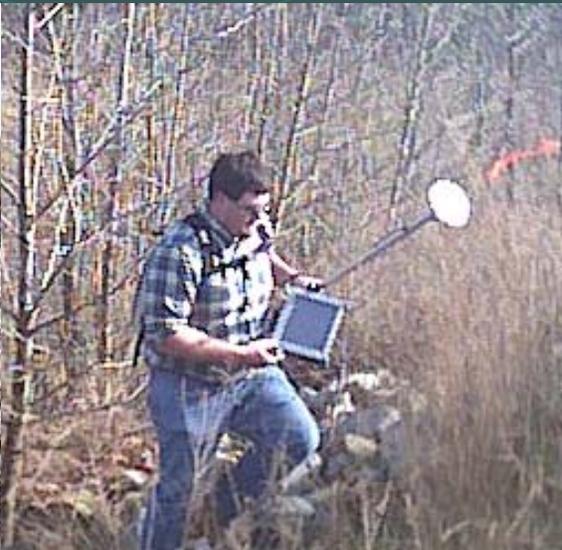




OSM Mobile Computing



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

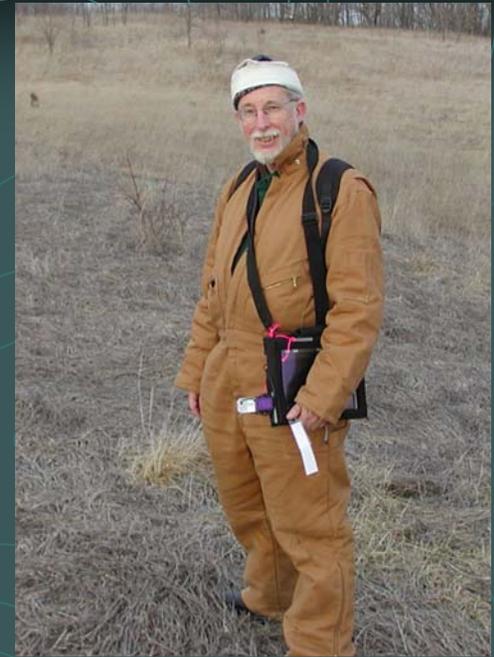
The field-centric nature of much of the Reclamationist workload offers the opportunity to provide software at the customer point-of-use.



Exciting advances in mobile computing technology from Microsoft with the 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 function computing hardware to implement CAD and GIS solutions in the field. Real time mobile mapping and computing are now a reality and many desktop based applications can now be taken to the field.



The OSM TIPS Mobile Computing Team has successfully tested field-oriented software running on mobile computing devices for both reclamation and regulatory applications under SMCRA.



Hardware

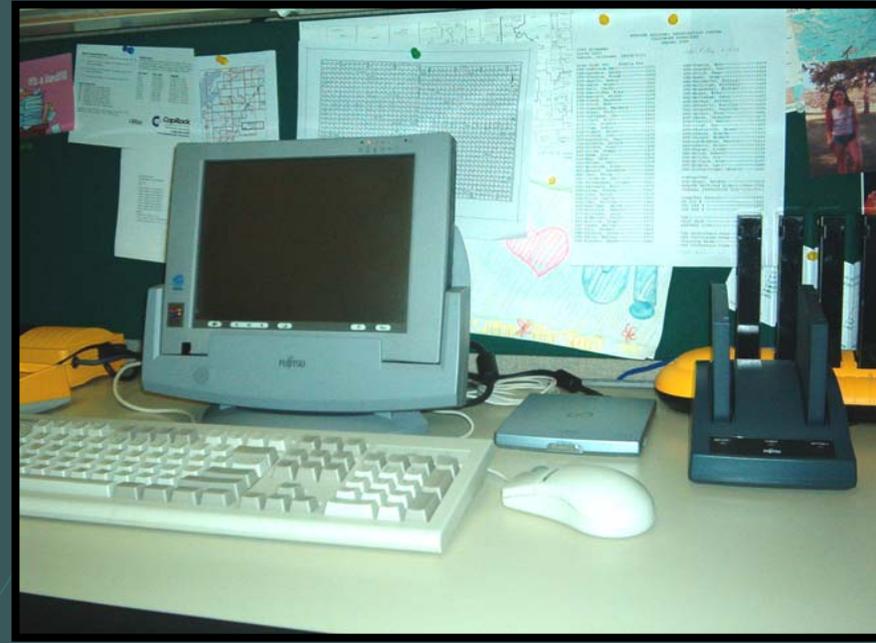


TOUGHBOOK



Fujitsu Stylistic 3500 Tablet

- Ruggedized, pen-based computer
- 3.2 lbs.
- 10.4" Reflective (Outdoor) Color LCD, Touch Screen
- 500 MHz, 256 MB RAM, 15 GB HD
- Win2000
- Int. 56K Modem, NIC in Docking Sta.
- USB, serial, IrDA v1.1, PCMCIA slot
- Sound, mic, headphone
- Hot-swap Lithium batteries
- Not waterproof



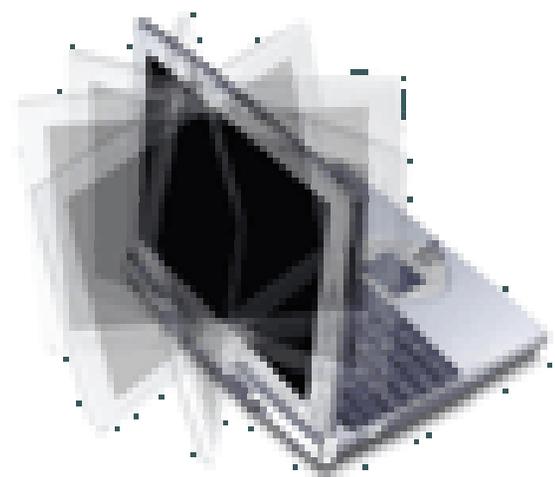
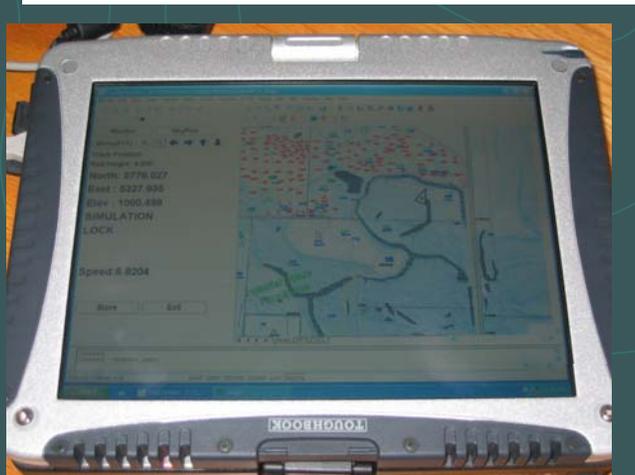
Panasonic Toughbook 18 Tablet

TOUGHBOOK 18

RUGGED, LIGHTWEIGHT, WIRELESS AND CONVERTIBLE



- Notebook PC Convertible to Tablet PC Design
- Full Magnesium Alloy Case
- 4.4 lbs. Lightweight Design
- Integrated Wireless WAN, LAN and GPS
- Intel® Centrino™ Mobile Technology
 - Intel® Pentium® M Processor 900 MHz
 - Intel® 855GM Graphic Controller
 - Intel® PRO/Wireless Network Connection 802.11b



Fujitsu Stylistic 4121 Tablet

- Ultra Low Voltage Mobile Intel® Pentium® III Processor 933 MHz – M
- Microsoft® Windows® XP Tablet PC Edition
- 10.4" XGA TFT with indoor/outdoor display
- 256-768 MB SDRAM memory
- 60 GB hard drive
- Built-in wireless LAN (802.11b), 10/100 Base-TX Ethernet
- One-year International Limited Warranty



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 drive¹
- Built-in 10/100/1000 Base-T/TX Ethernet
- One-year International Limited Warranty



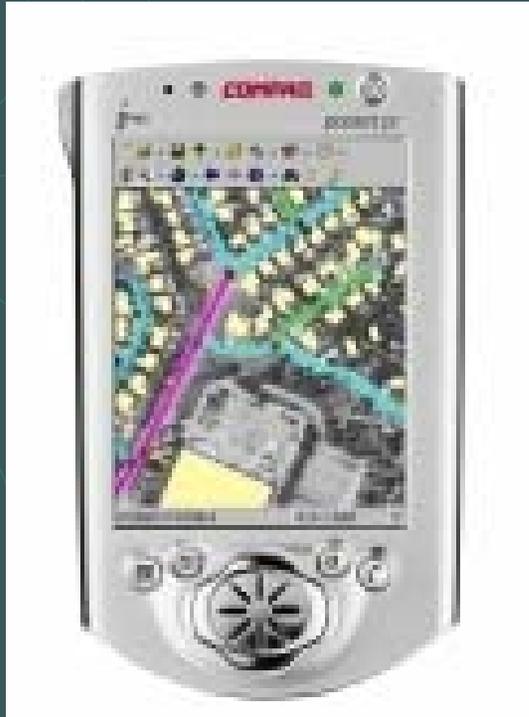
Bump case and the Harsh Environment Case for the Fujitsu Tablets



New Otterbox case for the Fujitsu Stylistic 4000 and 5000 Tablets



Compaq iPAQ Microsoft Mobile OS



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



GPS WAAS Enabled Compact Flash Cards

GPS Compact Flash GPS Receiver

- WAAS enabled
- Built-in antenna
- Low Power consumption-
- 12 channel GPS
- NMEA compliant
- Works with PDA's and Tablets



Teletype Bluetooth WAAS GPS

- WAAS Enabled, 12 Channel GPS Receiver
- Bluetooth wireless operation up to 30 feet between GPS receiver and Tablet or PDA
- Compatible with Bluetooth enabled Tablets and PDA's
- "Pager-sized" device – looks and feels like a pager – small and lightweight.



Trimble Geo Explorer 3 with BoB

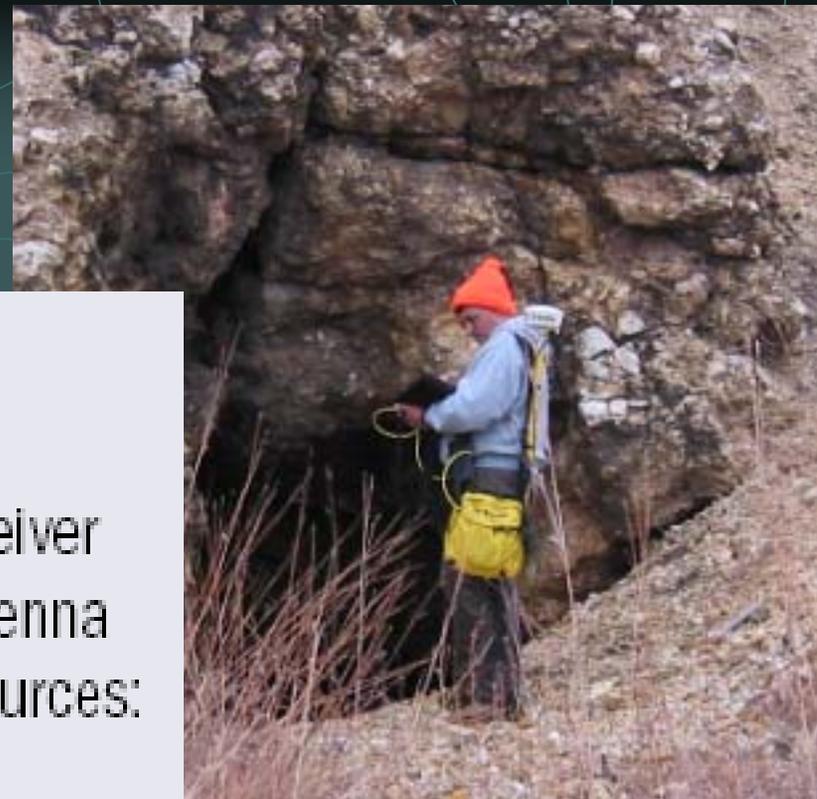


Trimble ProXR

Standard features

GPS

- Integrated GPS/beacon/SBAS receiver
- Integrated GPS/beacon/SBAS antenna
- Real-time differential correction sources:
 - Coast Guard radiobeacon
 - WAAS¹
- EVEREST multipath rejection technology
- RTCM input/output
- NMEA output
- Base station mode



Trimble ProXRS

Standard features

GPS

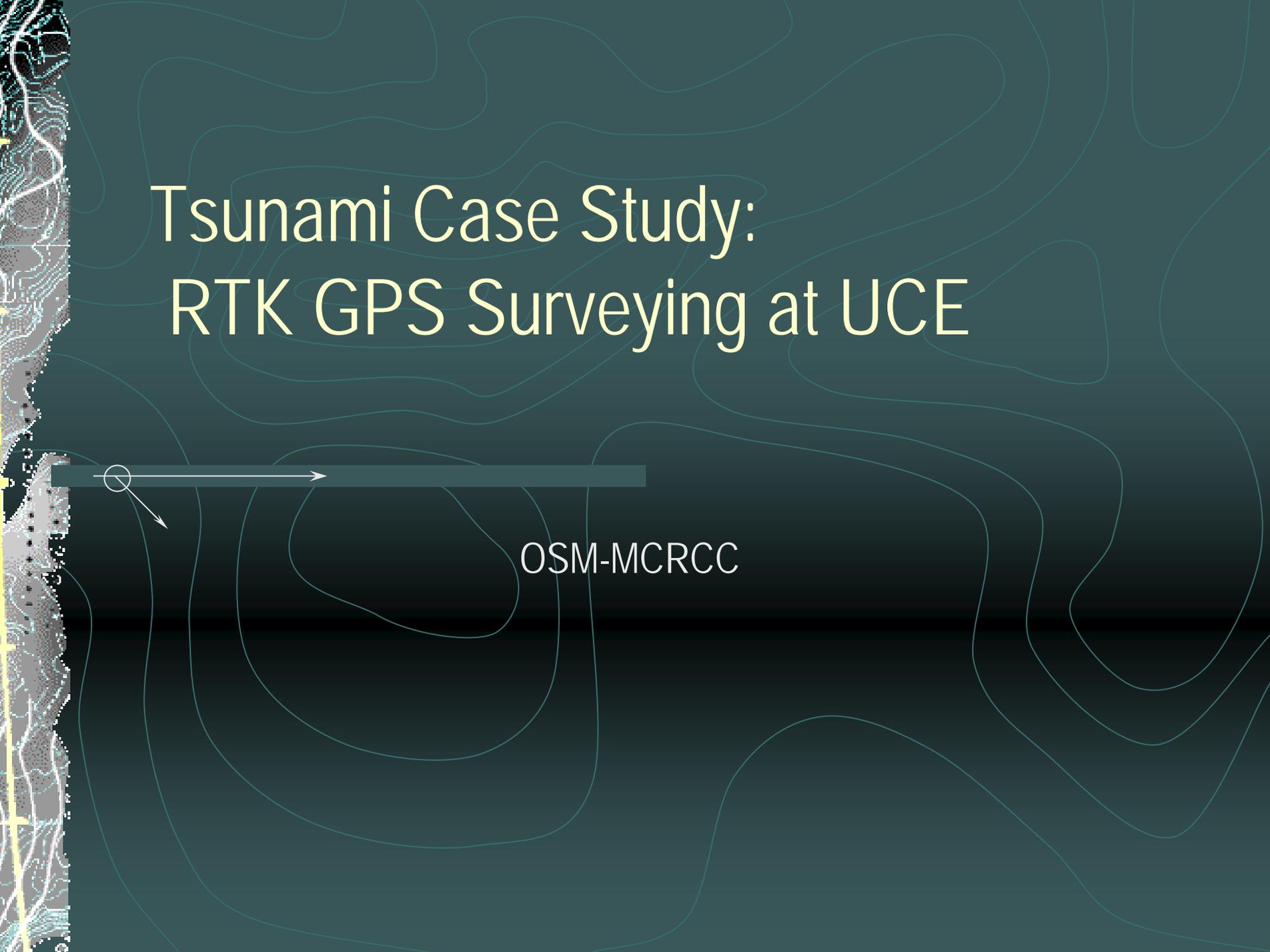
- Integrated GPS/beacon/satellite/SBAS receiver
- Integrated GPS/beacon/satellite/SBAS antenna
- Real-time differential correction sources:
 - Coast Guard radiobeacon
 - OmniSTAR satellite
 - LandStar satellite
 - WAAS¹
- EVEREST multipath rejection technology
- RTCM input/output
- NMEA output
- Base station mode



RTK - Leica System 500



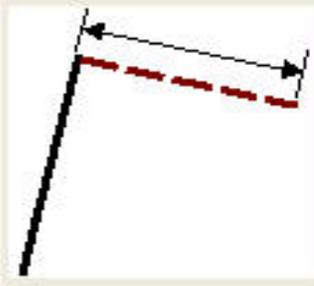
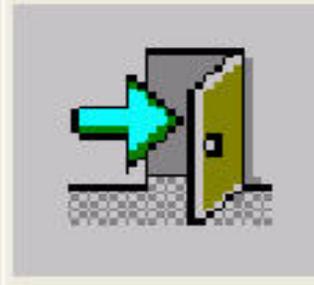
Tsunami Case Study: RTK GPS Surveying at UCE



OSM-MCRCC

T S U N A M I

Tsunami Functions

			
Point Store	Stakeout	Auto-Points	Centerline
			
Input GIS	GIS Inspect	Tape Line	Track
			
GPS Setup	Monitor	Alignment	Return (Esc)

Rod Height 

RTK GPS Surveying with Tsunami

- The 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

Equipment Used



A vertical strip on the left side of the slide shows a topographic map of a mountain range. A yellow line traces a path through the terrain, which is marked with contour lines and elevation points. The map is partially obscured by the text on the right.

Site Conditions

- Temperature 45-50° F
- Overcast
- Steady drizzle to rain
- Ground was soft when we started then got worse.

Survey Data Collection

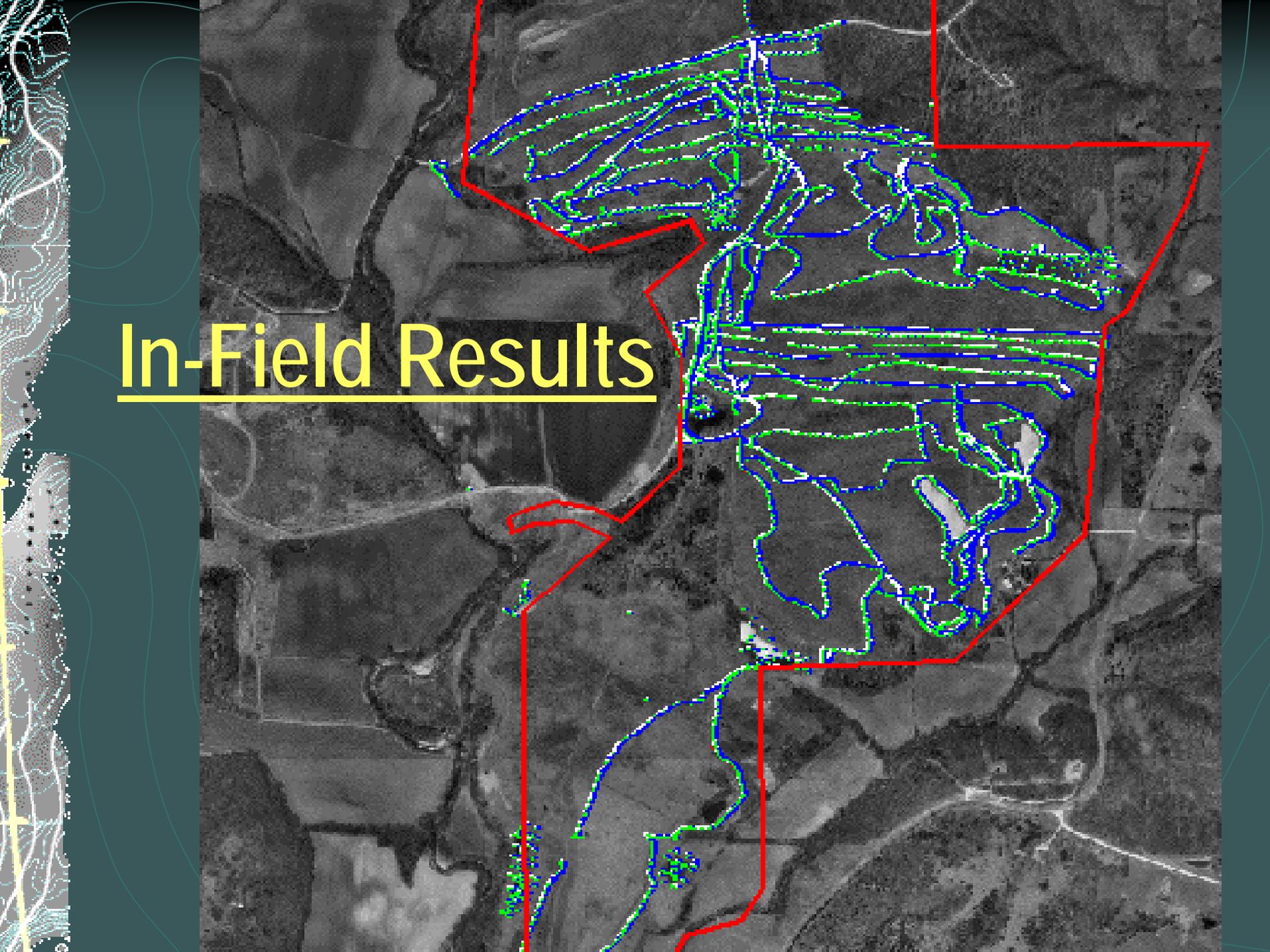
● 2 man crew

- 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

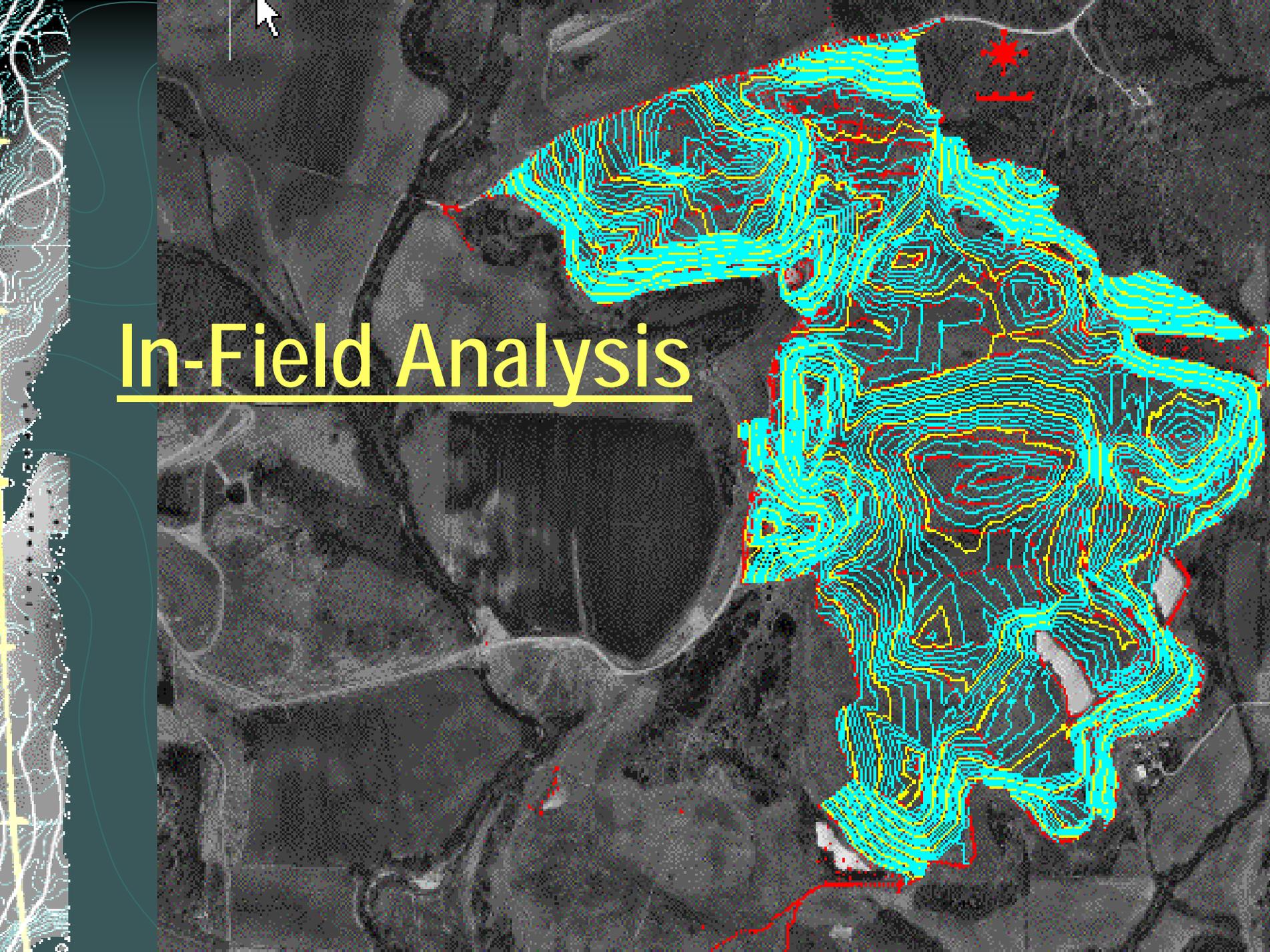
Survey Data Collection (cont.)



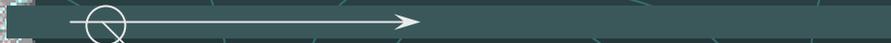
In-Field Results



In-Field Analysis



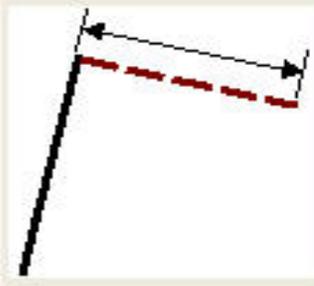
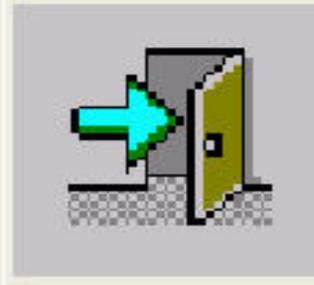
Tsunami Case Study: Permit Review - Cottonwood Creek Mine



OSM-MCRCC

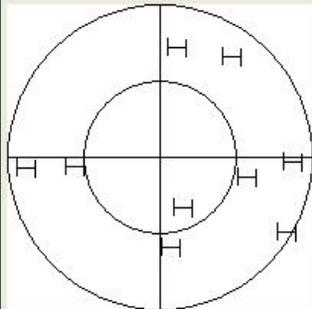
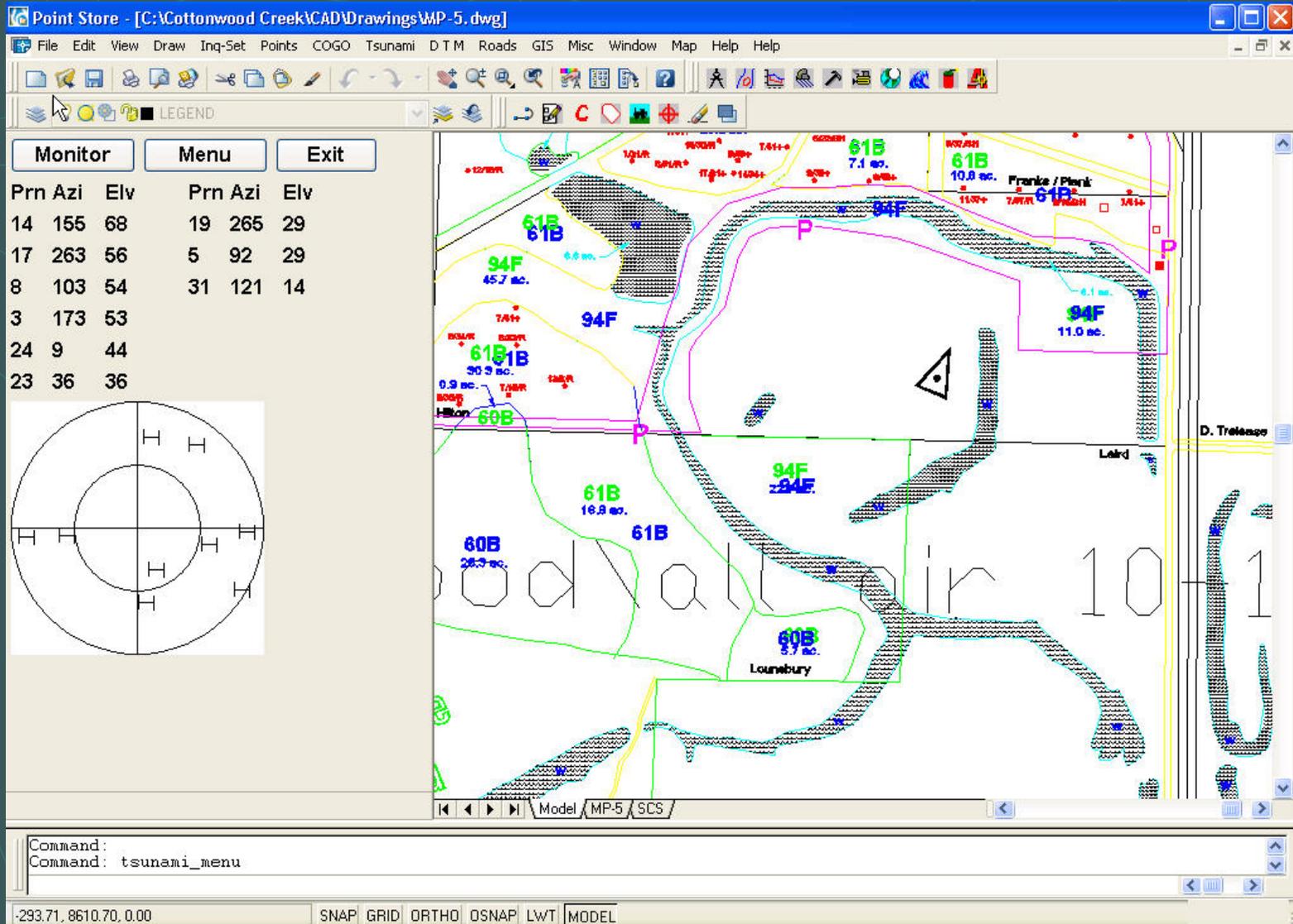
T S U N A M I

Tsunami Functions

			
Point Store	Stakeout	Auto-Points	Centerline
			
Input GIS	GIS Inspect	Tape Line	Track
			
GPS Setup	Monitor	Alignment	Return (Esc)

Rod Height 

Satellite Positions Relative to the Mine





LEGEND

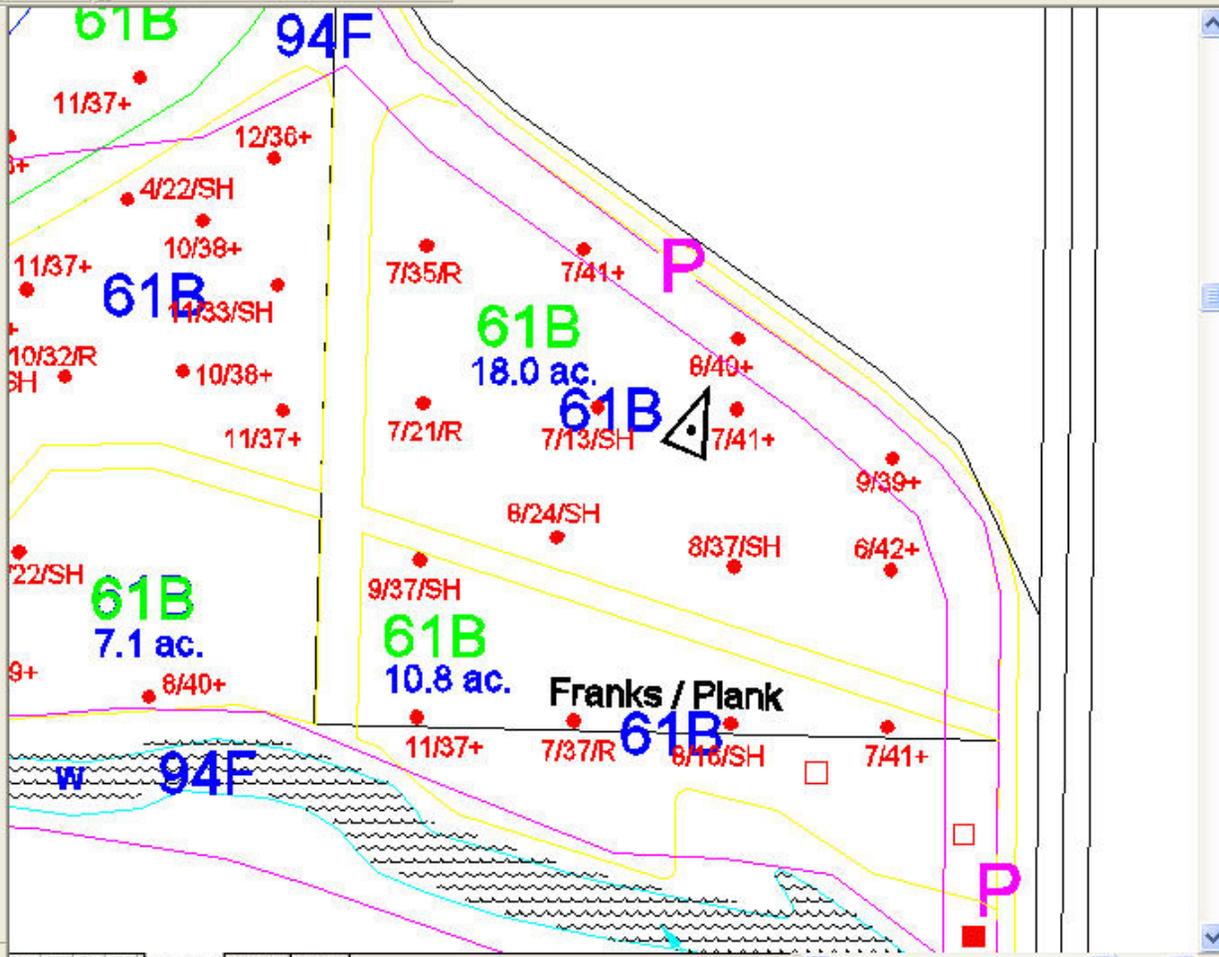
Monitor SkyPlot

Menu(F11) [Zoom In] [Zoom Out] [Left Arrow] [Right Arrow] [Up Arrow] [Down Arrow]

Track Position
Rod Height: 4.000
North: 7049.842
East : 5867.720
Elev : 1000.597
SIMULATION
LOCK

Speed:6.8185

Store Exit



Model / MP-5 / SCS

Command:
Command: tsunami_menu

5234.07, 6759.88, 0.00 SNAP GRID ORTHO OSNAP LWT MODEL



Monitor **SkyPlot**

Menu(F11) [Zoom In] [Zoom Out] [Previous View] [Next View] [Home] [Refresh]

Starting Continuous.

SIMULATION LOCK

Point Number: [Keyboard Icon]

Rod Height: [Keyboard Icon]

N: 6899.228 E: 5802.981

Z: 1001.005 No Elev

Desc: [Keyboard Icon]

Note **Options** **Code**

Linework

No Start Cont End

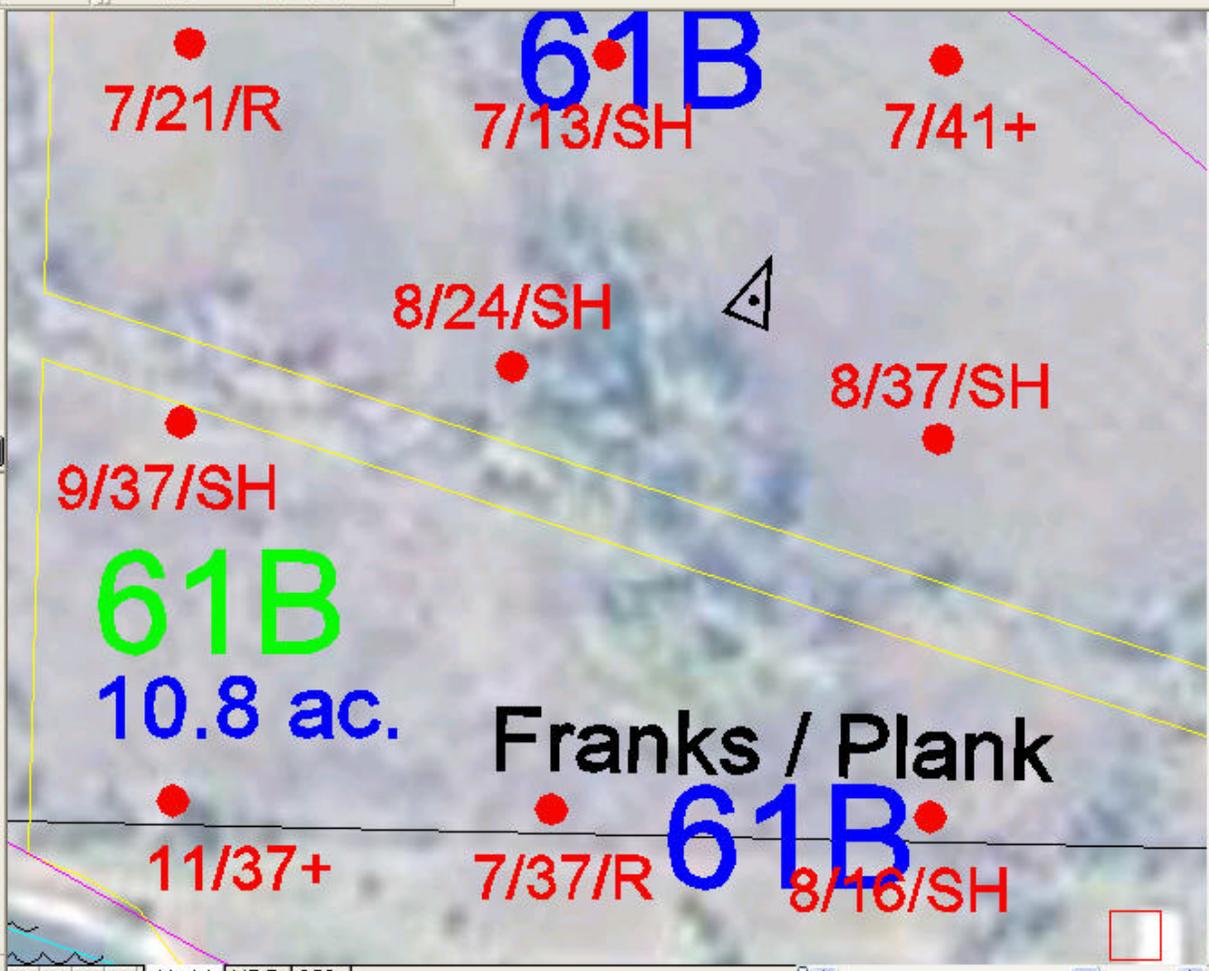
Special PC PT Close

Offset Join **Undo**

Read **Store**

Read & Store **Exit**

Stop Continuous



Command:
Command: tsunami_menu



Monitor SkyPlot

Menu(F11)

GIS Smart Prompting - Entity has no GIS Data

Current Output MDB: C:\Cottonwood Creek\CAD\Drawings\cotton Available Features: SAMPLING_POINT

ID	
Surface	Other
Photo Numbers	
topsoil depth	
topsoil color	
Topsoil pH	
Topsoil Texture	
Subsoil depth	
Subsoil Color	

Current Template MDB: C:\Cottonwood Creek\CAD\Drawings\data template.mdb

Image Utilities: PT_ID : 11

New Update Delete

Capture

Pick Camera Set Camera

Image Format

BMP JPG

>> F5 > F6 < F7 << F8

0 / 0

Current Feature: SAMPLING_POINT

Use MDB Form:

OK

Cancel

Shortcut keys:
 F2 = Capture image;
 F3 = Go to the first cell of record;
 F4 = Exit from spreadsheet;
 Spacebar = Check image "ON".

SIMULATION LOCK

Point Number: 11

Rod Height: 4.000

N: 5000.921 E: 5000.921

Z: 999.984 No Ele

Desc: SAMPLING_POINT

Note Options

Linework
 No Start Cont

Special PC PT
 Offset Join

Read St

Read & Store

Start Continuous

Command:
Command: tsunami_menu

GIS Smart Prompting - Entity has no GIS Data

Current Output MDB: C:\Cottonwood Creek\CAD\Drawings\cotton Available Features: SAMPLING_POINT

ID	
Surface	Other
Photo Numbers	Other
topsoil depth	Bare
topsoil color	Stony
Topsoil pH	Vegetated
Topsoil Texture	Wet
Subsoil depth	
Subsoil Color	

Current Template MDB: C:\Cottonwood Creek\CAD\Drawings\data template.mdb

Image Utilities:

PT_ID : 8

New Update Delete

Capture

Pick Camera Set Camera

Image Format

BMP JPG

>> F5 > F6 < F7 << F8

0 / 0

Current Feature: SAMPLING_POINT

Use MDB Form:

OK

Cancel

Shortcut keys:
F2 = Capture image;
F3 = Go to the first cell of record;
F4 = Exit from spreadsheet;
Spacebar = Check image "ON".





Mobile Computing With ArcPAD



Mapping and Data Collection using ArcPAD

Field mapping and GIS data collection tool

Created by ESRI (same folks that make ArcINFO)

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

Integrates GPS into GIS Software

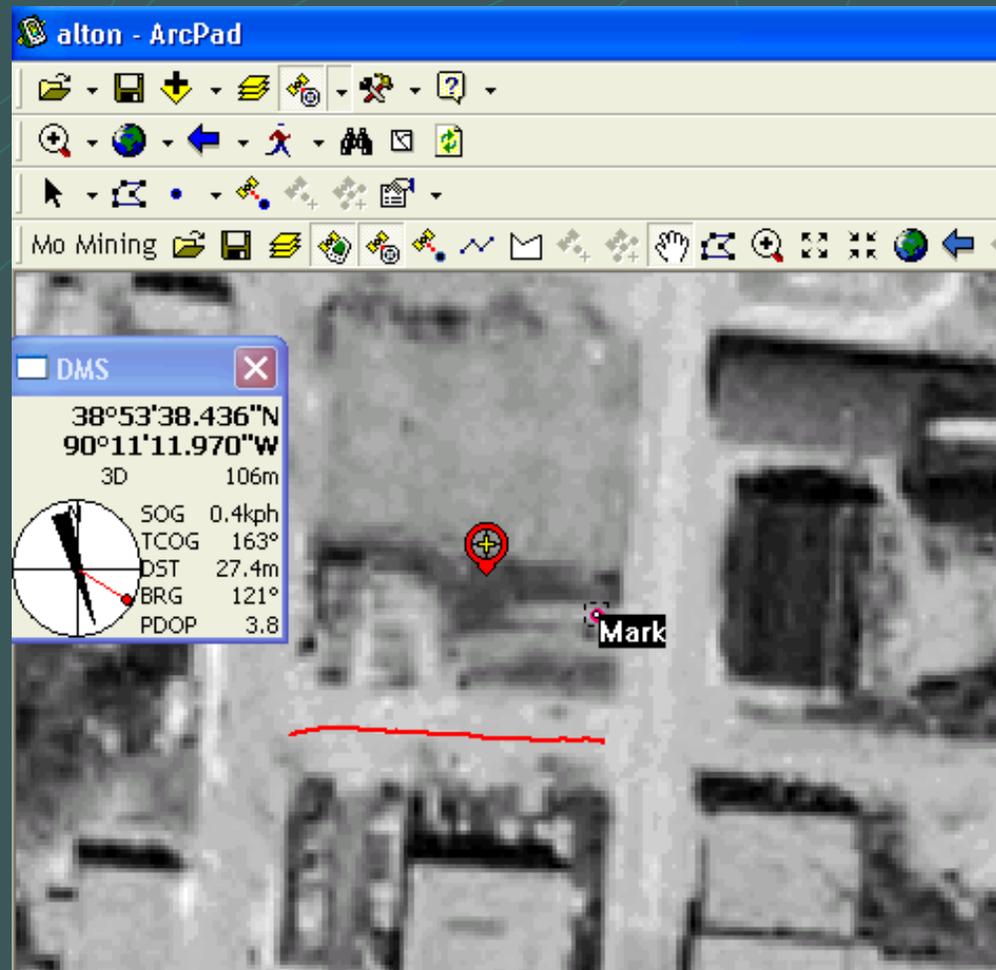
TIPS provides single use software on request

Easy to learn, easy to use

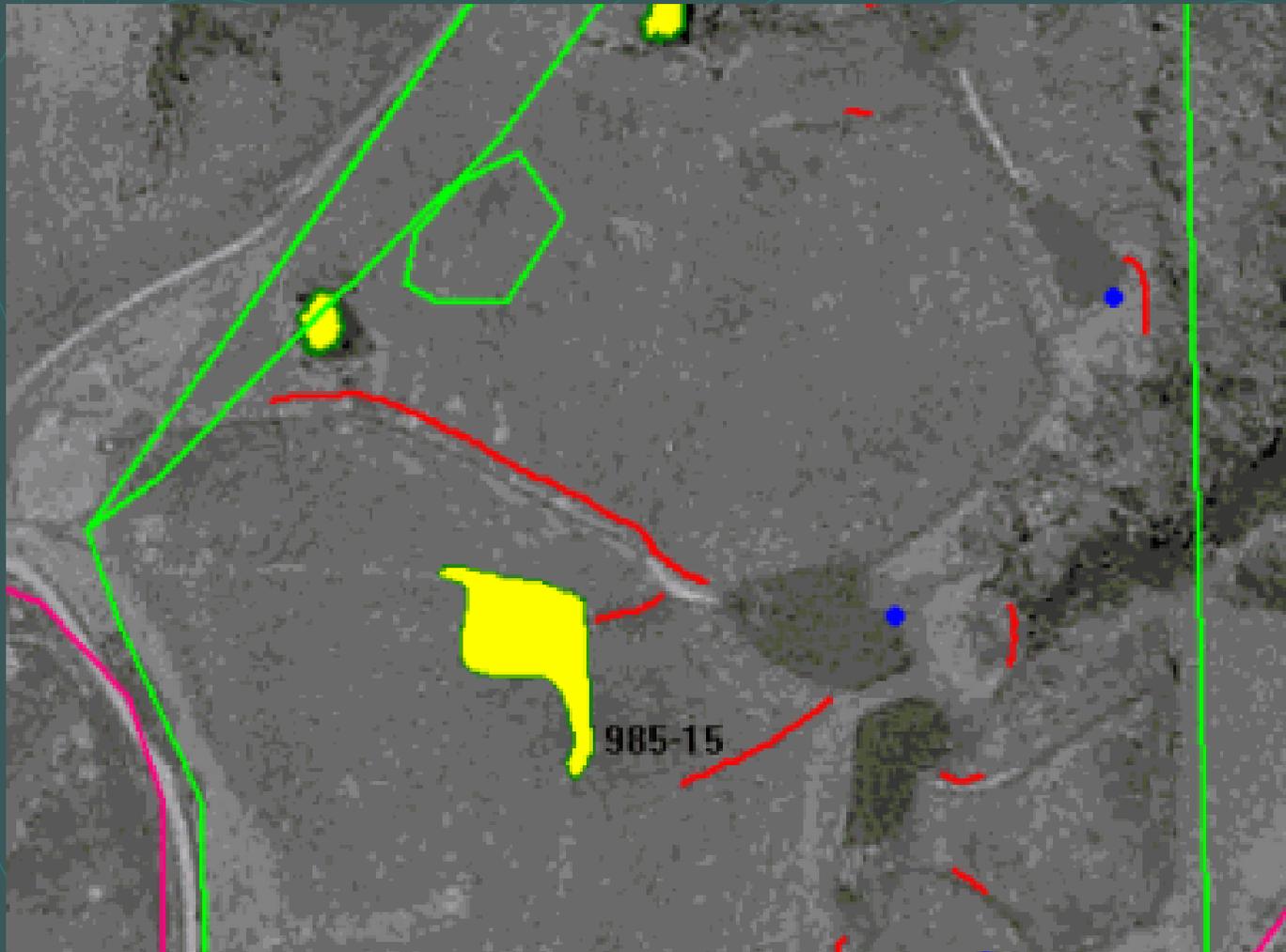
What ArcPAD Does

Links GPS data input with GIS function to:

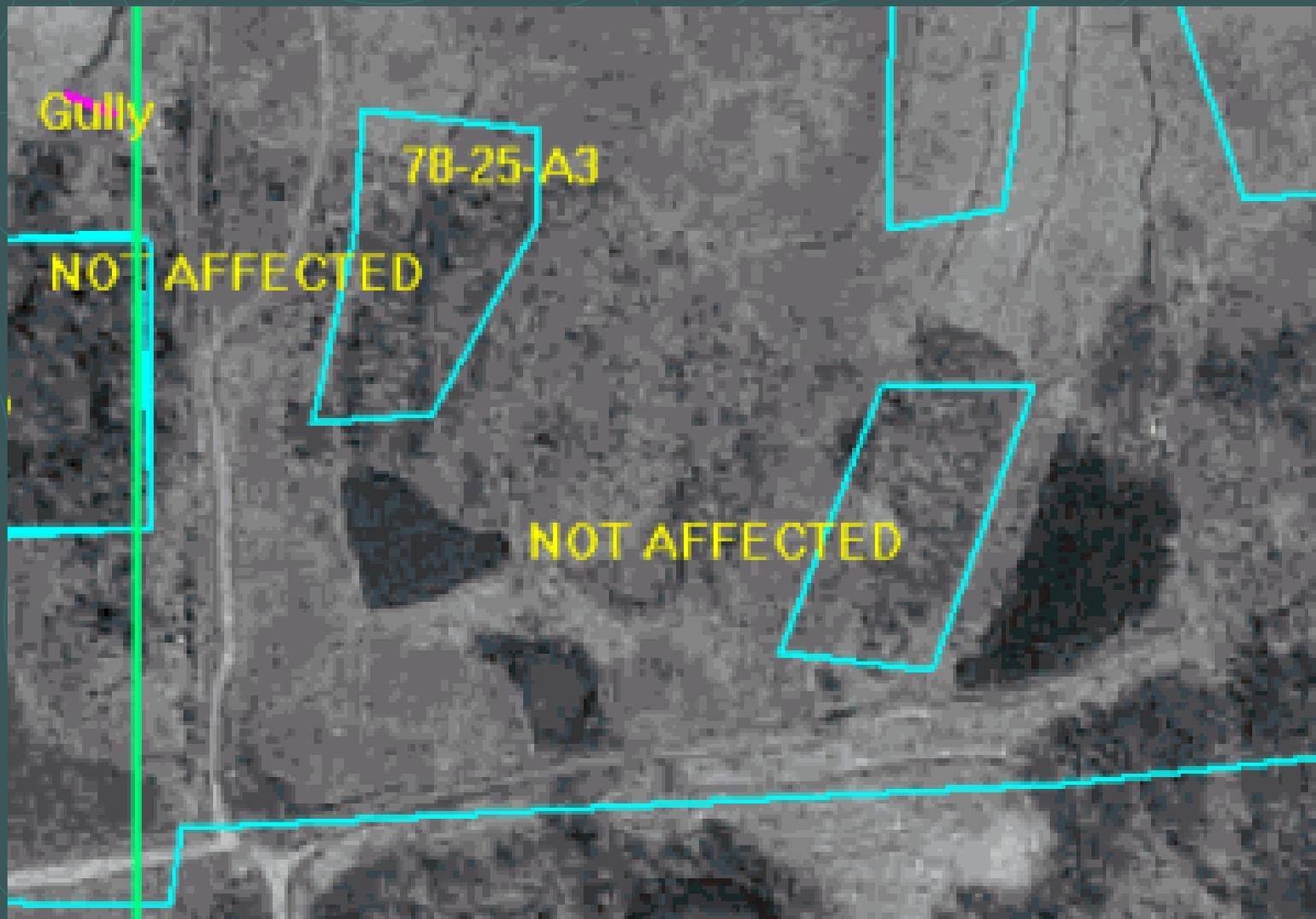
- Display maps and photos with an active GPS generated location.
- Navigate to features



Collect points, lines and polygons from GPS or Stylus



Navigate To Features



Edit Attribute Data

The screenshot displays the ArcPad interface for editing attribute data. The main window shows a grayscale aerial map with various colored overlays (green, red, yellow) and labels like '78-25-A4' and '985-15'. A dialog box titled 'Line Features' is open, showing a table of attributes for a selected feature.

Property	Value
ID	123 411
FEATURE_...	abc Gully
LENGTH_FT	123 0
WIDTH_FT	123 15
BASE_WID...	123 0
HEIGHT	123 0
DIAMETER	123 0
SAMPLE_ID	abc
TYPE	abc
GULLY_SL...	123 5
SLIDE_FACE	123
DEPTH	123 5.0
PH	123 0
EH	123
PERMIT_N...	abc
DATE	12/21/2003 20030226

The dialog box includes 'OK' and 'Cancel' buttons at the bottom. The background map shows a grayscale aerial view with various colored overlays (green, red, yellow) and labels like '78-25-A4' and '985-15'. The software title bar reads 'Missouri Mining - ArcPad'. The bottom status bar shows the ArcPad logo, a scale of 1:6814, and the time 3:47 PM.



Example ArcPAD Projects

Mine Shaft Mapping

Oklahoma Mine 7 AML Inventory

Missouri AECI Vegetation Assessment

Missouri Mining Site Mapping

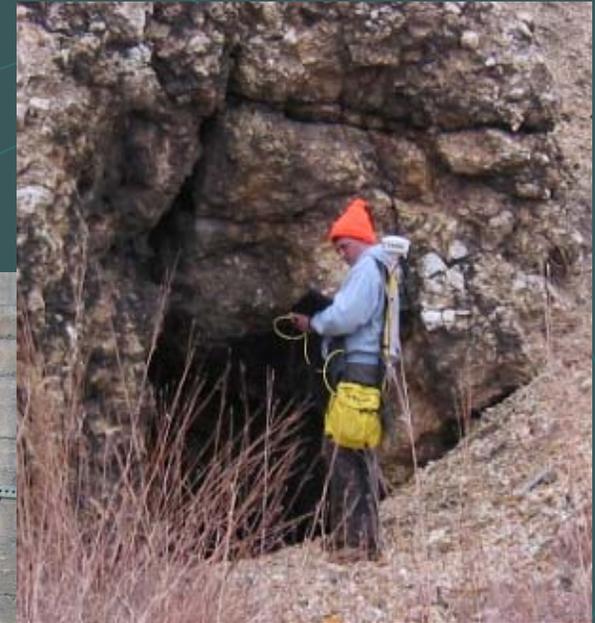
Mapping Mineshafts Prior to Closure

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 lines
- Gates
- Pond spillways
- Ditches
- AML features
- Access routes



Vegetation Assessment for Bond Release – AECl - Missouri

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

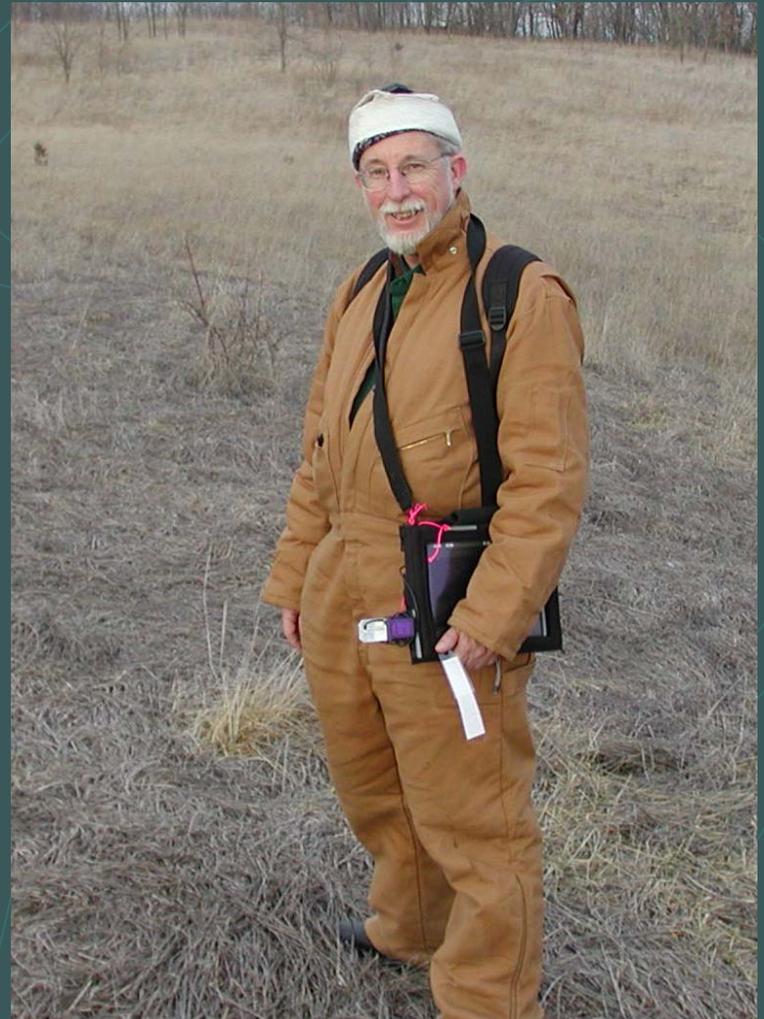
Permits as old as 1982

Compare veg. sample data to
actual on-ground conditions

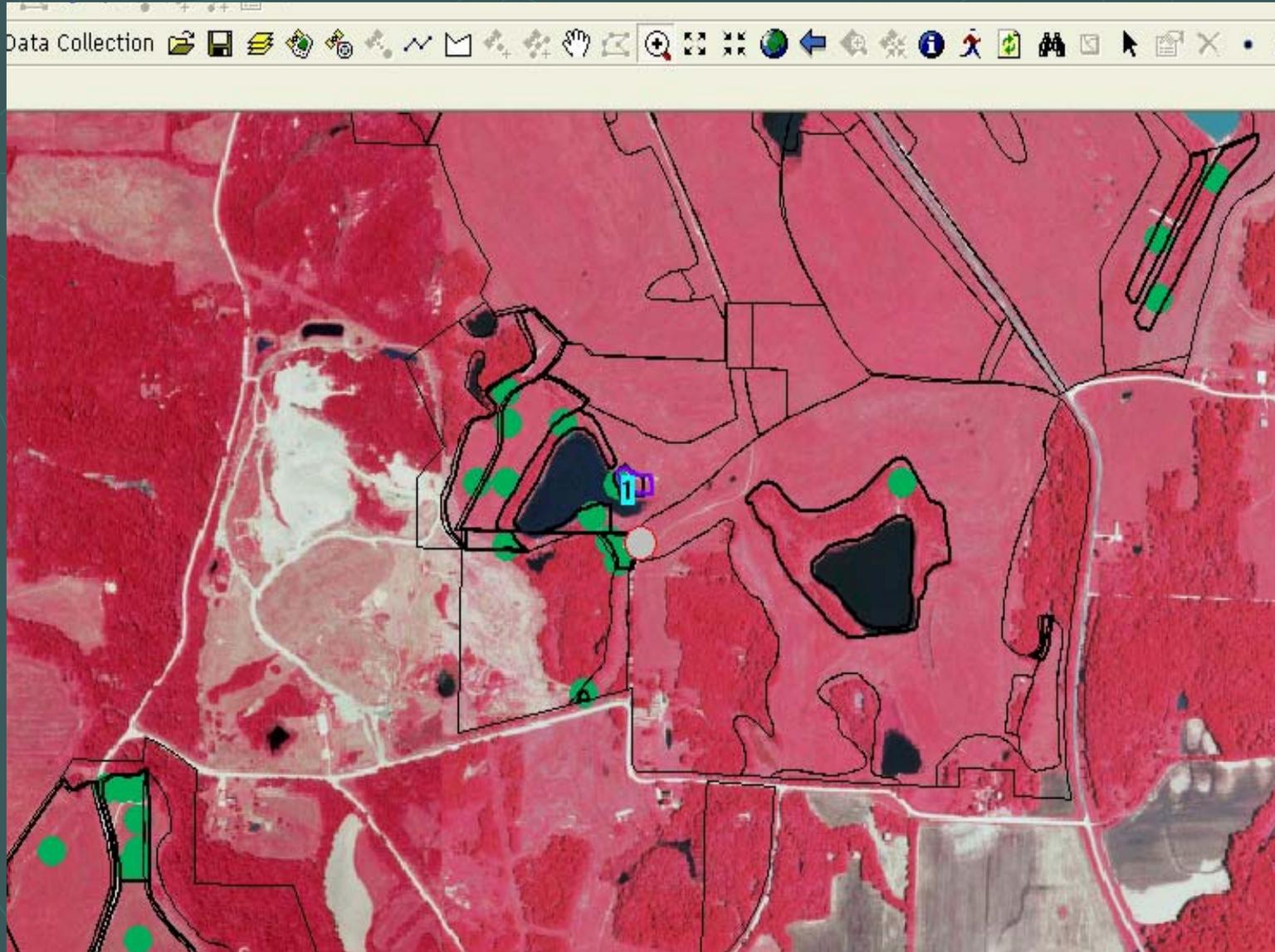
Data was developed in
AutoCAD

Opened .dwg in ArcMAP

Converted to Shapefiles and
exported for ArcPAD



Vegetation Analysis at AECl - Missouri



Missouri Mining Bond Forfeiture Reclamation Assessment





Missouri Mining Project Purpose

Estimate reclamation liability for Missouri Mining Company lands, and identify and map mine site features that need reclamation.

Missouri Mining Assessment Facts

2400 acres to assess

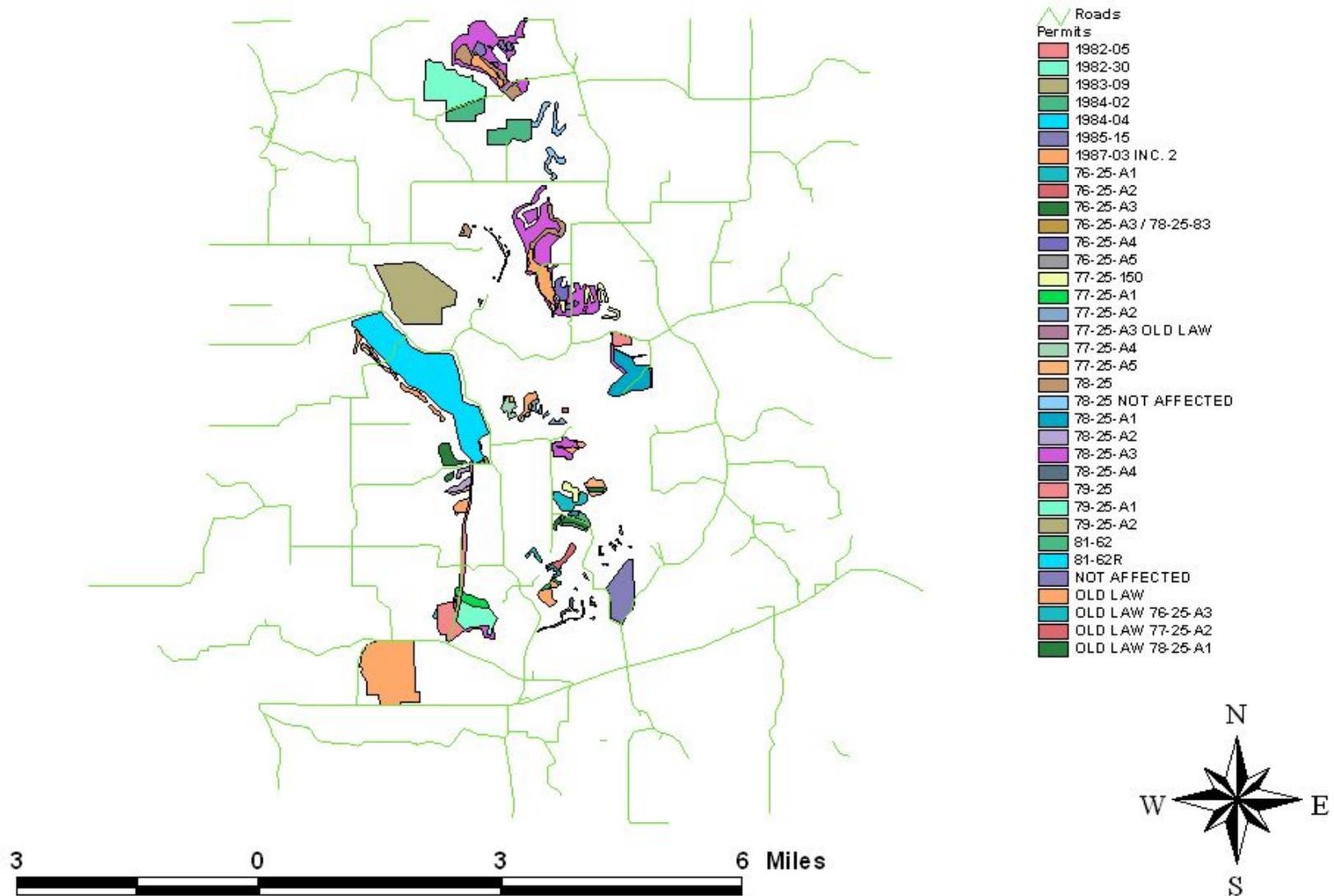
12 different permits
and many
amendments

Mined between 1977
and 1989

Bonds released on
dozens of bond
increments making
determination of
what remains, very
difficult



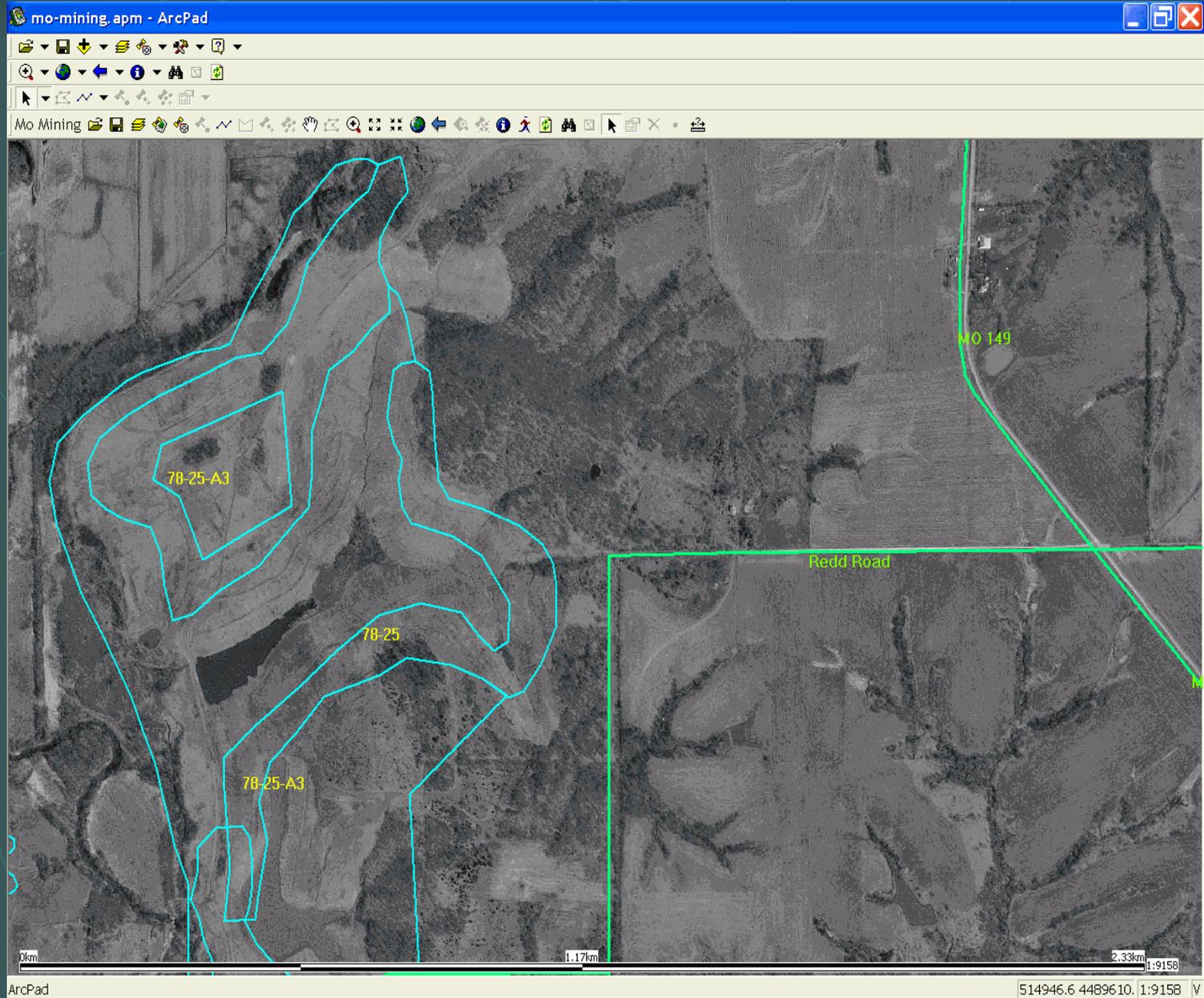
Missouri Mining Permit Area



The Crew and Conditions

- 5 staff - no prior exposure to the site
- Only 1 staff with previous ArcPAD experience
- 4 hour drive from office
- 3 weeks to get job done
- Temperature range from 10 – 50 degrees F
- Snow or rain 2 of the 3 weeks

Pre Plan Site Visits Using Existing GIS Data



Capture a New Feature

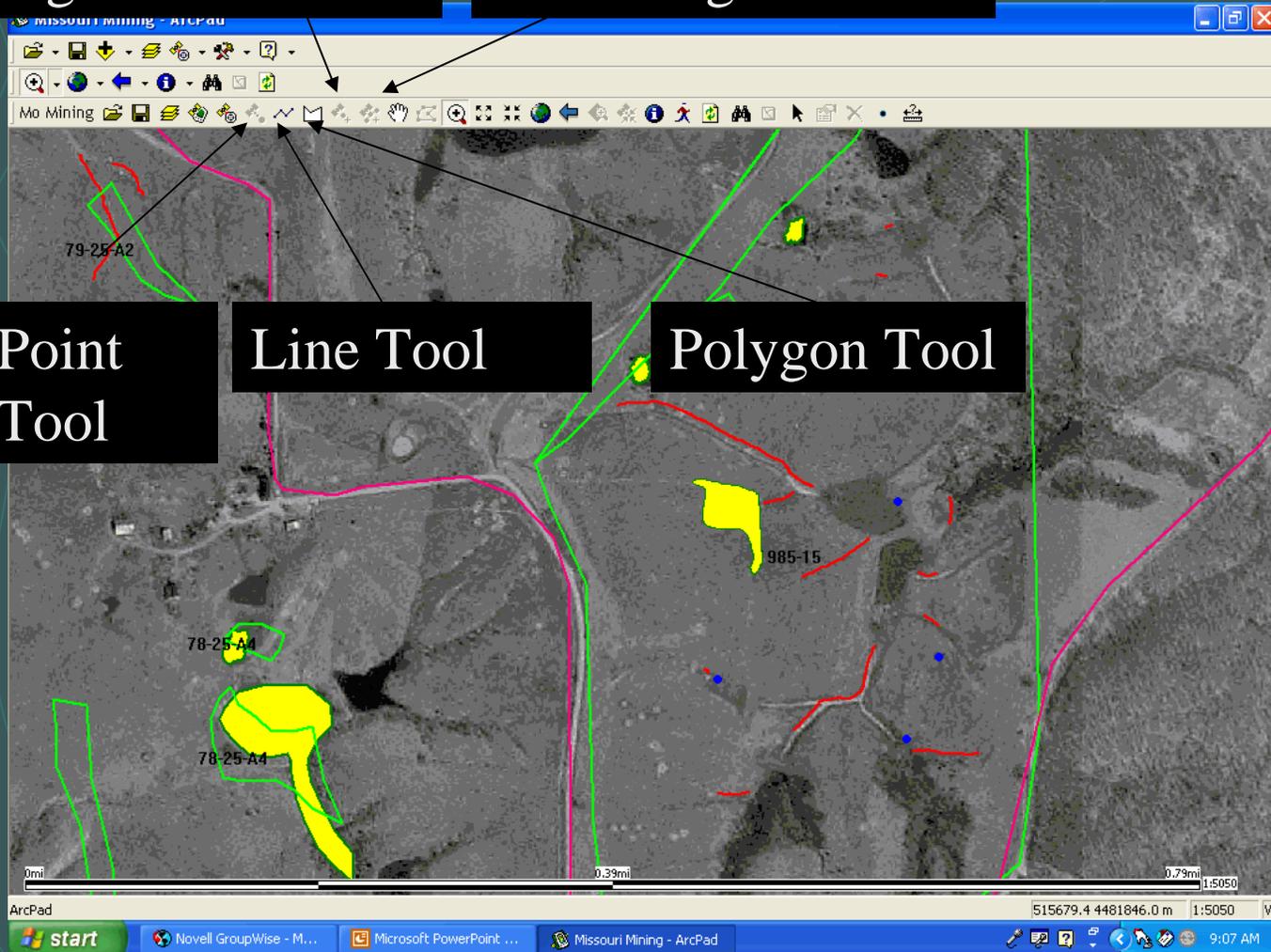
Single Vertex

Streaming Vertex

Point Tool

Line Tool

Polygon Tool



Collect Data

Missouri Mining - ArcPad

Line Features

Site Details Properties Comments Attributes

Line ID Number: 313

Date Visited: 9/25/2003

Line Feature Type: Gully

Photo Number:

OK Cancel

79-25-A2

79-25-A2

79-25-A2

79-25-A2

79-25-A2

0mi 0.32mi 0.64mi 1:4121

ArcPad 515831.1 4482549.6 m 1:4121 V

start Novell GroupWise - M... missourimining2 ArcView GIS 3.3 Missouri Mining - ArcPad 1:18 PM

Create and use custom data entry forms

Add Attribute Data

The screenshot displays the ArcPad interface for 'Missouri Mining'. The main map area shows a grayscale aerial view with several yellow polygons and red/green lines. The polygons are labeled '79-25-A2'. A 'Line Features' dialog box is open, showing various input fields for site details and water quality. The 'Attributes' tab is selected, and the 'Width (ft)' field is set to 7. The 'Water Quality' section includes fields for pH (0), EC (0), and EC Range. The 'Site Details' section includes fields for Length (ft), Gully Depth (Ft), Base Width (Ft), Gully Slope (X:1), Spillway Type, Pipe Diameter (in), Road Surface Type, and Highwall Height (Ft). A scale bar at the bottom indicates distances of 0mi, 0.31mi, and 0.62mi. The status bar at the bottom shows 'Feature 0x7 found', coordinates '516055.6 4482874.0 m', and a scale of '1:3960'.

Line Features

Site Details | Properties | Comments | Attributes

Width (ft)

Length (ft)

Gully Depth (Ft)

Base Width (Ft)

Gully Slope (X:1)

Spillway Type

Pipe Diameter (in)

Road Surface Type

Highwall Height (Ft)

Water Quality

pH

EC

EC Range

0mi 0.31mi 0.62mi 1:3960

Feature 0x7 found 516055.6 4482874.0 m 1:3960

Associate Photos with Locations

The screenshot displays the ArcPad interface for 'Missouri Mining'. The main map shows a terrain with several yellow polygons and red/green lines, each labeled '79-25-A2'. A 'Line Features' dialog box is open, containing the following fields:

- Line ID Number: 313
- Date Visited: 9/25/2003
- Line Feature Type: Gully
- Photo Number: 10-2

An inset photograph on the right shows a field with a gully, which is the location being associated with the photo. The photo is labeled '79-25-A2' in the bottom right corner. The ArcPad status bar at the bottom shows the coordinates 515828.9 4482550.7 m, a scale of 1:4121, and the time 1:30 PM.

Adding Comments

The screenshot displays the ArcPad interface for 'Missouri Mining'. The main map area shows a grayscale aerial view with several polygons overlaid. A large yellow polygon is the central focus, with several smaller yellow polygons nearby. Red lines and a dashed black rectangle are also visible on the map. Several labels '79-25-A2' are scattered across the map, identifying specific features.

A 'Line Features' dialog box is open in the foreground, with the 'Comments' tab selected. The dialog box contains the following text in its comment field:

Long Deep Ditch not really affected by existing permit area 96-25-a2

The dialog box has 'OK' and 'Cancel' buttons at the bottom. The background map includes a scale bar at the bottom with markings for 0mi, 0.32mi, and 0.64mi, and a scale of 1:4121.

Navigate to Difficult Features

The screenshot displays the ArcPad application window titled "mo-mining.apm - ArcPad". The main view is a grayscale aerial photograph overlaid with cyan-colored polygons and points. Several polygons are labeled with yellow text: "77-25-150", "78-25-A3", and "NOT AFFECTED". A "Gully" is also labeled. A point feature is highlighted with a red circle, and a dialog box titled "Point Features" is open over it. The dialog box has tabs for "Properties" and "Comments", with "Comments" selected. The comment text reads: "CLOSED PORTAL RAMP HAS 6FT SIDES". The interface includes a toolbar at the top with various navigation and editing tools, a scale bar at the bottom left showing "0m", "672.49m", and "1.34km", and a status bar at the bottom right showing coordinates "515317.2 4487059" and a scale of "1:5286". The Windows taskbar at the very bottom shows the "start" button, open applications including "tips sc mtng", "Microsoft Power...", and "mo-mining.apm ...", and the system clock showing "5:49 PM".

Finding the Way Back To The Truck



Customize GPS Settings

ArcPad Options



Protocol



GPS



Quality



Capture



- No Warnings
- Non-Compulsory Warnings
- Compulsory Warnings



Maximum PDOP

6



Maximum EPE



DGPS Mode Only



3D Mode Only

OK

Cancel

Customize GPS Point Settings

ArcPad Options 

 Protocol |  GPS |  Quality |  Capture |   

Enable Averaging

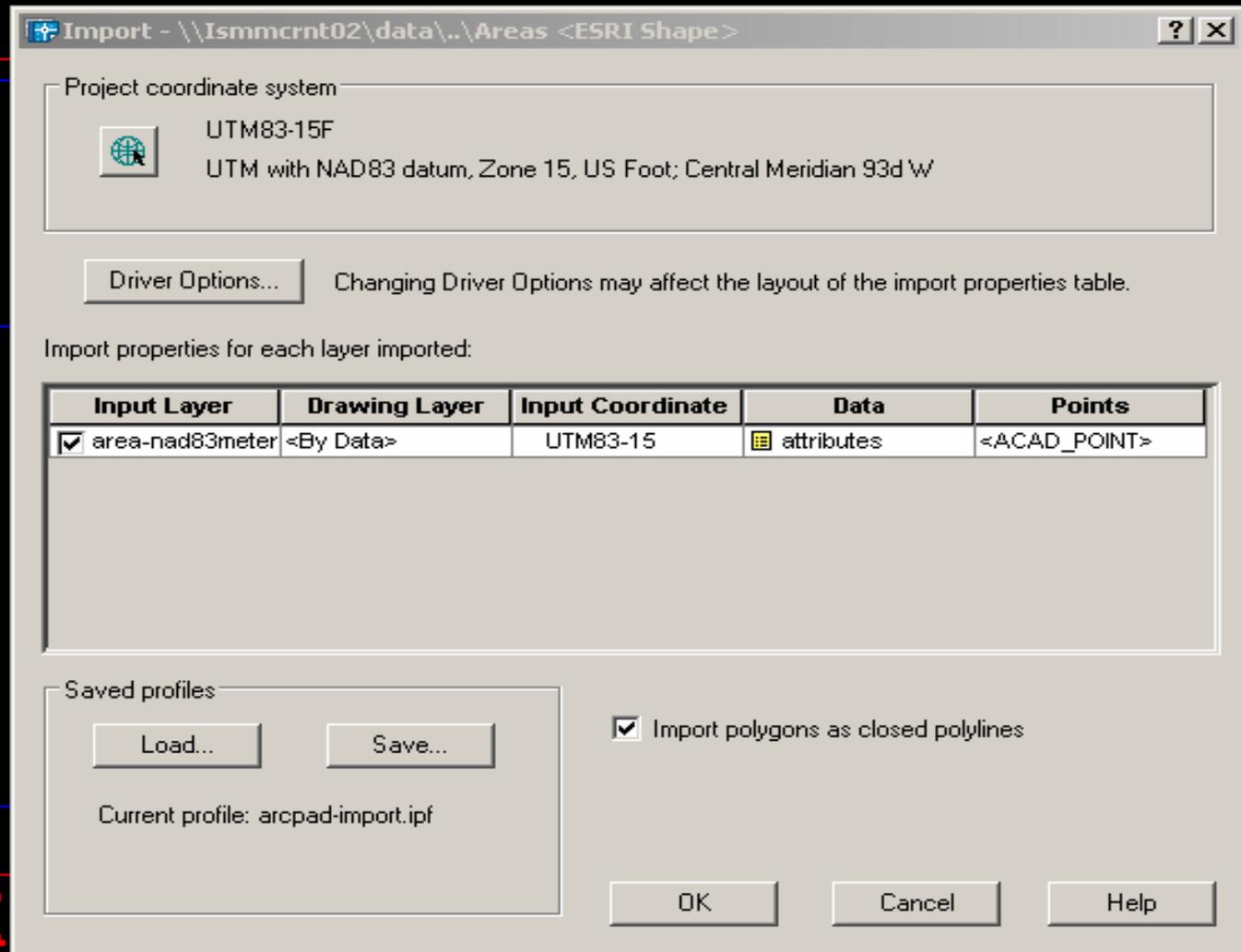
Number of positions to average :

Points

Vertices

Streaming Vertices Interval

Importing Field Data to Autodesk Map



Attribute Information in AutoCAD

The screenshot displays the AutoCAD interface with a map showing two ponds, 'POND 1' and 'POND 2', and several gullies labeled G2 through G8. A red dashed line with a question mark is drawn over one of the gullies. The Properties palette on the left shows the following information for the selected Polyline:

Polyline

Lineweight	ByLayer
Hyperlink	
Thickness	0.0000

Geometry

Vertex	1
Vertex X	1685568.1265
Vertex Y	14736337.5563
Start segment width	0.0000
End segment width	0.0000
Global width	0.0000
Elevation	0.0000
Area	686.5060
Length	138.2741

Misc

Closed	No
Linetype generation	Disabled

DD:attributes

BASE_WIDTH	0.0000
COMMENT	
DATE	20021203
DEPTH	3.0000
DIAMETER	0
EC	0.0000
EC_RANGE	
EH	0
FEATURE_TY	
GULLY_SLOP	10.0000
HEIGHT	0
ID	526
LENGTH_FT	0.0000
PERMIT_NO_	
PH	0
PHOTO_ID	
SAMPLE_ID	
SLIDE_FACE	0.0000
TYPE	
WIDTH_FT	15.0000
key	0

Summary

- Mobile GIS and CAD are a reality
- OSM -TIPS placing "seed" units in State and Tribal offices
- TIPS provides software
- We are looking for partners to help with training and development

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.



For More Information

Contact your TIPS Service Manager, or

Bill Joseph – Alton, IL 618-463-6463 x 106

Lou Hamm – Denver, CO 303 844-1400 x 1475

Len Meier – Alton, IL 618-463-6463 x. 109

Bob Welsh – Denver, CO 303-844-1400 x 1478

THIS CONCLUDES MY
PRESENTATION.
ARE THERE ANY
QUESTIONS?

