- Iowa regulatory program was approved in 1981. AML program established in 1983
- Division of Soil Conservation through the Mines & Minerals Bureau of the Dept. of Agriculture and Land Stewardship

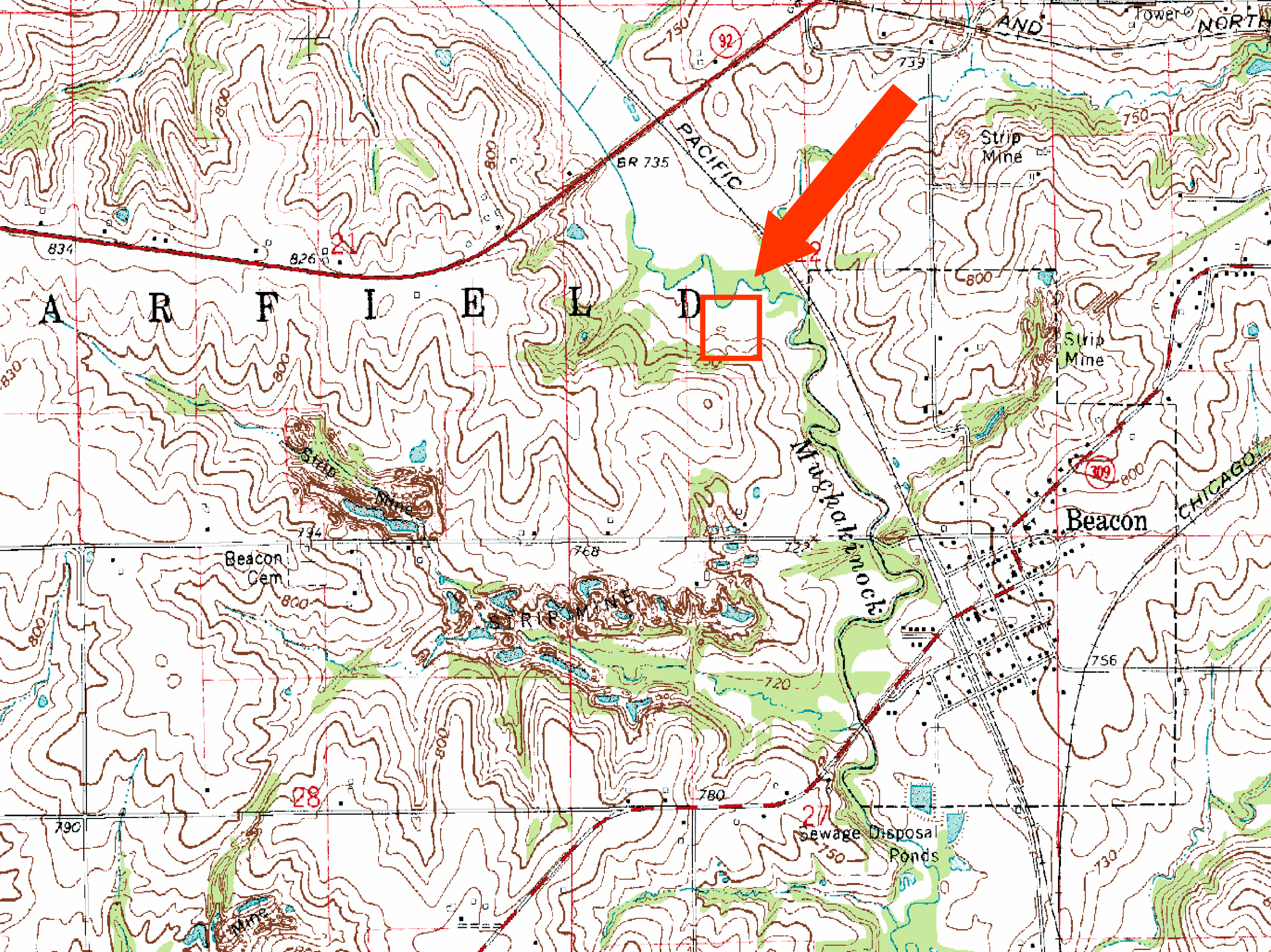
Iowa
Department of Agriculture and Land Stewardship
Mines & Minerals Bureau

Iowa Coal Mining

- 1995 coal production ended (last CHIA written in 1993)
- 28 permits issued since 1977 still require some level of reclamation
- Bankruptcies will require forfeiture of reclamation bonds at 21 of the 28 sites
- Largest number of abandoned problems in non-producing states



Herbert AML Site
LYON
OSCEOLA
DICKIN-SON
EMMET
KOSSUTH
WINNE-BAGO
WORTH
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
SIOUX
O'BRIEN
CLAY
PALO ALTO
HANCOCK
CERRO GORDO
FLOYD
CHICKASAW
FAYETTE
CLAYTON
PLYMOUTH
CHEROKEE
BUENA VISTA
POCAHONTAS
HUM-BOLDT
WRIGHT
FRANKLIN
BUTLER
BREMER
BLACK HAWK
BUCHANAN
DELAWARE
DUBUQUE
WOODBURY
IDA
SAC
CALHOUN
WEBSTER
HAMILTON
HARDIN
GRUNDY
JONES
JACKSON
MONONA
CRAWFORD
CARROLL
GREENE
BOONE
STORY
CLINTON
HARRISON
SHELBY
AUDUBON
GUTHRIE
DALLAS
POLK
Des Moines
JASPER
JOHNSON
CEDAR
SCOTT
MUSCATINE
POTTAWATTAMIE
CASS
ADAIR
MADISON
WARREN
MARION
MAHASKA
KEOKUK
WASHINGTON
LOUISA
MILLS
MONT-GOMERY
ADAMS
UNION
CLARKE
LUCAS
MONROE
WAPELLO
JEFFERSON
HENRY
DES MOINES
FREMONT
PAGE
TAYLOR
RINGGOLD
DECATUR
WAYNE
APPANOOSE
DAVIS
VAN BUREN
LEE



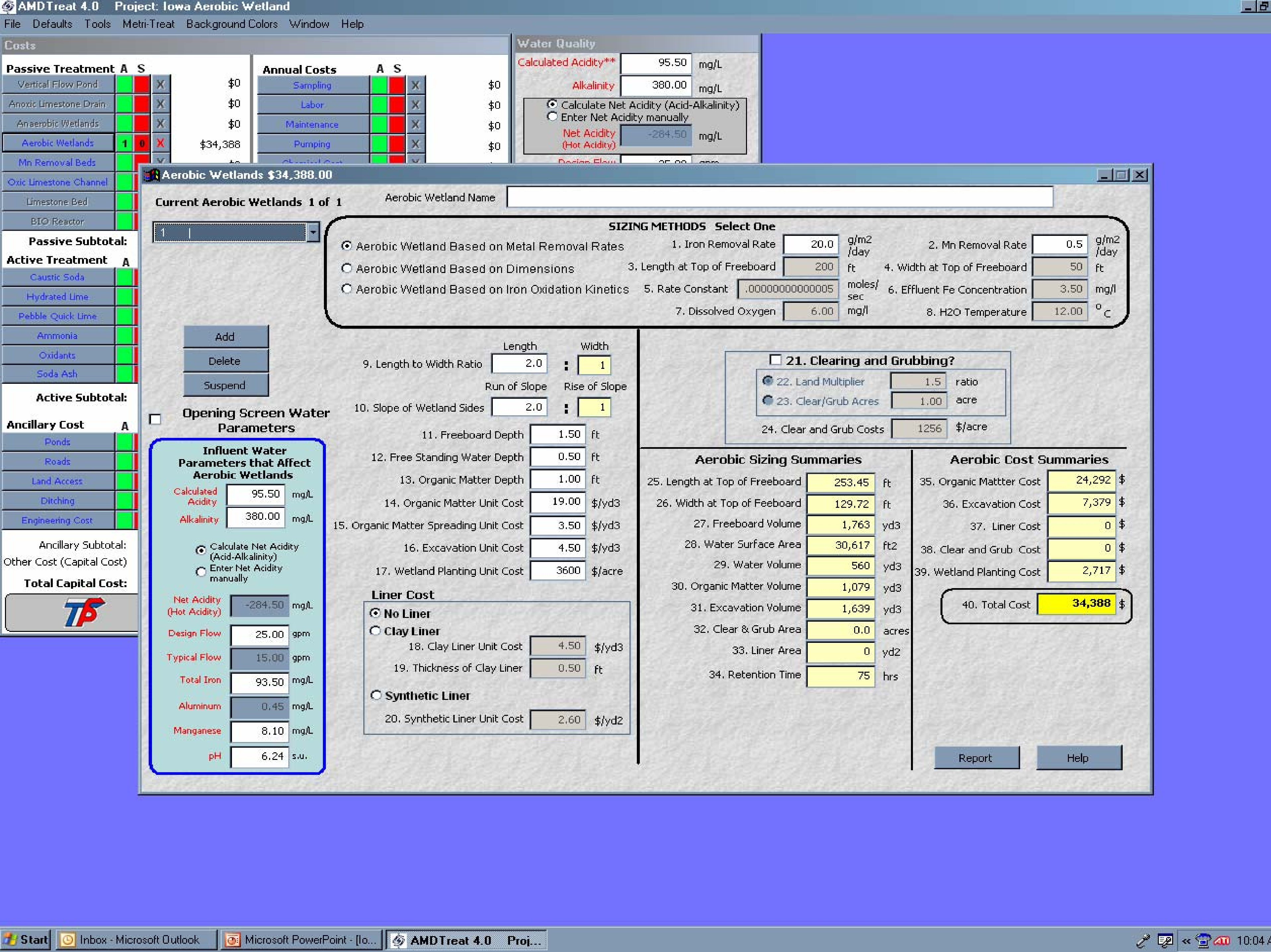
G A R F I E L D
Strip Mine
Strip Mine
STRIP MINE
Strip Mine
Mine
Muchakinock
Beacon
Beacon Cem
Sewage Disposal Ponds
PACIFIC
AND NORTH
CHICAGO
Tower
BR 735
92
309
21
22
27
28
834
826
830
800
750
739
768
734
722
720
780
790
756
730

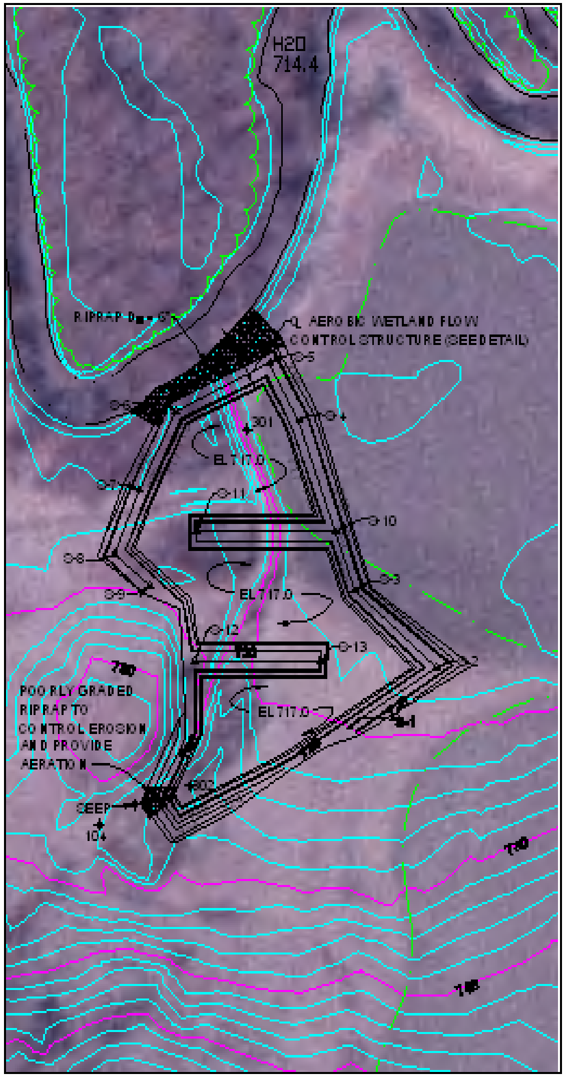

Seep

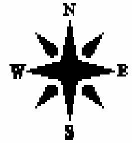

Muchakinock River
AMD discharge from ditch

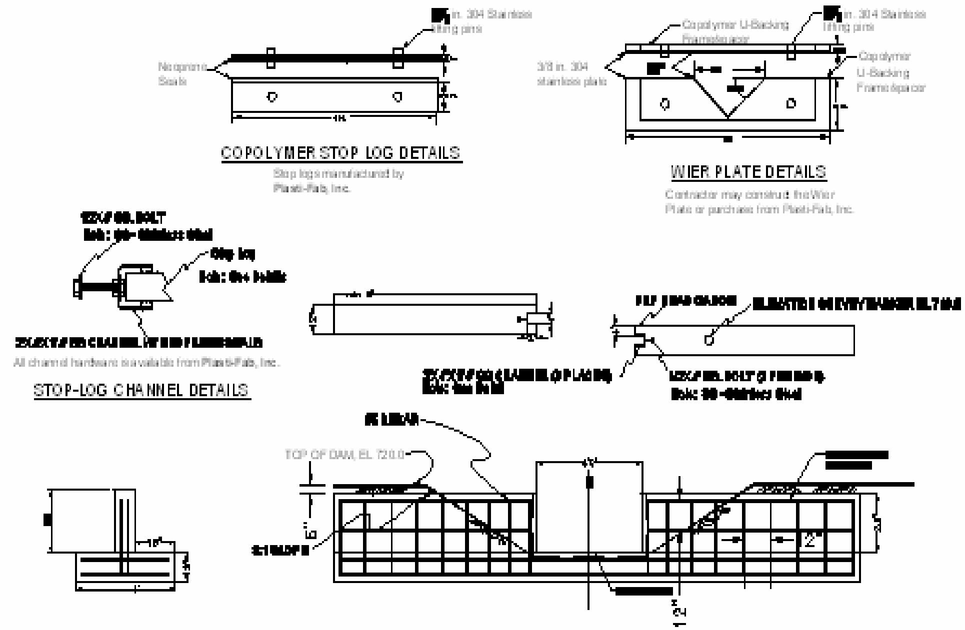
IA – AML Herbert Site
Ranges of Select Parameters

	Seep	Seep Discharge to Creek	Upstream Creek	Downstream Creek
pH (S. U.)	**5.9 – 6.4**	**6.4 – 7.3**	**6.3 – 8.0**	**6.2 – 8.1**
Alkalinity (mg/l)	**310 - 390**	**280 - 330**	**49 - 160**	**45 - 200**
Fe_T (mg/l)	**38 - 94**	**19 - 23**	**0.4 - 1**	**0.5 – 2.4**
Al_T (mg/l)	**<0.01 – 0.45**	**<0.01 – 0.32**	**0.02 – 0.7**	**0.02 – 0.8**
Mn_T (mg/l)	**3.7 – 8.1**	**<0.013 – 5.4**	**1.1 - 8**	**0.4 – 8.7**
SO_4^- (mg/l)	**1,000 – 1,950**	**1,050 – 1,900**	**60 - 740**	**98 - 760**


AMDTreat 4.0 Project: Iowa Aerobic Wetland
File Defaults Tools Metri-Treat Background Colors Window Help
Costs
Passive Treatment A S
Vertical Flow Pond $0
Anoxic Limestone Drain $0
Anaerobic Wetlands $0
Aerobic Wetlands 1 0 $34,388
Mn Removal Beds
Oxic Limestone Channel
Limestone Bed
BIO Reactor
Passive Subtotal:
Active Treatment A
Caustic Soda
Hydrated Lime
Pebble Quick Lime
Ammonia
Oxidants
Soda Ash
Active Subtotal:
Ancillary Cost A
Ponds
Roads
Land Access
Ditching
Engineering Cost
Ancillary Subtotal:
Other Cost (Capital Cost)
Total Capital Cost:
Annual Costs A S
Sampling $0
Labor $0
Maintenance $0
Pumping $0
Water Quality
Calculated Acidity** 95.50 mg/L
Alkalinity 380.00 mg/L
Calculate Net Acidity (Acid-Alkalinity)
Enter Net Acidity manually
Net Acidity (Hot Acidity) -284.50 mg/L
Aerobic Wetlands $34,388.00
Current Aerobic Wetlands 1 of 1
Aerobic Wetland Name
SIZING METHODS Select One
Aerobic Wetland Based on Metal Removal Rates
Aerobic Wetland Based on Dimensions
Aerobic Wetland Based on Iron Oxidation Kinetics
1. Iron Removal Rate 20.0 g/m2 /day
2. Mn Removal Rate 0.5 g/m2 /day
3. Length at Top of Freeboard 200 ft
4. Width at Top of Freeboard 50 ft
5. Rate Constant .00000000000005 moles/ sec
6. Effluent Fe Concentration 3.50 mg/l
7. Dissolved Oxygen 6.00 mg/l
8. H2O Temperature 12.00 °C
Add
Delete
Suspend
Opening Screen Water Parameters
Influent Water Parameters that Affect Aerobic Wetlands
Calculated Acidity 95.50 mg/L
Alkalinity 380.00 mg/L
Calculate Net Acidity (Acid-Alkalinity)
Enter Net Acidity manually
Net Acidity (Hot Acidity) -284.50 mg/L
Design Flow 25.00 gpm
Typical Flow 15.00 gpm
Total Iron 93.50 mg/L
Aluminum 0.45 mg/L
Manganese 8.10 mg/L
pH 6.24 s.u.
Length Width
9. Length to Width Ratio 2.0 : 1
Run of Slope Rise of Slope
10. Slope of Wetland Sides 2.0 : 1
11. Freeboard Depth 1.50 ft
12. Free Standing Water Depth 0.50 ft
13. Organic Matter Depth 1.00 ft
14. Organic Matter Unit Cost 19.00 $/yd3
15. Organic Matter Spreading Unit Cost 3.50 $/yd3
16. Excavation Unit Cost 4.50 $/yd3
17. Wetland Planting Unit Cost 3600 $/acre
Liner Cost
No Liner
Clay Liner
18. Clay Liner Unit Cost 4.50 $/yd3
19. Thickness of Clay Liner 0.50 ft
Synthetic Liner
20. Synthetic Liner Unit Cost 2.60 $/yd2
21. Clearing and Grubbing?
22. Land Multiplier 1.5 ratio
23. Clear/Grub Acres 1.00 acre
24. Clear and Grub Costs 1256 $/acre
Aerobic Sizing Summaries
25. Length at Top of Freeboard 253.45 ft
26. Width at Top of Feeboard 129.72 ft
27. Freeboard Volume 1,763 yd3
28. Water Surface Area 30,617 ft2
29. Water Volume 560 yd3
30. Organic Matter Volume 1,079 yd3
31. Excavation Volume 1,639 yd3
32. Clear & Grub Area 0.0 acres
33. Liner Area 0 yd2
34. Retention Time 75 hrs
Aerobic Cost Summaries
35. Organic Mattter Cost 24,292 $
36. Excavation Cost 7,379 $
37. Liner Cost 0 $
38. Clear and Grub Cost 0 $
39. Wetland Planting Cost 2,717 $
40. Total Cost 34,388 $
Report
Help
Start
Inbox - Microsoft Outlook
Microsoft PowerPoint - [Io...
AMDTreat 4.0 Proj...

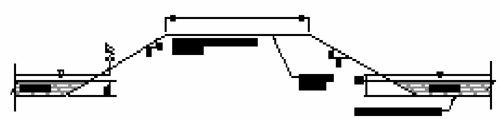






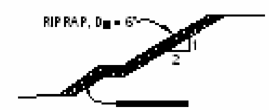
AEROBIC WETLAND FLOW CONTROL STRUCTURE

(NOT TO SCALE)



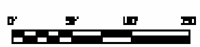
TYPICAL BERM CROSS-SECTION
(NOT TO SCALE)

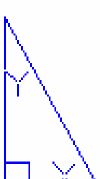
INTERIOR BERM AS SHOWN. EXTERIOR BERMS WILL HAVE
COMPOST AND WATER ONLY ON THE INTERIOR SIDE.



NORTH BERM CROSS-SECTION
WITH RIPRAP
(NOT TO SCALE)

SURVEY POINT	NORTHING	EASTING
G-1	468,640.8	2,222,257.7
G-2	468,685.8	2,222,331.8
G-3	468,743.3	2,222,2516.2
G-4	468,870.2	2,222,2115.2
G-5	468,913.3	2,222,189.9
G-6	468,877.7	2,222,110.8
G-7	468,818.3	2,222,079.4
G-8	468,770.8	2,222,058.6
G-9	468,746.8	2,222,088.6
G-10	468,787.3	2,222,127.5
G-11	468,787.3	2,222,246.5
G-12	468,680.8	2,222,125.7
G-13	468,680.8	2,222,233.3

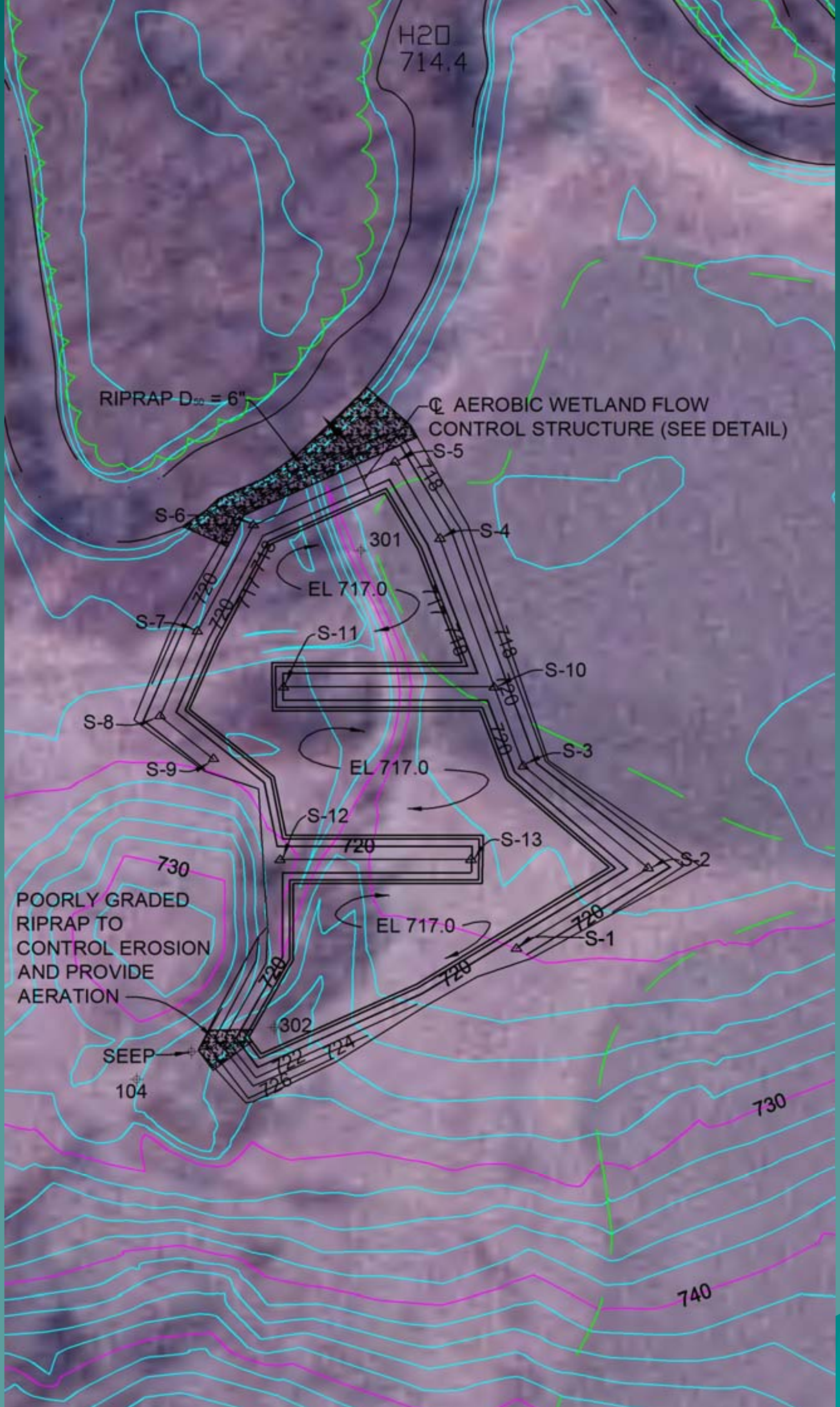




NO.	DESCRIPTION						

DRAWN BY: OSM
CHECKED BY: OSM
APPR. BY:
ISSUE DATE:
DRAWING NO.

HERBERT
AML PASSIVE
TREATMENT


H2O
714.4
RIPRAP D50 = 6"
℄ AEROBIC WETLAND FLOW CONTROL STRUCTURE (SEE DETAIL)
S-5
S-6
S-4
301
EL 717.0
S-7
S-11
S-10
S-8
S-3
S-9
EL 717.0
S-12
S-13
S-2
730
POORLY GRADED RIPRAP TO CONTROL EROSION AND PROVIDE AERATION
EL 717.0
S-1
302
SEEP
104
730
740

Project Status

- Currently revising the passive treatment design based on comments from the IDALS
- Continued water sampling on a quarterly basis
- Construction scheduled to begin in the spring of ‘08

Mid-Continent Region
Program Support Division

Technical Services Branch

Technical Assistance

Soils and Soil Substitution

Larry Emmons

MCR Soil Scientist

Bill Joseph

Technical Services Branch Chief

Regional and National Contact with Soils Programs and Special Studies

- Working with the State Regulatory Authorities in the Mid-Continent Region; assisting with permit review, oversight, and special studies.
- Working with the NRCS to develop national standards for reclamation of prime farmland.

Regional and National Contact with Soils Programs and Special Studies

- Fund and monitor an applied science study – Prime Farmland Soil Characterization.

- Indiana Soils/Prime Farmland Team member.

Recent Assistance

- Permit review of soils, AFM/TFM and revegetation for the Missouri program.
- Permit revision review for topsoil substitution and CCB beneficial use on the Mississippi lignite mine.

Missouri

- Review permit application data on soils and AFM/TFM
- Use ArcMap to overlay permit boundary on an aerial photo, develop a directory to capture the necessary information, and download on tablet computer in ArcPad
- Soil sample locations and data were recorded in the field. Wildlife habitat values information was collected on this same data set

Mississippi

- MS requested assistance on soils and hydrology issues of a new revision to the lignite mining operation

- Technical assistance consisted of reviewing the permit revision application for topsoil substitution proposal and beneficial use of CCBs

Mississippi (cont.)

- Soils on the site are generally high in sand and are very erodable, requiring extensive erosion control

Mississippi (cont.)

- Soil reconstruction study test plots

Mississippi (cont.)

- Analysis of test plot productivity data - Three years of forage production analyzed

- OSM Determined that production from the oxidized substitute material was the same as the production from the reclaimed topsoil over oxidized overburden

Mississippi (cont.)

- Analysis of Physical and Chemical Properties
- The original topsoil is quite variable. Soil associations are the primary upland mapping units
- Texture—the topsoil and oxidized substitute materials each range from fine sandy loam, to loam, to clay loam

Mississippi (cont.)

- pH of topsoil ranges from 4.5 to 6.0
- pH of substitute material (oxidized overburden) ranges from 4.5 to 6.0
- Available water capacity is very similar for topsoil and subsoil, except for fragipan in natural soils

Mississippi (cont.)

- Pyritic sulfur level less than 0.1 for topsoil and oxidized overburden (substitute material)
- SAR generally higher in oxidized overburden than topsoil, but consistently less than 6.0
- No acid/toxic forming materials in the oxidized substitute material

Mississippi (cont.)

- Post-mining land use considerations
- Pre-mine land uses are unmanaged woodland (no current landuse), pasture, cropland (hayland), and historical row crop cropland
- Post-mining land use is managed/commercial pine forest. Need relatively deep rooting medium with minimum compaction. This rooting medium can be managed for the same pre-mine land uses

Mississippi (cont.)

- Oxidized overburden can be placed in deep lifts, eliminating the potential for compaction that occurs when topsoil is placed on the reclaimed area

- Mechanical compaction from replacing topsoil can be alleviated (deep ripping), however, the proposed substitute material met the Mississippi regulatory criteria of:

Mississippi (cont.)

- The overburden materials soil medium is equal to, or more suitable for sustaining vegetation than the existing topsoil, and
- the resulting soil medium is the best available in the permit area to support revegetation
- Recommendation to MS DEQ that topsoil substitution plan be approved

Topsoil Substitute Salvage

End dumped oxidized spoil

Mississippi (cont.)

- CCB beneficial use review - Proposal to use coal combustion byproducts from the adjacent power plant to stabilize roadways, dragline bench, roads across spoil for end dumps, and culvert stabilization.

- Analysis of CCB for toxic materials

Mississippi (cont.)

- CCBs would not produce toxic materials to impact vegetation
- Post-mining land use is 90 + percent commercial pine forest
- CCBs would require 10-foot cover depth to ensure adequate rooting media for post-mining vegetation – recommended approval--with modification to insure internal soil drainage is maintained

Mid-Continent Region

Some other technical assistance projects have included:

- Indiana PFL team sponsorship of Purdue University developing new mapping units for the NRCS to describe mined land soils
- Development of a interpretive handbook to teach Boy Scouts about natural science along trails at their summer camp.

Mid-Continent Region

- Oklahoma -- Alpine 4114 Project just south of Stigler
  - Bond forfeiture site. Bond was not adequate to reclaim the site, and civil penalty funds were obtained.

Technical Resources

- OSM's Technical Library
- Connection with various universities
- Knowledge bank of MCR staff

Technical Resources
Staff Experience

- Larry Emmons – Soils/rooting media identification and development, plant and soil interaction, establish working relationship with NRCS, NEPA document reviews for Iowa and Arkansas
- Kale Horton – Field application of mobile computing, vegetation, wetlands, NEPA, experience working with the COE

Technical Resources
Staff Experience

- Geologist and Hydrologist – Chemistry, Treatment for AMD, Experience in remediation/reclamation of mine sites, use of amendments for treatment.

- Engineers – Design experience in widely varying environments/locations, AutoCAD expertise over different applications.

Mid-Continent Region

- If you have any soil or vegetation questions, please give me a call – if the answer isn't in our corporate knowledge base, we will be able to help research the issue for you.

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING

US Department of the Interior
Office of Surface Mining
Mid-Continent Region

OSM Mobile Computing

Mobile Computing ?

Traditional use of computer technology has largely been confined to the user's desktop computer in an office setting.

The field-centric nature of much of the Reclamationist workload offers the opportunity to provide software at the customer point-of-use.

- **Advances in mobile computing technology (Microsoft and Tablet Operating System) have stimulated hardware and software vendors to broaden the range of hardware and software appropriate to performing powerful field computation tasks.**
- **Mobile computing is the next step beyond GPS data collection. It uses full or semi-function computing hardware to implement CAD and/or GIS solutions in the field. Real time mobile mapping and computing are now a reality and many desktop based applications can now be used in the field.**

Hardware


WorldNavigator
TELETYPE GPS


COMPAQ


FUJITSU


Trimble

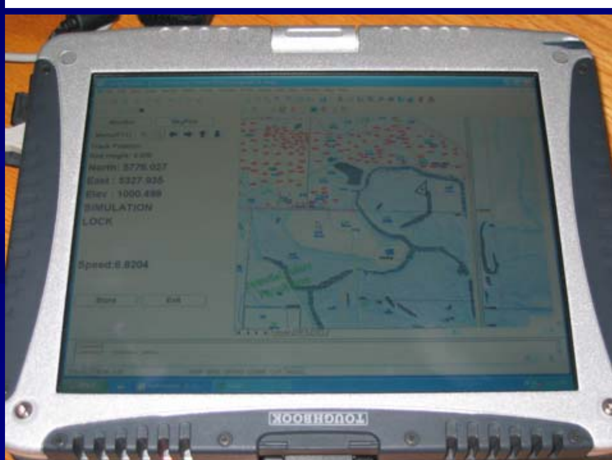

xplore


TELETYPE GPS


Trimble


Trimble
ProXH

Panasonic Toughbook CF 18 Tablet



Fujitsu Stylistic 5011 Tablet

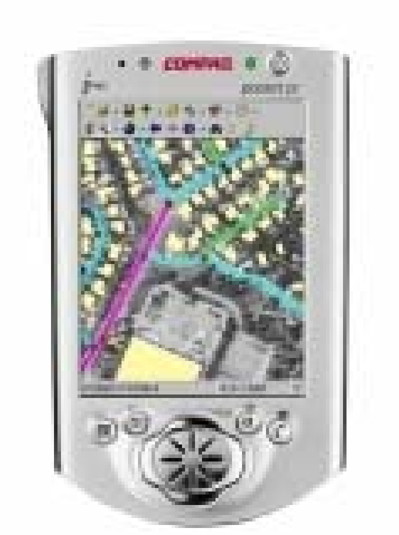
- Ultra Low Voltage Intel® Pentium® M processor 1.0 GHz
- Microsoft® Windows® XP Tablet PC Edition
- 10.4" XGA TFT with indoor/outdoor display
- 256 MB – 2 GB DDR 333 SDRAM memory
- 40 -60 GB 4200 rpm hard drive
- Built-in 10/100/1000 Base-T/TX Ethernet

Bump case and the Harsh Environment Case for the Fujitsu Tablets

Otterbox case for the Fujitsu Stylistic 4000 and 5000 Tablets

Xplore Tablet PC

PDAs




Start
2:43
Monday, October 18, 2003
Owner: Joe Howard
Weekly PR Conference Call
9:00AM-10:00AM
Budget Review
1:30PM-2:30PM (Meeting Room 2)
Carpool for soccer practice
7:00PM-8:00PM (Eastside Park)
Dinner with Kate
9:30PM-11:30PM (1st Street Grill)
ActiveSync: 8 Unread Messages
3 Active tasks
New
iPAQ
Pocket PC

Trimble GeoXT Microsoft Mobile OS

Standard features

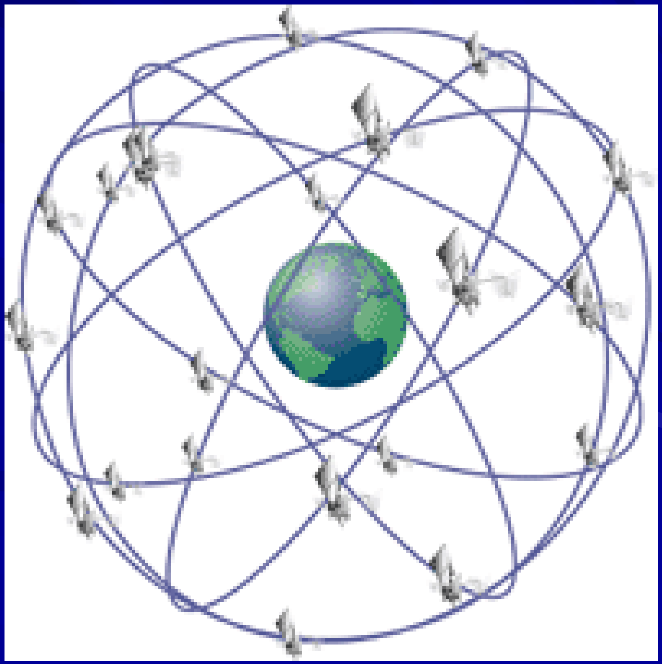
- Embedded Windows CE version 3.0 operating system
- 206 MHz StrongARM processor
- 512 MB non-volatile Flash data storage
- Outdoor color display
- Ergonomic cable-free handheld
- Rugged and water-resistant design
- All-day internally rechargeable battery

GPS

- Submeter accuracy
- Integrated WAAS1
- RTCM real-time correction support
- NMEA and TSIP protocol support
- EVEREST multipath rejection technology

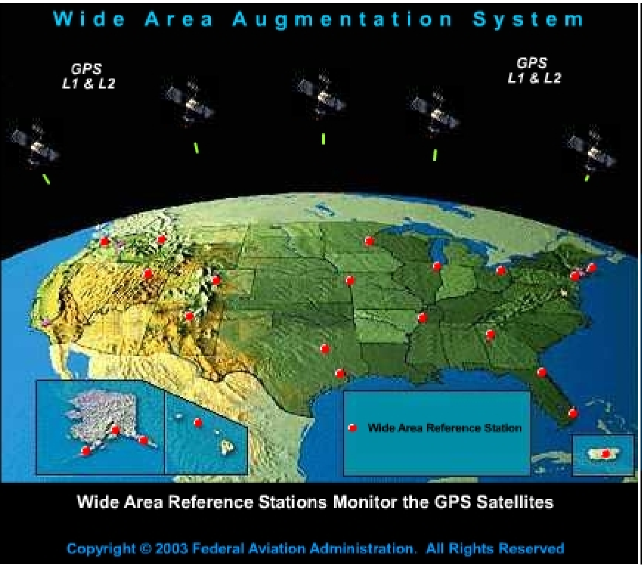
Global Positioning System (GPS)

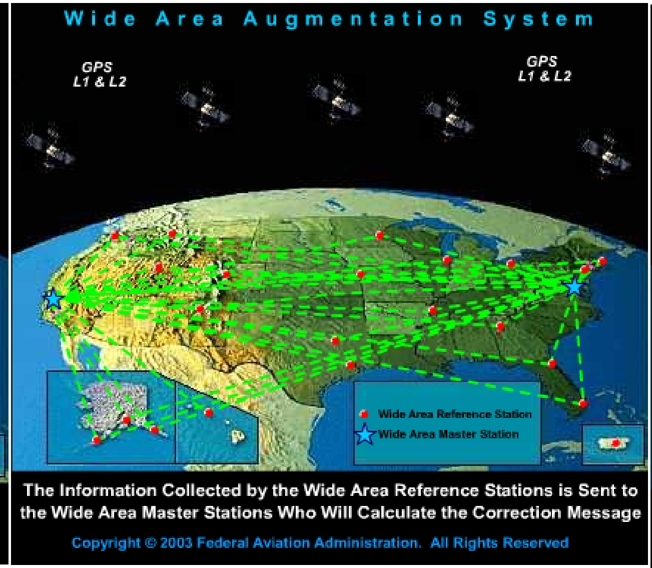
<u>GPS is a space-based radio-navigation system</u> consisting of a constellation of satellites and a network of ground stations used for monitoring and control. A minimum of <u>24 GPS satellites orbit the Earth at an altitude of approximately 11,000 miles</u> providing users with accurate information on position, velocity, and time anywhere in the world and in all weather conditions.



WAAS

- The <u>Wide Area Augmentation System (WAAS)</u> was commissioned by the Federal Aviation Administration (FAA).
- The WAAS provides augmentation information to GPS receivers to enhance the accuracy and reliability of position estimates.
- <u>WAAS often provides accuracy with 2 - 3 meters horizontally</u>, and 1 -2 meters vertically.


Wide Area Augmentation System
GPS L1 & L2
GPS L1 & L2
Wide Area Reference Station
Wide Area Reference Stations Monitor the GPS Satellites
Copyright © 2003 Federal Aviation Administration. All Rights Reserved


Wide Area Augmentation System
GPS L1 & L2
GPS L1 & L2
Wide Area Reference Station
Wide Area Master Station
The Information Collected by the Wide Area Reference Stations is Sent to the Wide Area Master Stations Who Will Calculate the Correction Message
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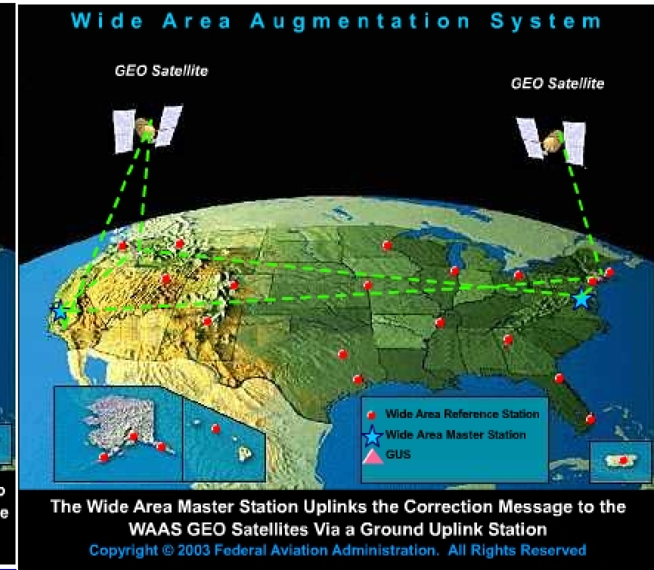
Wide Area Augmentation System
GEO Satellite
GEO Satellite
Wide Area Reference Station
Wide Area Master Station
GUS
The Wide Area Master Station Uplinks the Correction Message to the WAAS GEO Satellites Via a Ground Uplink Station
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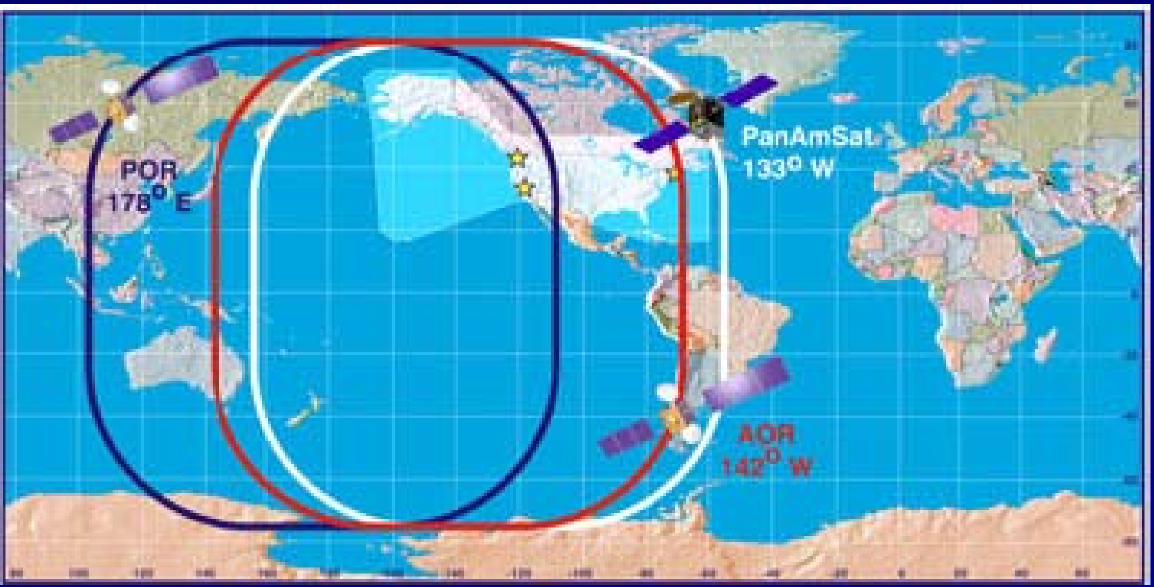
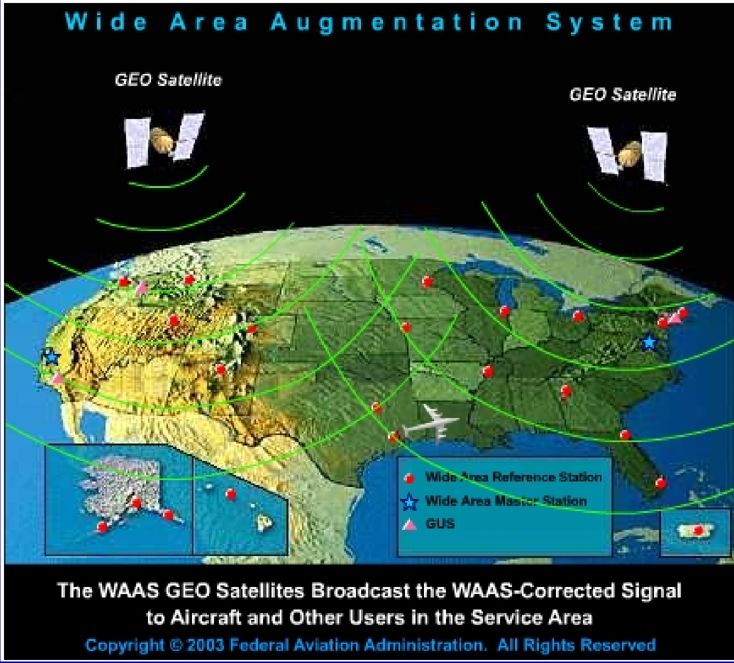

POR
178° E
PanAmSat
133° W
AOR
142° W


Wide Area Augmentation System
GEO Satellite
GEO Satellite
Wide Area Reference Station
Wide Area Master Station
GUS
The WAAS GEO Satellites Broadcast the WAAS-Corrected Signal to Aircraft and Other Users in the Service Area
Copyright © 2003 Federal Aviation Administration. All Rights Reserved

WAAS Enabled GPS Receivers

Compact Flash Cards
- Built-in antenna
- Low Power consumption-
- 12 channel GPS
- NMEA compliant
- Works with PDA's and Tablets

Bluetooth Recievers
- 12-16 Channels
- Up to 30 feet between GPS receiver and Tablet or PDA
- "Pager-sized" devices – look and feels like a pager – small and lightweight.

New Trimble Products
GPS Receivers and PDA's
Pro XH and XT; GeoXH/XM; XB and XC

Old Units - Trimble Geo Explorer 3 with BoB

Trimble ProXRS

Standard features

- Integrated GPS/Beacon/SBAS Reciever/Antena
- Real-Time Differential Correction
  - Coast Guard RadioBeacon
  - OmniSTAR Satellite
  - LandStar Satellite
  - WAAS
- EVEREST Multipath Rejection Technology
- RTCM Input/Output
- NMEA Output
- Base Station Mode
- Submeter accuracy

RTK - Leica System 500

Software Tested

- ArcPad by ESRI
- Field Module by Carlson Software (used to be called Tsunami) running on Autodesk Map
- TerraSync by Trimble
- Pathfinder

Mapping and Data Collection using ArcPAD

Created by ESRI (same folks that make ArcINFO)

Field mapping and GIS data collection tool

Runs on a tablet/laptop computer or Windows CE device (iPAQ or Trimble GeoXT)

Integrates GPS into GIS Software

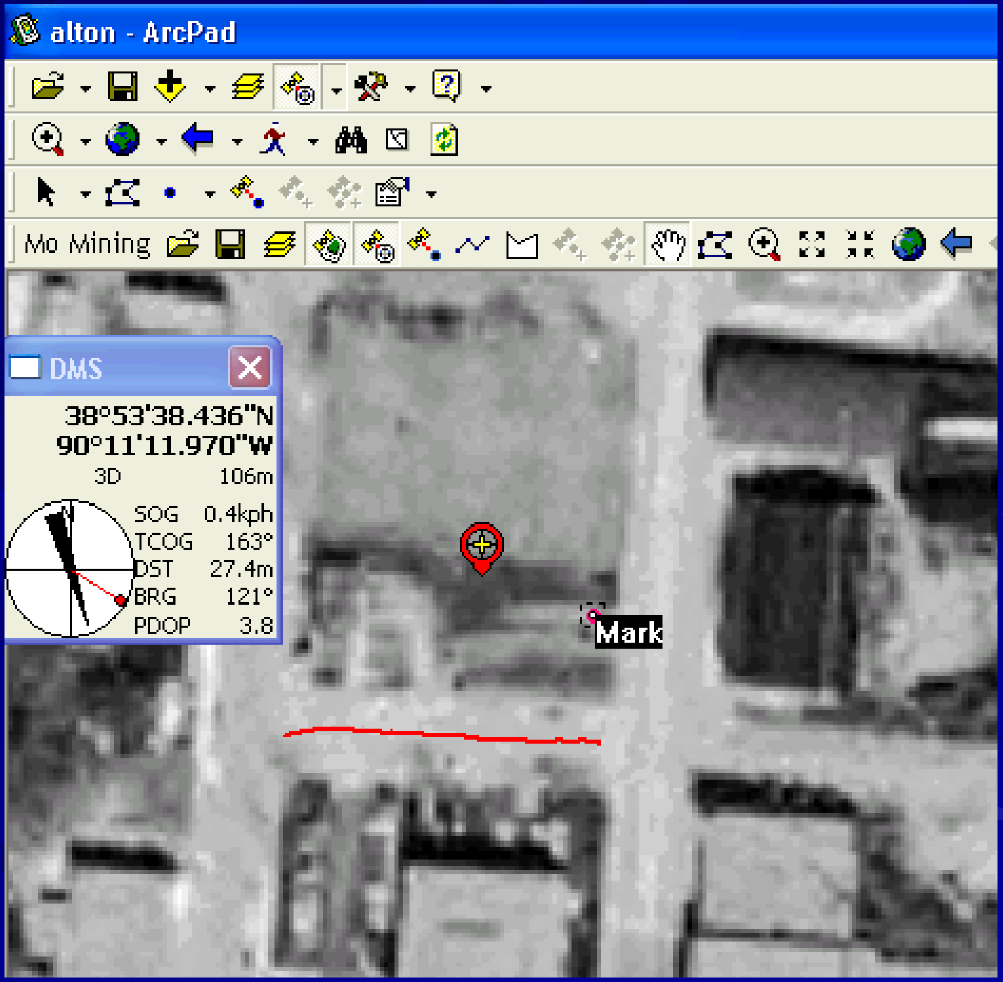
Easy to learn, easy to use

What Does ArcPAD Do ?

Links GPS data input with GIS

function to:

- Display maps and photos with an active GPS generated location.
- Navigate to features.
- Collects data



Example ArcPAD Projects

Mine Shaft Mapping

Oklahoma Mine 7 AML Inventory

Missouri AECI Vegetation Assessment

Missouri Mining Site Mapping

Mapping Mineshafts Prior to Closure

Field Data

- coordinates
- dimensions
- depth
- collar condition

Closure Data

- type of closure
- date of closure
- who performed

Mapping AML Features
Rock Island No. 7 Oklahoma

- Historic structures
- Fence ihes
- Gates
- Pond spillways
- Ditches
- AML features
- Access routes

Vegetation Assessment for Bond Release – AECI - Missouri

Assess validity of Phase 3 Bond Release Requests on 10,000 acres

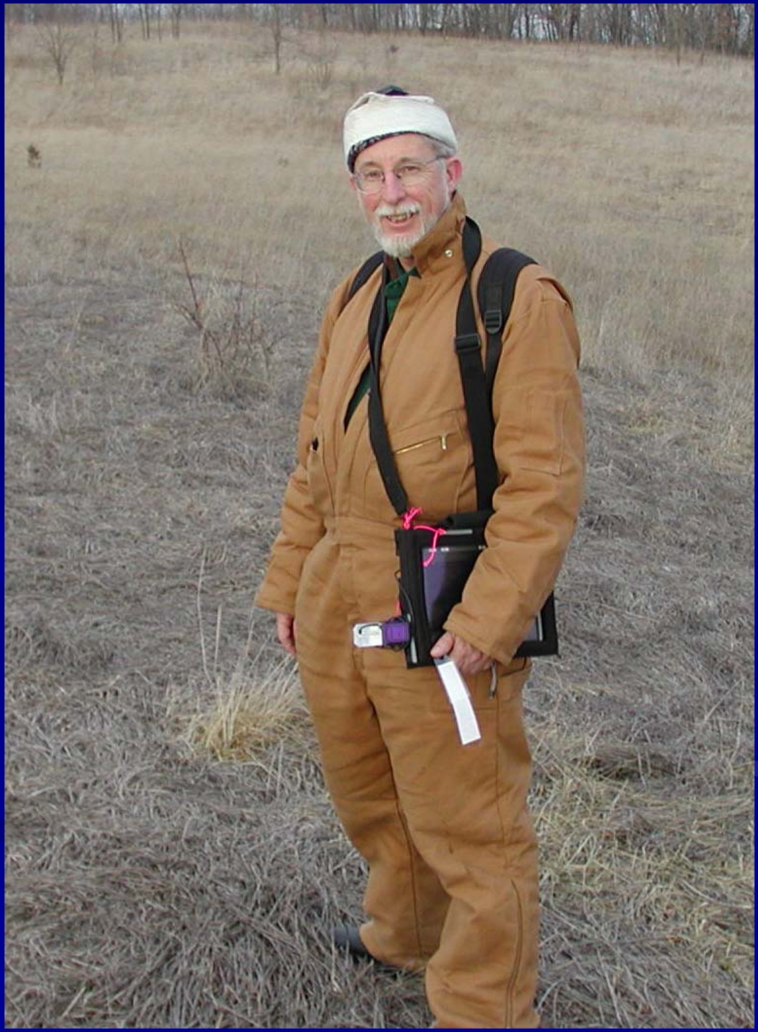
Permits as old as 1982

Compare veg. sample data to actual on-ground conditions

Data was developed in AutoCAD

Opened .dwg in ArcMAP and Converted the features to Shapefiles

Exported for ArcPAD



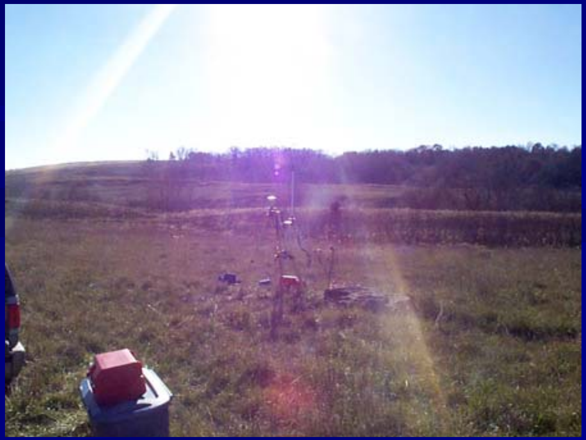
Missouri Mining Project

- Purpose – Estimate reclamation liability for Missouri Mining Company lands, and identify and map mine site features that need reclamation.
- 2400 acres to assess
- 12 different permits and many amendments
- Mined between 1977 and 1989
- Bonds released on dozens of bond increments making determination of what remains, very difficult

Finding the Way Back To The Truck

Tsunami (Field Module) Case Study: RTK GPS Surveying at UCE

- **MCRCC and MO LRP staff surveyed 700 acre bond forfeiture site.**
  - **Goal – To obtain a topographic survey and document bare spots, slides, gullies, etc. to be used to prepare reclamation designs.**
  - **Equipment used – Leica SR 530 RTK GPS base station and rover, Fujitsu Stylistic 3500R computer, John Deere Gator 4x6 vehicle**



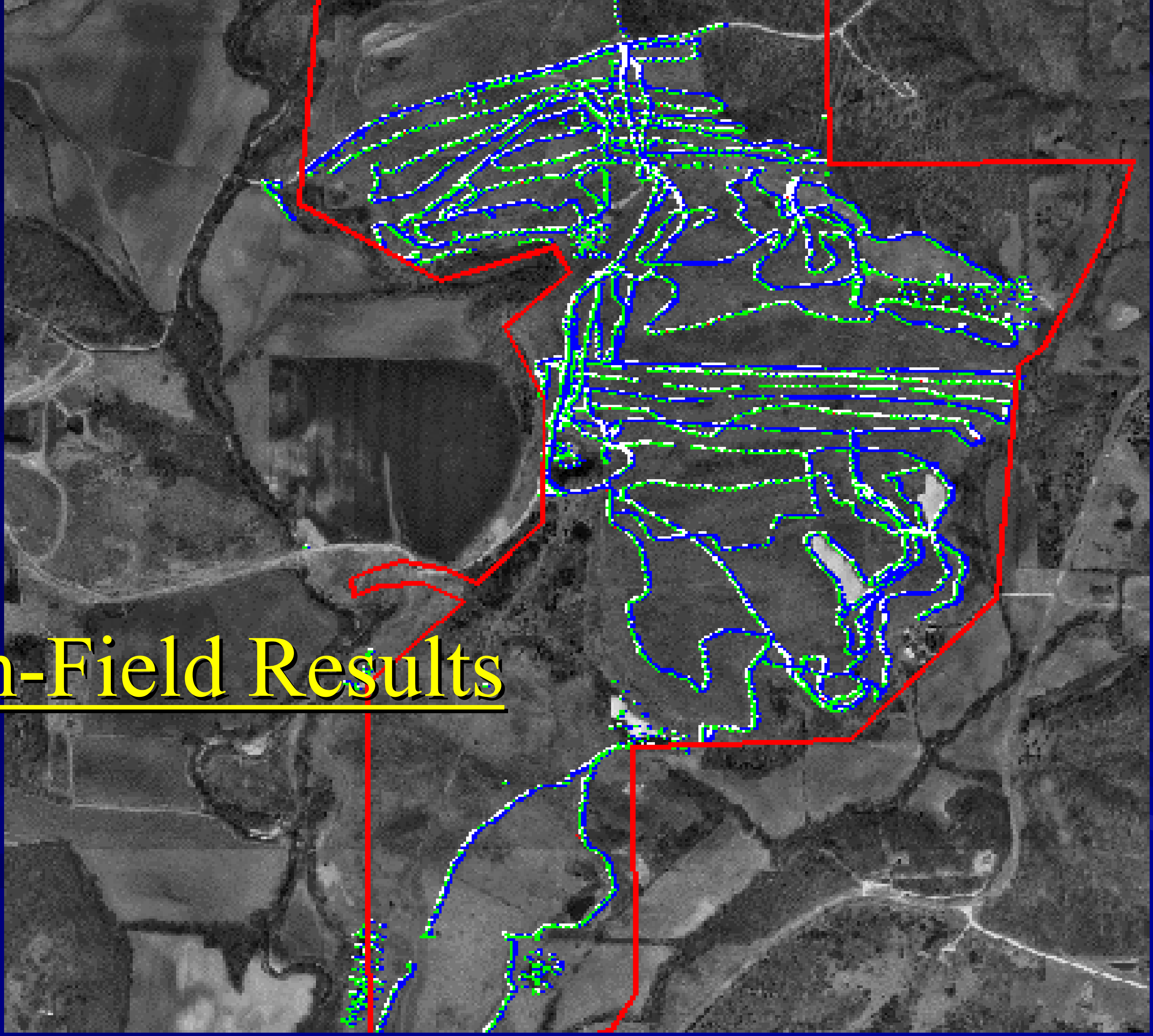
Data Preparations and Equipment Setup

- **Due to a short lead time on the project, the MO staff brought all of the background data to the site and it was loaded in the field.**
- **MO staff data was in UTM NAD 83, but the equipment had been configured for MO State Plane feet.**
- **Autodesk Map and Autodesk Raster design were used in the field to transform background drawings, survey control points, and images.**

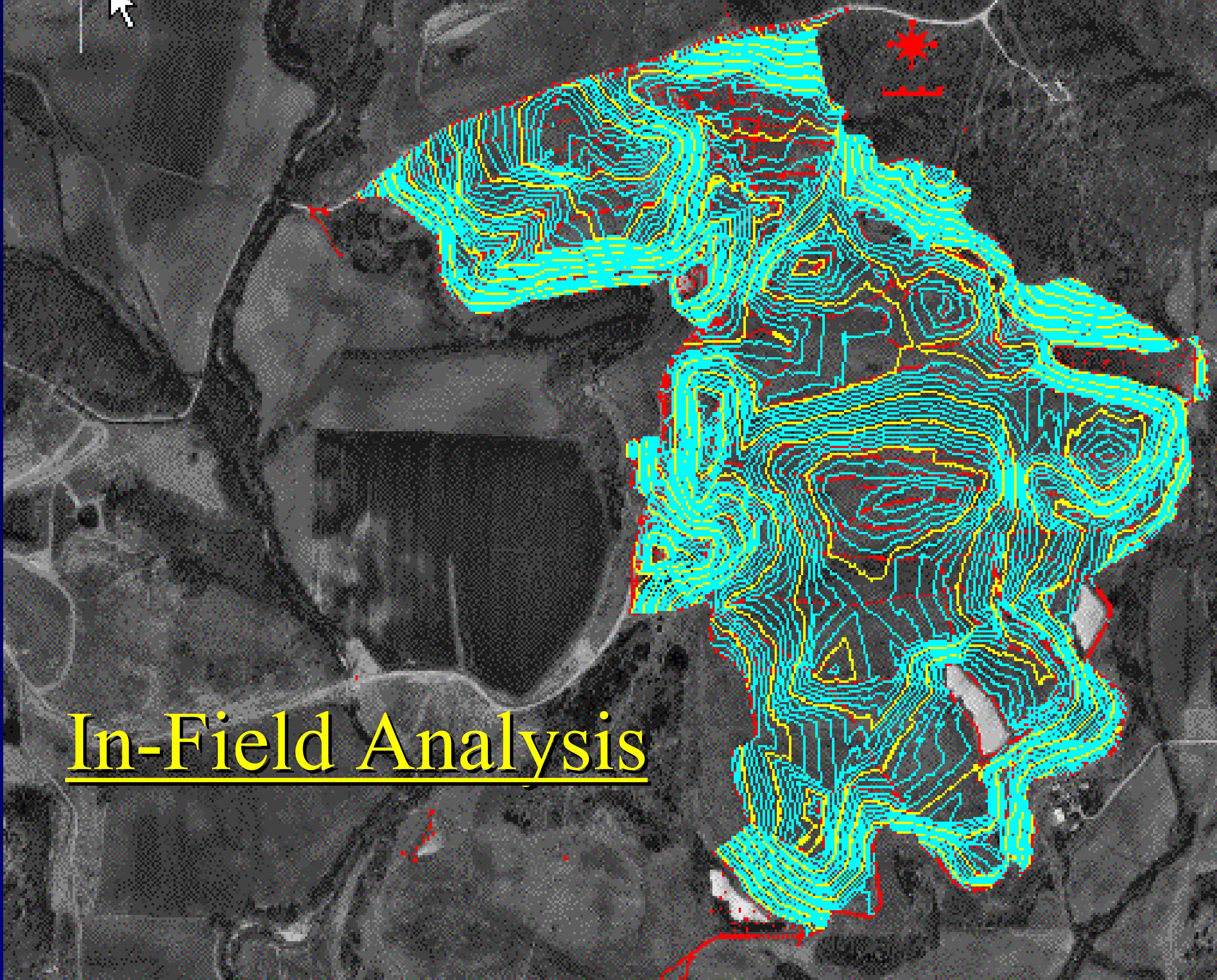
Survey Data Collection

- **2 person crew**
  - **One person drove the gator while the other rode in the passenger seat to operate the computer and hold the pole steady.**
  - **Used the Auto-Points feature to collect points every 25 feet horizontally or 1 foot vertically.**
  - **Collected topo shots from the Gator. When other features were encountered, the crew got off of the gator and mapped the features**

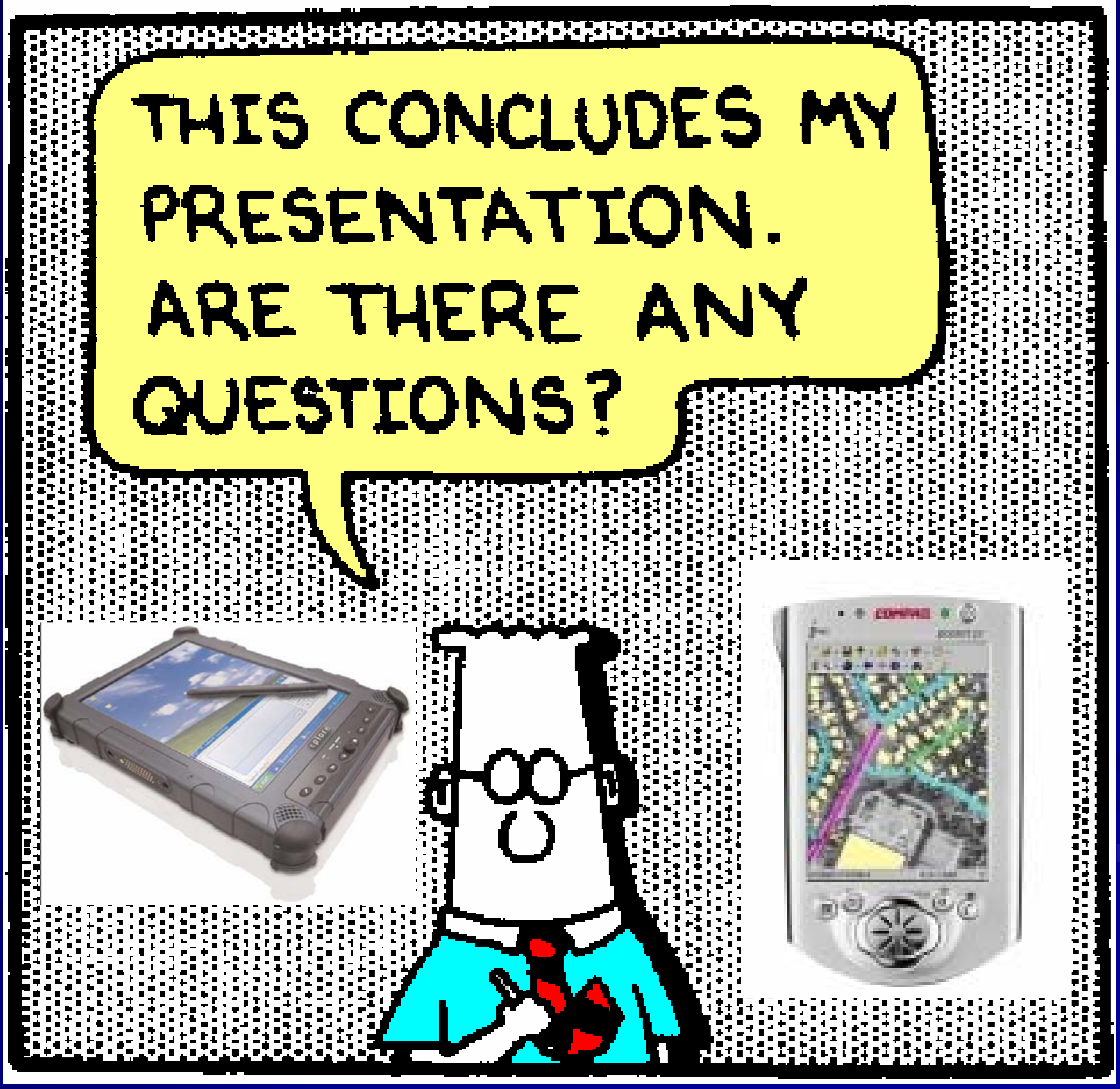
In-Field Results



In-Field Analysis



Through TIPS, OSM continues to work with our State and Tribal partners on workshops, field demonstrations and training to increase the use of Mobile GIS and CAD.


THIS CONCLUDES MY PRESENTATION. ARE THERE ANY QUESTIONS?

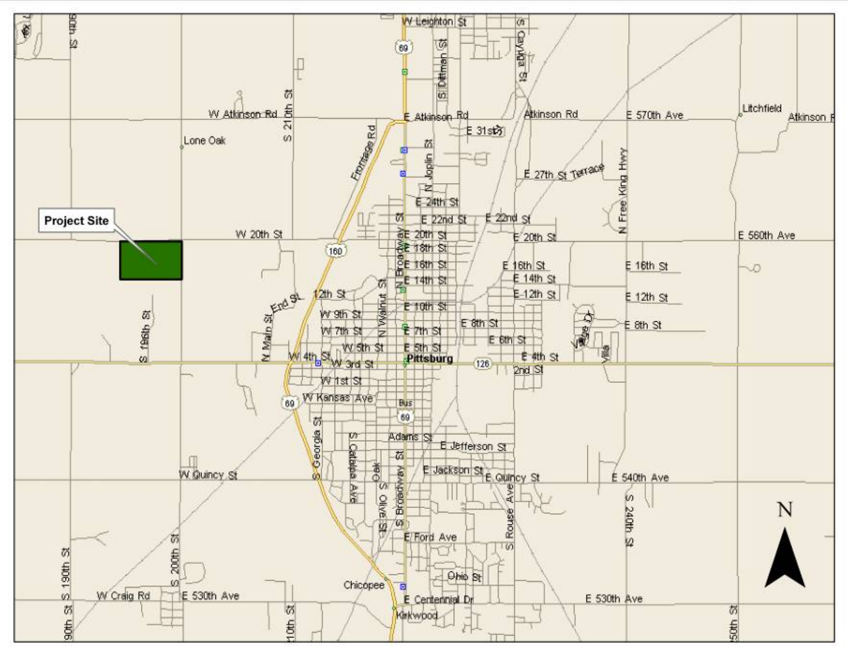
OSM Technical Assistance: Section 404 Permit Application and Wetland Delineation

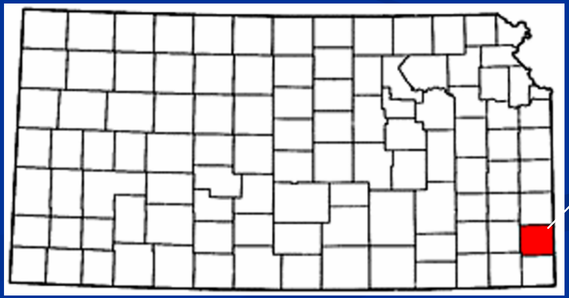
Quail Farm II – AML Restoration Project

Crawford County, Kansas

Quail Farm II

- Kansas State Park
- Located in southeast Kansas
- Managed Public Use Area for Wildlife and Recreation
- Surface mined in the 1920's and 1930's
- Site topography, hydrology, and soils drastically altered

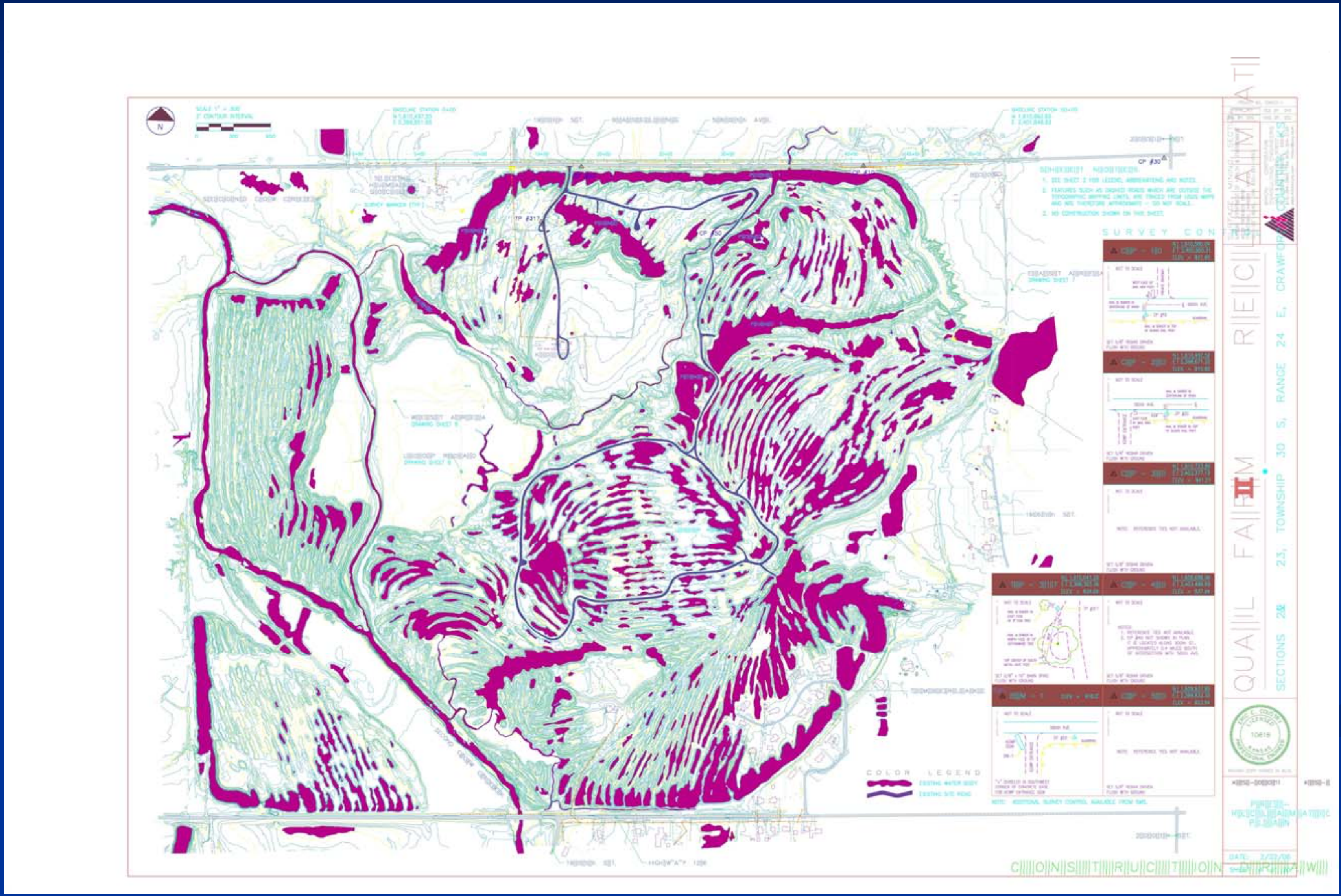




Site Problems

- Over 11,400 feet of Dangerous Highwall (DH), much along state highways and park roads (Several guardrail and partial solutions in past have failed)
- Many scattered unauthorized trash disposal areas (IRW) dating from pre-park days
- Sedimentation and storm water problems
- Degraded fish and wildlife habitat

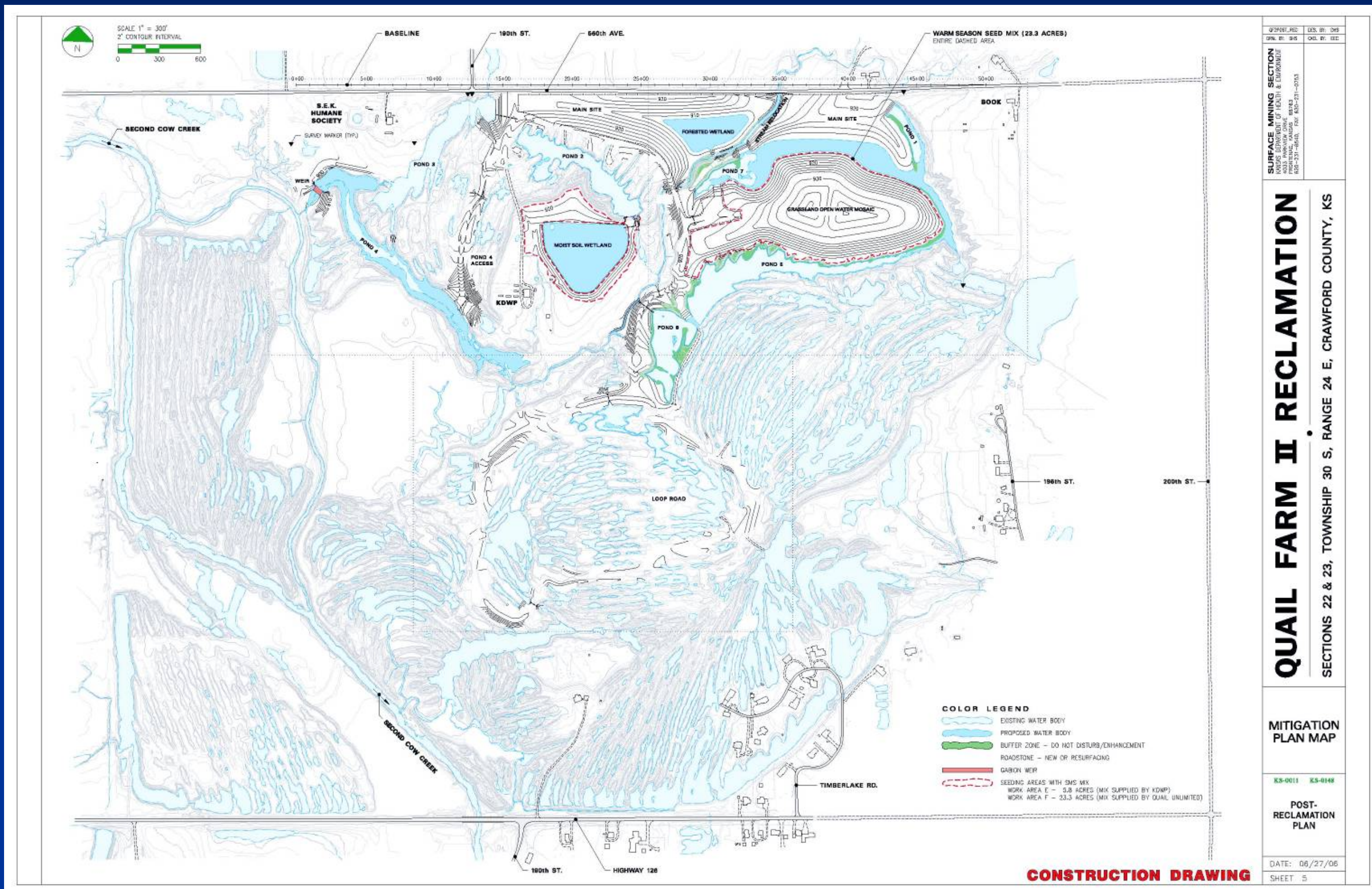
Pre-Reclamation Landscape



Project Description

- Goal was to address public safety along the highway and park roads
- Reduce public exposure to unauthorized trash dumps
- Enhance and repair strip pits
- Create and improve wildlife habitat
- Create a mosaic of habitat features - Mitigation

Reclamation Plan



Section 404 Issues

- Washboard topography and hydrology
- Jurisdictional vs. Isolated
- Thousands of isolated “pocket” wetlands in project site
- Spoil was highly variable and varied greatly in short distances
- Vegetation was highly variable
- Stream mitigation
- Gray bat
- Individual permit vs. General permit

Is There Really a Surface Water Connection???

Jurisdictional Determination

Site specific waters of the United States adversely impacted by project activities

Waters of the United States	**Acres**	**Linear Feet**	**Land Type**
Pond 1 - Surface Water	3.4		Open Water
Pond 1 - Wetland	.04		Emergent
Pond 1 – Intermittent Stream		274	Forested
Pond 4 - Intermittent Stream		636	Forested
Pond 4 – Intermittent Stream		122	Forested
Pond 4 - Wetland	1.8		Forested
Pond 4 - Wetland	0.2		Forested
Pond 4 –Wetland	.07		Emergent
Pond 5 - Ephemeral Stream		726	Forested
Pond 5 - Wetland	.04		Emergent
Pond 5 - Wetland	.12		Forested

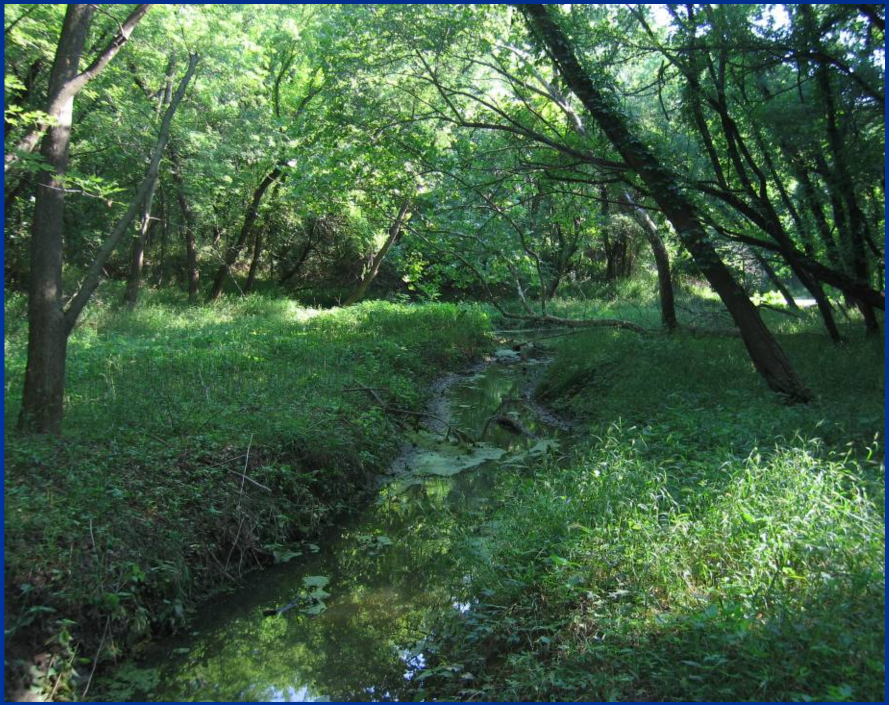
Project activities would adversely impact a total of 3.4 surface acres of open water, 2.1 acres of forested wetlands, 0.15 acre of emergent wetland, 1,032 linear feet of intermittent stream, and 726 linear feet of ephemeral drainage

Wetlands

Backwater emergent fringe wetlands

Forested streamside wetlands

Streams



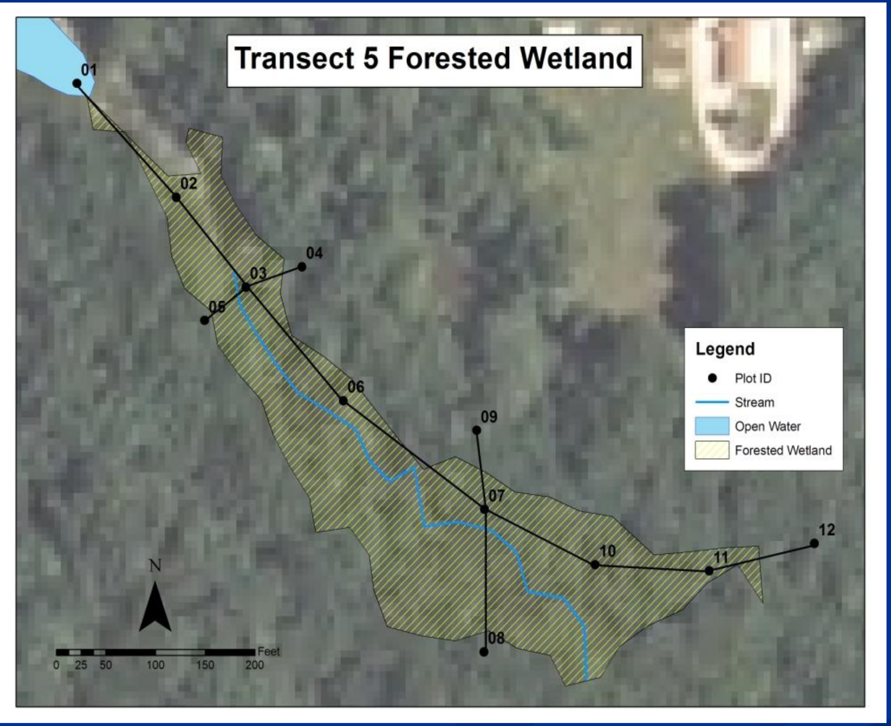
Early stream formation in spoil valleys

Regional General Permit 31-K

- Designed for AML Reclamation Projects
- Applicable in southeast Kansas
- Corps notification required prior to commencing activities
- Must receive written confirmation of authorization from Corps before starting reclamation
- No linear stream or areal wetland impact limits
- Adverse impacts to waters of the US must be determined minimal by the Corps
- Mitigation compared to adverse impacts for this project qualified it under GP 31-K

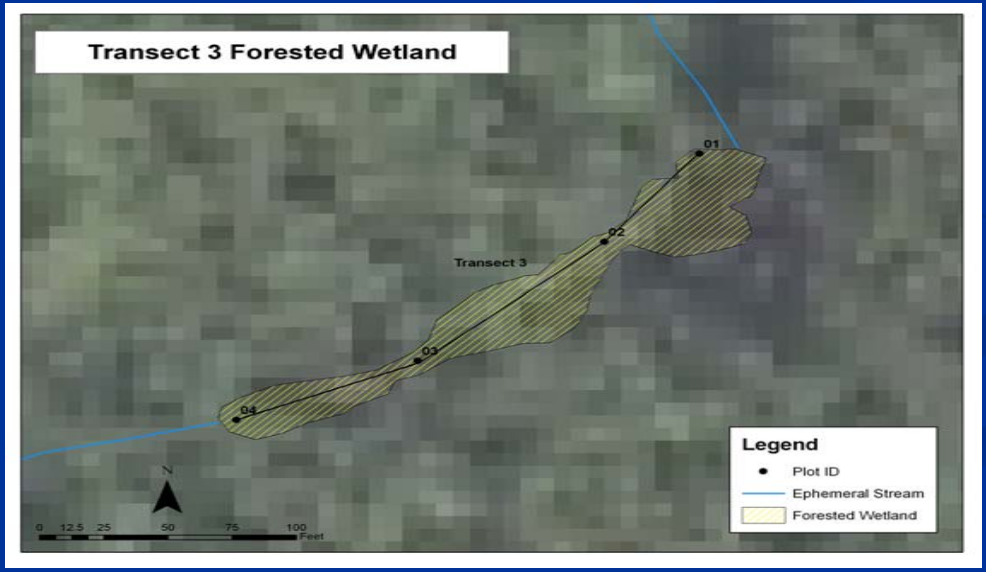
Wetland Delineations

- Soils, Vegetation, and Hydrology
- In accordance with 1987 Manual
- Mobile Computing Technologies employed
- Transects
- Delineating boundaries
- Delineation Forms can be created in ArcPad 7.0



Mobile Mapping and ArcGIS

- Collect spatial information in field
- All stream and wetland project information is collected in one GIS database
- ArcPad 7.0
- Desktop analysis (acreage, linear feet – analysis of extent of adverse impacts)
- Quality maps for Section 404 permit submittal to Corps
- Mitigation plan design



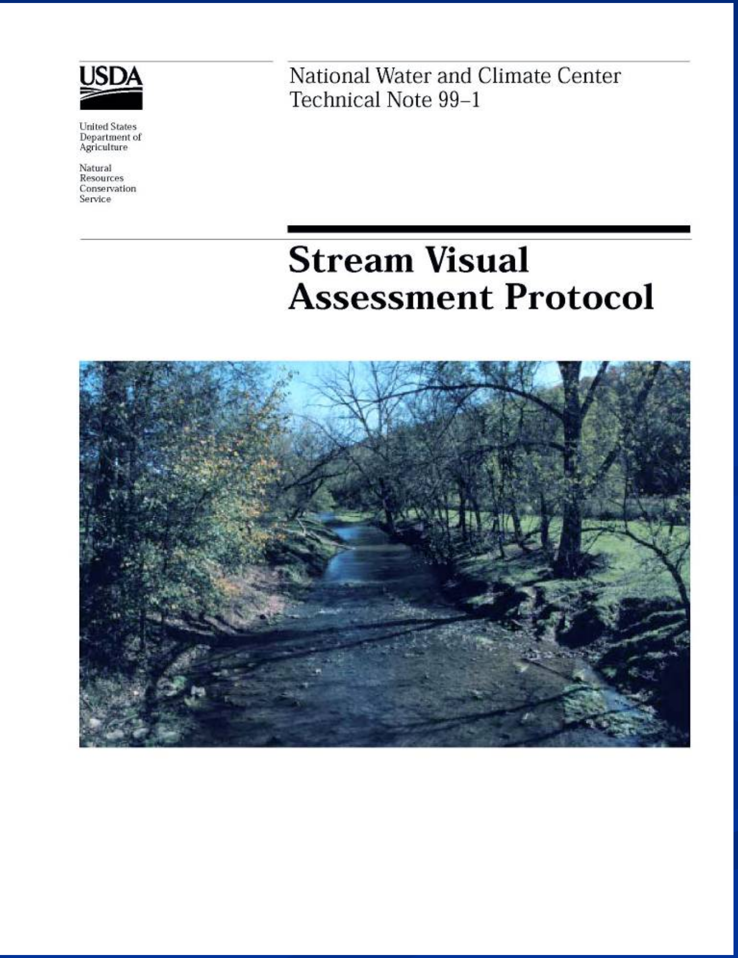
Assessment Techniques

- Collect baseline information on the ecological integrity of streams and wetlands on the project site to ensure mitigation works
- Stream Assessments accomplished using NRCS Stream Visual Assessment Protocol
- Wetland Assessments accomplished using a Floristic Quality Method

NRCS Stream Visual Assessment Protocol

Evaluation model based on physical and biological conditions

- Stream Channel Conditions
- Hydrologic Alterations
- Riparian Health
- Bank stability
- Water Appearance
- Substrate
- Each element is scored and the mean provides a value for the stream


USDA

United States Department of Agriculture

Natural Resources Conservation Service

National Water and Climate Center Technical Note 99–1

Stream Visual Assessment Protocol

Floristic Quality Index

- Plant tolerance to disturbance
- Plant fidelity to specific habitat integrity
- “Species Conservatism”
- Each native plant species is assigned a coefficient (C) based its conservatism relative to other native plants in the region
- Dominant wetland plant species inventoried during delineations were assigned (C) values

$\sum (c_1+c_2+c_3+...c_n)/N$

Floristic Quality Index

- Where c is the coefficient of conservatism for each plant species identified on the site and N is the total number of native species inventoried in the wetland sample area.

$$\text{Mean C} = \sum (c_1 + c_2 + c_3 + ... c_n) / N$$

Floristic Quality Index

- Higher Mean C indicate higher floristic classifications, but do not account for species richness
- The Floristic Quality Index (FQI) adds a weighted measure of species richness by multiplying the Mean C by the square root of total number of species.
- For comparison between wetlands, FQI values that account for species richness as well as mean conservatism are included in the analysis

$$FQI = \sum (c_1 + c_2 + c_3 + \ldots c_n) / \sqrt{N}$$

Stream and Wetland Assessment

Table 4. Mean C and FQI values for wetlands impacted by project activities

Waters of the US	Acres	Mean C	FQI	Land Type
Pond 1 - Wetland	0.04	2.0	1.4	Emergent
Pond 4 - Wetland	1.80	3.3	12.7	Forested
Pond 4 - Wetland	0.20	7.7	20.4	Forested
Pond 4 –Wetland	0.07 3.3		8.2	Emergent
Pond 5 - Wetland	0.04	1.5	3.0	Emergent
Pond 5 - Wetland	0.12	2.2	6.7	Forested

Table 5. Stream ratings using NRCS assessment protocols

Waters of the US	Linear Feet	NRCS Assessment Score	Functional Quality
Pond 1 - Intermittent Stream	274	6.3	Fair
Pond 4 - Intermittent Stream 636		3.5	Poor
Pond 4 - Intermittent Stream 122		5.2	Poor
Pond 5 - Ephemeral Stream	726	N/A	N/A

Mitigation

Table 2. Cumulative impacts to waters of the United States

Impacted Waters of the US	Acres	Linear Feet
Surface Water	3.4	
Forested Wetland	2.1	
Emergent Wetland	0.15	
Intermittent Stream		1,032
Ephemeral Stream		726

Table 3. Proposed mitigation for the Quail Farm II reclamation site

Proposed Mitigation	Acres	Linear Feet
Surface Water	5.0	
Forested Wetland	2.2	
Moist Soil Wetland	5.1	
Riparian Stream Enhancement/Preservation		1,657
Intermittent Stream Construction		275
Open Water Riparian Buffer Enhancement/Preservation	5,100	
Native Grassland - Open Water Mosaic	23.3	

Wildlife Reclamation

- Create expansive warm season grassland/open water mosaic with forested edge for neotropical and game bird habitat
- Improve inadequate strip pits for fisheries
- Expansive moist soil wetland managed for waterfowl
- Enhance existing strip pits and improve forested buffers for an increase in Gray bat foraging and roosting sites
- Reclaim a large tract of un-managed forested wetland to offset losses created by inundation

Monitoring Plan

- Five-year plan submitted to the Corps
- Annual inspections in the last month of the growing season after planting
- Annual reports after first inspection
- Documentation on how mitigation meets/does not meet and compares with assessment evaluations

Questions?

Geochemistry of Steel Slag Use in AMD Treatment

Paul T. Behum

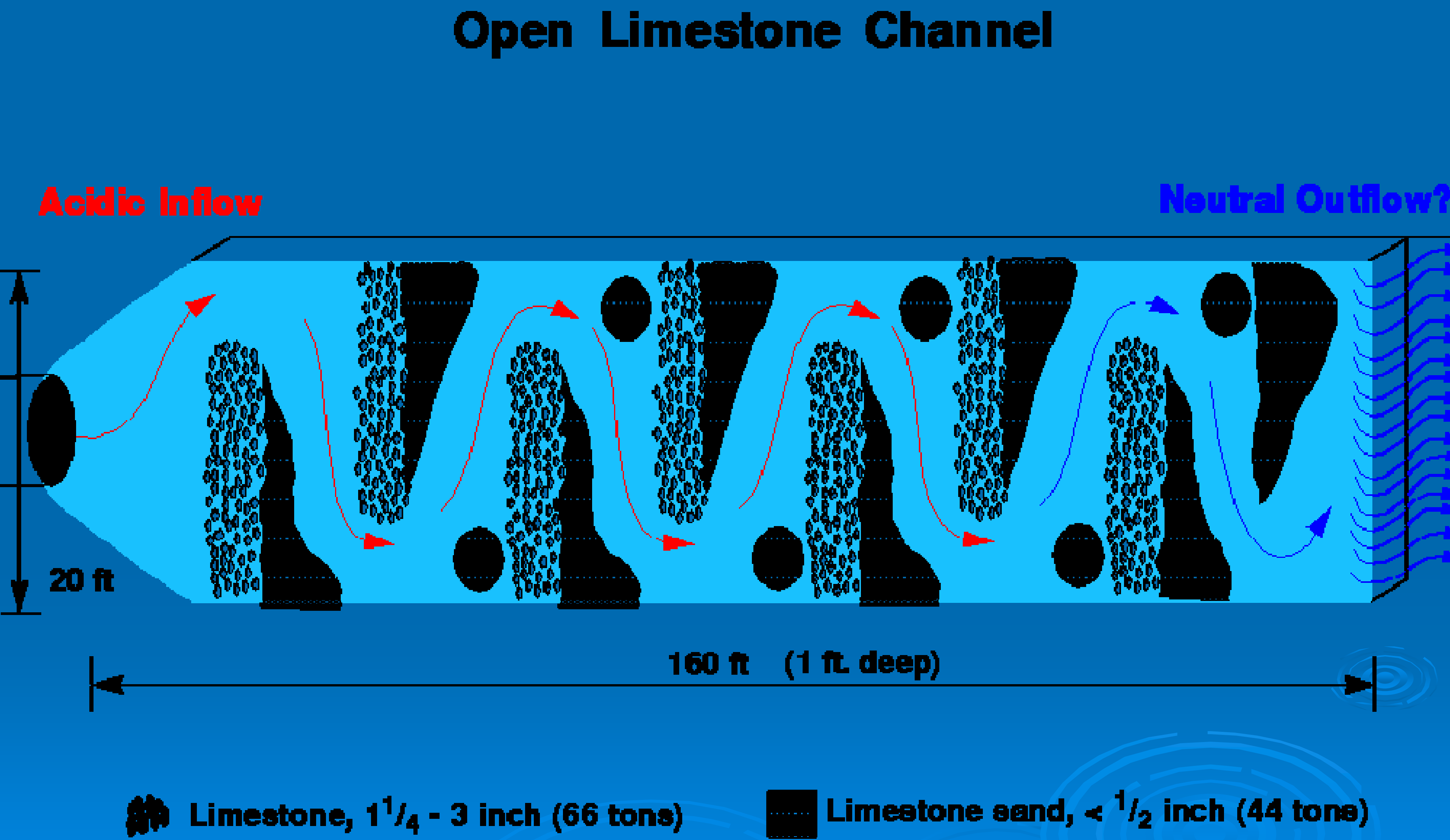
Hydrologist, OSM-MCR

Prepared for Alabama Technology Transfer Briefing, March 28, 2007

Application Methods

- In-stream Additions
- Horizontal Flow Bed – Indirect Treatment
- Slag Leach Bed (SLB) - Direct Treatment
- Alkaline Addition – Recharge Trench
- Alkaline Addition – Surface Applications
- Soil Amendment

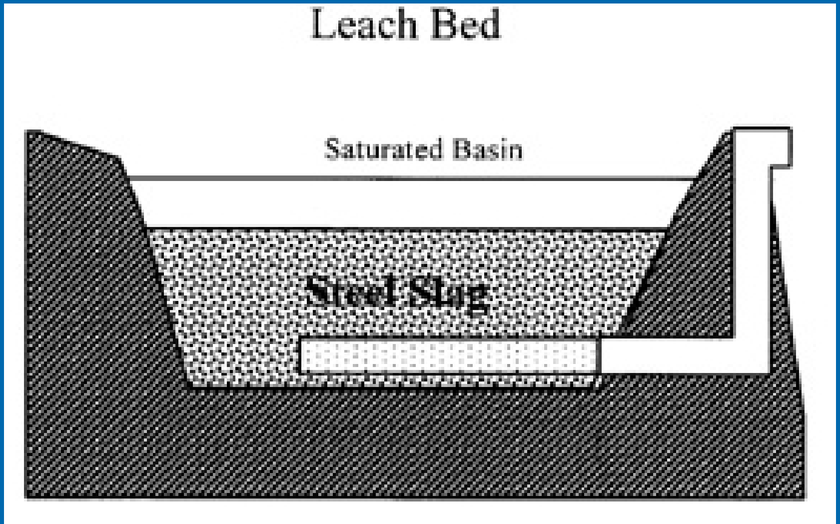
In-Stream Additions as Limestone Replacement



Horizontal Flow Bed – Indirect Treatment: As Limestone Replacement

Big Bear Lake Project, W. Va.; Source: Skousen, 2007

Slag Leach Bed (SLB) - Direct Treatment



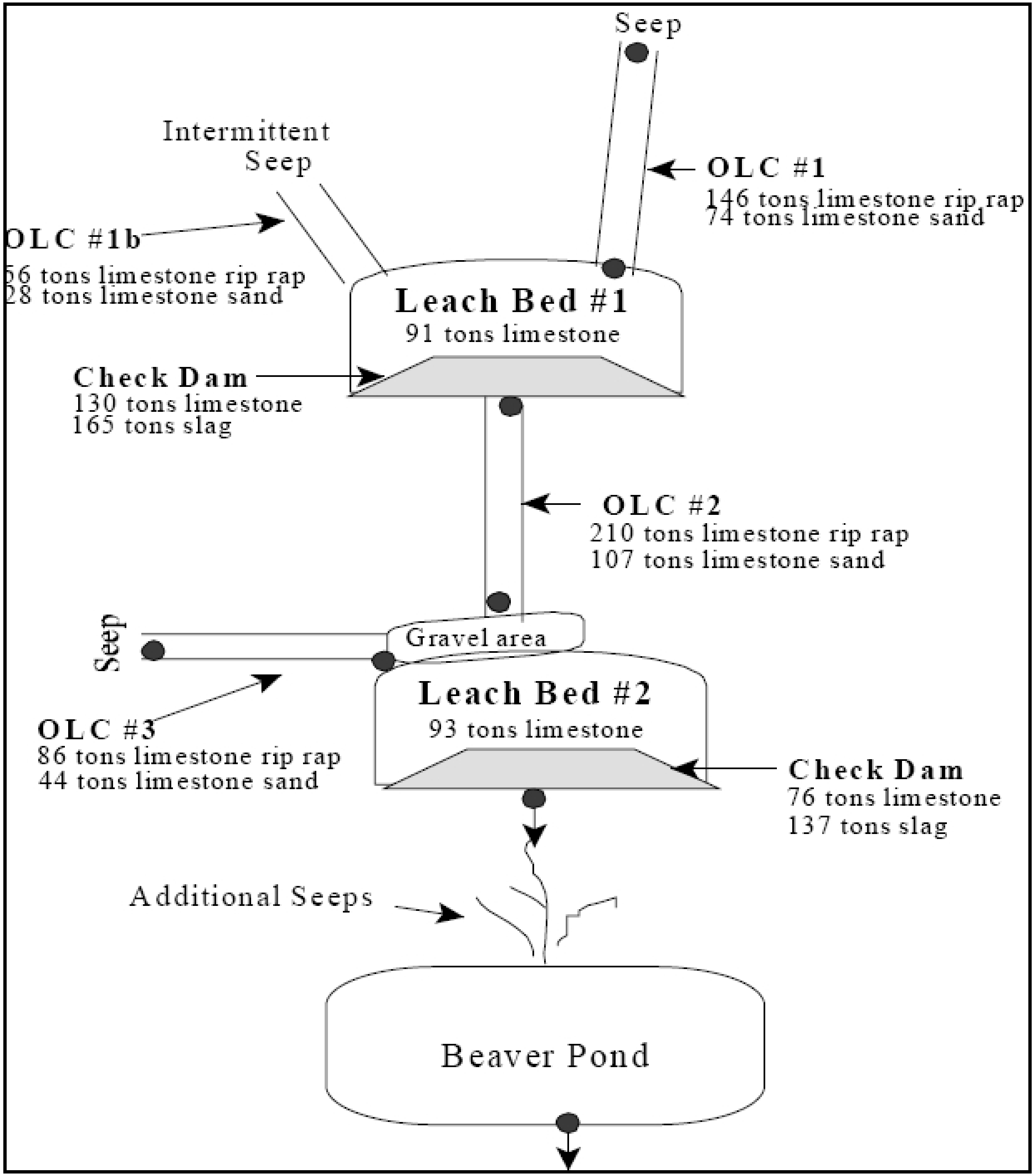
SLB (Zeimkiewicz, 1998)

Table 3. Early water quality results from the pit lake at the Middle Fork of Greens Run site.

Sampling Station	US Slag Check Dam	DS Slag Check Dam
pH	2.7	10.5
acidity	1087.2	0.0
alkalinity	0.0	43.0
acid-alk	1087.9	-43.0
Mg	23.9	1.3
Ca	63.7	20.4
Fe	255.0	0.1
Al	51.6	0.3
Mn	3.6	BDL
Cond	4170.0	171.0

BDL= Below Detection Limit

Direct Treatment: Slag Leach Bed (SLB): Example – the McCarty Highwall Project West Va. (Simmons and Zeimkiewicz, 2003)



Advantages of Steel Slag

- Low cost alkalinity source
- Will <u>not</u> degrade in time due to reaction with carbon dioxide as per hydrated lime:

  $$Ca(OH)_2 + CO_{2(g)} \dashrightarrow CaCO_3 + H_20$$

  allowing long-term storage without degradation.
- Can produce extreme alkalinity to offset acidity from highly acidic discharges.
- Extremely High Neutralization Potential (NP)
- Can precipitate Manganese and many trace metals.

In-Stream Additions as Limestone Replacement: Example – Middle Fork of Greens Run, West Va. (Simmons and Zeimkiewicz, 2003)

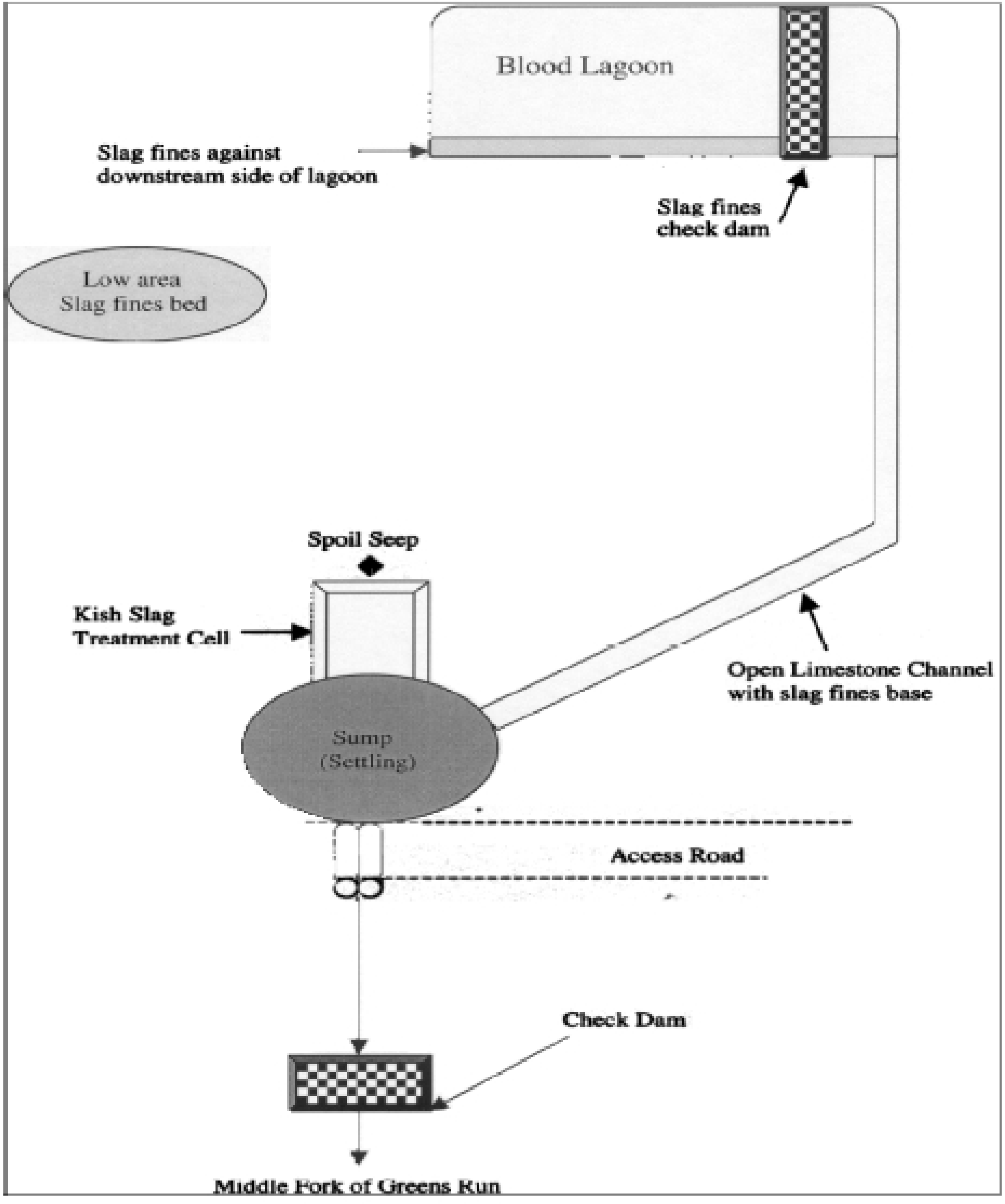


Table 3. Early water quality results from the pit lake at the Middle Fork of Greens Run site.

Sampling Station	US Slag Check Dam	DS Slag Check Dam
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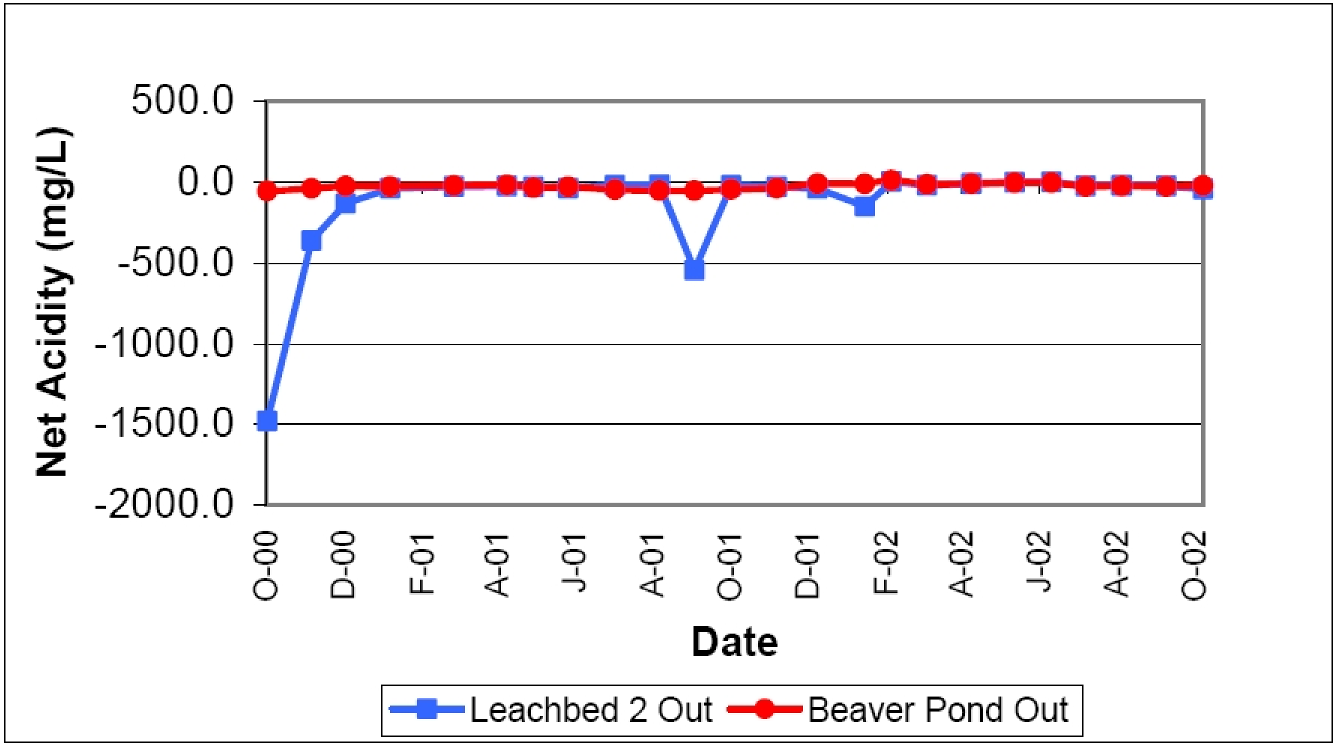
Ca	63.7	20.4
Fe	255.0	0.1
Al	51.6	0.3
Mn	3.6	BDL
Cond	4170.0	171.0

BDL= Below Detection Limit

Long-term Alkalinity

Example: Middle Fork of Greens Run, West Virginia



Source: Simmons and Ziemkiewicz, 2003

High Neutralization Potential (NP)

Table 1. Neutralization potential of various steel slags.

	Neutralization Potential	
Steel Slag Type	(%)	Tons/1000 tons
C fines; Mingo Jct., OH	78	780
C fines; Weirton, WV	77	770
Slag fines ½ X 0; Weirton, WV	76	760
Fallen slag: Cartech; Reading, PA	71	710
Fallen slag: Lukens; Coatesville, PA	70	700
Recmix; Washington, PA	69	690
Slag fines - 1/8 in.; Mingo Jct., OH	66	660
EAF: Waylite; Johnstown, PA	59	590
Slag fines - 1/8 in., Hecate; Ashland, KY	59	590
Slag fines - 1/8 in., USX; Fairfield, AL	53	530

Source: Ziemkiewicz and Skousen, 1998 Source: Ziemkiewicz and Skousen, 1998

Disadvantages of Steel Slag

- Produces <u>Uncontrolled</u> Caustic Alkalinity.
- Produces High pH Conditions: amount of OH^- ions will buffer pH in discharge >>10.3 no means in a passive system to regulate pH.
- Bicarbonate alkalinity in discharge is not stable at high pH and will want to convert to the carbonate ion.

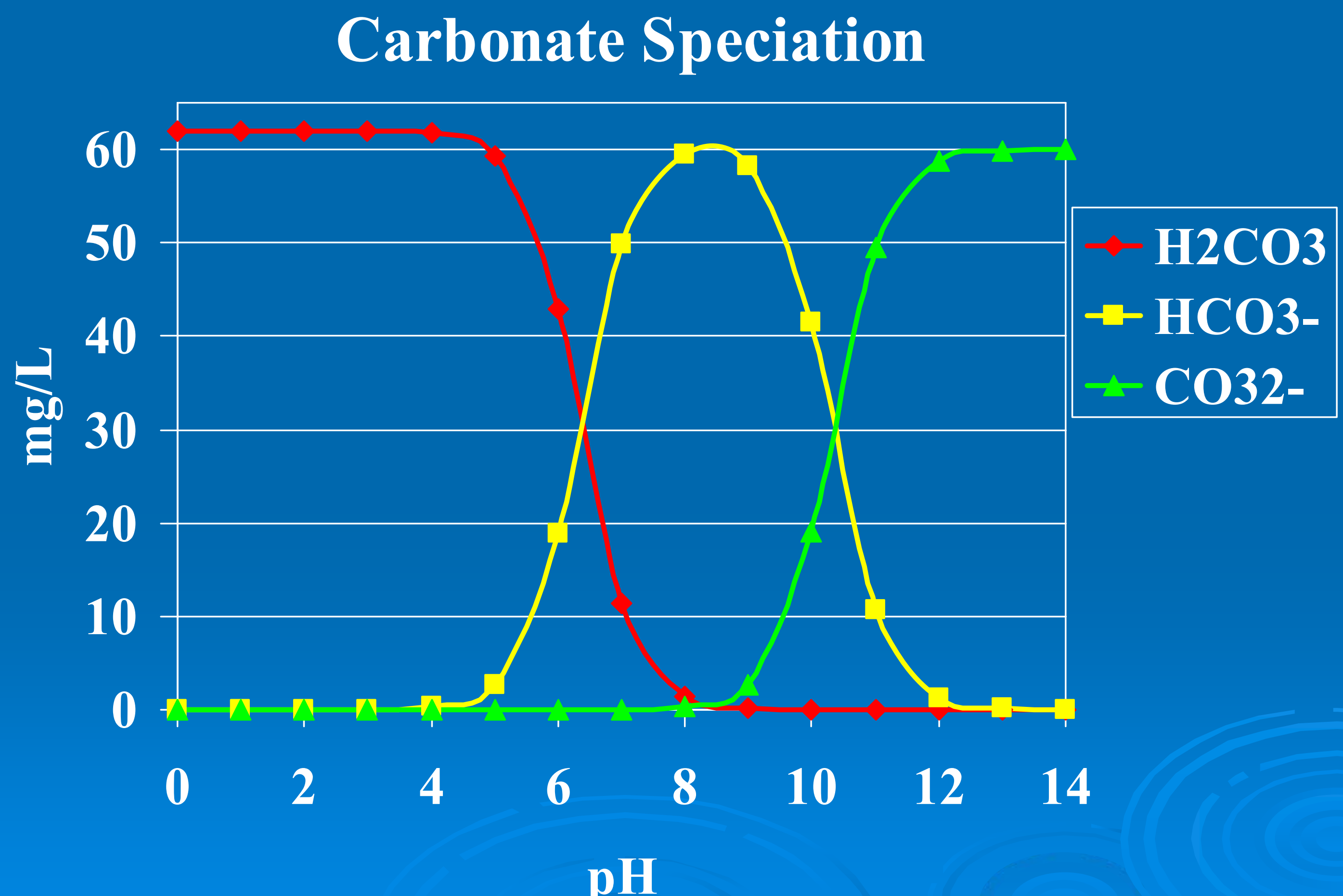
Chemistry of Carbonate System

- The carbonate system is complex because it involves numerous dissolved species:

Carbon Dioxide	Carbonic Acid	Bicarbonate	Carbonate	Acidity
CO_2	H_2CO_3	HCO_3^-	CO_3^{2-}	H^+

- The amounts of CO_2, H_2CO_3, HCO_3^- , and CO_3^{2-} in H_2O are related to one another

Caustic Alkalinity

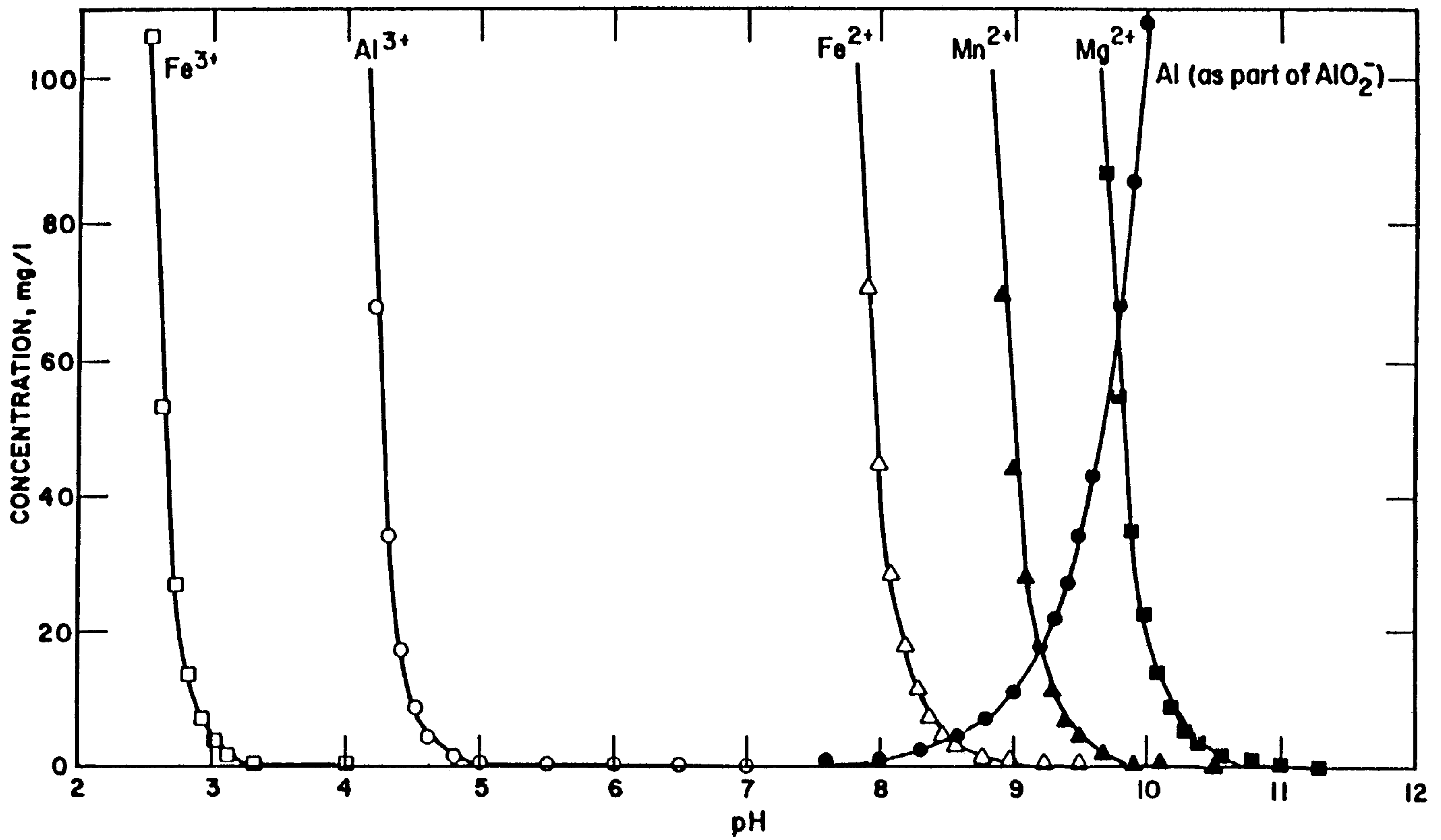


Disadvantages of Steel Slag

- Aluminum the AMD and in clay minerals of structures will be mobilized.
- Magnesium and possibly calcium will precipitate increasing sludge and sulfate problems and adding metal acidity—lowering pH.
- Metals release from the slag ? – Need to evaluate – use TCLP or SPLP tests?
- Due to caustic nature of the material: a

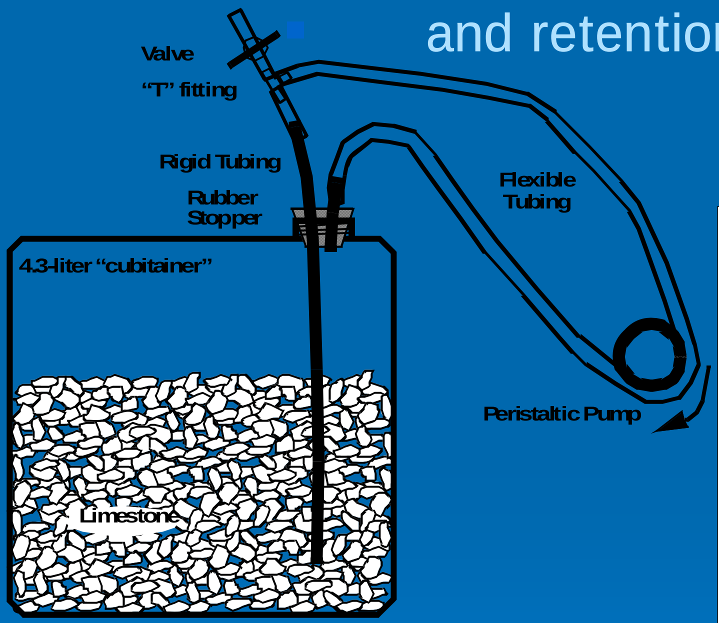
  safety liability with surface applications (eye and skin contact).

Metal Precipitation and pH

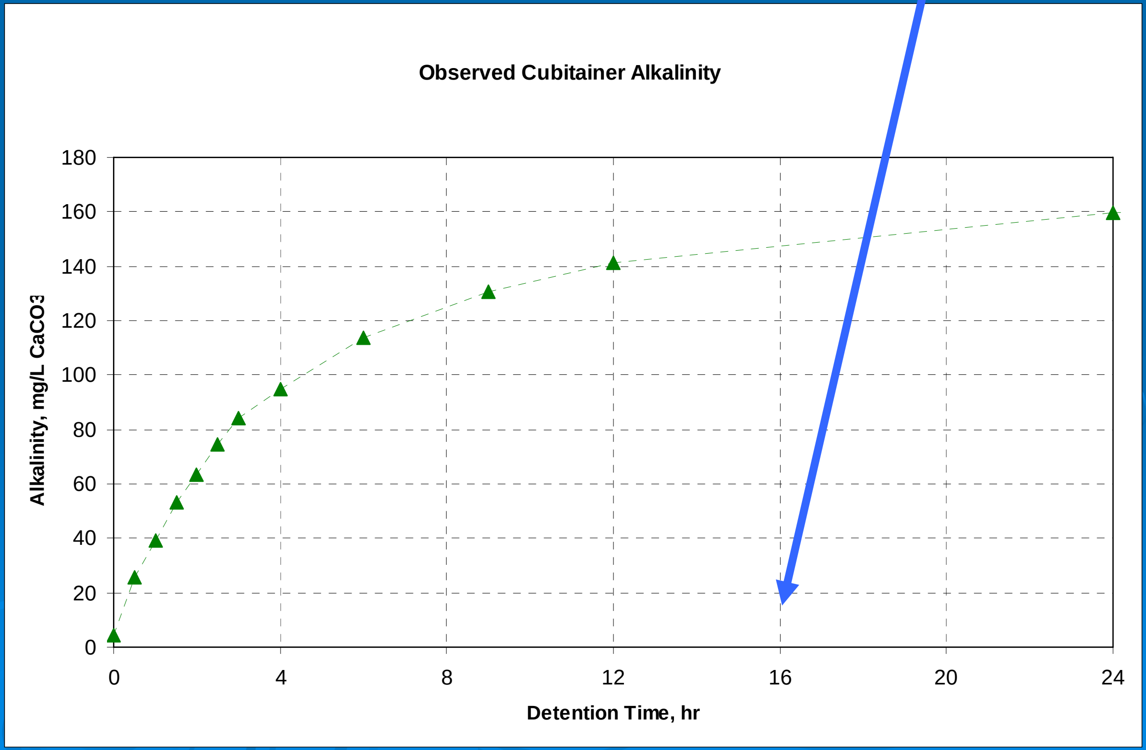


Cubitainer Tests

- Cubitainer Tests are useful for determining Alkalinity production
- and retention times.

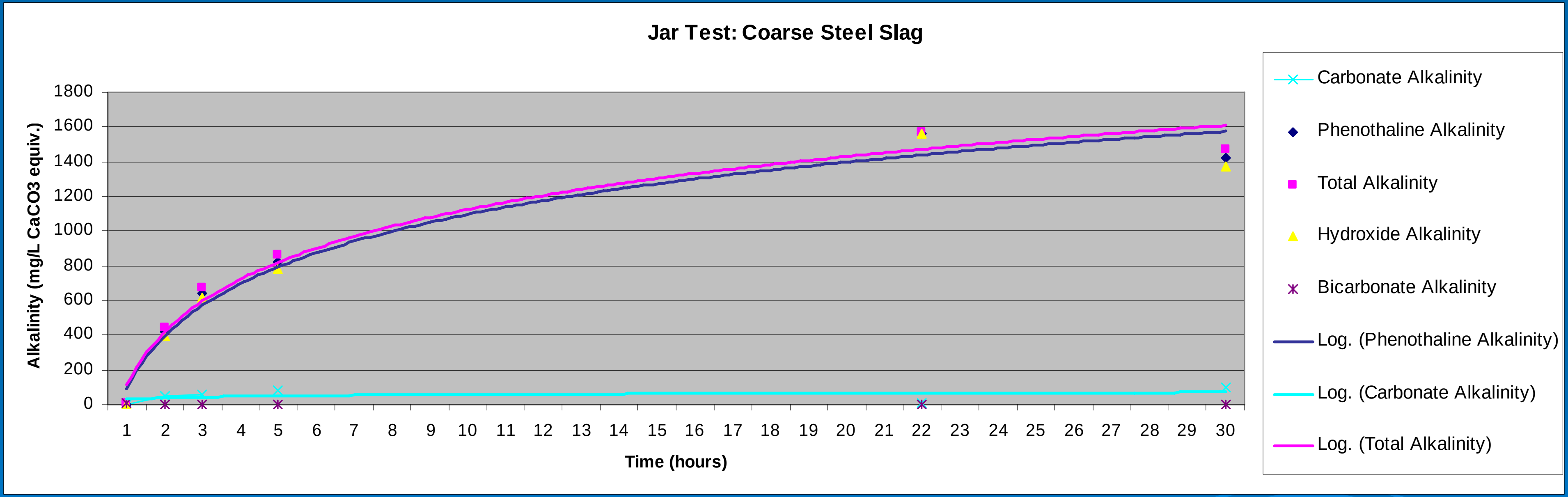


16 hrs

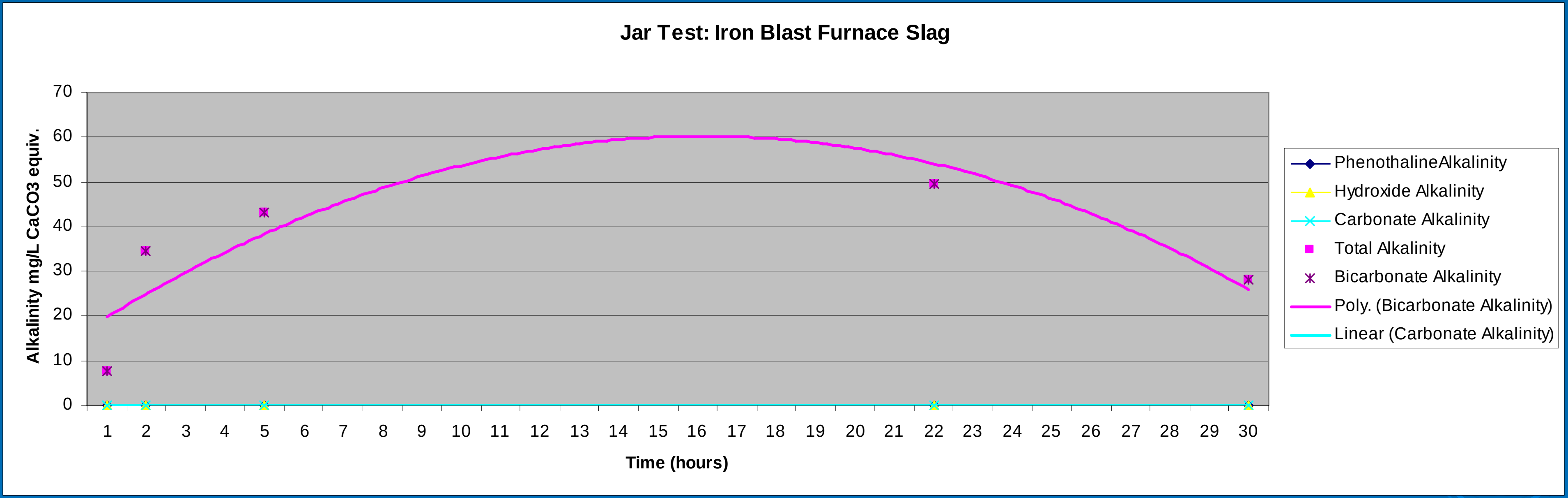


Experimental Total Alkalinity Generation Rate - Steel Slag Jar Tests: Tab Simco Project, Illinois

Experimental Component Alkalinity Generation Rates - Steel Slag Jar Tests: Tab Simco Project, Illinois



Experimental Component Alkalinity Generation Rates - Iron Slag Jar Tests: Tab Simco Project, Illinois



Example of the Results of TCLP Test on Steel Slag

Source: Ziemkiewicz and Skousen, 1998

		TCLP		EPA Drinking Water	
Mingo Junction Slag - 1/8 in.		Limit	Pass	Limit	Pass
pH	11.7				
Cond.	4780 uS/m				
alkalinity	1450 mg/L				
As	<0.05 mg/L	5 mg/L	yes	50 ug/L	yes
Se	0.05 mg/L	1 mg/L	yes	50 ug/L	yes
Ba	0.02 mg/L	100 mg/L	yes	2000 ug/L	yes
Cd	<0.001 mg/L	1 mg/L	yes	5 ug/L	yes
Cr	0.03 mg/L	5 mg/L	yes	100 ug/L	yes
Cu	0.058 mg/L				
Pb	0.1 mg/L	5 mg/L	yes	15 ug/L	yes
Ni	0.041 mg/L	70 mg/L	yes	10 ug/L	no
Zn	<0.002 mg/L	1 mg/L	yes	6 ug/L	yes
V	<0.05 mg/L				
Tl	<0.05 mg/L	7 mg/L	yes	2 ug/L	?
Be	0.0013 mg/L	0.007 mg/L	yes	4 ug/L	yes
Ti	<0.05 mg/L				
Sb	0.08 mg/L				
Mo	0.008 mg/L				
Ag	<0.005 mg/L	5 mg/L	yes		
Hg	<0.0003 mg/L	0.2 mg/L	yes		

Summary

- Applications:
  - Indirect neutralization of high acidity water.
  - Manganese and trace metal removal.
  - Hydrated lime replacement: Soil amendment.
  - Hydrated lime replacement: Alkaline addition.
- Need for TCLP and/or SPLP Testing as appropriate.
- Geographic constraints – must be near source due to shipping costs

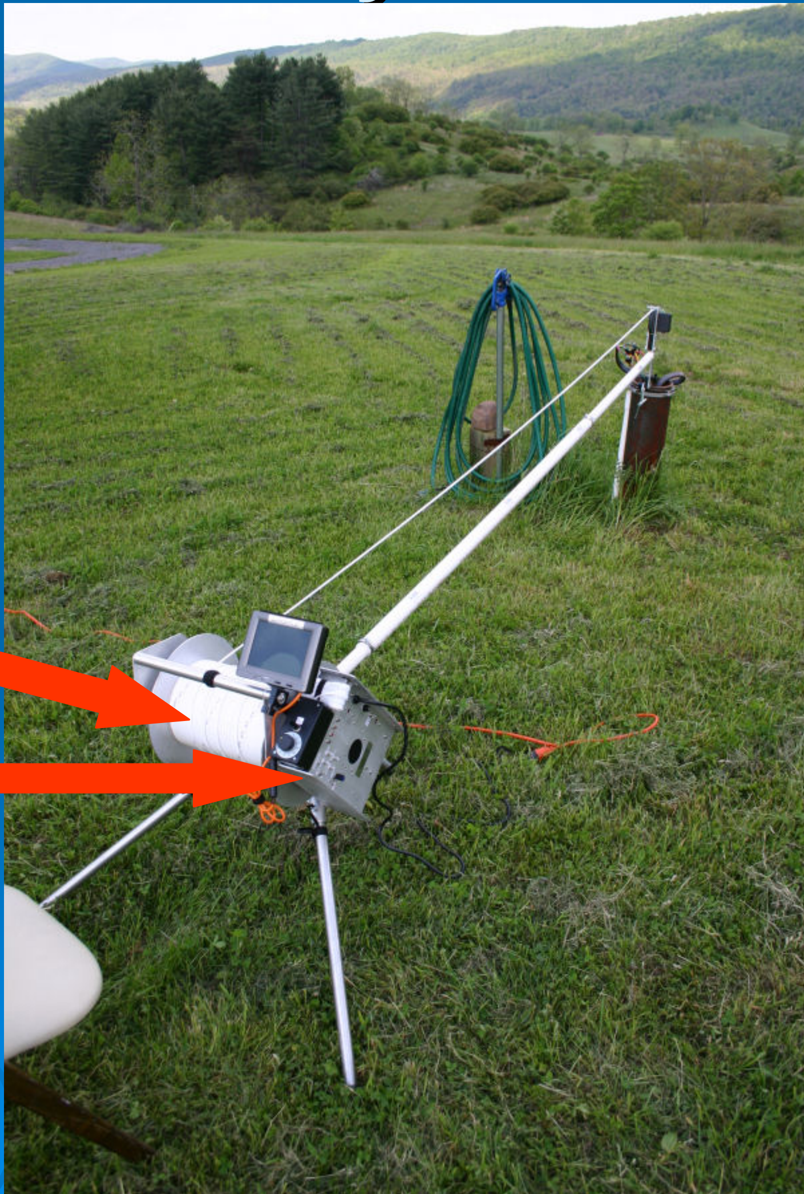
The End

MCR Borehole Camera System

Deborah A. Dale, Hydrogeologist
U. S. Dept. of the Interior
Office of Surface Mining
MCR – Alton, IL

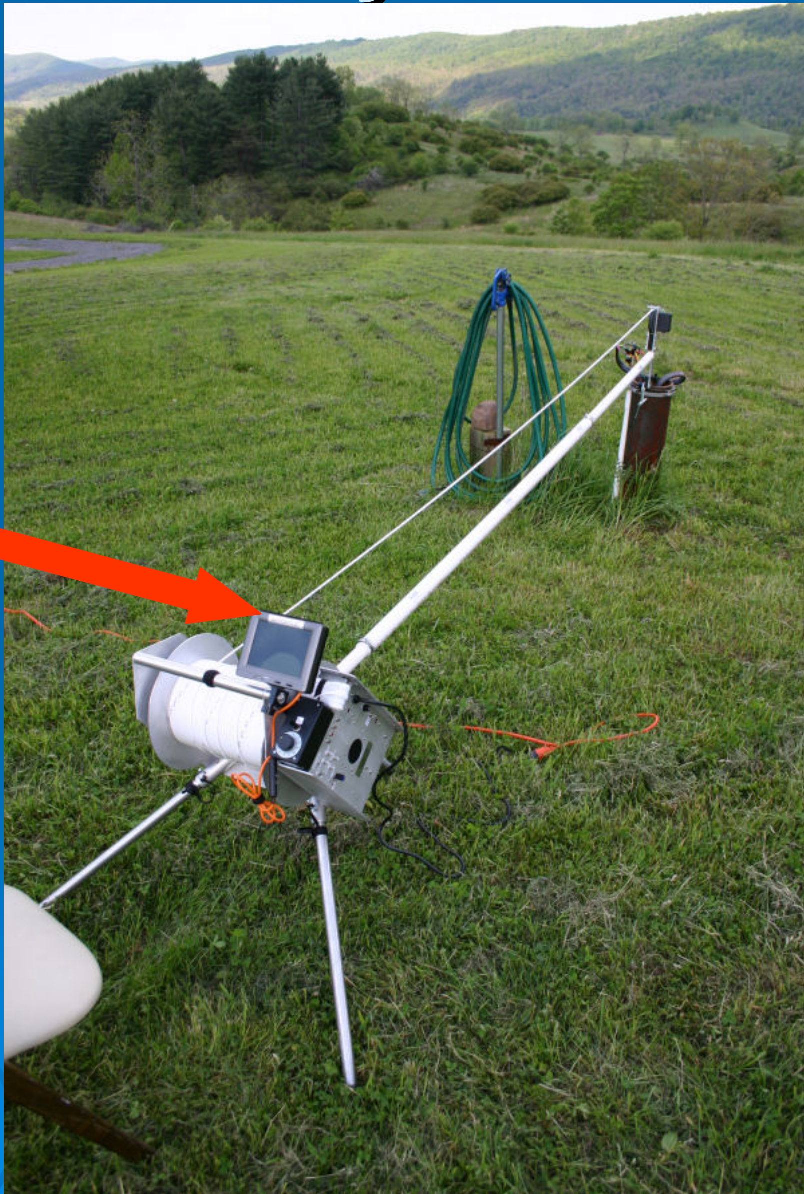
MCR Borehole Camera System

- **GeoVISION™ Jr Deluxe borehole video camera system purchased by OSM-MCR in August of 2006**
  - ✓ **Motorized wench system with 1,000 ft cable (polyethylene coated, footage marked at 1-ft intervals)**
  - ✓ **System Power Supply (system powered from a 120-240 VAC 50-60 Hz sine wave source)**



MCR Borehole Camera System

- **GeoVISION™ Jr Deluxe borehole video camera system purchased by OSM-MCR in August of 2006**
  - ✓ **Sony Digital8® Video Walkman monitor & recorder**



MCR Borehole Camera System

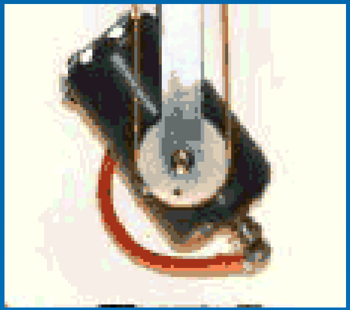
MCR Borehole Camera System

- ✓ Color camera
  - Water proof PVC housing
  - Built-in white LED lights
  - Manual camera-tilting attachment
  - 1 5/8” diameter, 3 1/4” long

MCR Borehole Camera System

✓ **Color camera**

- **Water proof PVC housing**
- **Built-in white LED lights**
- **Manual camera-tilting attachment**
- **1 5/8” diameter, 3 1/4” long**



✓ **Black & white Ultra Low Light**

- **Water proof PVC housing**
- **Built-in white LED lights**
- **Manual camera-tilting attachment**
- **1 1/2” diameter, 2 1/2” long**
- **Particularly useful in mines & large boreholes**
- **LED lights only - 5” to 10 ft or more**


0089 FT

Actual footage from Arkansas shafts

OSM/EPA Rulemaking on CCBs

KIMERY C VORIES

OFFICE OF SURFACE MINING

ACTIVE COAL MINE APPLICATIONS UNDER TITLE V SMCRA

ALKALINE SEAL TO PREVENT ACID MINE DRAINAGE

CONSTRUCTION MATERIAL AS COMPACT DURABLE BASE

Mine Road Building (Before Ash)

Mine Road Building (During)

Mine Road Building (After Ash)

NON-TOXIC FILL
TO REDUCE RECLAMATION COST

Mine Fill with Ash

ABANDONED MINE LAND APPLICATIONS EITHER SMCRA FUNDED OR STATE FUNDED

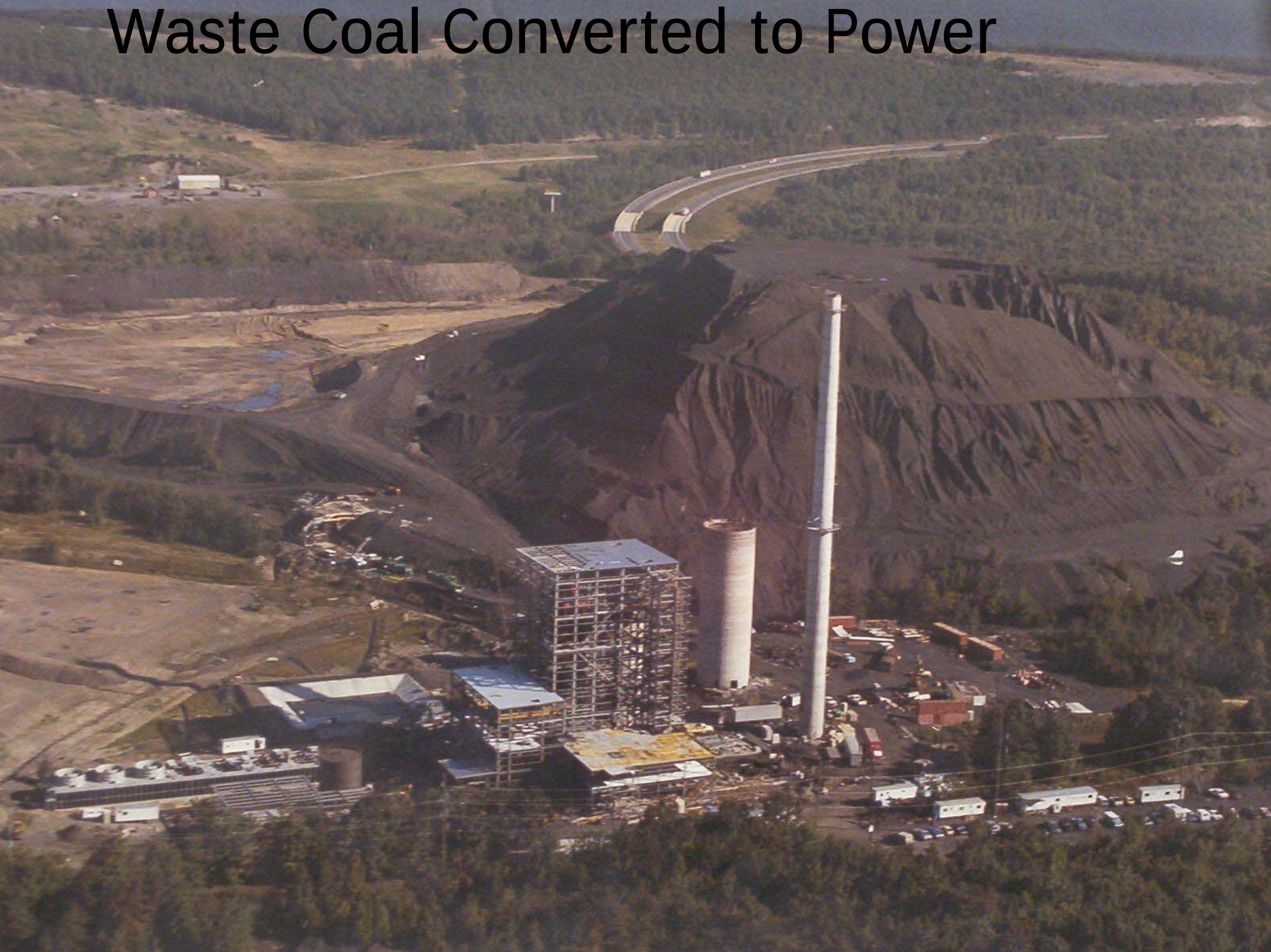
ALKALINE FILL
FOR ACID AML PIT

SOIL SUBSTITUTE FOR AML RECLAMATION

ASH GROUTING FOR AMD ABATEMENT OR SUBSIDENCE CONTROL

STATE FUNDED AML PROJECTS

Waste Coal Converted to Power



AML Reclamation with FBC Ash

AML Ash and Harbor Dredge Fill (Before)

AML Ash & Harbor Dredge Fill (After Reclamation)

STATE RCRA PROGRAMS

- NORTH DAKOTA RELEASES FINAL PITS FROM SMCRA MINES UNDER AN INDUSTRIAL LAND USE WHERE IT IS RELEASED AS A SOLID WASTE LANDFILL REGULATED BY THE STATE SOLID WASTE PROGRAM FOR DISPOSAL OF CCBs.

Mine Placement Economic Realities

Limited to:

- Low transportation cost situations
  - Mine mouth power plants
- Small power plants without RCRA disposal facilities
- Beneficial applications

Volumes of CCBs Placed at Mines

- Around 1.4% of all generated CCBs placed in mines
- CCBs placed equal to 0.15% of coal mined nationally
- Beneficial use cases: maximum 5% of coal volume replacement
- Mine mouth power plants: maximum 25% of coal volume

Regulatory History

- 1988 EPA Report to Congress
  - No Subtitle C regulations needed
- 2000 EPA Regulatory Determination
  - No Subtitle C regulations needed
  - RCRA, SMCRA or a combination

SMCRA
Regulatory Background

- No explicit regulatory provisions related to CCBs in SMCRA
- CCB placement subject to all permitting and performance requirements

OSM Rulemaking Process

- Advanced Notice of Proposed Rulemaking (March 14, 2007)
- Proposed Rulemaking (2007)
- Final Rulemaking (2008)

ANPR

- Seeking comments on intention to propose rule
  - Looking for input on what rule should address
  - Will not commit OSM to a single direction, but will announce our intention to regulate under the authority of SMCRA

Active Mining Rules

- Title V
  - Permitting
  - Bonding
  - Monitoring
  - Performance Standards
  - OSM rules will be based on existing SMCRA authorities (not RCRA)
  - Rules will draw from existing regulations whenever possible
  - Rules will collect authority into one place and make implicit requirements explicit

AML Rules

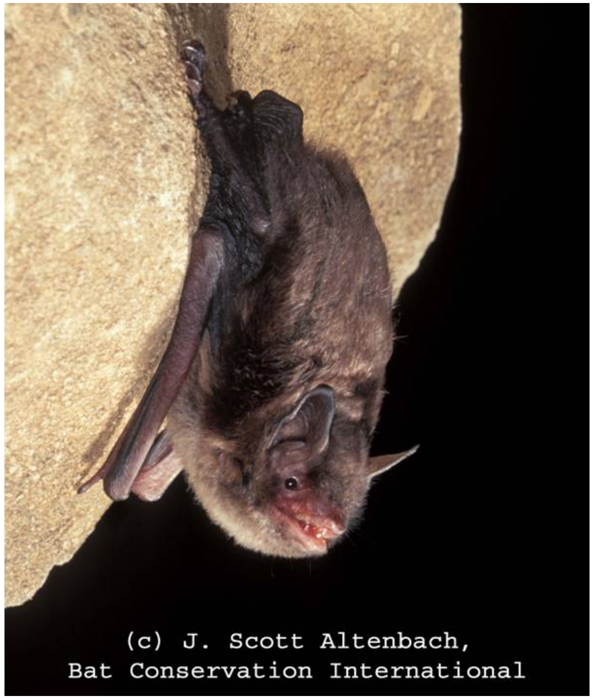
- Title IV (AML)
  - Limited to sites using AML Fund monies
  - Information requirements
  - Analysis/Design requirements

EPA Rulemaking

- RCRA Rules for Utility CCB Impoundments and Landfills.

T & E ISSUES IN SMCRA

THE INDIANA BAT



KIMERY VORIES
OSM
ALTON, IL

TITLE IV

- Requires T & E Section 7 USFWS Consultation

Title V

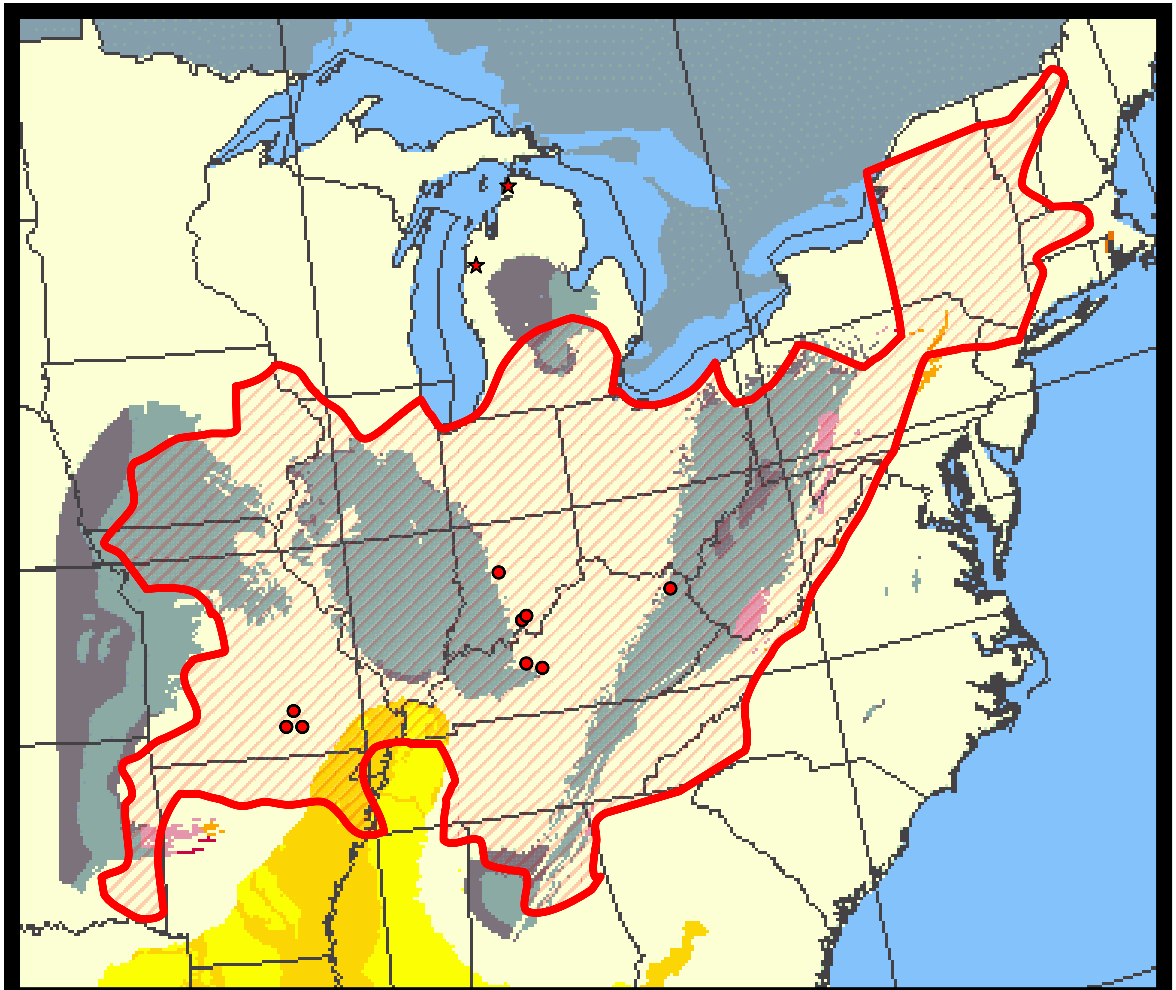
- Must follow 1996 USFWS/OSM Biological Agreement

1996 OSM/USFWS Biological Opinion

- SMCRA Permits “Not likely to Jeopardize”
  - Include provision for “incidental take”
  - Terms & Conditions to minimize “incidental take”
  - USFWS recommend species specific measures to RA
  - Use chain of command for RA disagreements about USFWS species specific measures

U.S. Fish & Wildlife Service

Range of the Indiana Bat (*Myotis sodalis*)
in relation to Eastern U.S. Coal Fields



Approximate Indiana Bat Composite Range (summer and winter)

Isolated Record

Priority I Hibernacula (>30,000 bats since 1960)

Anthracite (potentially minable)

Lignite (potentially minable)

Low Volatile Bituminous (potentially minable)

Medium and High Volatile Bituminous (potentially minable)

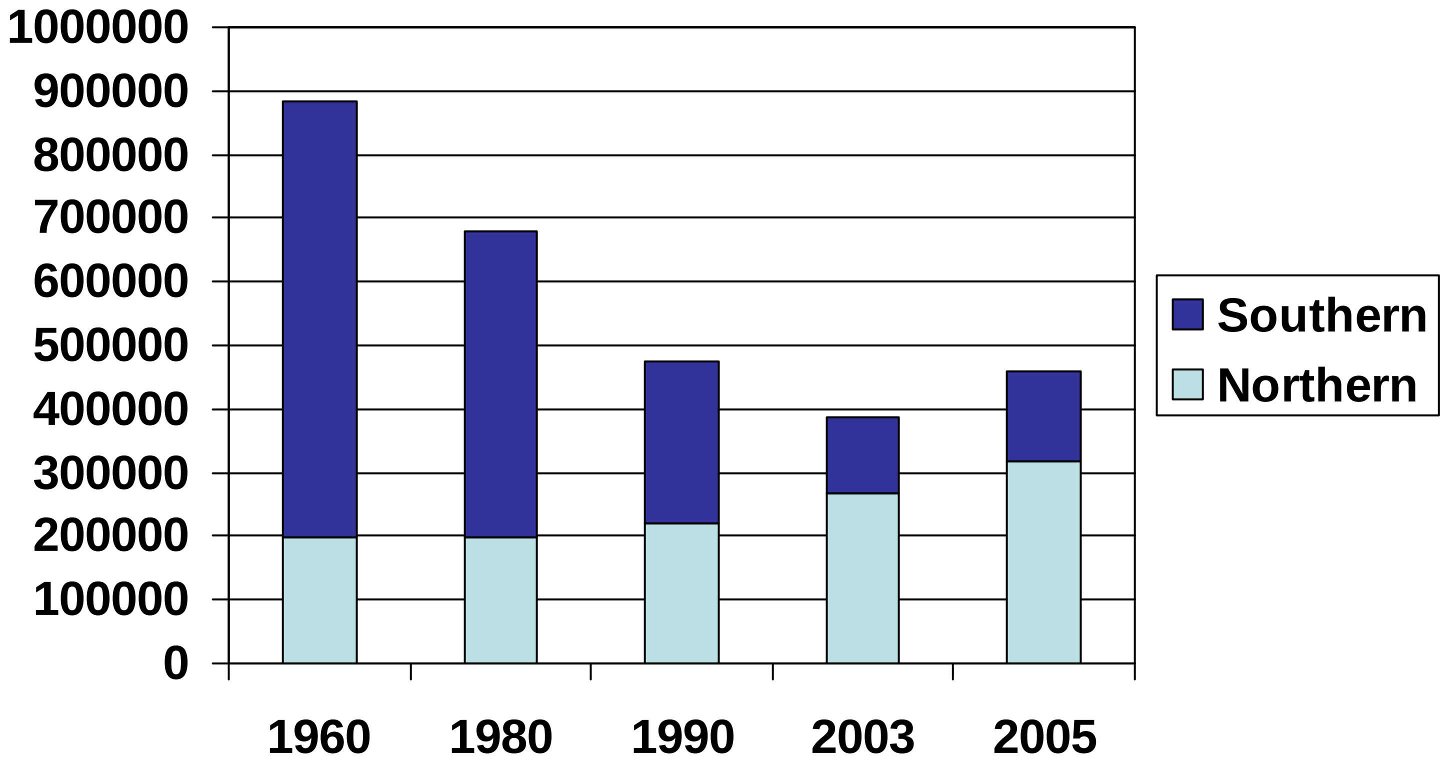
Medium and High Volatile Bituminous (other uses)

Bat Conservation International

Coal field and Indiana bat range (based on data compiled by Bat Conservation International) boundaries were accessed via The National Atlas of the United States (http://nationalatlas.gov). Map prepared by Andrew King, Bloomington, Indiana Field Office, U.S. Fish and Wildlife Service.

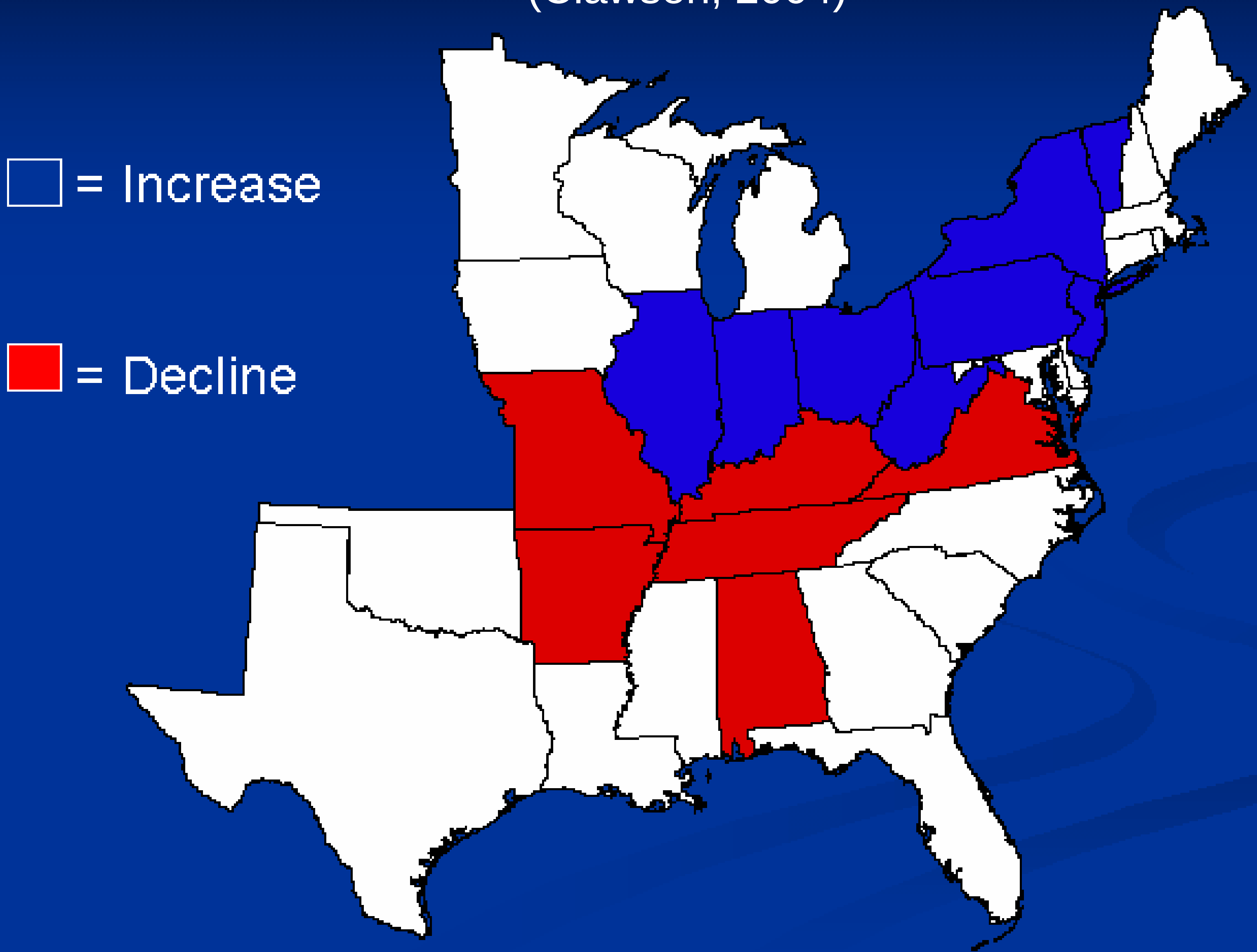
Range Wide Population of Indiana Bats

(Clawson, 2004) (King, 2005)



State Population Trends

(Clawson, 2004)



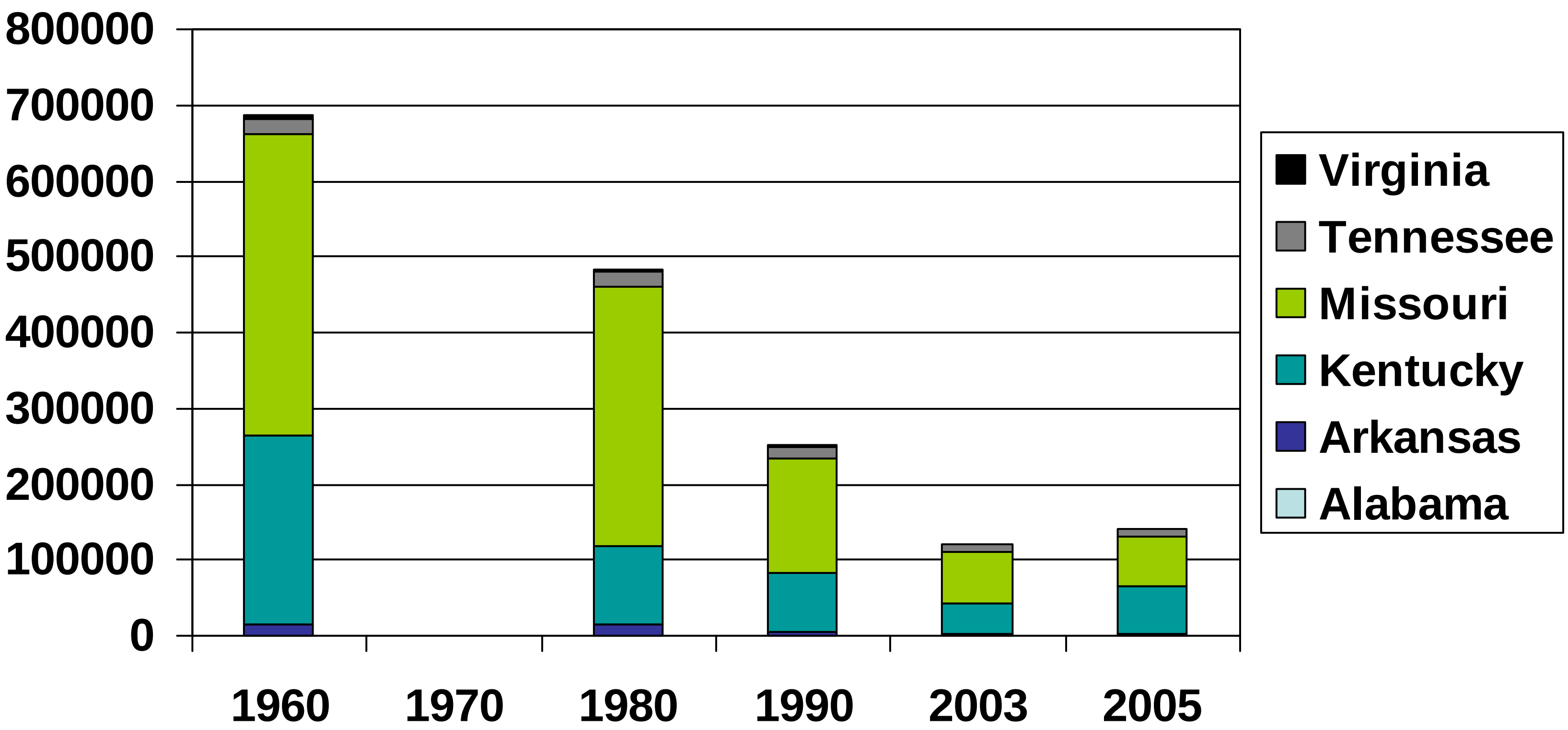
Southern Region Hibernacula

(Clawson, 2004) (King, 2005)

	1960/1970	~ 1980	~ 1990	2003	2005
Alabama	350	350	350	320	296
Arkansas	15,000	15,000	4,500	2,120	2,067
Kentucky	248,100	102,200	78,700	41,500	63,339
Missouri	399,000	342,000	150,100	66,800	65,104
Tennessee	20,100	20,100	16,400	8,900	9,971
Virginia	3,100	2,500	1,900	1,080	735
Totals	685,650	482,150	251,950	120,720	141,512

Southern Region Population of Indiana Bats

(Clawson, 2004) (King, 2005)



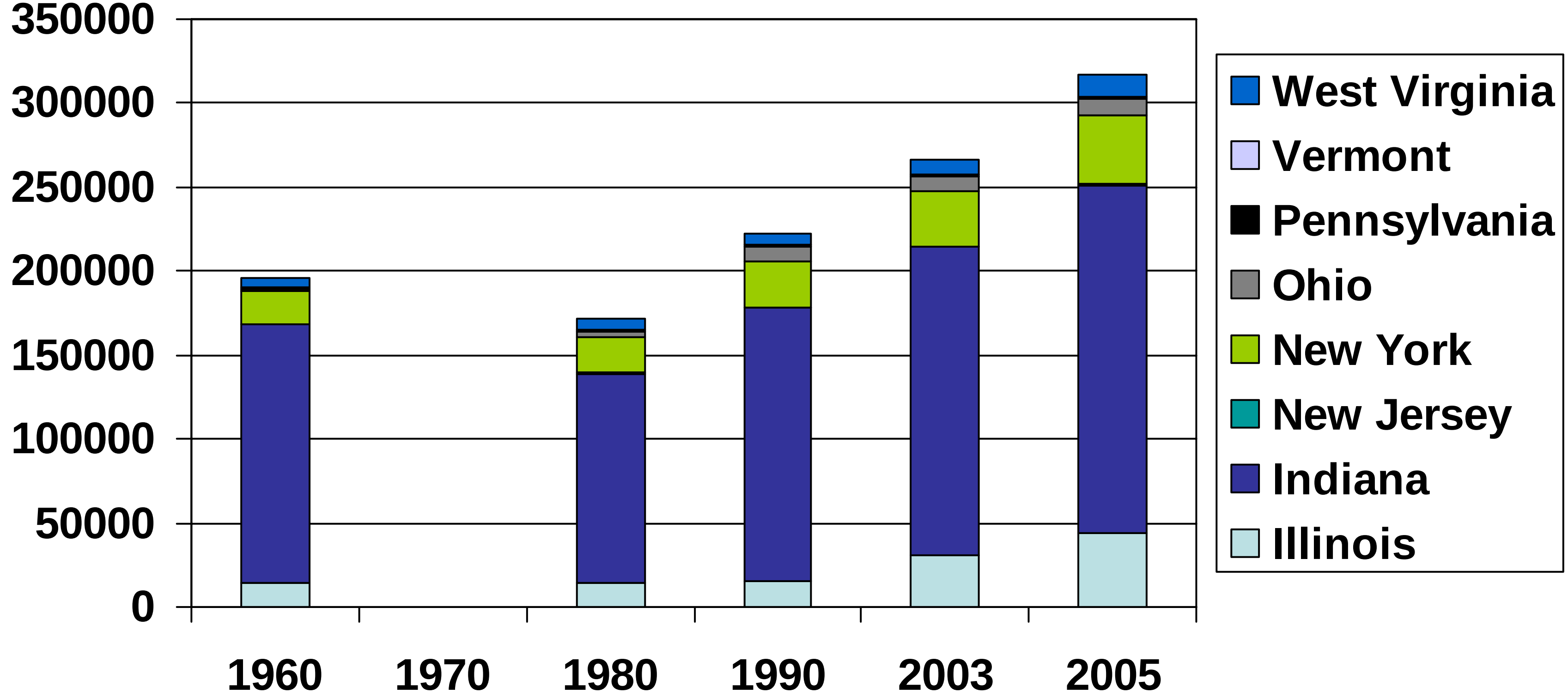
Northern Region Hibernacula

(Clawson, 2004) (King, 2005)

	1960/1970	~ 1980	~ 1990	2003	2005
Illinois	14,800	14,800	14,900	30,850	44,343
Indiana	153,600	124,400	163,500	183,330	206,609
New Jersey	110	110	110	110	652
New York	20,200	21,100	26,800	32,920	41,702
Ohio	9,500	9,500	9,500	9,440	9,769
Pennsylvania	700	700	400	790	746
Vermont	310	310	310	310	297
West Virginia	6,500	6,500	6,500	8,830	12,677
Totals	205,720	177,420	222,020	266,580	316,795

Northern Region Population of Indiana Bats

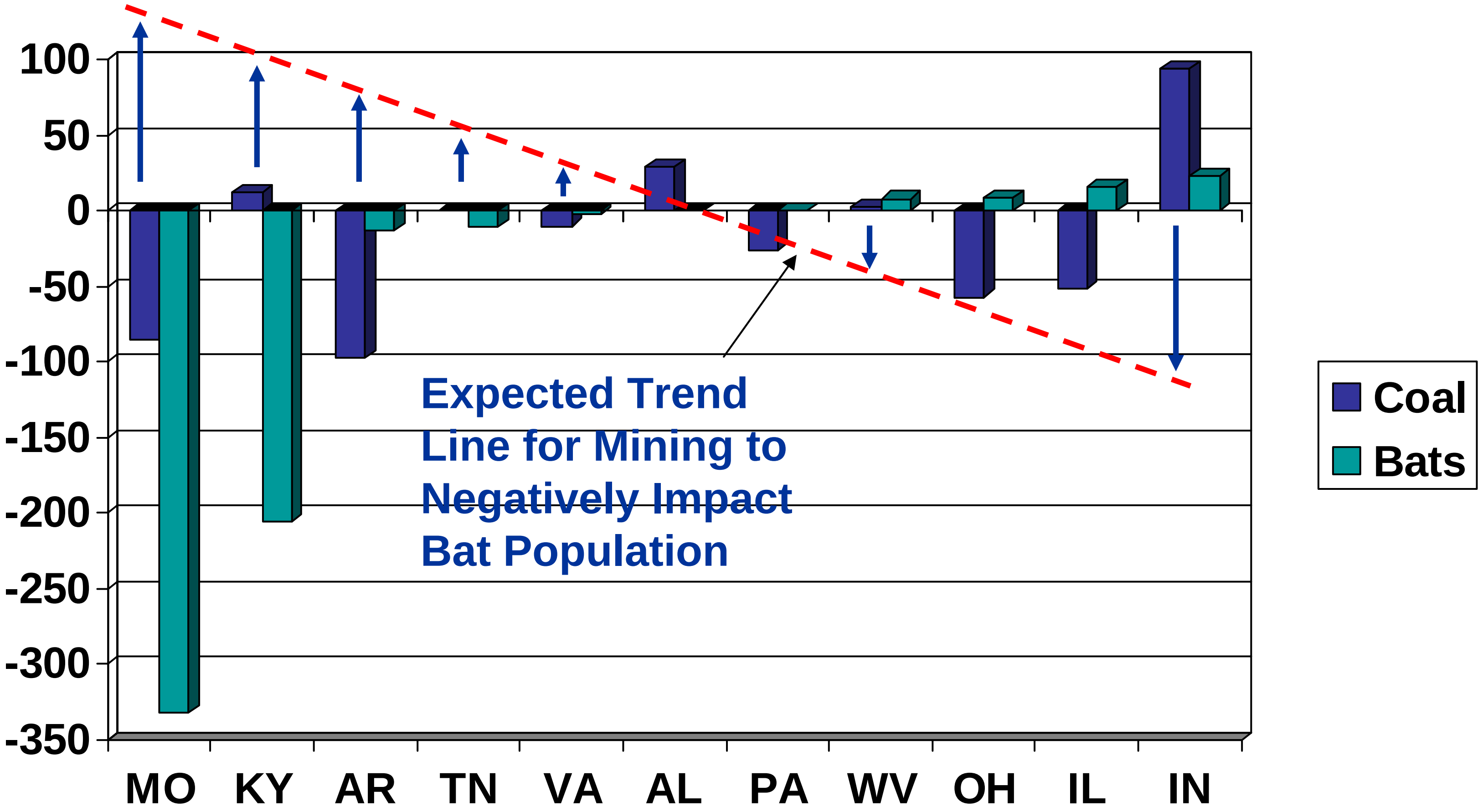
(Clawson, 2004) (King, 2005)



TREND ANALYSIS

- BAT POPULATION CHANGE VERSUS PERCENT COAL PRODUCTION CHANGE AS AN INDICATOR OF RATE OF GROWTH OR DECLINE IN COAL MINING ACTIVITY

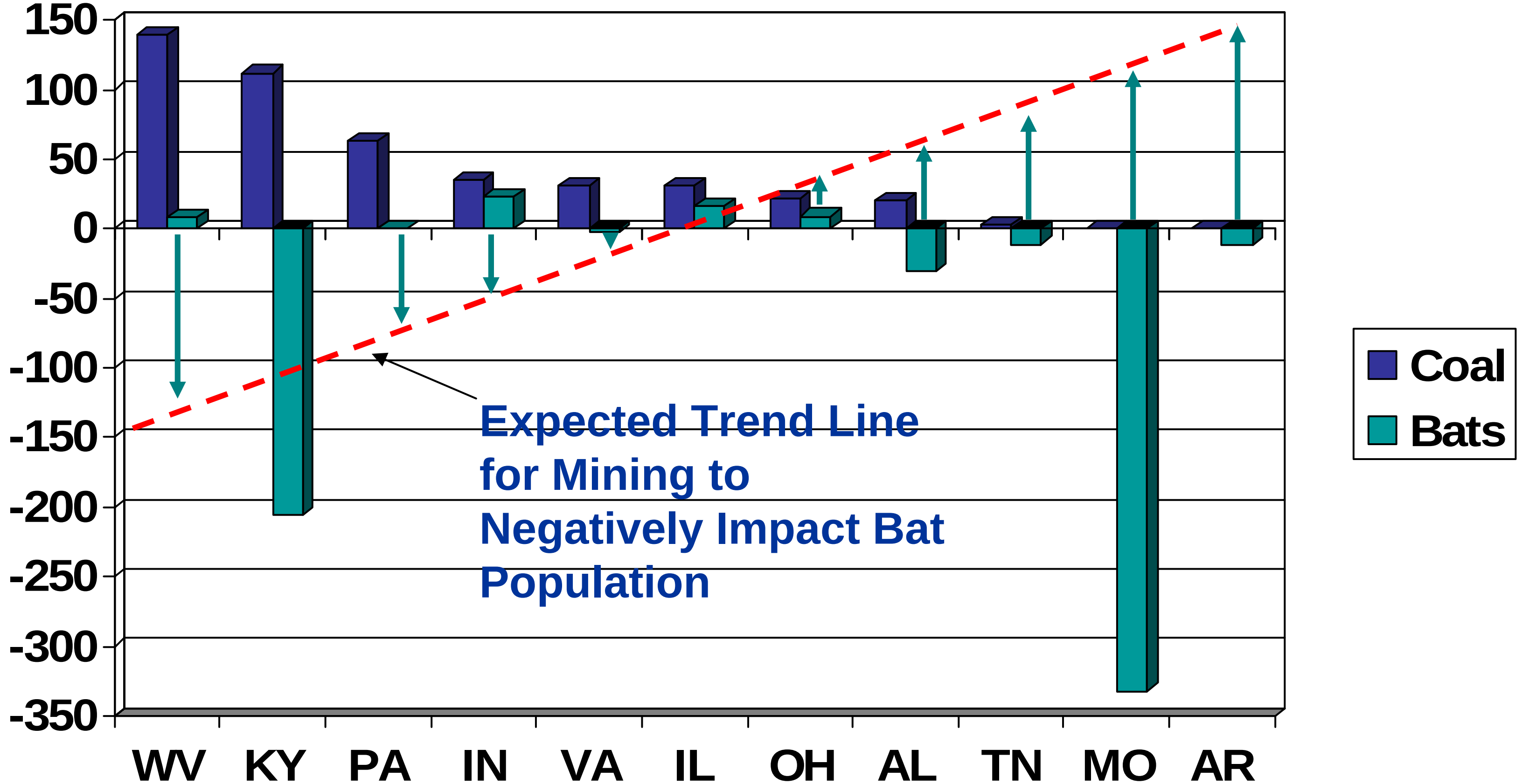
IN BAT POPULATION CHANGE (Thousands) VERSUS (%) CHANGE IN COAL PRODUCTION 1960-2003 by State



TREND ANALYSIS

- POPULATION CHANGE VERSUS TOTAL COAL PRODUCTION AS AN INDICATOR OF THE INFLUENCE OF A LARGE VERSUS SMALL STATE COAL MINING INDUSTRY

2003 TOTAL COAL PRODUCTION BY STATE (Millions of Tons) VERSUS IN BAT POPULATION CHANGE (Thousands)



RESULTS

- NO CORRELATION COULD BE IDENTIFIED BETWEEN CHANGES IN INDIANA BAT POPULATIONS AND ASPECTS OF COAL PRODUCTION OR MINING METHOD EITHER POSITIVE OR NEGATIVE.

IN Bat Review of T & E Status

- USFWS 5 Year Review of T & E Status 9/21/2006
  - OSM Recommendations 12/14/2006
    - USFWS Conduct Research to determine actual cause of population decline/increase
    - OSM & USFWS cooperate to determine actual impact of coal mining on bat populations
    - OSM/USFWS/States partner to determine appropriate conservation measures under authority of SMCRA and the 1996 Biological Opinion

USFWS Revised Recovery Plan

- Original Published 1976 & Revised in 1983
- USFWS Notified OSM 8/24/2005 that a revised plan was to be published by February 2006 at the latest.
- USFWS currently not certain when or if the plan will be published.

OSM IN Bat
Recovery Plan Workshop

- October 2005 OSM IN Bat Steering Committee Plans for Recovery Plan Workshop in May or 2006.
- Workshop dates revised several times before it was put on indefinite hold early in 2007.

Workshop Goals

- Communicate latest status of Indiana Bat Populations, Revised Recovery Plan, and State SMCRA Guidance Document Development
- Develop Interest Specific Recommendations to USFWS on Recovery Plan during FR Comment Period

USFWS Critical Habitat Finding

- USFWS 3/6/2007 Rejects petition to add summer habitat as critical habitat for IN Bat. Provides evidence that summer habitat is not limiting to the species.

AL T & E Issues

- Discussion

TECHNOLOGY TRANSFER AT MCR

Mid Continent Region

Technology Transfer Team

2007 Members

- Alabama AML: Larry Barwick
- Alabama Surface Mining Commission: Randall Johnson
- Arkansas Mining Division: Greg Melton
- Illinois Office of Mines and Minerals AML: Larry Lewis
- Illinois Office of Mines and Minerals: Dean Spindler
- Indiana: John Richardson
- Indiana AML: Marvin Ellis
- Iowa Mines and Minerals Bureau: Julia Jeske
- Kansas Surface Mining Section: Tim Wilson
- Louisiana Injection and Mining Division: Dale Bergquist
- Mississippi Office of Geology: Stan Thieling
- Missouri: Clint Bishop
- Oklahoma AML: Mike Sharp
- Oklahoma Department of Mines: Tekleab Tsegay
- Texas Surface Mining and Reclamation Division: Mark Schlimgen
- OSM Mid-Continent Regional Coordinating Center (MCRCC): Kim Vories

Purpose

- To provide a forum to guide, coordinate and communicate technology development and transfer (TDT) activities in the Mid-Continent Region.

To do this, team members:

Identify technology transfer priorities based on regional needs, Communicate technology transfer activities occurring in other regions, Support and help leverage State efforts to improve methods, increase use of technology, or further the science of mining and reclamation to protect people and the environment

Review and make recommendations regarding proposed Applied Science Projects for funding by OSM.

Accomplishments

- Began meeting in 2003
- Created a Charter
- Conduct monthly meetings complete with agenda and minutes for each meeting
- Identified technology transfer concerns of State programs at that time
- Agreed on regional issues

Accomplishments Cont.

- Conducted a workshop in: Missouri on Tree Planting in 2003, Indiana on Passive Treatment of AMD in 2004, and Missouri on PHC/CHIAs in 2006.
- Completed a PHC/CHIA Resource document that should be available soon.
- Distributes monthly tec transfer calendar

Accomplishments Cont

- Reviewed and recommended projects for 2005 & 2006 OSM Applied Science Funding
- Exchanged information on Technology innovations and Tec Transfer opportunities
- Supported selected state travel requests to Tech Transfer events nationwide.
- Recommended creation of a “GIS for Mine Mapping” course which is now being offered by TIPS.

Upcoming Events

- Indiana Bat Recovery Plan Workshop (2007???)
- Alabama Tech Transfer Workshop
- Indiana Tech Transfer Workshop
- AMD Passive Treatment Workshop in Illinois (September 2007)

REGIONAL WORKSHOPS & FORUMS

DATE	EVENT TITLE	PART	VAL
1998	PRIME FARMLAND FORUM	116	3.5
1998	PRIME FARMLAND WORKSHOP	85	3.3
1998	MCR COAL SYMPOSIUM	97	3.1
1999	MCR ELECTRONIC PERMITING	56	
2003	MO REFORESTATION WORKSHOP	19	
2004	IN ACID MINE DRAINAGE WORKSHOP	34	93%
2006	MCR PHC/CHIA WORKSHOP	28	100%

YOU CAN PLAY A PART

- Communicate with your technology transfer team representative,
- In cooperation with your supervisor, work with us on technical papers, posters or presentations, (we might be able to help fund travel to technical events)
- When testing and using TIPS tools or technologies, report to your TIPS representative and document results.