



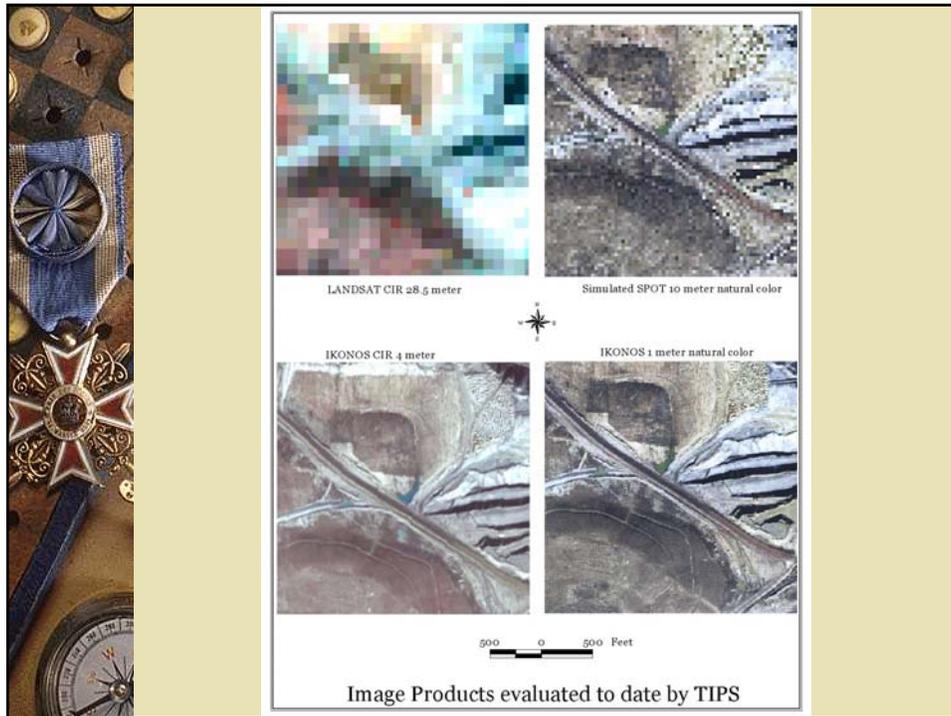
Remote Sensing Technology Update

By Kyle Bohnenstiehl
OSMRE-WRCC-TIPS



OSMRE Remote Sensing

- ◆ Program began January, 2001
- ◆ Evaluating High Resolution Satellite Imagery and Digital Aerial Photography
- ◆ Pilot Projects in 6 eastern states
- ◆ Operational in western region
- ◆ Technology is appropriate for OSM's mission



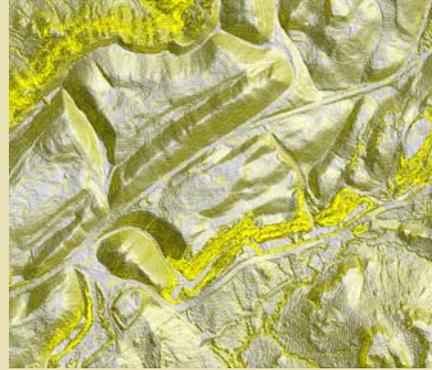
IKONOS and Quickbird Satellites

- ◆ “Spy Satellite”
- ◆ 1 meter B&W
- ◆ 4 meter Color Infrared
- ◆ 3 day revisit
- ◆ Stereo capability
- ◆ About \$0.15/acre
- ◆ Restrictive Licensing



Digital Aerial and LIDAR Imagery

- ◆ Traditional Aerials
- ◆ Light Detection and Ranging
- ◆ High accuracy topography
- ◆ 2 foot contours, 6” precision
- ◆ In-house processing
- ◆ About \$0.50/acre
- ◆ **Can share data with permit holders and others**



Remote Sensing Activities FY2002

- ◆ One workshop with 11 state and 3 OSM attendees
- ◆ ERDAS software licenses available to any TIPS customer. Currently 3 full suites.
- ◆ 10 stereo imaging workstations deployed
- ◆ Customer demand is high

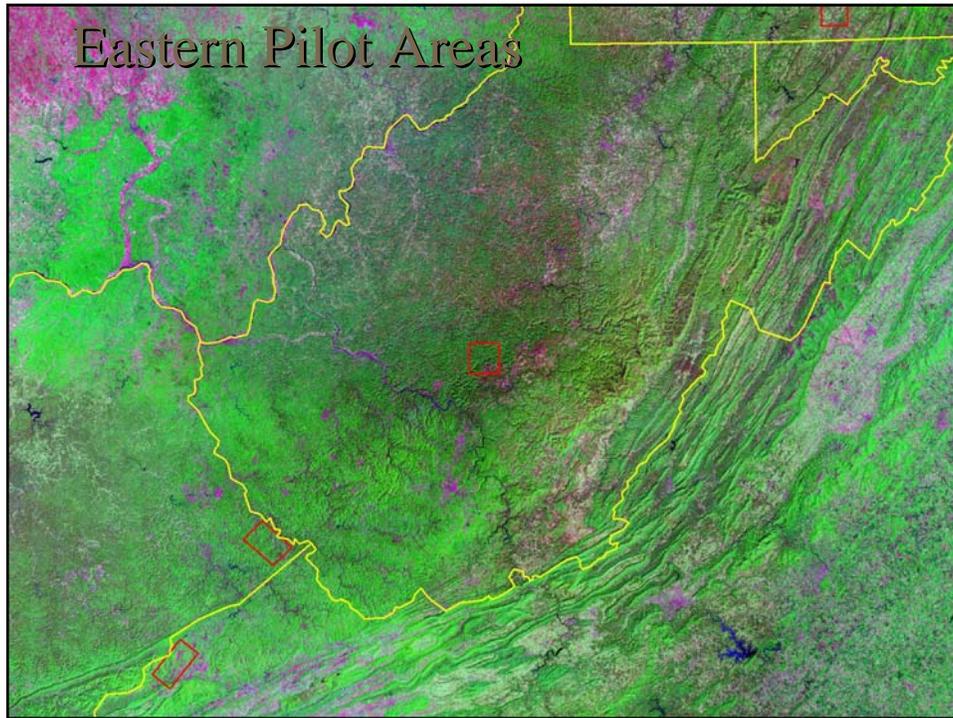


High Accuracy GPS Surveying



Eastern Remote Sensing Pilot Projects

- ◆ Acquire Stereo 1m CIR IKONOS data in WV, VA, KY, TN and PA
- ◆ Study areas are 100km²
- ◆ Will identify research areas, methods and tools.
- ◆ Summarize findings in a report that will serve as a “cookbook” for future projects
- ◆ Pilot project states will have access to ERDAS software (Professional, Orthobase, Stereo, and Virtual GIS)
- ◆ On site field visits to each state for GPS fieldwork, software installation, and needs assessment.

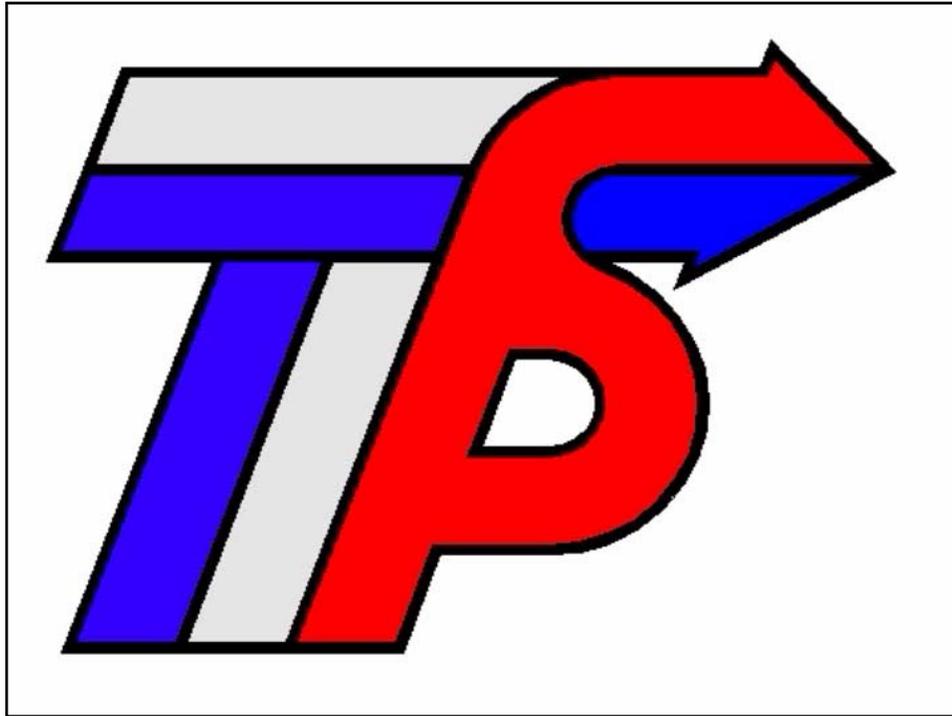


Southern Anthracite Mapping Project: Full Cost Bonding

- ◆ Technical request to OSM from PA DEP
- ◆ Mapping 100,000 acres with 5 foot contours and 1 foot orthoimagery
- ◆ Cost is about \$0.20 an acre

LCN July 99
28 12:35 PM

The slide features a vertical strip on the left side containing images of a compass, a surveying instrument, and other surveying tools. The main content is a photograph of a large, open-pit mine or quarry with a body of water in the center. A person is standing on the rocky shore in the foreground. The text is overlaid on the right side of the photograph.



Western Region Activities

- ◆ Albuquerque inspection staff is utilizing imagery on a routine basis
- ◆ Serves as an inspection and enforcement tool:
 - Maps in inspection reports with GPS data
 - Target areas to visit in field
 - Review reclamation progress
 - Quarterly updates are acquired

Sequence of Mining/Reclamation Activities: Envelope distance

- ◆ Line A- Brushing line outer most edge
- ◆ Line B- Denotes the toe of the highwall
- ◆ Line C- Location of the edge of rough grading
- ◆ Line D- Location of the edge of topsoil placement



TABLE 5 1-1
MINING/RECLAMATION ENVELOPE DISTANCES

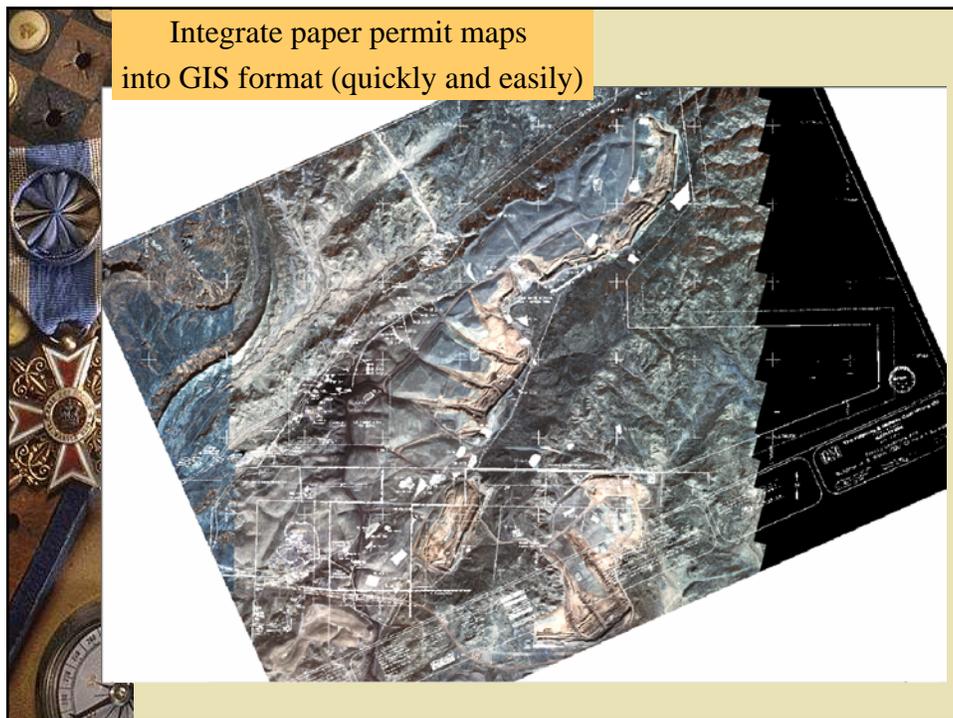
MINING AREA*	1996			1997			1998			1999			2000 & Beyond		
	A-B	B-C	C-D	A-B	B-C	C-D	A-B	B-C	C-D	A-B	B-C	C-D	A-B	B-C	C-D
Area 2 - prestrip	800	1400	800	800	1300	800	800	1200	800	800	1100	800	800	1000	800
Area 2 - no prestrip	600	1500	1100	600	1400	1000	600	1200	900	600	1000	800	600	800	800
Area 3 - no prestrip	600	1400	800	600	1300	800	600	1200	800	600	1100	800	600	800	800
Area 3 - Idled	600	1400	800	600	1300	600		1200	200	600	1100	200	600	800	200
Area 3A Plug***															
Area 6 - prestrip	800	1400	800	800	1300	800	800	1200	800	800	1100	800	800	1000	800
Area 6 - no prestrip	600	1300	800	600	1200	800	600	1100	800	600	1000	800	600	800	800
Area 10 - prestrip	800	1000	800	800	1000	800	800	1000	800	800	1000	800	800	1000	800
Area 10 - no prestrip	600	800	800	600	800	800	600	800	800	600	800	800	600	800	800
Area 12 - no prestrip	600	1200	800	600	1200	800	600	1000	800	600	800	800	600	800	800

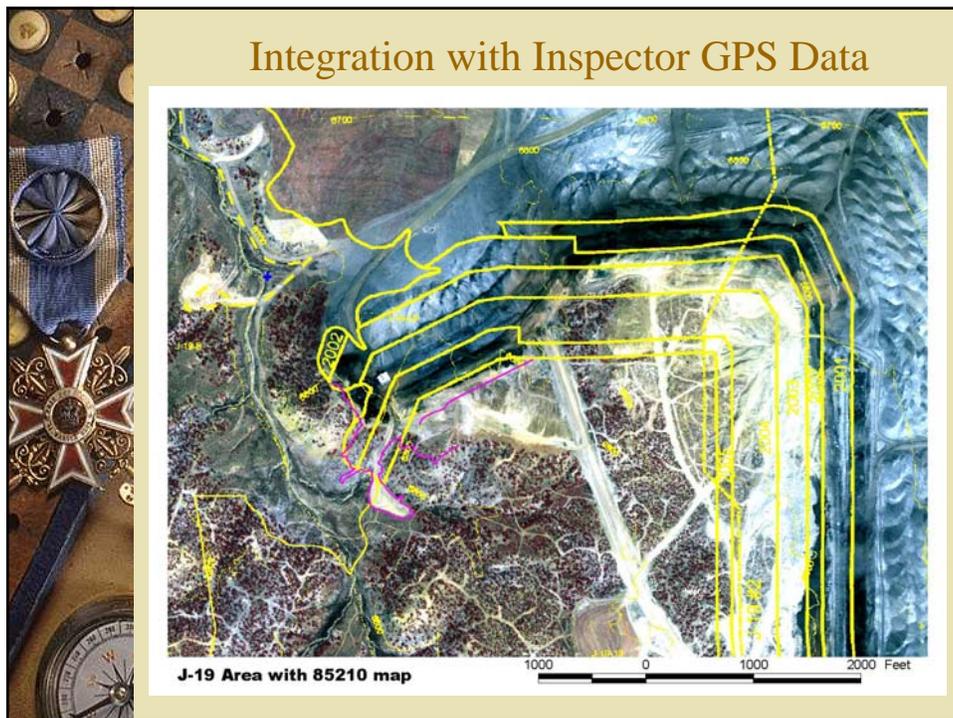
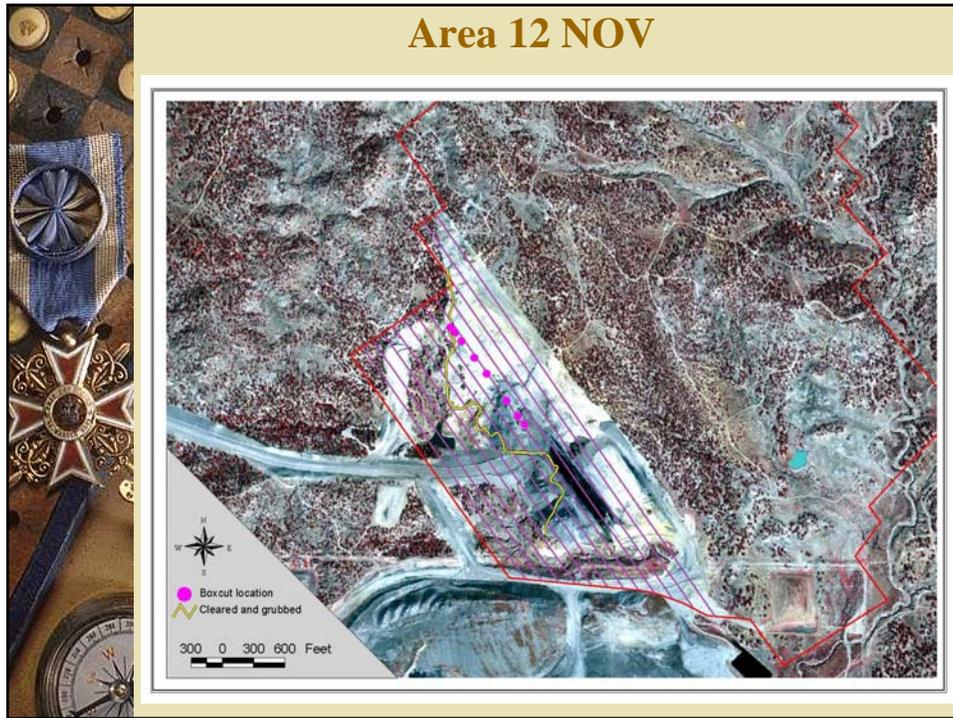
FOR AREA LOCATIONS AND MAPSHEET INDEX, REFER TO EXHIBIT 1.4-2 IN VOLUME 1.

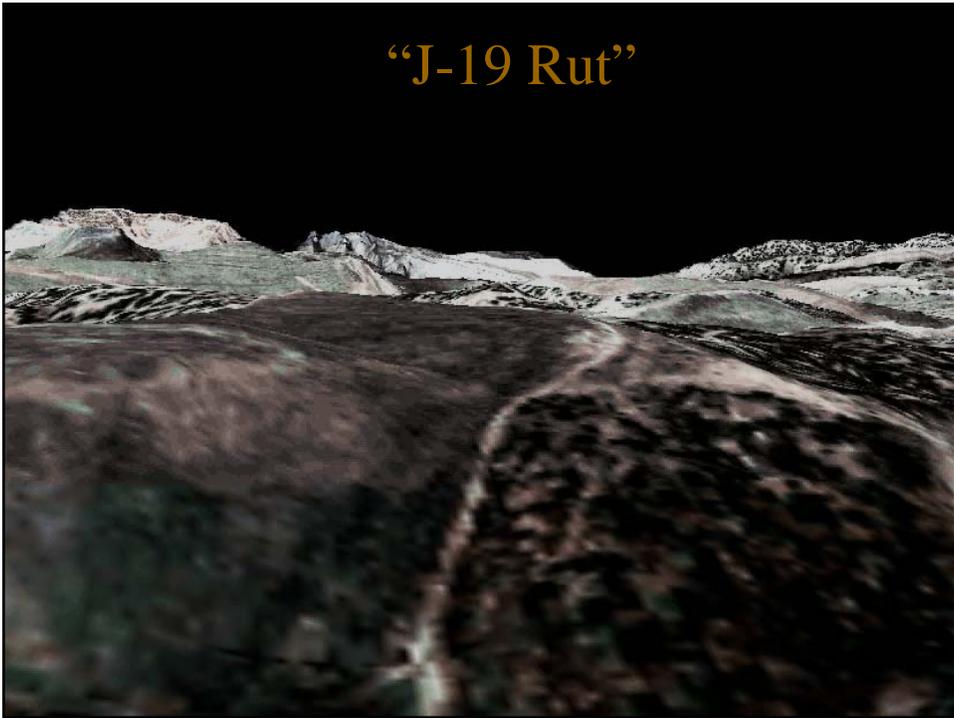
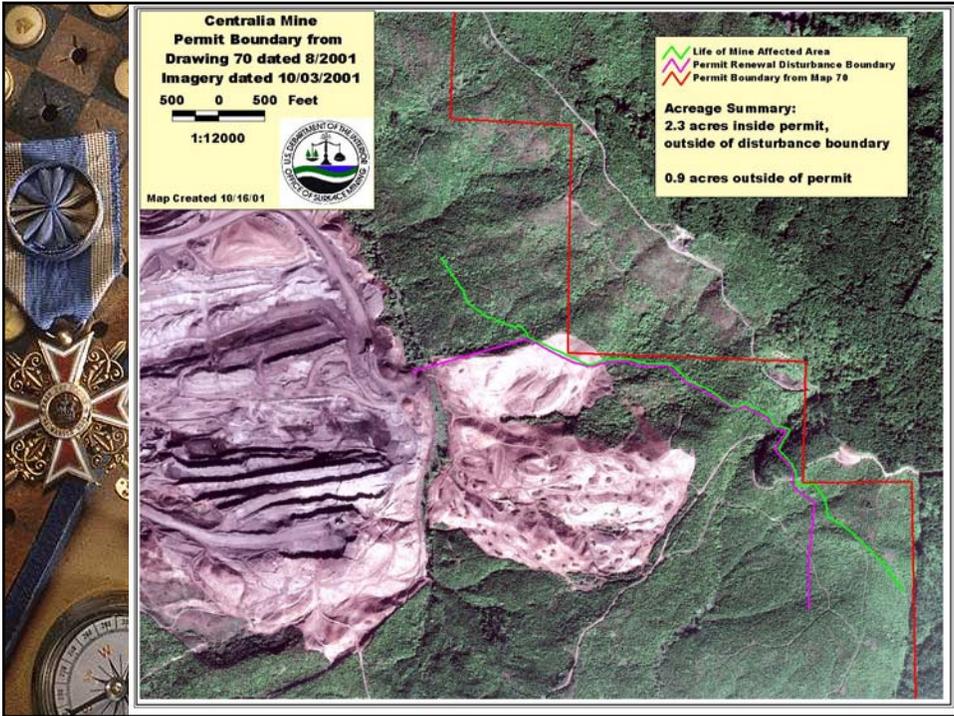
*** Buffer reserved for 3A Plug - see Exhibit 5 1-1, Sheet 2, for area to be held open to accommodate mining. See Section 5 1.2 for specific details.

For pits that are planned to be idled for more than six months, the C-D distance will be closed to 400 feet (unless a shorter distance is noted above) within 180 days of last exposed coal removal. Four-hundred feet allows for the mitigation and topsoiling of whole grids plus a 70-foot buffer for future grading. The 180 days is required to allow time for grid sampling, pre-stripping/distribution of mitigation material, topsoiling and seeding.

08-May-2000 5.1-7







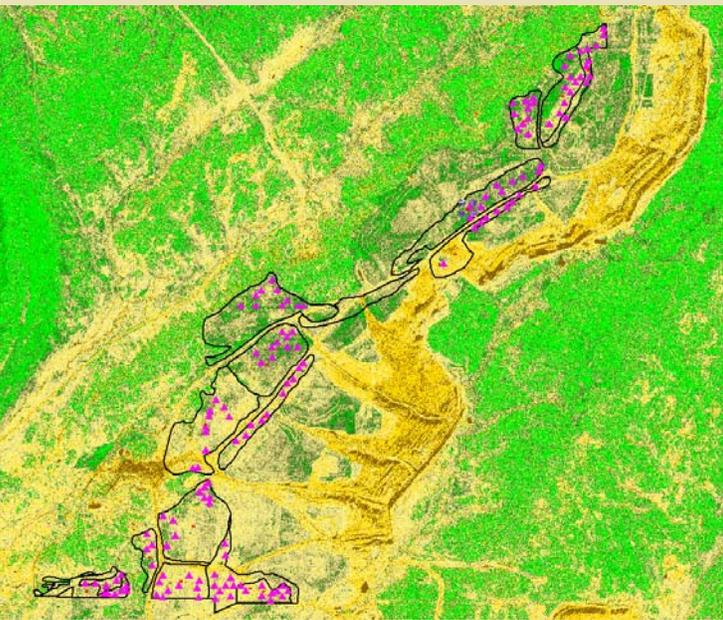


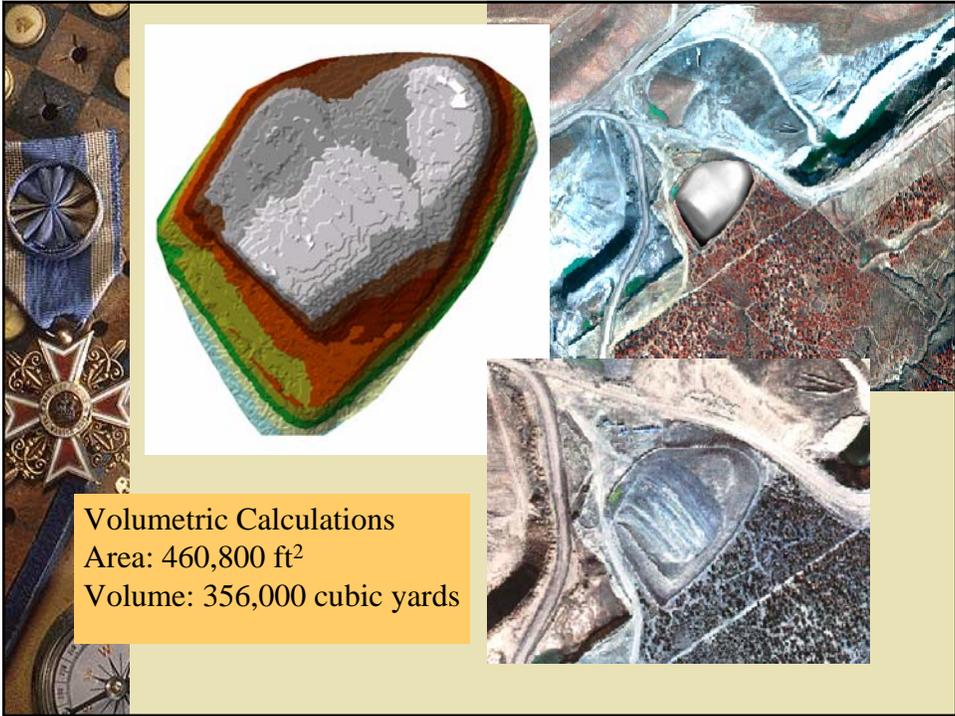
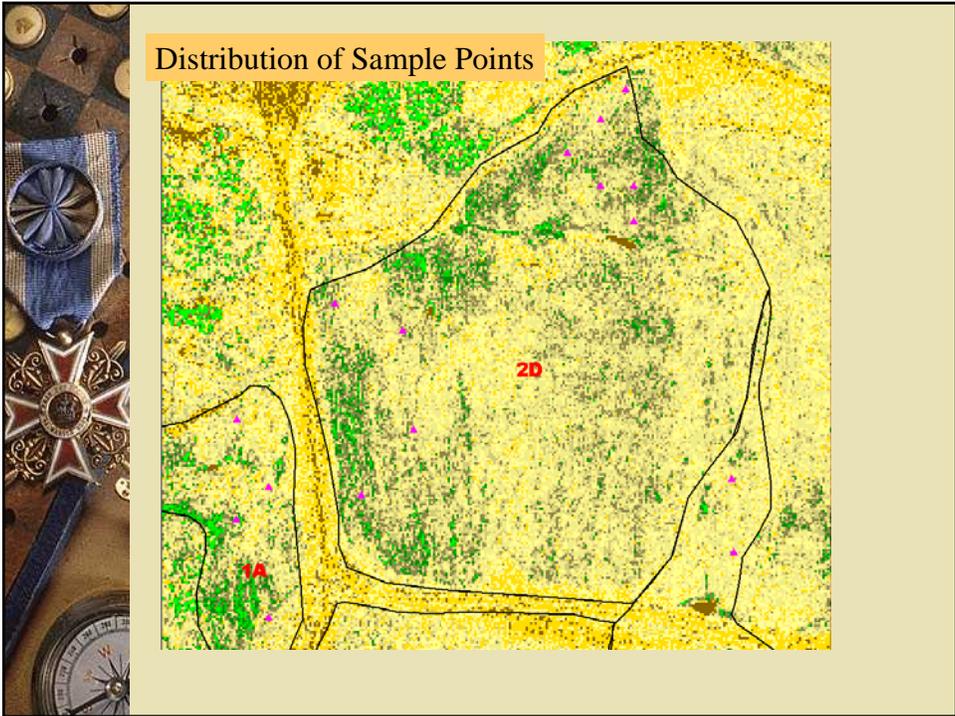
Expedite bond release process by verifying revegetation success.

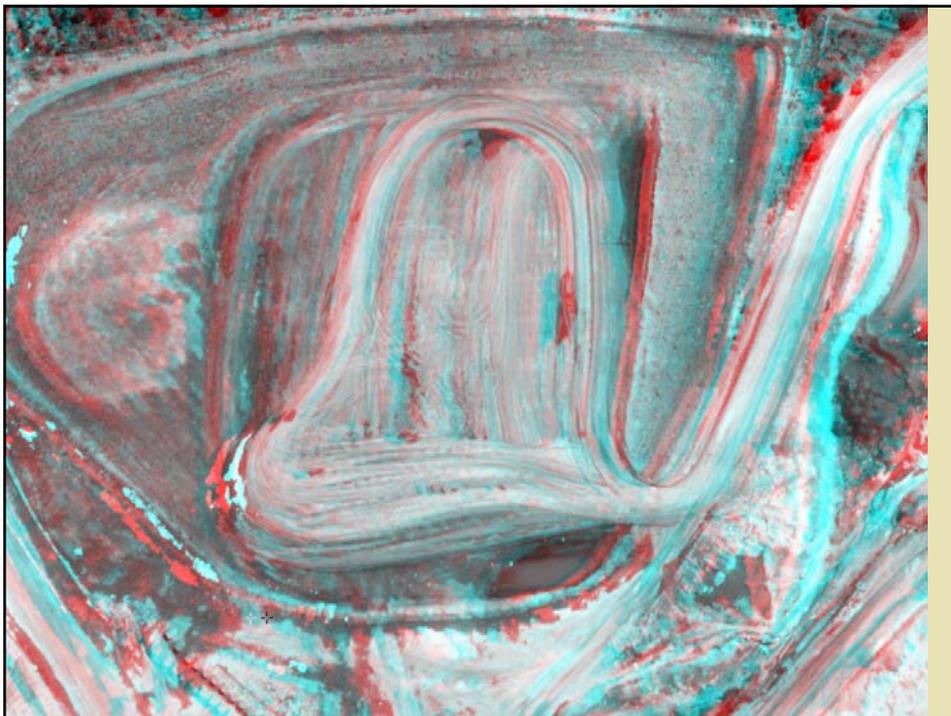
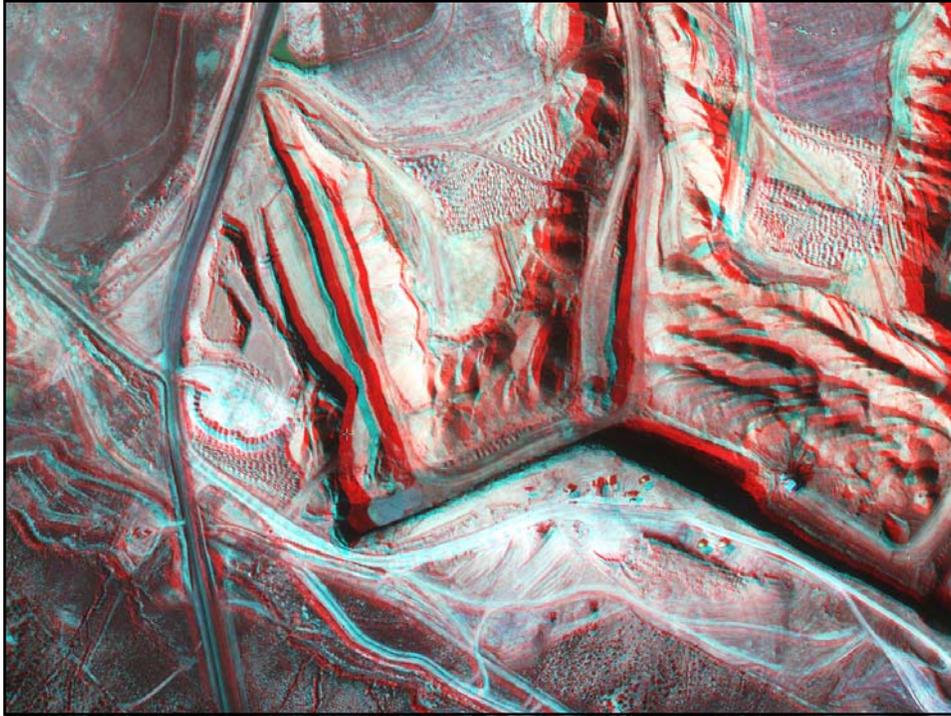
- ◆ Relative vegetation cover mapping is a proven technology
- ◆ OSM has prototyped IKONOS satellite imagery for this purpose
- ◆ Uses ratio of bare soil to green vegetation present (Normalized Difference Vegetation Index NDVI)

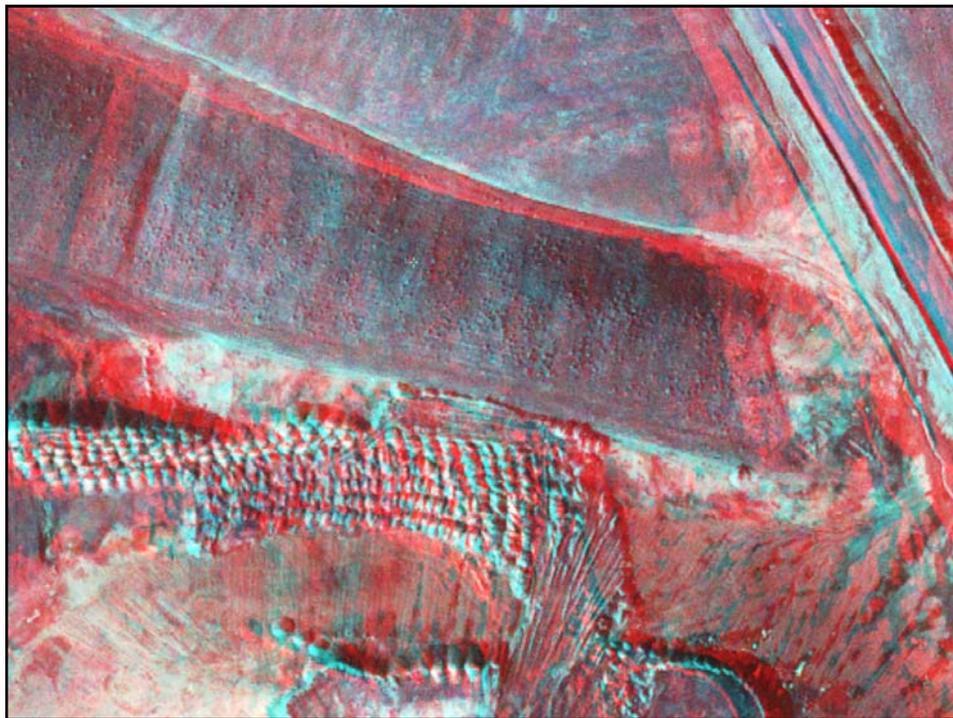
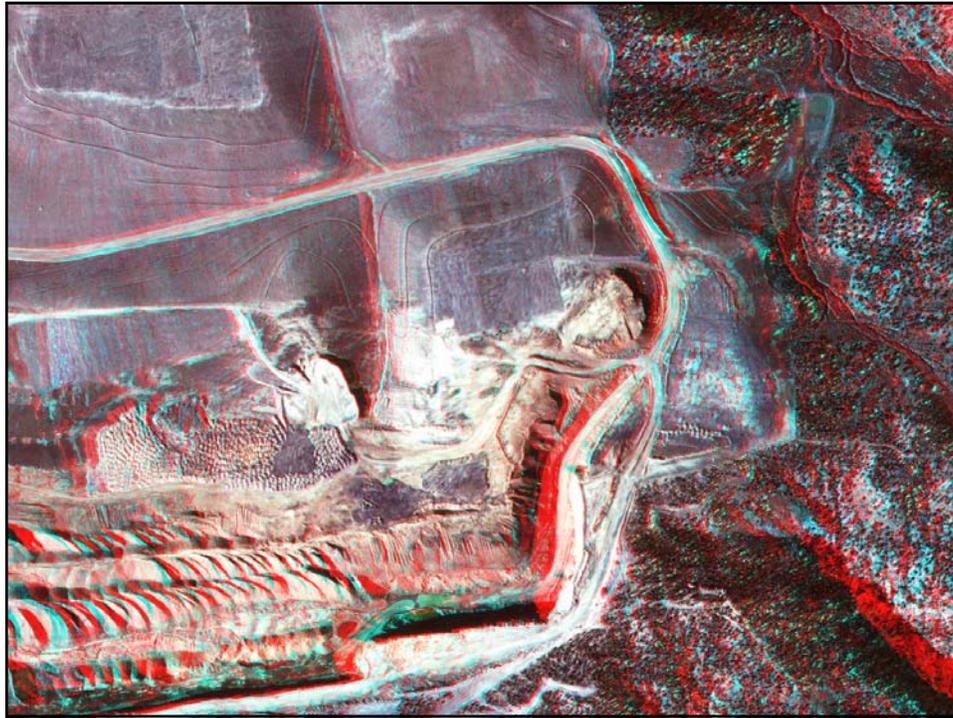


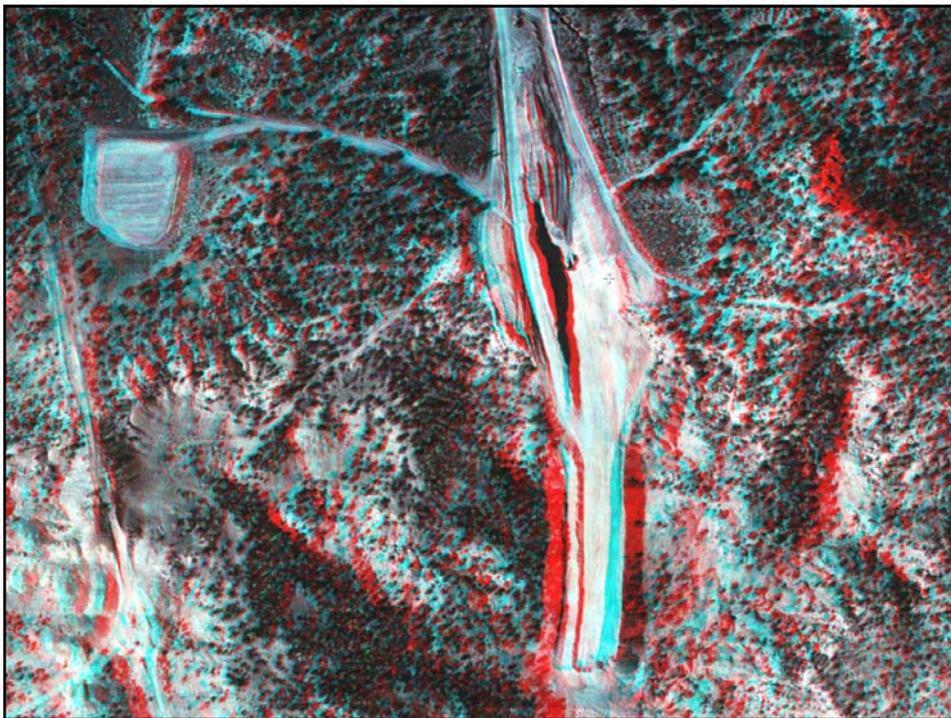
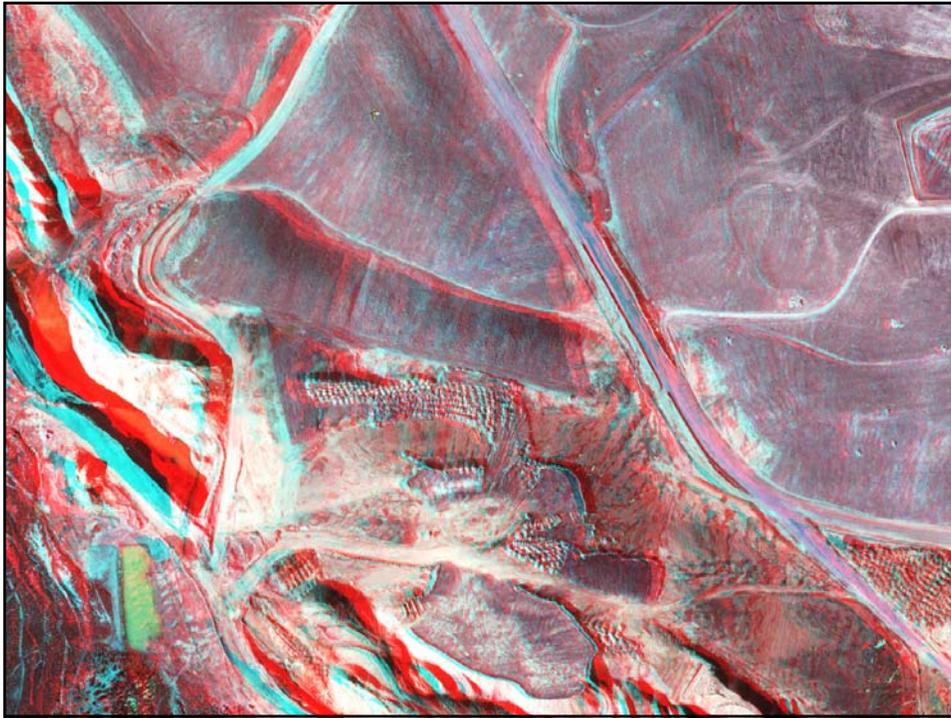
VMA's and Sample Locations from 2000 Annual Report

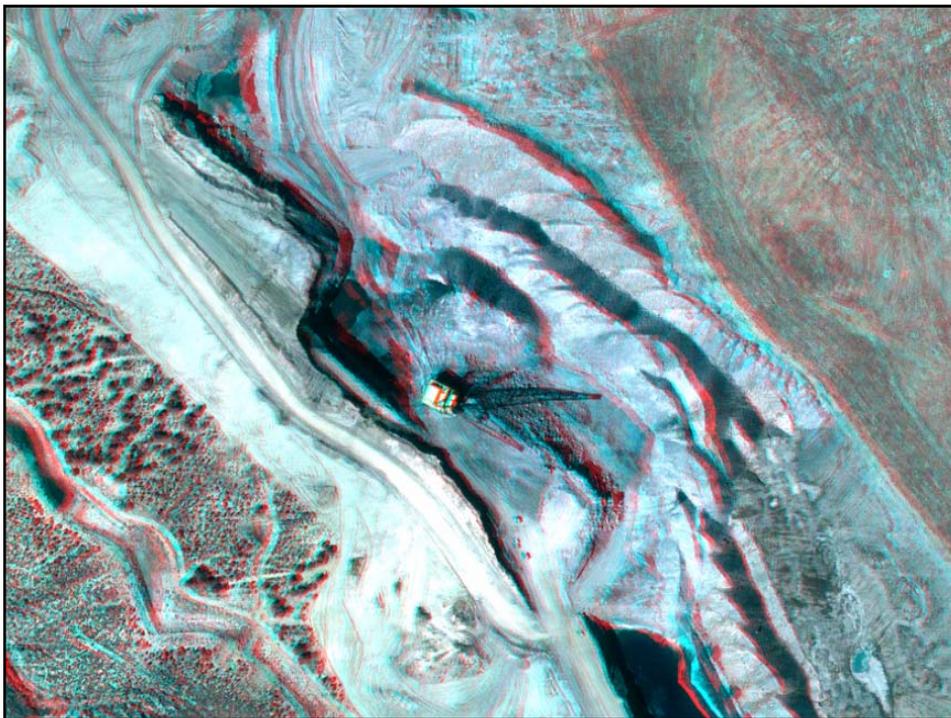
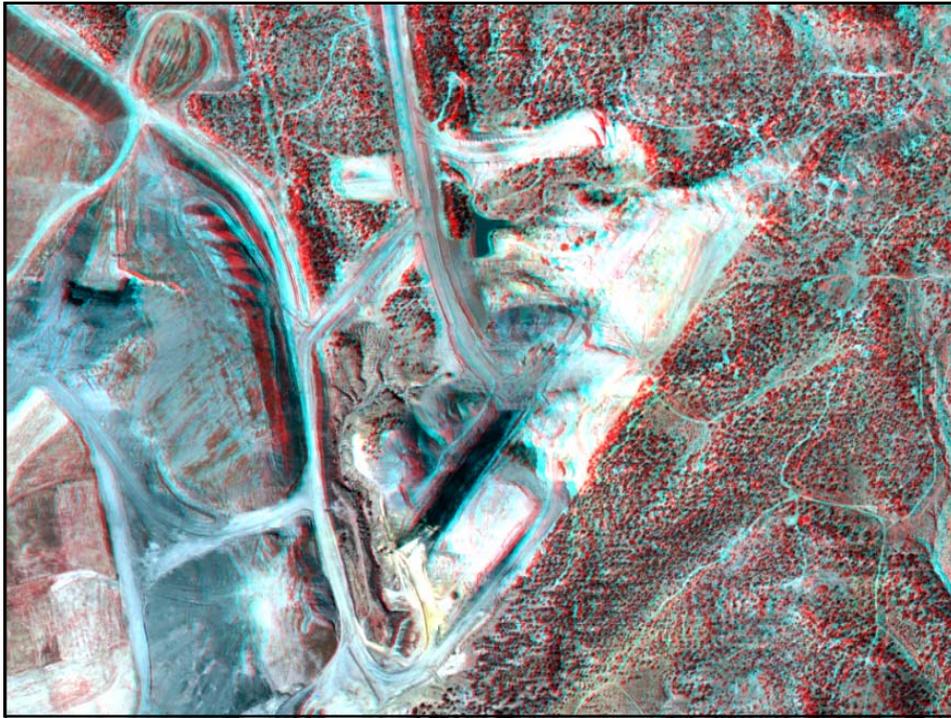














The End

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