GeoMine - Appalachian Coal Mining Geographic Information System Pilot Project Proposal

Robert Welsh (OSM)

August 3, 2010

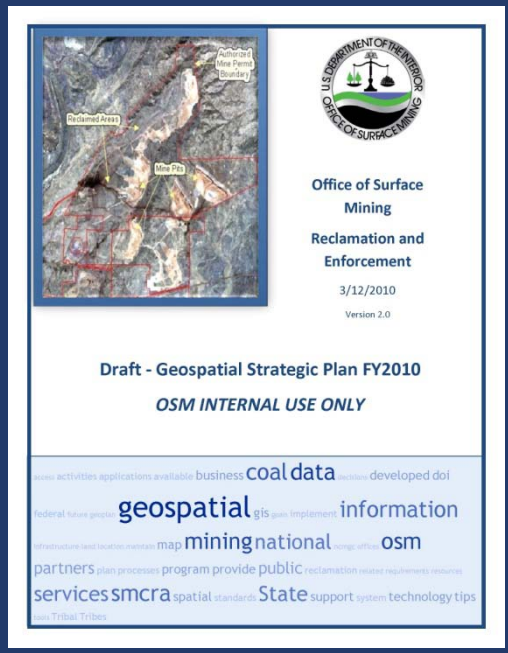
State/Federal Interagency GeoMine Pilot Project Meeting

Purpose of Presentation

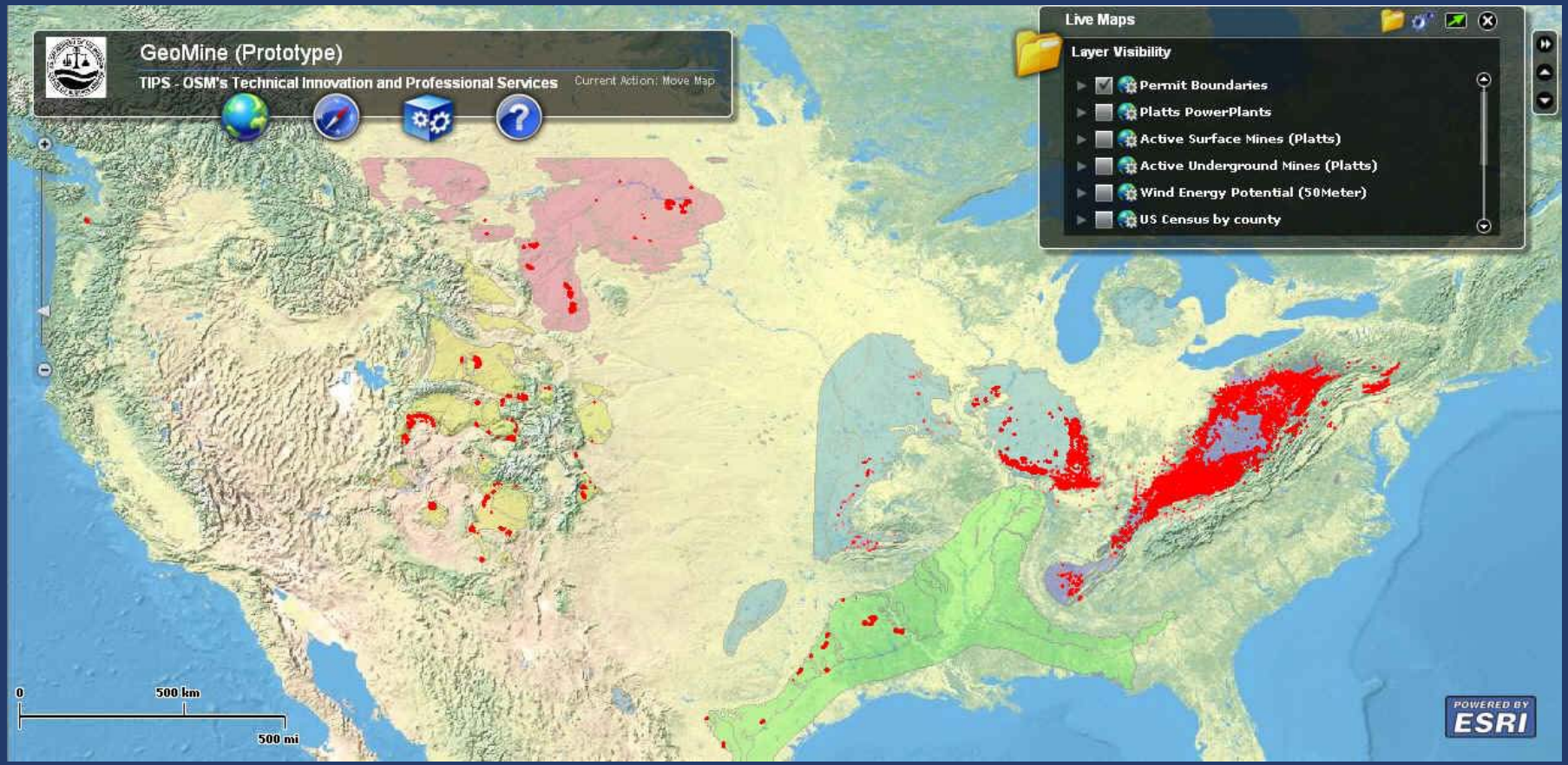
- Appalachian GeoMine Pilot Project concept
- Benefits of a common GIS
- Partnership of seven Agencies

OSM Geospatial Strategic Plan

- Consulted with TIPS & NTTP Steering Committees and Geospatial Committee
- Now finalizing
- SMCRA Authoritative Data Sources - the States/Tribes
- Continue to develop national data standards collaboratively
- GeoMine Pilot Project will begin to implement GeoPlan goals
- Forming the OSM GeoTeam and Interagency GeoCommittee



GeoMine Prototype – A "System of Systems"



GeoMine Concept Development

- DOI, EPA, & USACE - June 2009 MOU - enhance cooperation/coordination
- MOU agencies agreed on the development of a common geo-referenced (GIS) database
- OSM presented the GeoMine prototype to Federal agencies as a possible solution

GeoMine Concept Development

- Feds agreed to begin serious discussion around GeoMine Pilot Project
- States acknowledged as the authoritative data sources for most of the critical data layers
- OSM led initial coordination with States

State/OSM Discussions

- May 26th briefing with potential pilot project states
- SMCRA agencies met June 30th-July 1st
- Face-to-face meeting with the four States and three Federal agencies
- Federal agencies are seeking project funding and resources

Appalachian GeoMine Pilot Project Vision

Federal and State partners in Appalachian coal mine permitting have a shared interest in collaborating and leveraging resources to develop a collective geospatial information system that will enhance the ability of each agency to make more informed and expedited decisions under their respective programs.

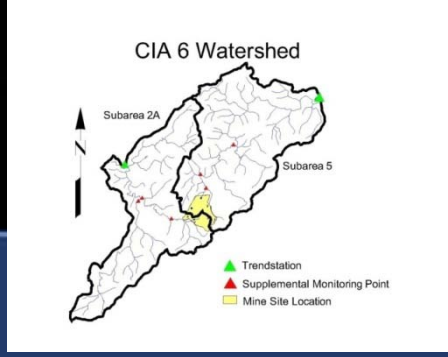
Proposed GeoMine Scope

- Kentucky, Tennessee, Virginia, and West Virginia
- Focus first on critical geospatial data themes (OSM/States have ASTM-approval on several)
- Demonstrate results quickly

Proposed GeoMine Scope

- Phased approach over two years
- Scope of coal mining activity
  - Proposed mines (200)
  - Operating/reclaimed mines (5000 on 2.3 million acres)
  - Abandoned Mines (400,000 acres)
- Funding: System Design and Data Theme Development

GeoMine Benefits



- Coordination of permitting activities
- Improved decision-making
- Improved environmental analyses
- Geospatial data transparency (one-stop shop)
- All agencies can access 24/7

GeoMine Critical Data Themes

1. **Existing Coal Mining Permit boundaries - SMCRA RA**
2. **Proposed Coal Mining Permit boundaries - SMCRA RA**
3. **Reclaimed Coal Mining site boundaries - SMCRA RA**
4. **Abandoned Mine Land site boundaries - SMCRA RA**
5. **Excess spoil fill footprints - SMCRA RA**
6. Generalized vegetation types within mine boundaries - SMCRA RA
7. **Post-Mining Land Use - SMCRA RA**
8. Impaired Streams – CWA RA
9. TMDL sampling sites - CWA RA
10. Existing outfalls - CWA RA
11. Hydrologic Unit Code - CWA RA
12. Existing USACE permit locations (USACE CorpsMap)
13. Impact mitigation locations (USACE CorpsMap)
14. National Hydrologic Dataset (NHD) and Watershed Boundary Dataset (WBD) (USGS)
15. National Wetlands Inventory (FWS Wetlands Mapper)

Summary

- In formative stages
- Collaboration is key
- State RAs and Federal Agencies are Authoritative Data Sources
- GeoMine serves needs of all seven agencies

END

Questions/Comments

GEOMINE
DATA NORMALIZATION TECHNOLOGY RECOMMENDATION

Presented by:
Gregory L Morlock
US Department of Interior
Office of Surface Mining
Denver, Colorado, USA

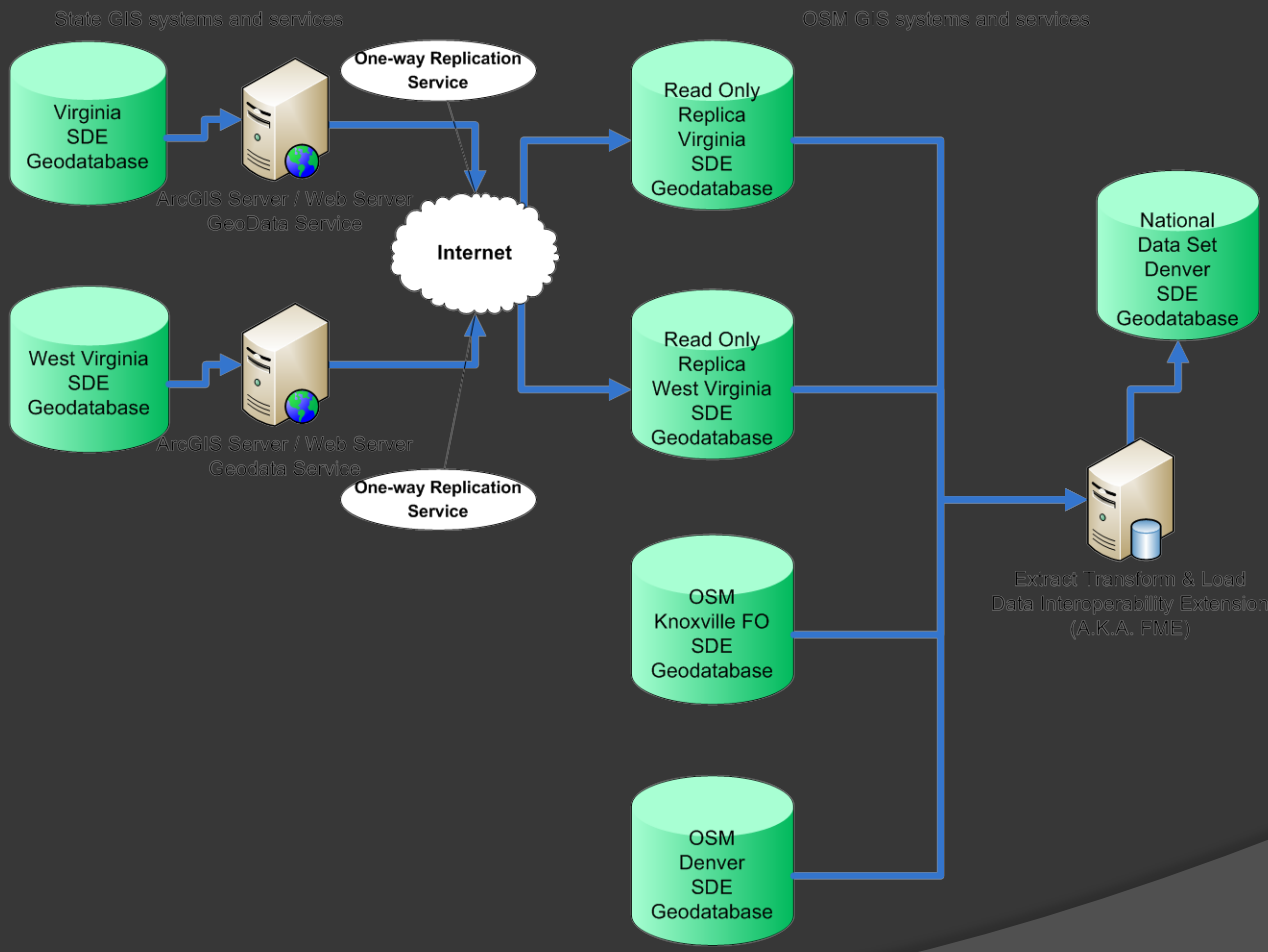
Background

- OSM won a “Special Achievement in GIS” (SAG) award from ESRI in 2008 for creating a proof-of-concept federated coalmining GIS in cooperation with Virginia and West Virginia
- Considered several approaches
- Selected ESRI geodatabase replication to central location followed by an “spatial extract, load and transform” (ETL) using the “Data Interoperability Extension”, A.K.A., Feature Manipulation Engine (FME)

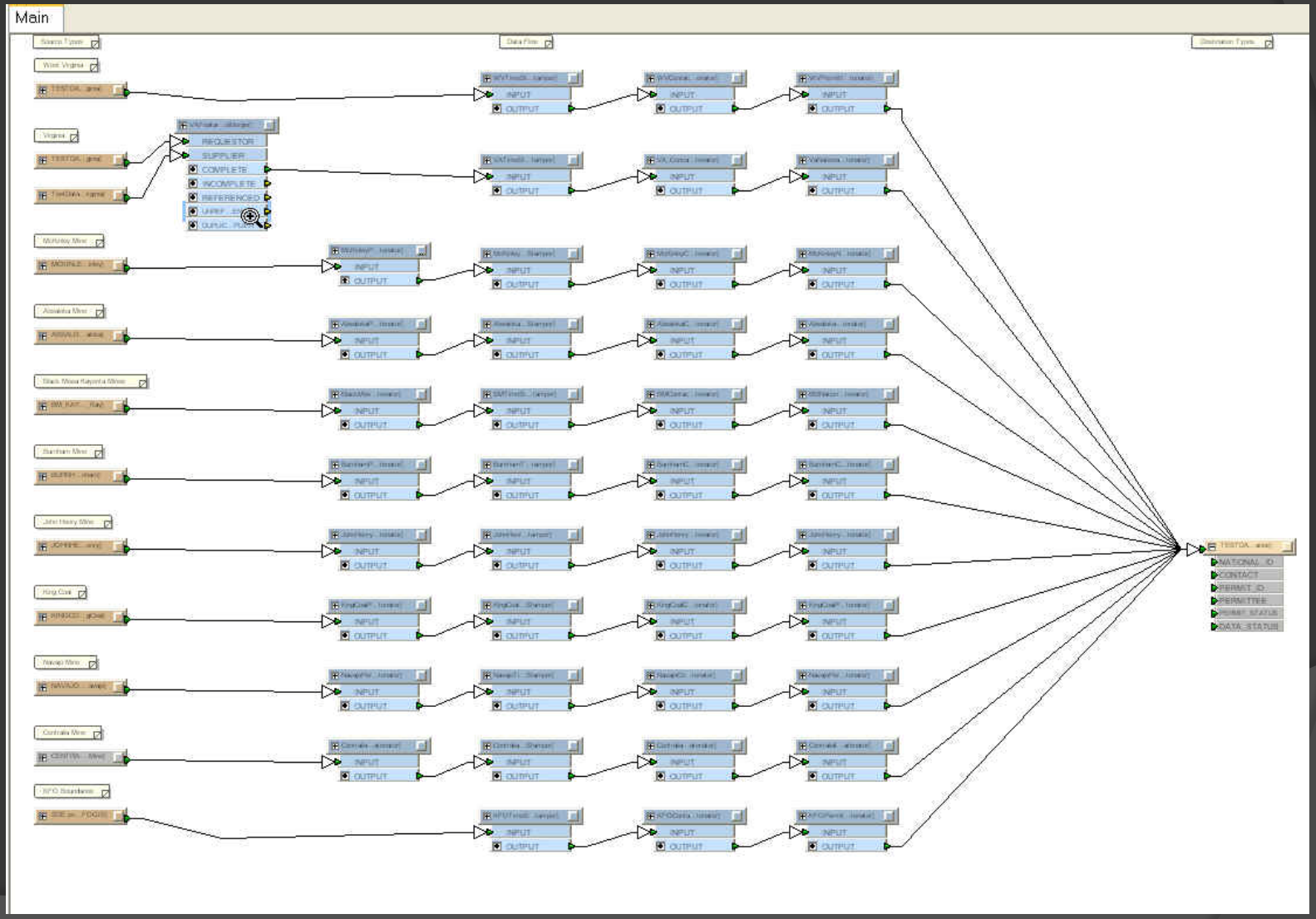
Test Methodology

- Virginia and West Virginia published SDE 9.2 feature classes with relevant permit boundary information using ArcGIS Server 9.2
  - Published “geodata services” which allow geodatabase replication
- OSM created one-way replicas of the published features on an SDE 9.2 server in their Denver office
- OSM created an extract, ETL tool using FME
  - Tool ingested state replicas and several OSM internal feature classes and outputs a single feature class

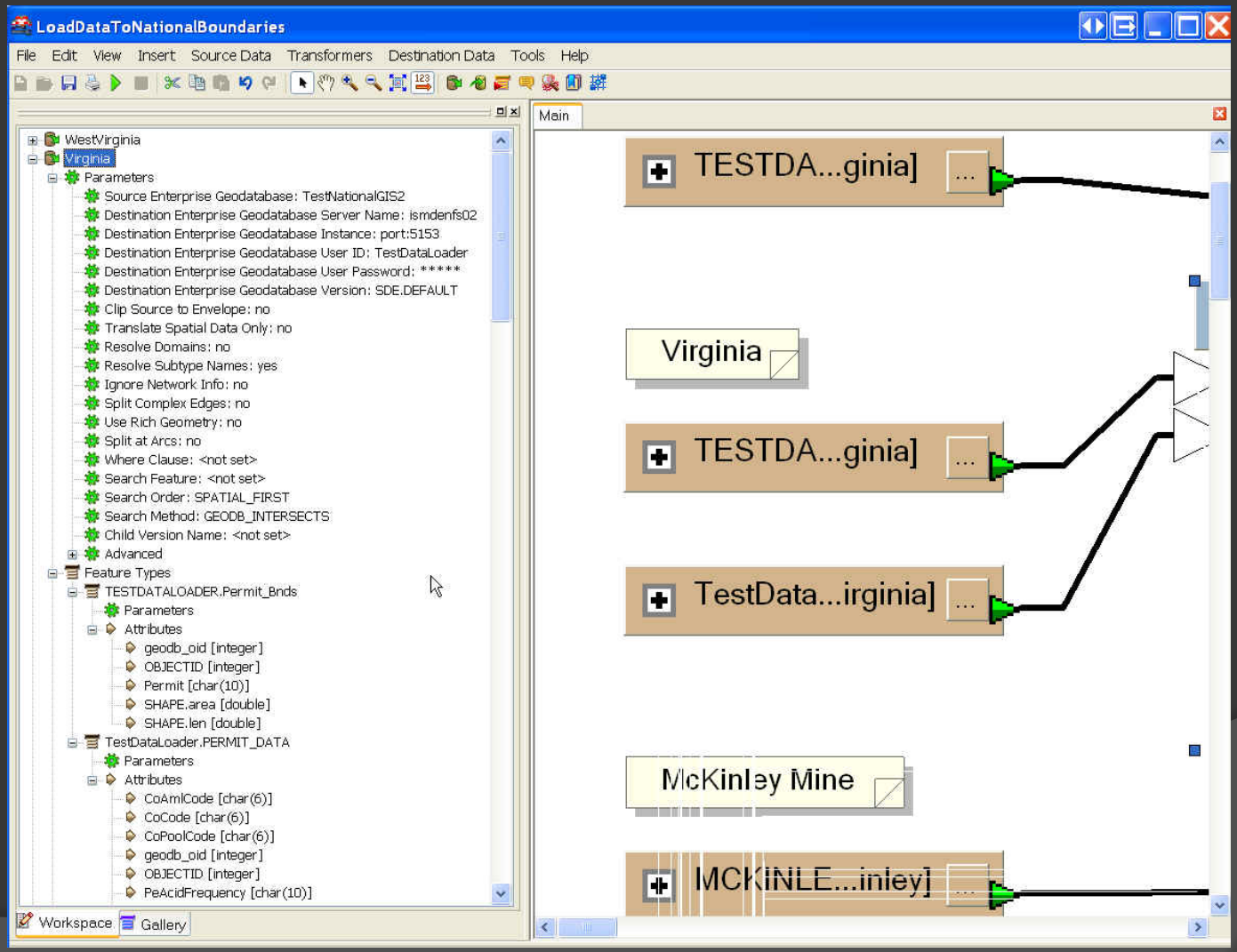
Test Configuration



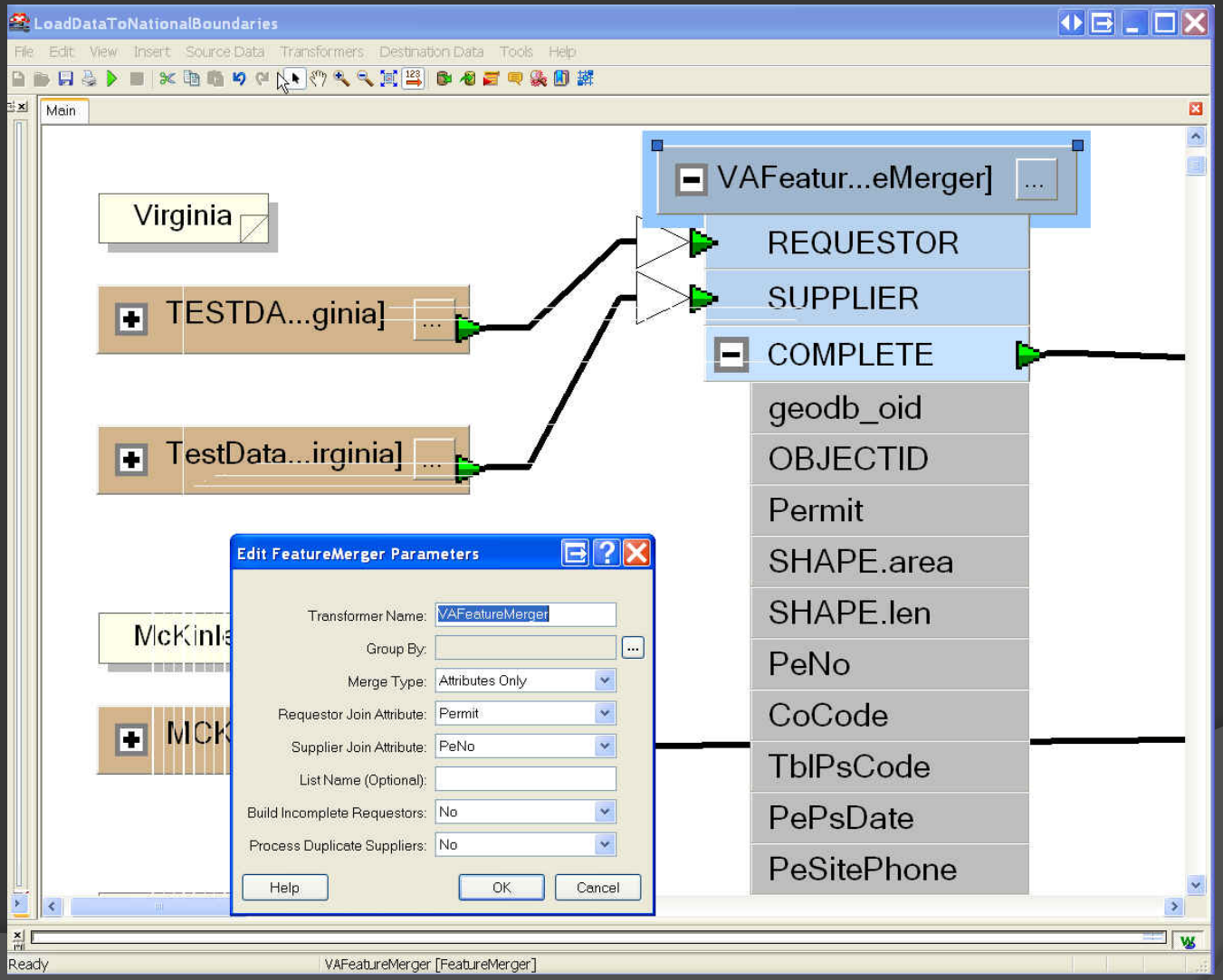
ETL Tool Designed for Test



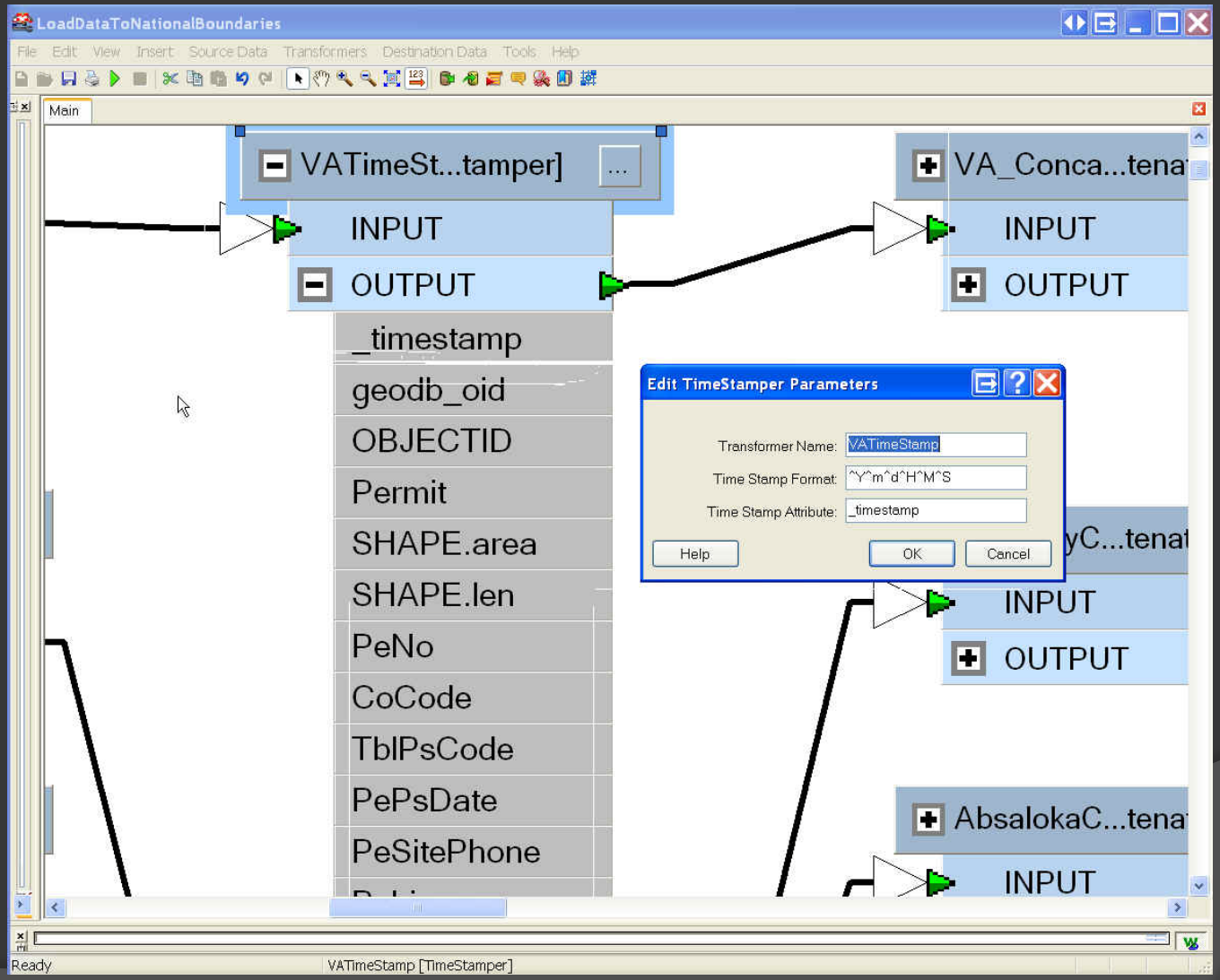
Connection to Replicated Virginia Database



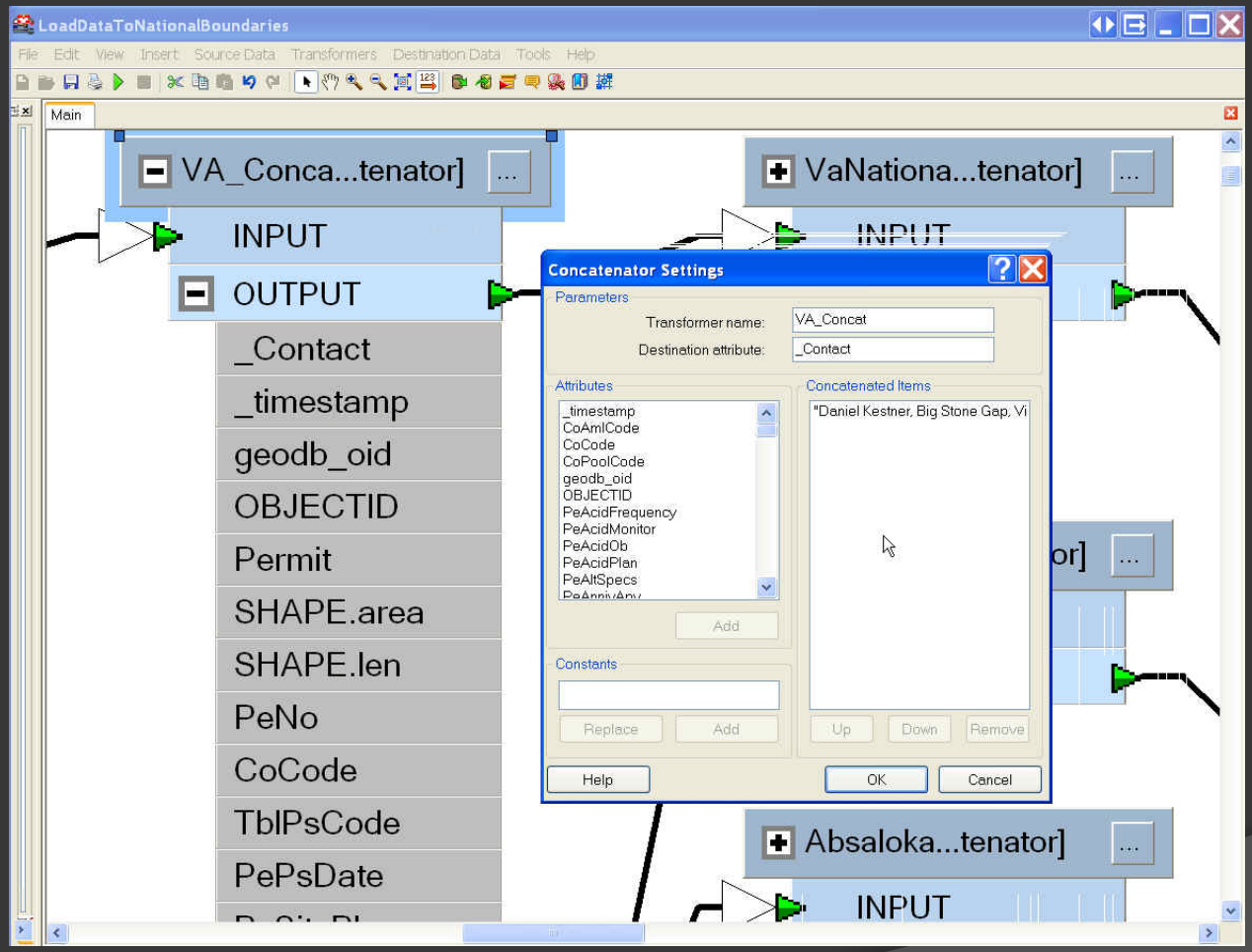
Merging Virginia's Permit Polygon Data with Related Attribute Table



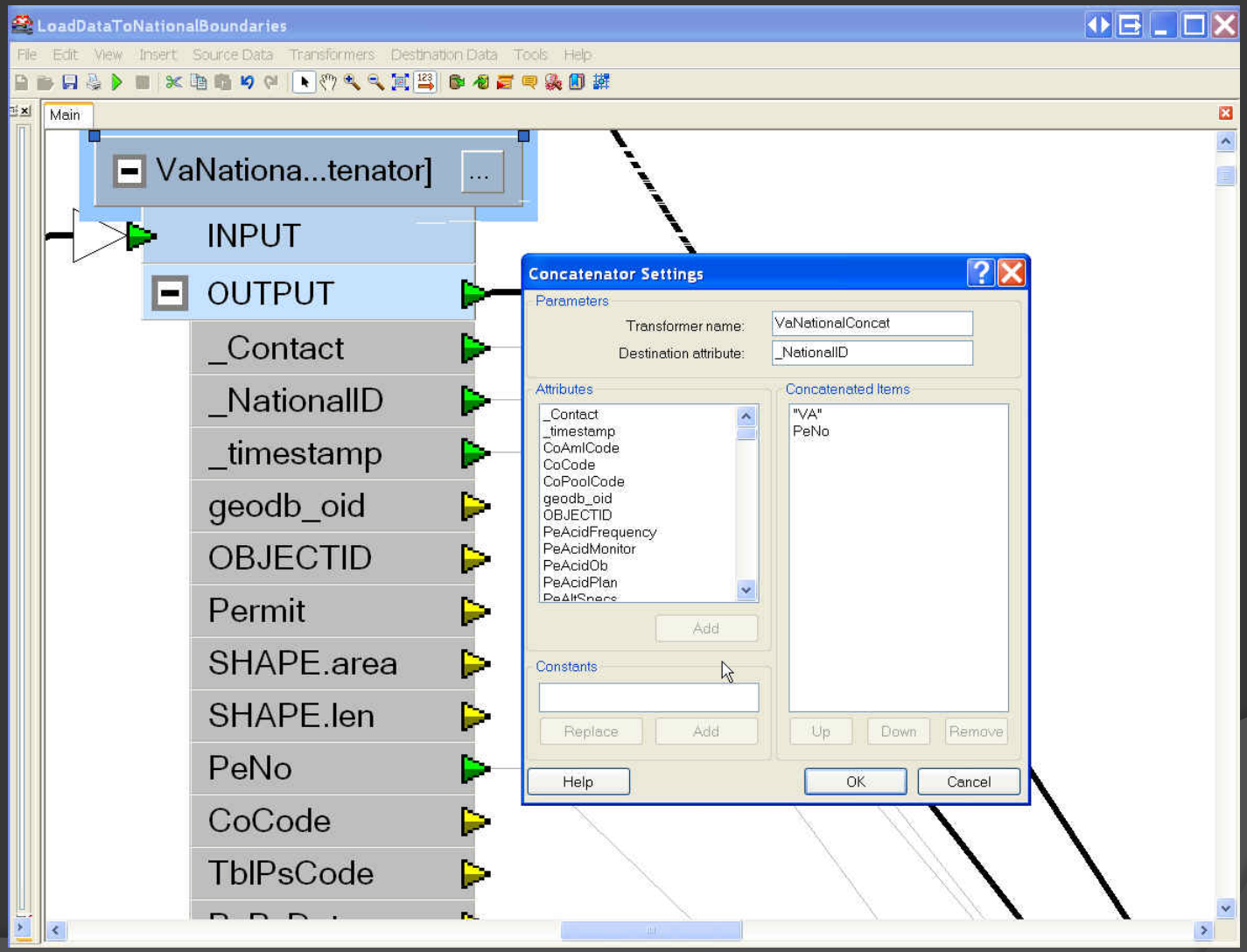
Generating Time Stamp



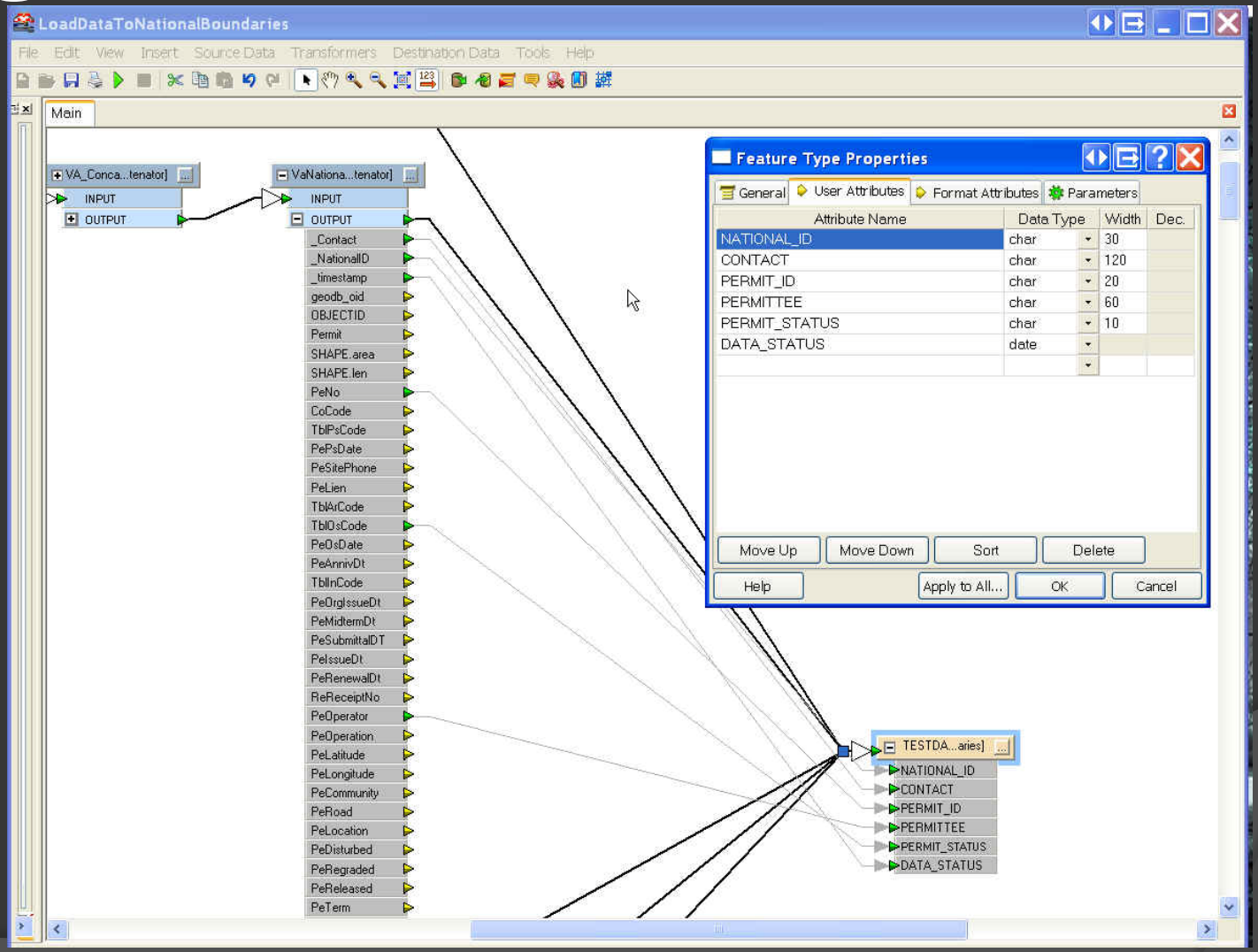
Generating "Contact" Information



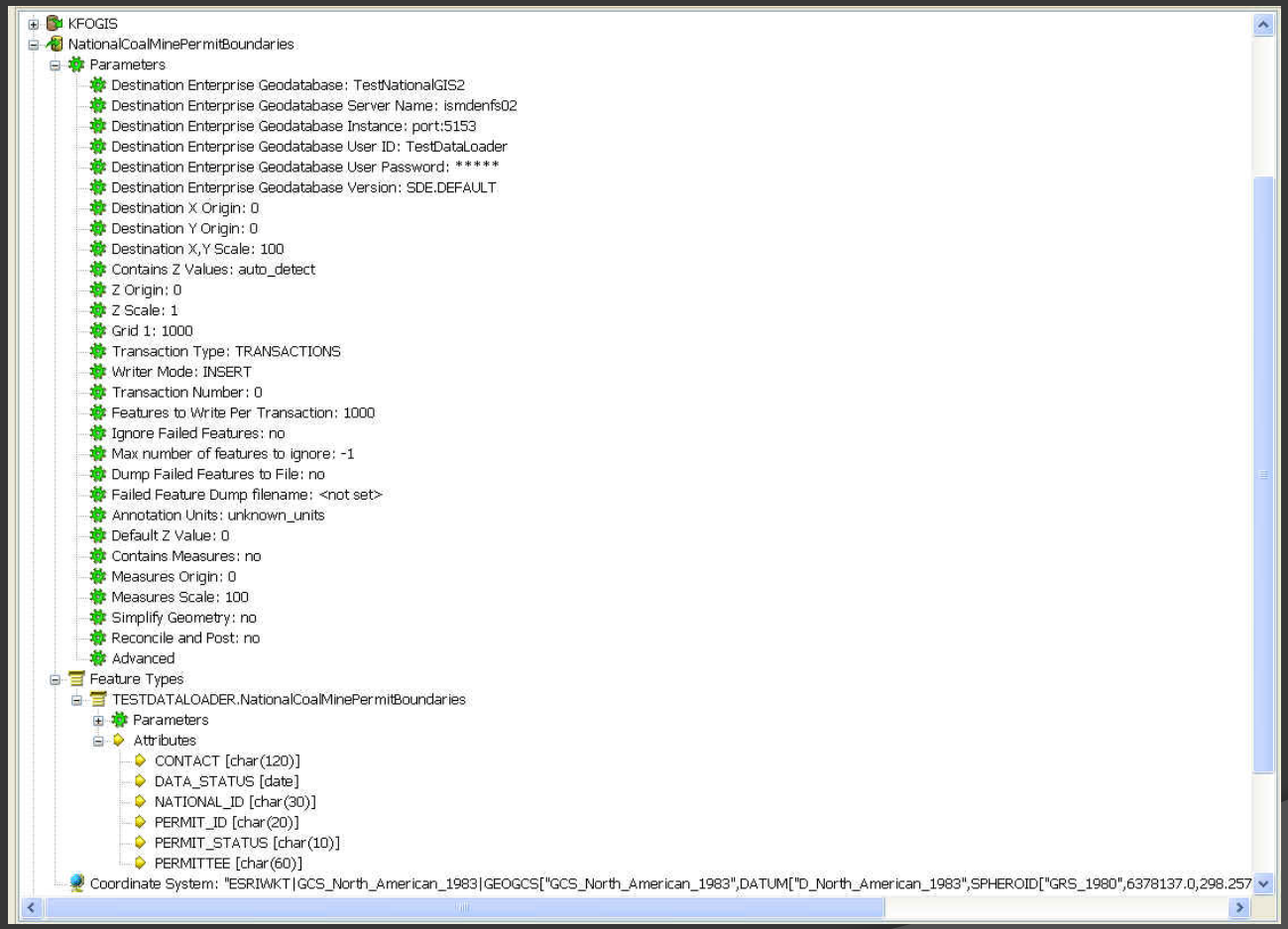
Generating Unique National ID Attribute



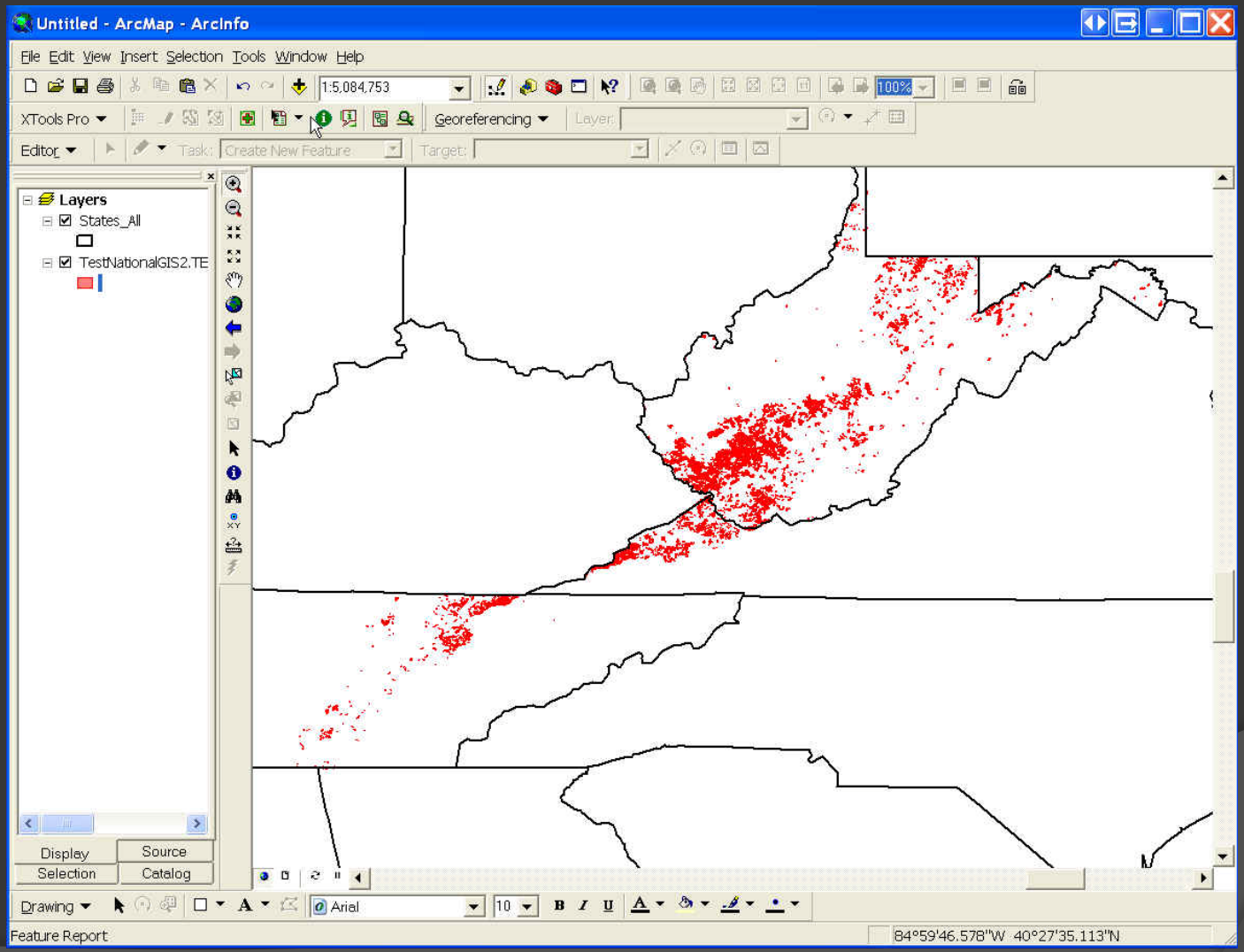
Merging Virginia's Data into Single National Feature Class



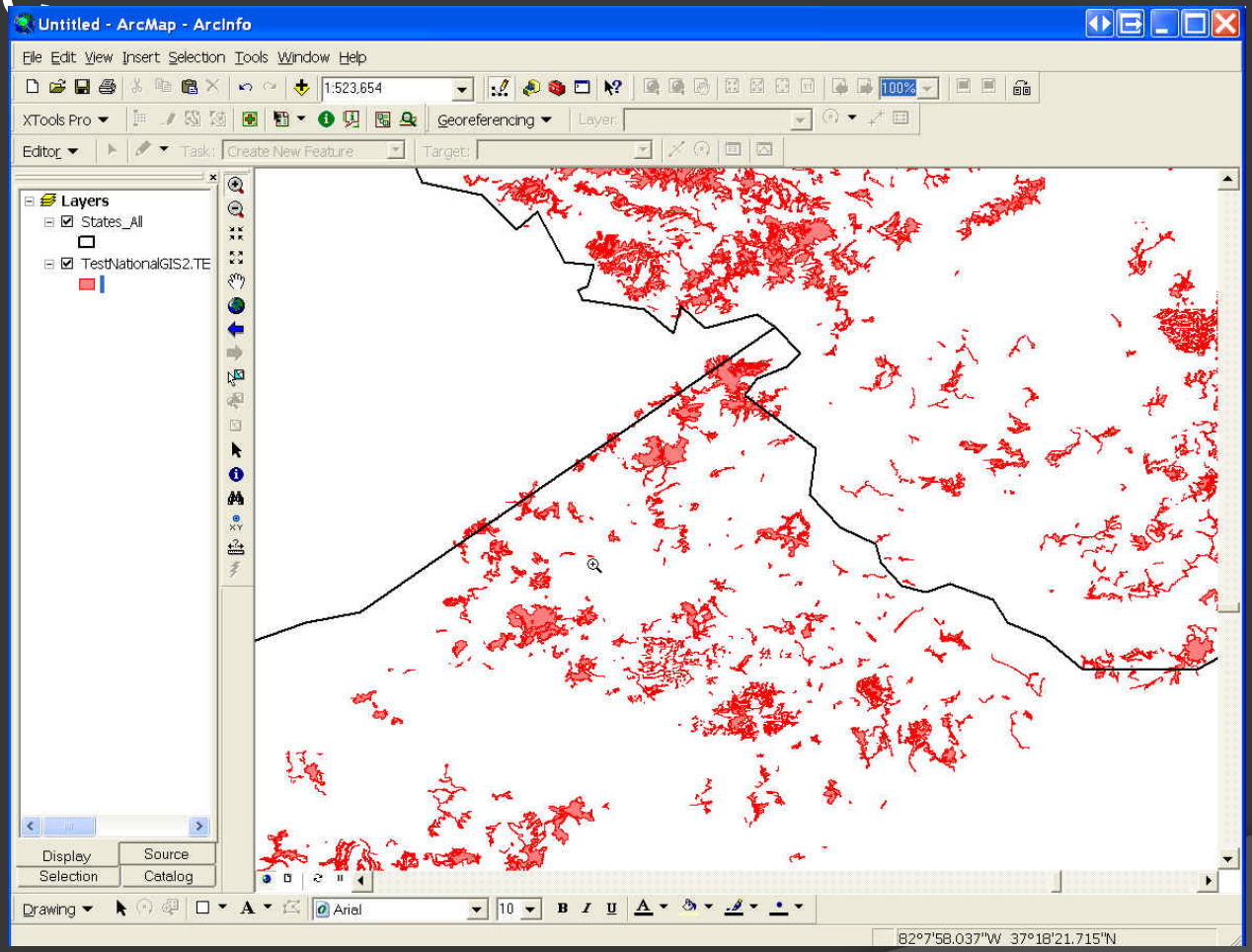
Setting the National Feature Class' Attributes and Coordinate System



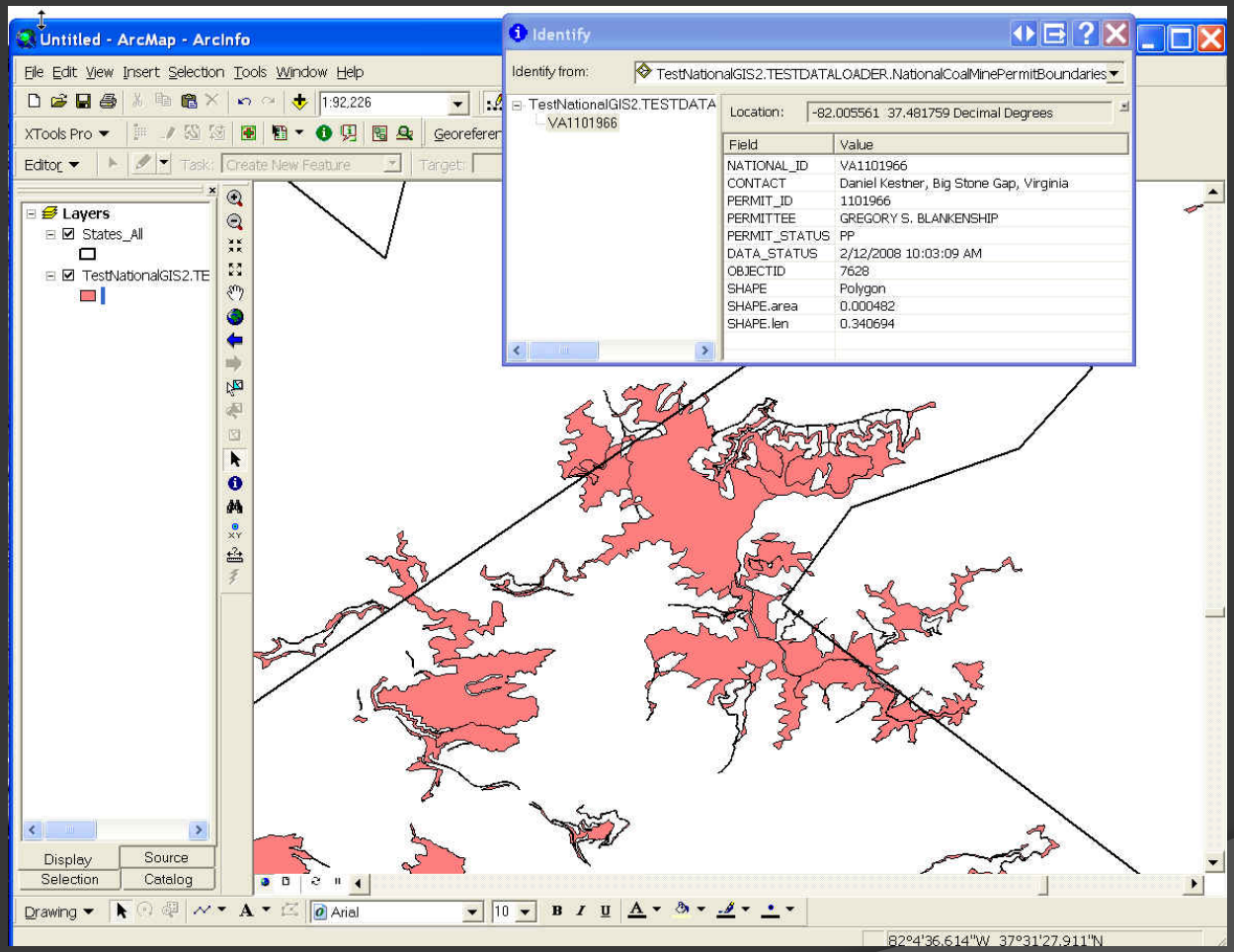
National Feature Class – Eastern View



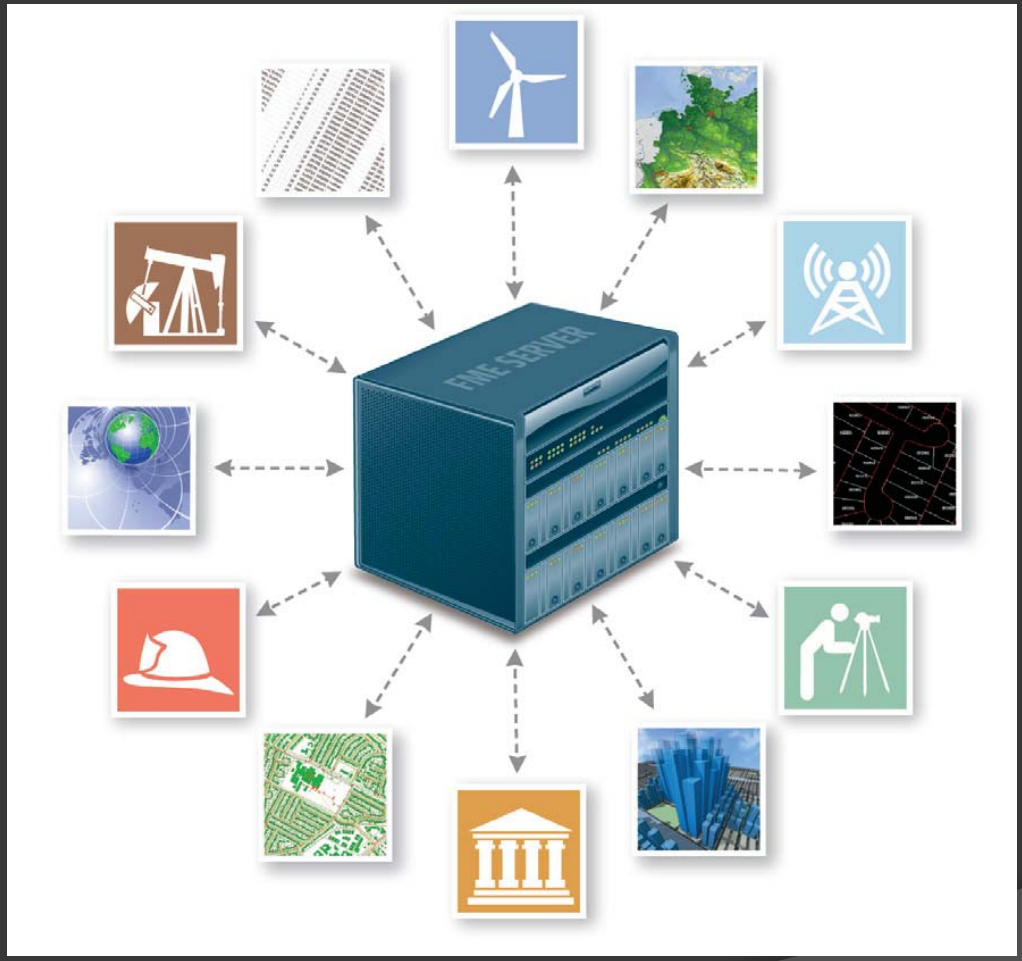
National Feature Class – Zoom Near Virginia -West Virginia State Line



Permit Attributes



FME Server adds new options



GeoMine Technology Recommendations

- Leverage OSM, VA and WV experience
- Use the comercial-off-the-shelf software, FME, for ETL operations
- Investigate efficacy of using new FME server for ETL of live web services
  - Test output of live federated service created from live feeds
- Investigate cloud hosting options

Contact

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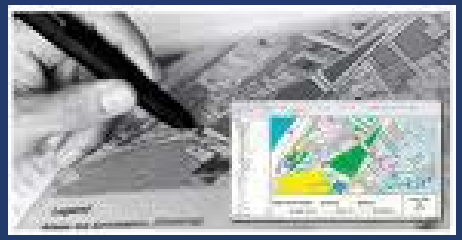
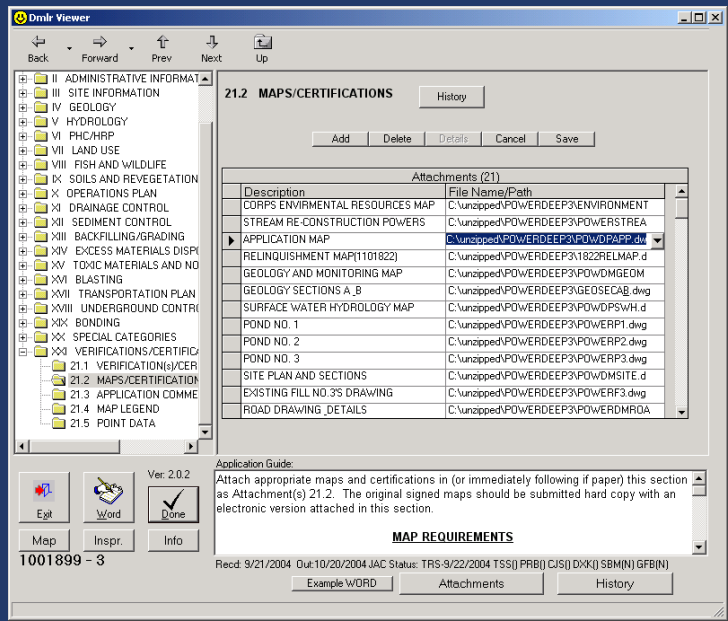
Creating a National Coal Mining GIS

Interstate Mining Compact Commission

Project Components

- Collection of Legacy data
  - Digitization of map features
- Collection of industry submitted map data
  - Digital data from industry
    - ESRI Shapefiles
    - AutoCAD drawings
- Combine State Partners data into national GIS

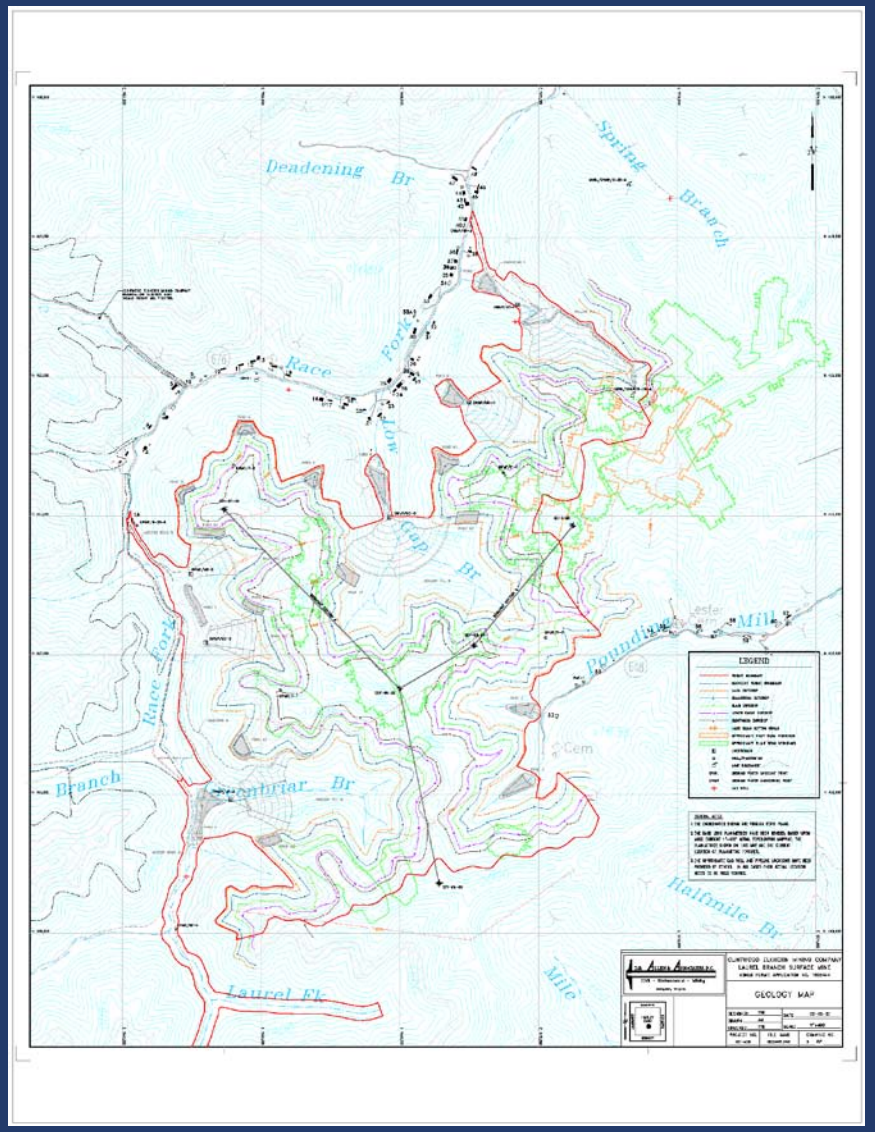




Maps - Data Sources

Through permitting process

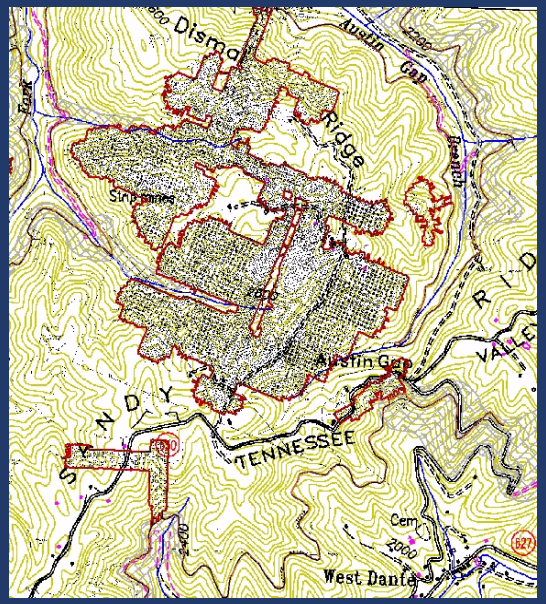
- hardcopy maps
- Image files
- Adobe PDFs
- CADD formats
- Etc



Map Archives

The maps have been archived in many forms

- Hardcopy map storage
- Microfilm
- Scanned images
- CADD formats

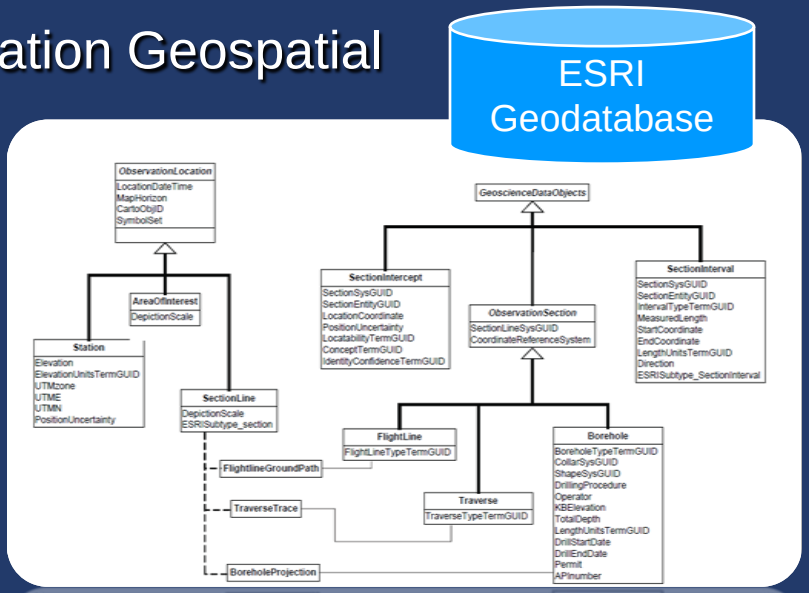


Creating GIS Data

- Mapped features (points, lines, areas)
  - Features on a map
    - Permit Boundary
    - Post-Mining Land Use
    - Excess spoil fill footprint
    - etc
- Attribution
  - Information about the mapped feature
    - Ex. Permit Number, Company Name, Acreage
  - Stored in
    - Hardcopy document
    - Scanned document
    - Database tables
    - Spreadsheets
    - etc

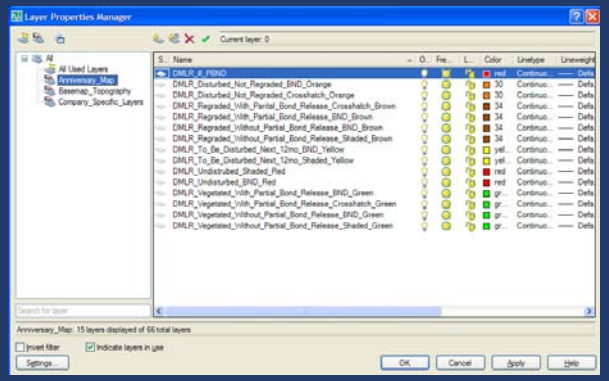
Data Standards - GIS

- Define a data model (standard) for GIS
  - Leverage existing ASTM Coal Mining Geospatial standards
  - Limited subset of CADD content
  - Limited subset of shapefiles
  - To be used for data aggregation from contributing states
  - To be used for powering the integration Geospatial Portal



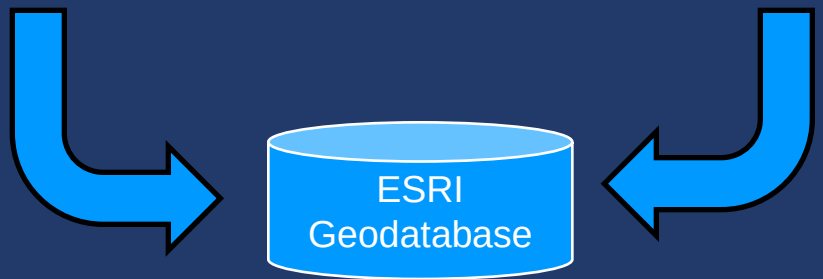
Digital Map Data Collection

- Industry submitted map data in structured formats
  - Define ESRI Shapefile requirements
    - Leverage existing map requirements
  - Define CADD standards for each state
    - Leverage existing templates from existing states
    - Layers, line styles, projection parameters
- Will facilitate the conversion from Industry data to Regulatory Authority (RA) GIS
- Will facilitate the automation of data interoperability

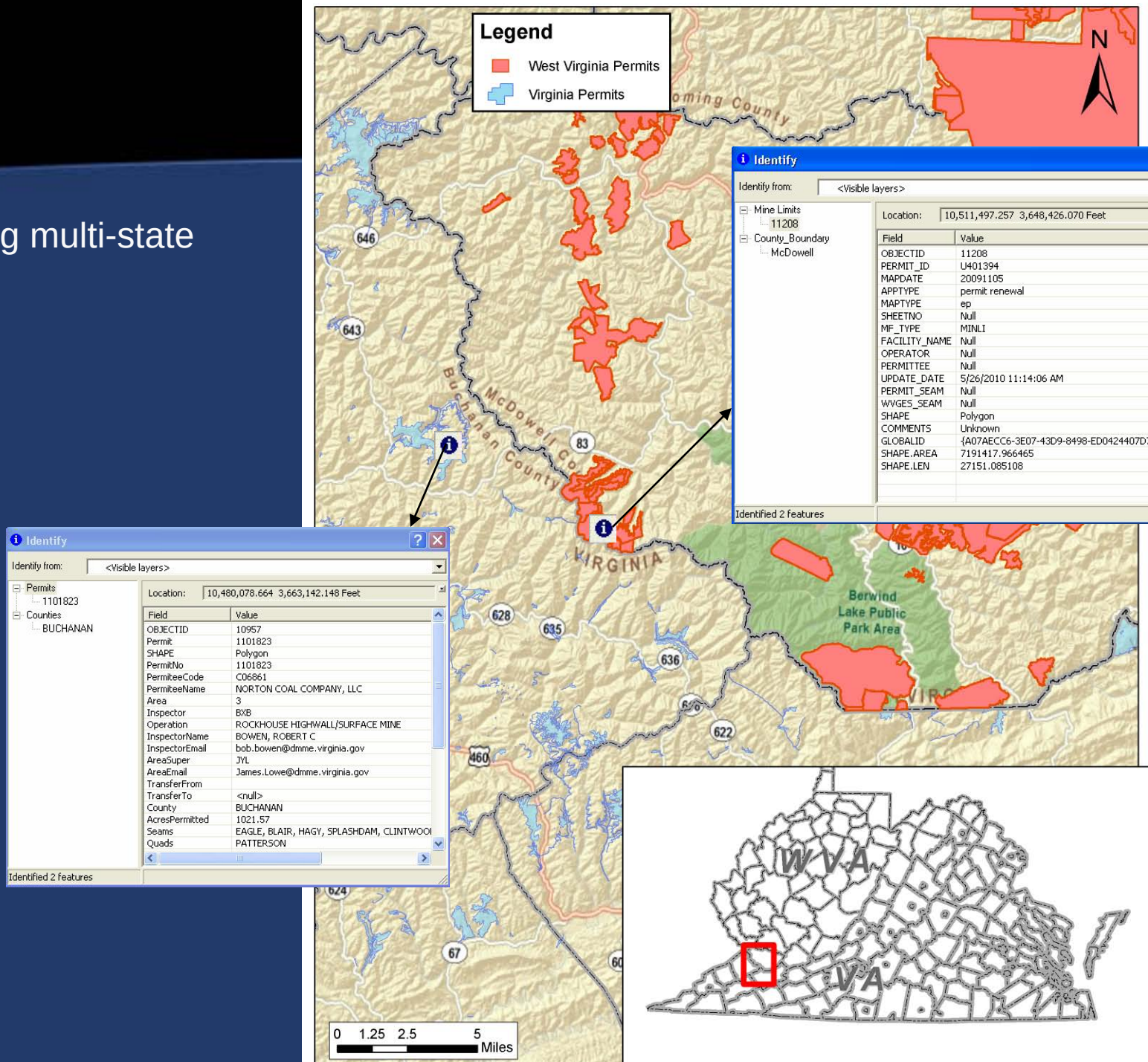


Use of GIS Layers

- Combining layers from multiple states
  - Multiple inputs to create a single layer
- Standardization
  - Defined minimum requirements
- Analysis
  - Local, regional, state and national levels

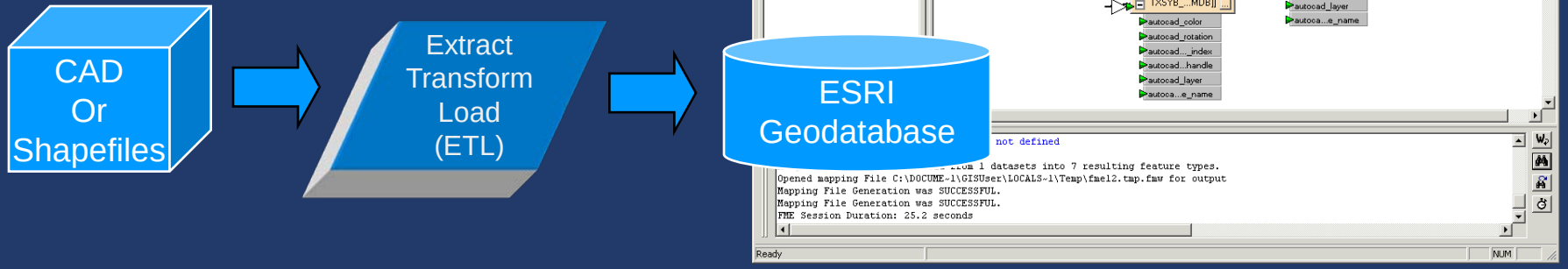


Example: Using multi-state GIS data



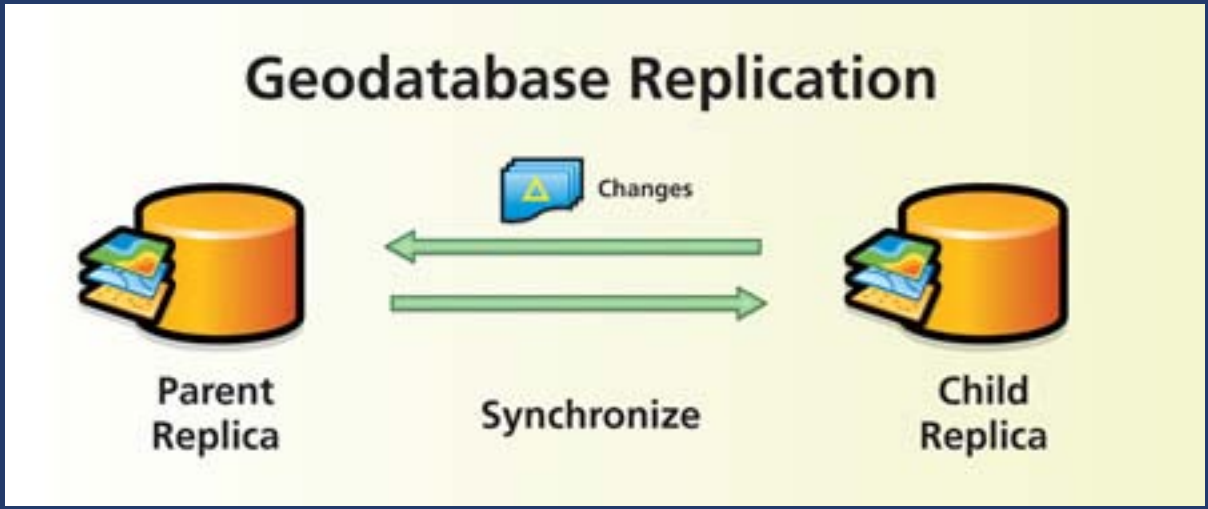
Industry Data to GIS Automation

- Define adapters for each partner state
  - Input is source files for that state
  - Outputs into standard GIS model
  - Prepares data for automated replication of GIS content to a central location



GIS Replication

- Automated tool in each state
  - Uses ESRI data replication
  - Only deltas are exchanged
  - Prepares data for automated replication of GIS content to a central location
  - QA / QC integrated into data pushes
  - Feeds Integrated GIS Portal

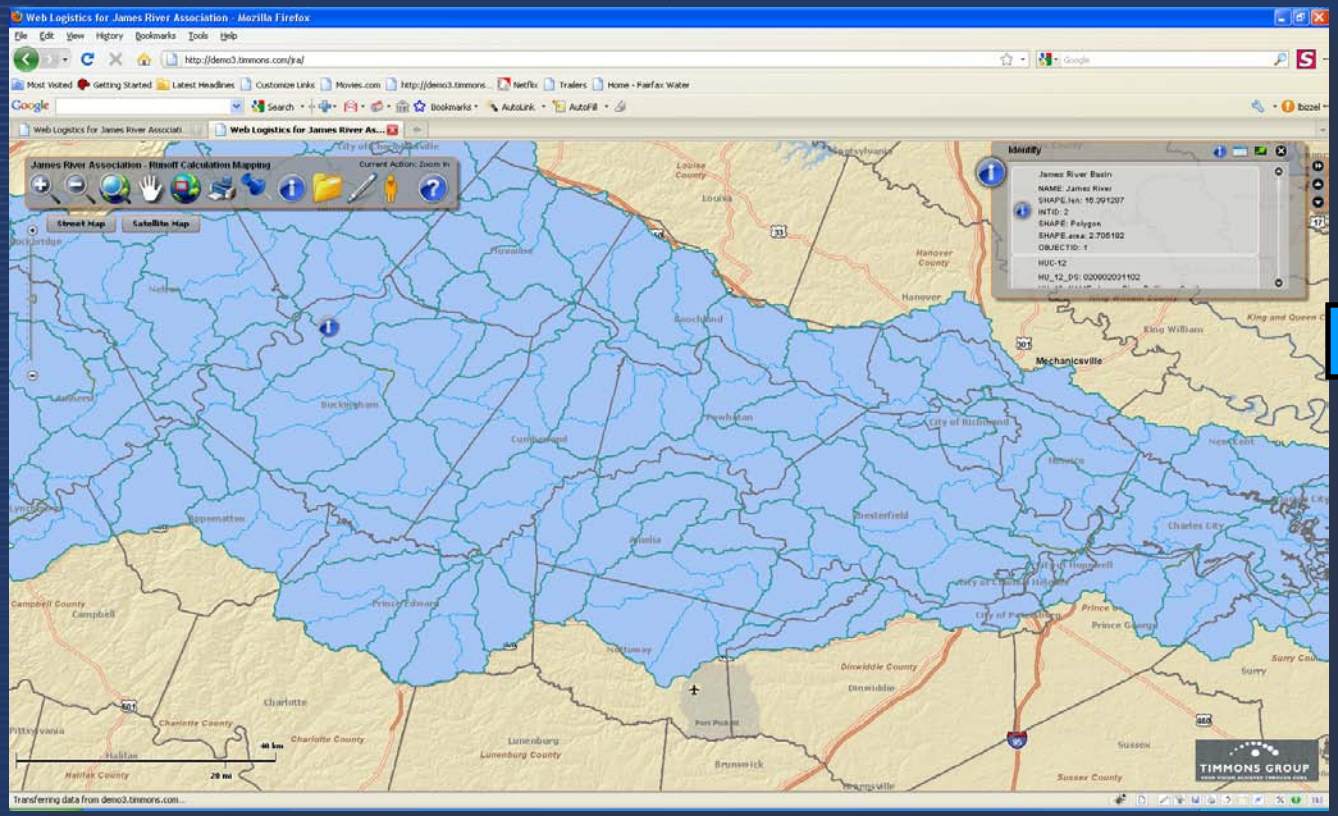


Integrated Portal - IMCC

State Partner Data (geodatabase)

One-stop location for access

- Display
- Analyze
- Share



OUTPUT

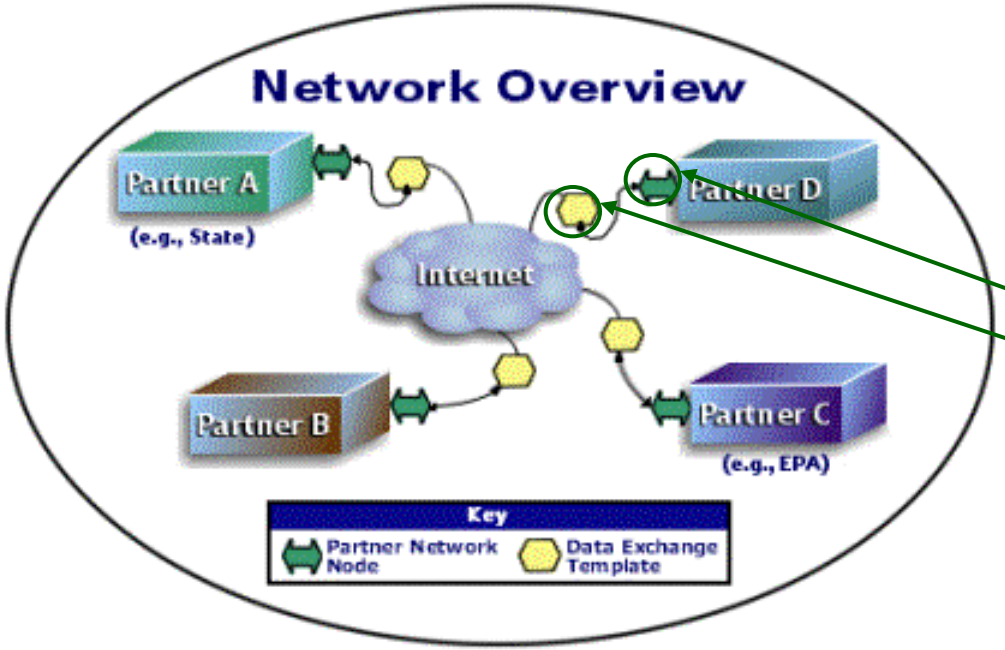
OSM GeoMine

National Environmental Information Exchange Network

US Environmental Protection Agency
Office of Environmental Information

What is the Exchange Network?

An Internet and standards-based method for exchanging environmental information between partners

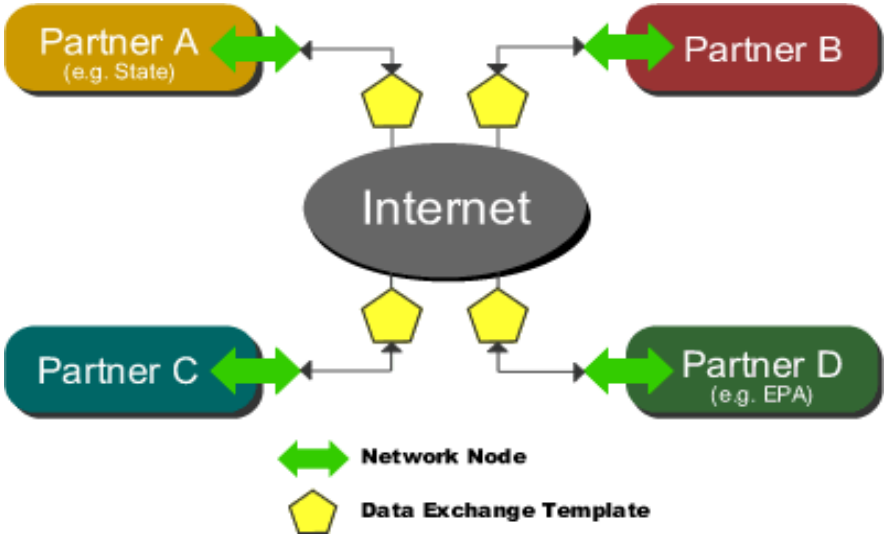


Key Components

- **Data Standards and Standard Protocols**
- **Nodes**
- **XML Schema/Registry**
- **Trading Partner Agreements**
- **Grant Program**

Purpose of Exchange Network

- Supports automated exchange of data
- Enables timely and accurate exchange
- Reduces reporting burden
- Improves data quality



Types of Data Exchanges on the Network

State-to-EPA

- Facility Data
- **Water Quality Data**
- Drinking Water Data
- Hazardous Waste Data
- Air Emissions Data
- Air Quality Data

EPA-to-State

- Toxic Release Inventory Data Submissions
- Substance and Chemical Data
- Facility Data
- Air Quality Data

State-to-State

- Water Quality Data
- Hazardous Waste Transporters
- Air Quality Data
- Homeland Security Data

Intrastate

- Environmental Data to Health Departments
- Drinking Water Labs to States
- Homeland Security/Law Enforcement Data
- County Water Data

Exchange Network Grants From 2002 – 2010*

Kentucky	Office of Technology
	Dept. for Environmental Protection
Tennessee	Dept. of Environment and Conservation
Virginia	Dept of Environmental Quality
	Dept of Health
	Dept of Conservation and Recreation
	Dept of Mines Minerals and Energy
West Virginia	Dept of Environmental Protection
	Dept of Health & Human Resources

* These state organization received one or more EN Grants from 2002 - 2010

Services Provided by the Exchange Network

- 1. Business process analysis, management and re-engineering;
- 2. Registration – Identity management, authorization and authentication;
- 3. Data collection and exchange;
- 4. Data transformation and quality assurance;
- 5. Discovery and publishing;
- 6. Security, records management, archiving and systems monitoring;

Data Flows in Exchange Network Grants

- RCRA Hazardous Waste
- Integrated Compliance Information
- National Air Emissions
- Surface Water Discharge Monitoring Reports
- Water Quality Monitoring
- Safe Drinking Water Information
- Underground Injection Control
- Facility Information
- Biodiversity Data
- Hydrography

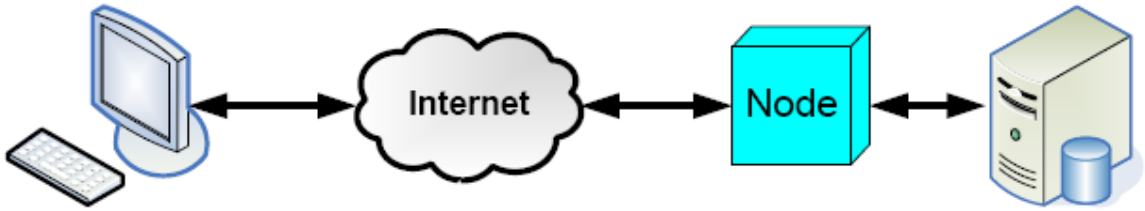
What is a Network Node?

*"A simple environmental information **Web service** that initiates requests for information, processes authorized queries, and sends/receives the requested information in a standard format."*

- Is a Server accessible on the Web
- Complies with the protocols to ensure secure exchanges
- Sends and receives standards-based messages
- Returns requested information as XML
- Each partner has only one Node

Node Client Applications

- Simplify access to services on full Network Nodes
  - Cannot listen (and respond) to requests from other nodes
- Human-to-Machine interaction
- Easy to install and use
- Available in .NET and JAVA versions
- Node Client Software Developer Kit (**SDK**) - simplifies integrating Node client functions (web service calls) with just a few lines of script



What is the Exchange Network Web Client?

- ***Simple web access*** to Exchange Network services - EPA's first generation web interface
- ***Accesses services*** that enable users to quickly send, receive, and publish information (or dataflows) using Exchange Network services
- ***Simple Alternative to Node Client/Network Desktop***
  - *No installation needed*
  - *Non-technical personnel can use*

Resources

- EPA Exchange Network
  http://www.epa.gov/exchangenetwork
- Exchange Network
  http://www.exchangenetwork.net
- Central Data eXchange (CDX)
  http://www.epa.gov/cdx/
- CDX Node Help Desk
  - nodehelpdesk@csc.com
  - 1-(888)-890-1995

U.S. Fish And Wildlife Service

Digital Wetlands Data

Interagency Cooperation

Shared Agency Interests

The U.S. Fish and Wildlife Service (the Service) is the principal Federal agency that provides information to the public on the extent and status of the Nation's wetlands. The Service is often asked to provide scientific information on wetlands to other Federal agencies, industry and the public. These types of analyses rely on digital map information to provide fast, efficient and scientifically sound mechanisms for resolving resource management issues.

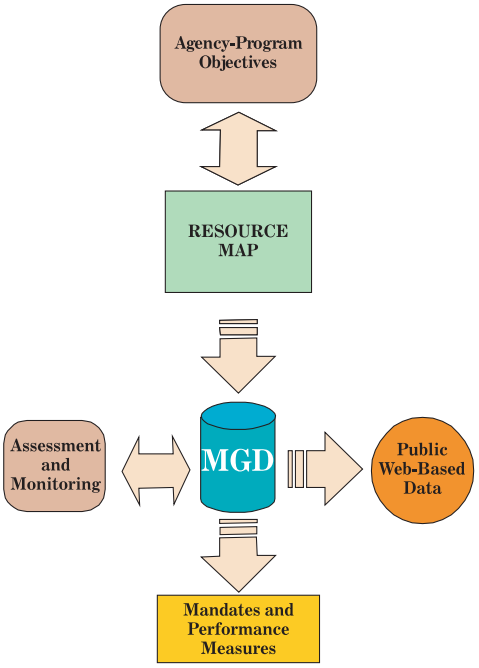
The U.S. Geological Survey (USGS) Water Resources Discipline provides reliable, impartial, timely information needed to understand the water resources of the United States. The USGS maintains expertise in technical areas of digital cartography, computer assisted mapping, geographic information systems and publications.

Through an active partnership, both the Service and the USGS are actively engaged in the system design and implementation of new tools and techniques to create, analyze and store wetlands map data. This partnership has yielded benefits to both agencies. The two agencies have entered into a multiyear interagency agreement to redesign and improve wetlands mapping capabilities.

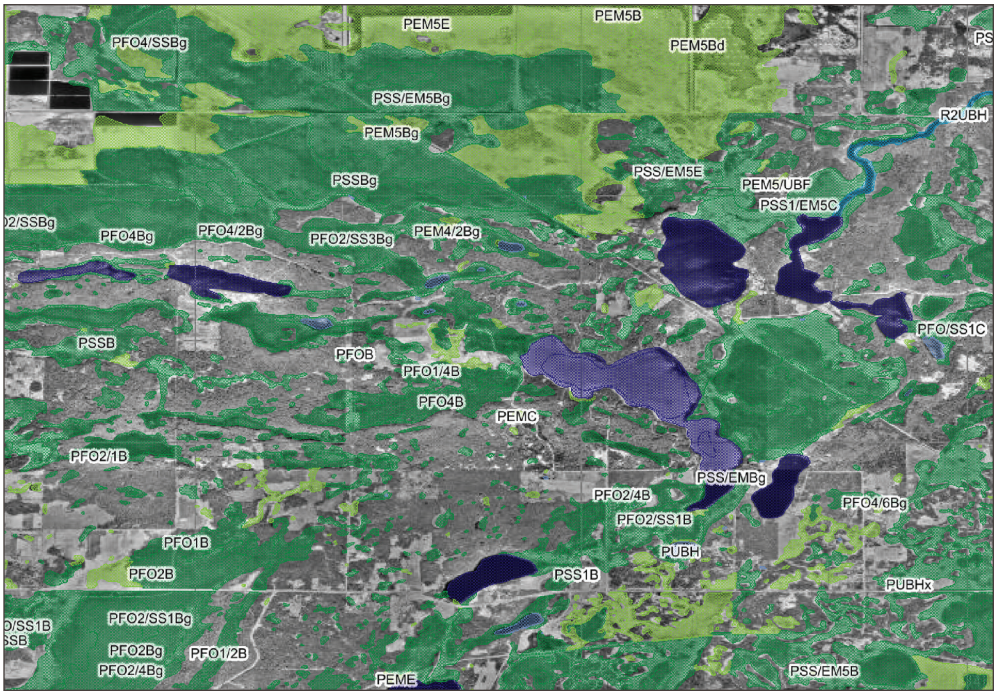
The Wetlands Master Geodatabase

The concept for a comprehensive Wetlands Master Geodatabase (MGD) stems from past successes in producing and distributing wetlands maps and wetlands status and trends information. With the advent of computer technologies that now allow the integration of large relational databases with spatial information and display, the MGD provides the Service an opportunity to capitalize on years of data collection effort by developing scientifically sound, technologically relevant tools for data analysis, distribution, archiving and updating aquatic resource information.

The creation of a Master Geodatabase for the national wetland dataset was an ambitious and very involved undertaking. The MGD provides a standardized map updating process, the creation of a wetlands relational database with temporal version capability, the incorporation of nondigital data, and a truly seamless data-storage and retrieval system. By implementing modern database technology, the MGD permits client-server database access with greatly improved interface to the Service users as well as the public. These improved capabilities, combined with enhanced access, help the Service realize the objectives of providing scientifically based applications for wetlands and water resource data.



Wetlands in Aitkin County, Minnesota



Web-Based Tools for the Nation

The development of the **Wetlands Mapper** stems from the Service's need to expand and improve the availability of digital wetlands data. The Service's strategic plan for digital wetland data is focused on the development, updating, and dissemination of wetlands data and information to Service resource managers and the public. The **Wetlands Mapper** responds to the need to integrate digital map data with other resource information to produce timely and relevant management and decision support tools.

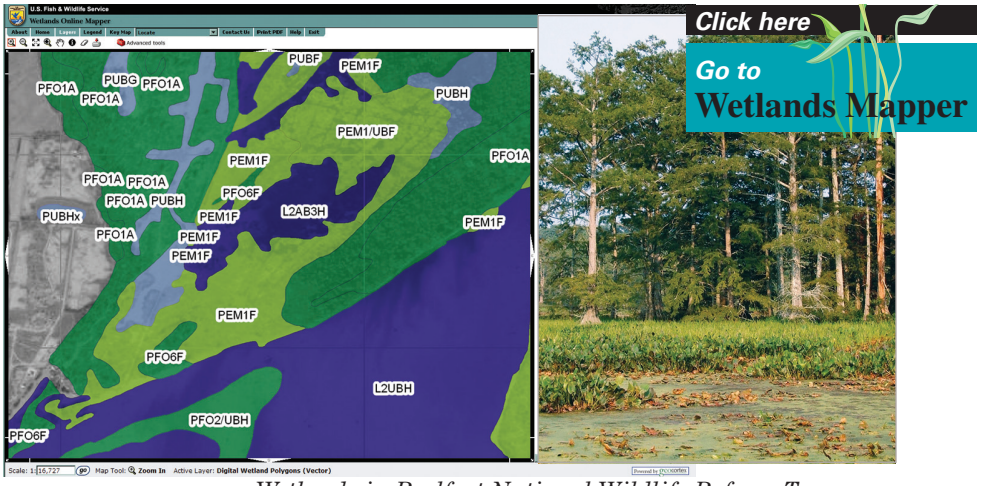
The **Wetlands Mapper** is designed to promote greater awareness of wetlands map data applications and deliver easy-to-use, maplike views of America's wetland resources in a digital format. It has been developed in collaboration with the USGS. This Federal partnership has yielded tremendous benefits in ongoing efforts to configure, improve and distribute the wetlands map information using newer technologies in computerized mapping and web-serving capabilities.

Geography and The National Map

Governments depend on base geographic information that describes the Earth's surface and locates features. They use this information for economic and community planning, land and natural resource management, education and delivery of public services. It is also the foundation for studying and solving geographically based natural resource issues. Geographic information underpins an increasingly large part of the Nation's economy.

The USGS is developing *The National Map* as a seamless, continuously maintained and nationally consistent set of online, public domain, geographic base information. *The National Map* is designed as a network of digital databases that will provide a consistent geographic data framework for the country. This base geographic information will be the foundation for integrating, sharing and using natural resource information such as wetlands information.

For the Service, an important goal is to improve the Internet delivery of updated digital data to keep pace with growing demand for wetland resource information and to support the Administration's Electronic Government initiatives to achieve operational efficiencies and enhance customer service. Incorporation of the digital wetlands data as part of *The National Map* and the Geospatial One-Stop has been instrumental in achieving this goal. Wetlands map information can be viewed on *The National Map* viewer as part of the hydrography data layer at: http:// nationalmap.gov/



Wetlands in Reelfoot National Wildlife Refuge, Tennessee

Sound Science and New Technologies

The Service's Division of Resource and Habitat Conservation and the U.S. Geological Survey have a close working relationship and are collaborating on a number of wetland projects and scientific reports, including national reports on wetland resources. The USGS tests and applies emerging technologies in cartography. The USGS also develops and maintains information databases that support the Office of Water Information and provides cartographic and geographic information systems support within the USGS and to other Federal agencies.

Additional Information

Information about the U.S. Fish and Wildlife Service is available at http://www.fws.gov/

Information about the U.S. Geologcal Survey is avaialble at http://www.usgs.gov/

Information about the Fish and Wildlife Service's wetlands maps and the Wetlands Mapper is available at http://www.fws.gov/wetlands/data/

More information about *The National Map* is available at http://www.nationalmap.gov/

Program Contacts

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December 2008

U.S. Fish & Wildlife Service

Frequently Asked Questions:
Wetlands Mapper

May 2010

Mapper Content and Display

How does the public access the new Mapper?

The Wetlands Mapper can be found at: http://www.fws.gov/wetlands/

Does the updated mapper display all wetland polygons from the Wetlands Geodatabase?

Yes. All available wetland map data both vector and raster scanned images are on the Mapper.

Does the updated mapper display all wetland labels?

Yes. Larger polygon labels will display right away. Smaller polygon labels will display at larger scale and appear inside the feature.

At what scale do the Wetlands display on screen?

Wetlands first display at 1:144,448 scale. The nominal scale for wetland data is 1:12,000 or 1:24,000 although higher resolution is possible.

How is the display scale determined?

Display scales are pre-determined intervals. The maximum zoom scale is 1:4,514. ESRI base maps will not display below 1:144,448 scale resolution for the Pacific Trust Islands.

Can I minimize the Available Layers Window?

Yes. Click on minimize + or – symbol in the upper right hand corner of the Available Layers Window.

Can I zoom to locations? How do I find the Pacific Trust Islands?

Yes. Use the "Zoom to" tool to quickly go to Alaska, Hawaii, Puerto Rico and Virgin Islands or the Pacific Trust Islands. Enter the name or zip code into the "Find Location" tool to go to a specific location.

Wetlands and Riparian Data, and Other Information

How do I identify a wetland or riparian polygon?

Clicking on a polygon will display a pop-up box containing information about the selected feature. This box also provides links to the various metadata documents. Please note that one of the layers containing polygon data must be selected to use this function. Clicking on the [X] at the top-right side of the pop-up will close it.

How can I view the wetland polygon outline without color fill?

Pressing on the  button will display a control for the layer's opacity. Move the slider to decrease or increase the color fill.

What are Areas of Interest?

This layer was designed to highlight wetlands that exhibit unique or important ecological characteristics. It currently includes sites located throughout the United States. It includes Wetlands of International Importance (Ramsar sites) as well as state natural areas, National Parks and National Wildlife Refuges. Each site is marked with a geographic location and includes a link to additional information about that particular wetland. Additional site and information will be added in the future.

Is there a measure tool?

There are two measurement tools available: Polyline and Polygon. To measure a polyline, select the tool and start measuring by mouse left-clicking one or more times, and finish the measurement by mouse double left-clicking. Use the same procedure for Polygons. To clear the lines or polygon, close the Measurement tool popup window.

Can I view riparian areas in conjunction with wetlands?

Yes. Check both the riparian and wetlands data options on the Available Layers menu

Are Riparian data only available in the western U.S.?

Yes. By definition, FWS maps riparian habitats only in the arid regions of the western U.S.

How do these data relate to the wetlands layer of the National Spatial Data Infrastructure?

This forms the Wetlands Spatial Data Layer of the National Spatial Data Infrastructure (NSDI). National standards are followed to facilitate inclusion of new wetlands data into the NSDI.

Metadata, Base Imagery and Base Maps

How do I access metadata for the wetlands or riparian information?

Metadata information can be found on the Wetlands Product Summary page. Metadata files for all the layers displayed on the Wetlands mapper can be found at www.fws.gov/wetlands/Data/metadata.html.

What is Project Metadata?

Wetland mapping is conducted in defined geographic areas called projects. Imagery is used as the base information to define the type and location of each wetland. The scale, type and date of imagery used in a project is provided in a pop-up window when a wetland polygon is selected on the Wetlands Mapper. Investigators that complete a wetland mapping project record information on the source imagery, collateral data, inventory method, data limitations, geographic features, landforms, wetland types and other specifics in a project metadata document. This project level metadata can be found by selecting a wetland polygon on the Wetlands Mapper and then clicking on the link next to 'Project Metadata' in the pop-up window. Note: Not all areas have a Project Metadata document.

What is "Historic Map Information"?

Information about the wetland types, vegetation, regional and temporal conditions and geographic features are captured in a historic map document. This document is specific to a geographic area and can be accessed by selecting a wetland polygon on the Wetlands Mapper and then clicking on the link next to 'Historic Map Info' in the pop-up window. Note: Not all areas have a Historic Wetlands Map Information document.

How do I find the date of the base imagery?

This detailed imagery map presents satellite imagery for the world and high-resolution (1m or better) imagery for the United States. The map includes NASA Blue Marble: Next Generation 500m resolution imagery at small scales (above 1:1,000,000), i-cubed 15m eSAT imagery at medium-to-large scales (down to 1:70,000) for the world, and USGS 15m Landsat imagery for Antarctica. The map also includes i-cubed Nationwide Prime 1m or better resolution imagery for the contiguous United States, Getmapping 1m resolution imagery for Great Britain, and GeoEye IKONOS 1m resolution imagery for Hawaii, parts of Alaska, and several hundred metropolitan areas around the world. For current imagery contributors and dates, please visit this website:

http://resources.esri.com/help/9.3/arcgisonline/about/start.htm#contributors_wi.htm?

What options are available for base maps?

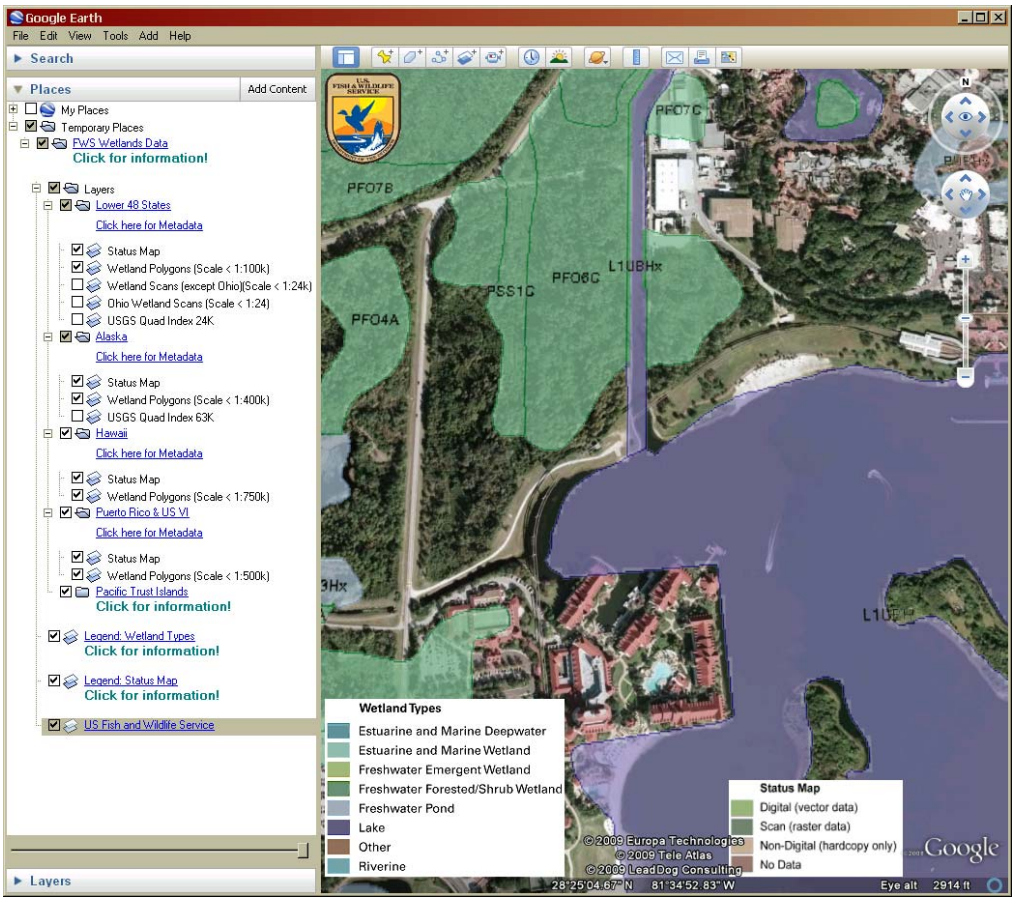
There are several options for base maps including “Streets” showing transportation routes for locating and navigating, topographic maps provided by ESRI and U.S. Geological Survey digital raster graphics of topographic mapping. The following base map types are currently available on the wetlands Mapper:

- Streets - displays the road map view with labels.
- Imagery - displays satellite and aerial images.
- Imagery/Labels - displays a mixture of satellite and aerial images, and road maps with labels.
- Topo - displays a topographic base map.

Click on the desired base map type button to switch views to the desired base map type. Please allow a few seconds for the view to refresh.

U.S. Fish And Wildlife Service

Viewing Wetlands with Google™ Earth[1]



Google Earth maps the surface of the Earth by super-imposing images from satellites and aerial photography. Most land areas, except for islands, are shown using satellite imagery with a resolution of about 15 meters per pixel or better. In this application, Google Earth imagery can be used as a backdrop for viewing the wetlands digital data.

A Keyhole Markup Language file has been created to view Wetlands Data with Google Earth[2]. To ensure that you use the latest version, it is recommended that you load the file and open Google Earth by starting your internet browser and navigating to the following HTML link:

(http://www.fws.gov/wetlands/data/GoogleEarth.html)

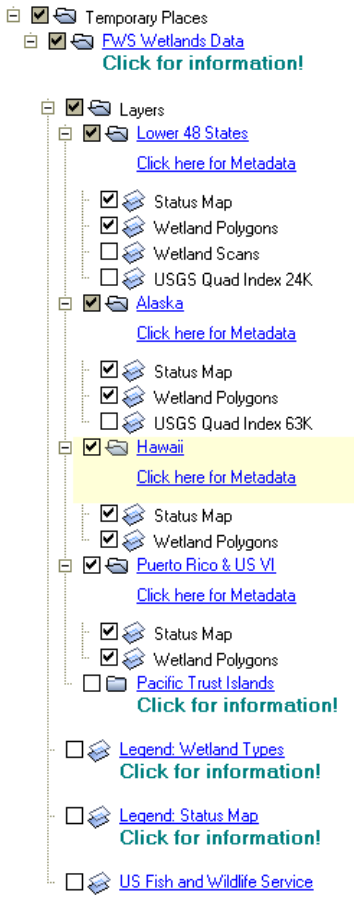
Once you navigate to the previously mentioned web page, select the link:

WetlandsData.KMZ

If Google Earth fails to launch automatically, the file can also be used by first launching the Google Earth application. Select the menu option File, Open, and then locate the previously downloaded file (WetlandsData.KMZ); then click the Open button.

Notes:

- Double click any layer title to zoom into its area.
- Click on any layer or legend checkbox to view or hide it.
- The Lower 48 States Wetland Scans layer is hidden by default. To view the image layer, first zoom into an area that has Wetland Scans information, then turn on the layer.
- Important: Do not leave the Wetland Scans layer on (checked) while viewing areas that do not have scanned data. A large red X will appear if you do so.
- To remove the Wetlands KMZ file from Google Earth, right-click on the FWS Wetlands Data folder located under Places (Google Earth left panel), then select **Delete**.
- Please visit our Map Creation and Mapper Display web page (http://www.fws.gov/wetlands/data/MapperTips.html) for more tips and technical information.



- This data is available through an OGC compliant Web Map Service[3].

Digital data available on this source represent the latest, most accurate information available from the U.S. Fish and Wildlife Service. These data are also available on The National Map (http://nationalmap.gov/).

U.S. Fish and Wildlife Service
800/344-WILD
http://www.fws.gov

November 2008

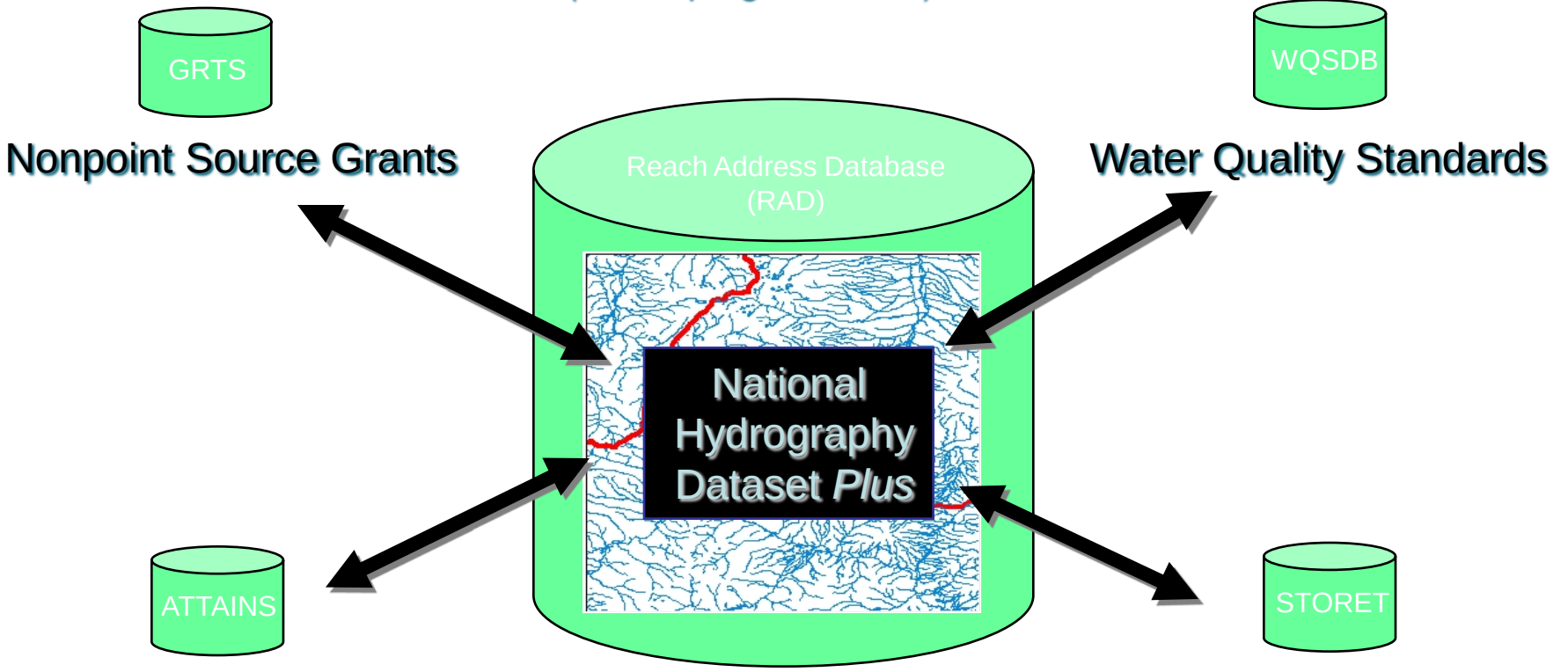
[1] The use of trade, product, industry or firm names or products is for informative purposes only and does not constitute an endorsement by the U.S. Government or the Fish and Wildlife Service. Links to non-Service Web sites do not imply any official U.S. Fish and Wildlife Service endorsement of the opinions or ideas expressed therein or guarantee the validity of the information provided. Base cartographic information used as part of the Wetlands Mapper has been provided through a collaborative effort with the U.S. Geological Survey and The National Map.

[2] Please note that Google Earth version 4.2, or higher, is required to run this script.

[3] Follow this link for more information about Web Map Service: http://www.fws.gov/wetlands/data/WebMapServices.html

EPA's Geospatial Information: *WATERS* Geospatial Data Architecture

(**W**atershed **A**ssessment, **T**racking & **E**nvironmental **R**esult**S**)
(www.epa.gov/waters)



NHDPlus

A National Geospatial Surfacewater Framework

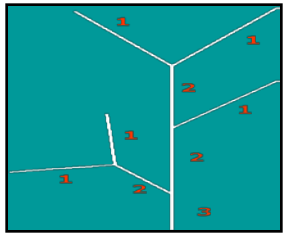
(http://www.epa.gov/waters)

NHD*Plus* is a suite of application-ready geospatial products that build upon and extend the capabilities of the National Hydrography Dataset (NHD) by integrating it with the National Elevation Dataset and National Watershed Boundary Dataset. NHDPlus provides:

Enhanced NHD Network & Names

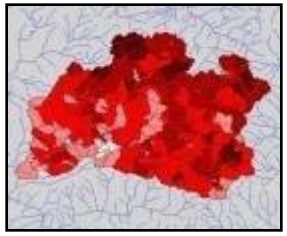
Updated network relationships enable robust up/downstream navigation. Additional hydrographic feature names enable improved map labeling, query-by-name, and linking of water quality data.

Value-Added Attributes



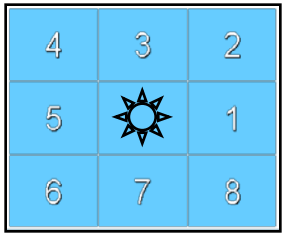
Fourteen different Value-Added Attributes, including stream order, are derived from the underlying NHD and enable advanced query, analysis and display functionality.

Catchments With Attributes



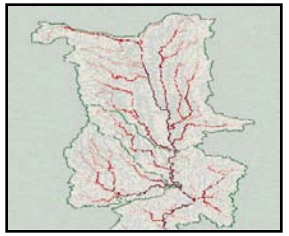
Incremental and cumulative drainage areas for each stream segment in the NHD network enable analysis of associated landscape characteristics, including temperature, precipitation and land cover.

Flow Direction & Accumulation Grids



Flow direction and accumulation grids associate the land surface (topography) with the NHD network enabling landscape analysis and characterization.

Flow Volume and Velocity Estimates



Mean annual stream flow volume and velocity for each stream segment in the NHD network enable time-of-travel and pollutant dilution modeling.

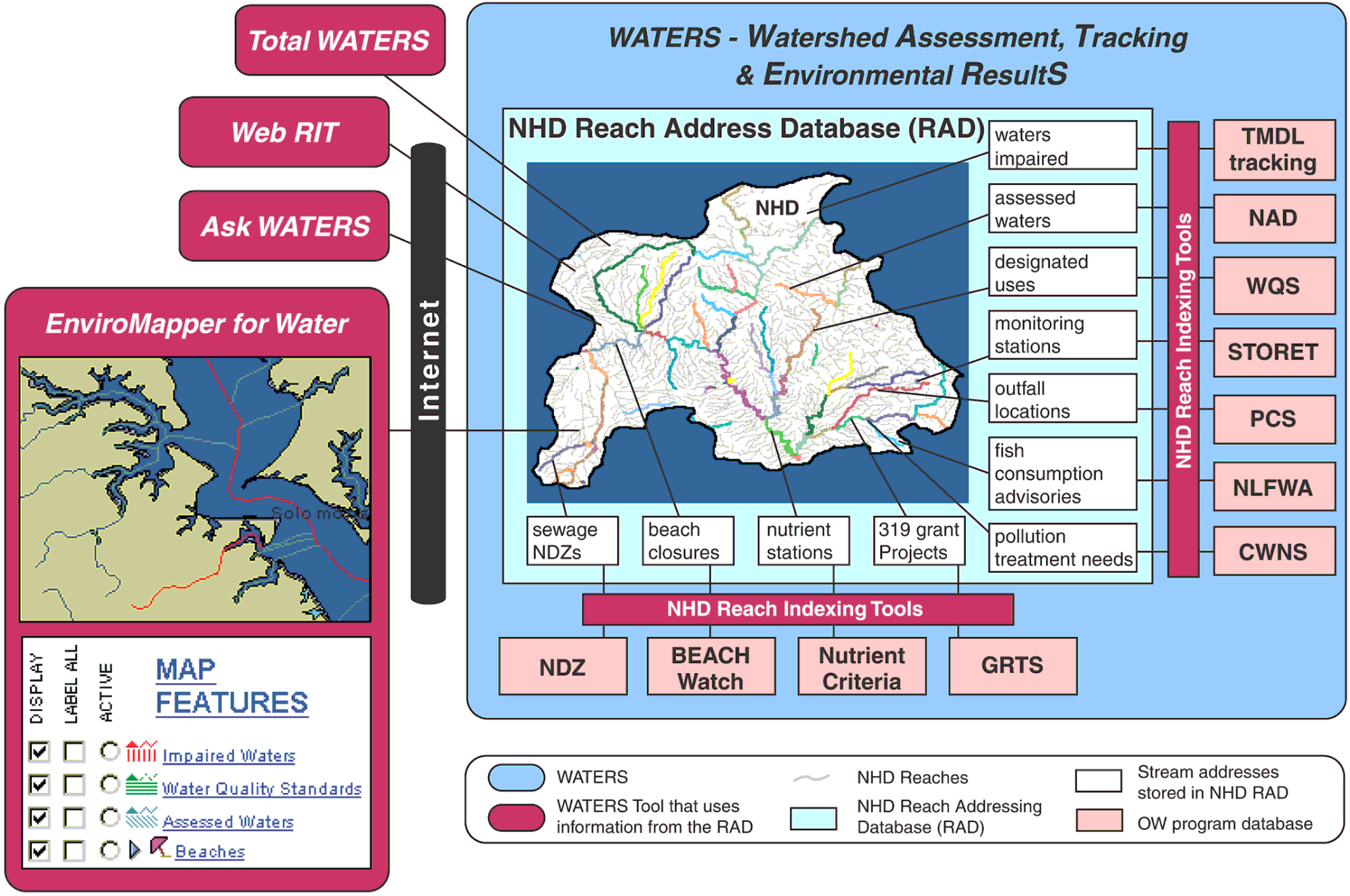
The National Hydrography Dataset

is a comprehensive set of digital geospatial data that contains information about surface water features such as streams, rivers and lakes. The NHD provides:

A rich set of hydrographic features for making maps.

A stream addressing system for linking water quality data to the NHD network.

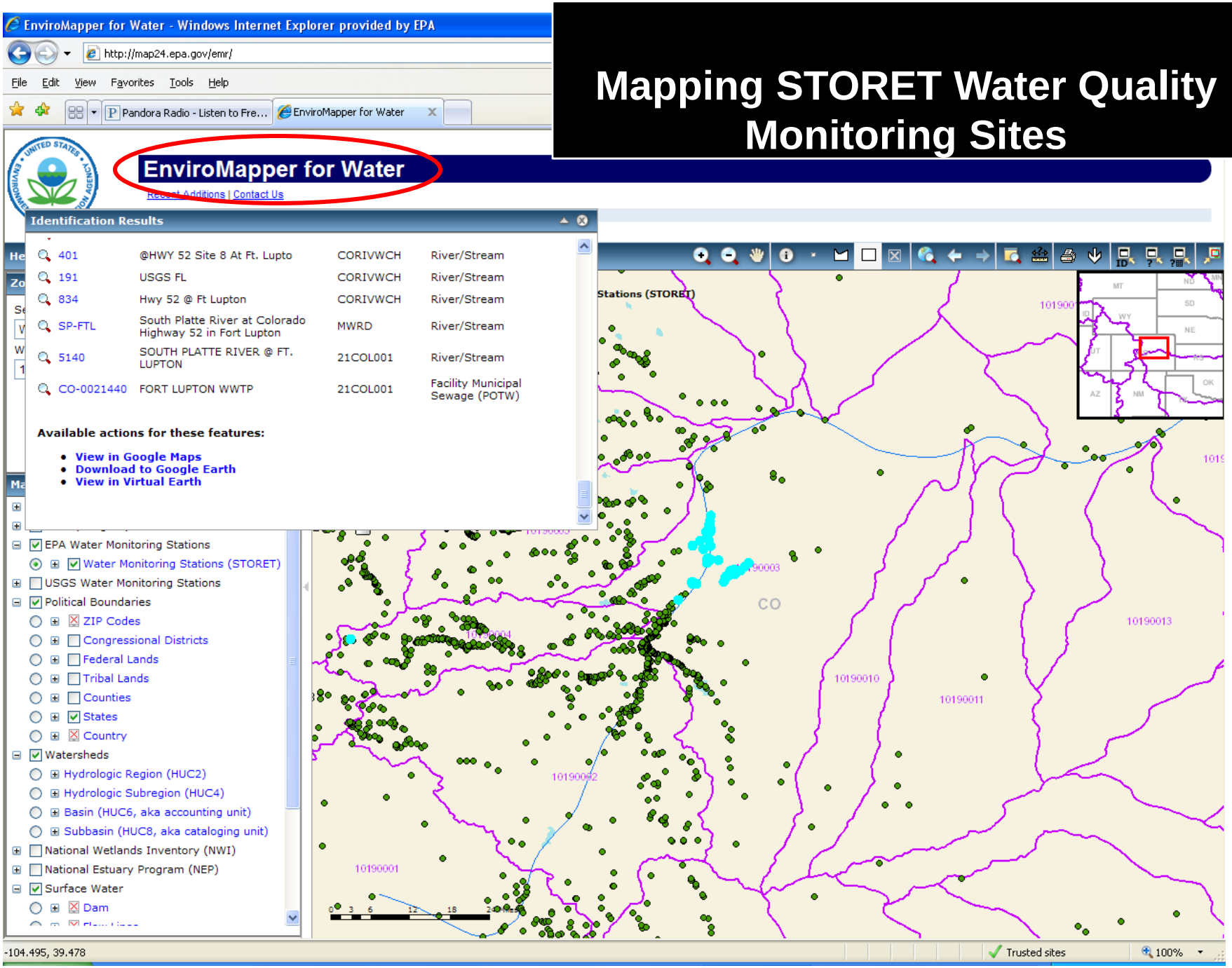
A drainage network for supporting up/downstream query, analysis and modeling.


Total WATERS
Web RIT
Ask WATERS
EnviroMapper for Water
Internet
WATERS - Watershed Assessment, Tracking & Environmental ResultS
NHD Reach Address Database (RAD)
NHD
waters impaired
assessed waters
designated uses
monitoring stations
outfall locations
fish consumption advisories
pollution treatment needs
sewage NDZs
beach closures
nutrient stations
319 grant Projects
NHD Reach Indexing Tools
TMDL tracking
NAD
WQS
STORET
PCS
NLFWA
CWNS
NHD Reach Indexing Tools
NDZ
BEACH Watch
Nutrient Criteria
GRTS
DISPLAY
LABEL ALL
ACTIVE
MAP FEATURES
Impaired Waters
Water Quality Standards
Assessed Waters
Beaches
WATERS
WATERS Tool that uses information from the RAD
NHD Reaches
NHD Reach Addressing Database (RAD)
Stream addresses stored in NHD RAD
OW program database

WATERS Core Tools

- Reach Indexing Tools
  - Desktop - coordinating with BLM to enhance their Hydro Event Manager (HEM) tool to meet EPA needs
  - Web - WATERS Lite Viewer can sketch over desired NHD features (sketches can then be indexed)
- EnviroMapper for Water V2
- AskWATERS
  - Continue to add queries to query library
- Sharable Web Services
  - Map features, identify, batch indexing, total waters, up/downstream, watershed delineation, watershed report

Mapping STORET Water Quality Monitoring Sites



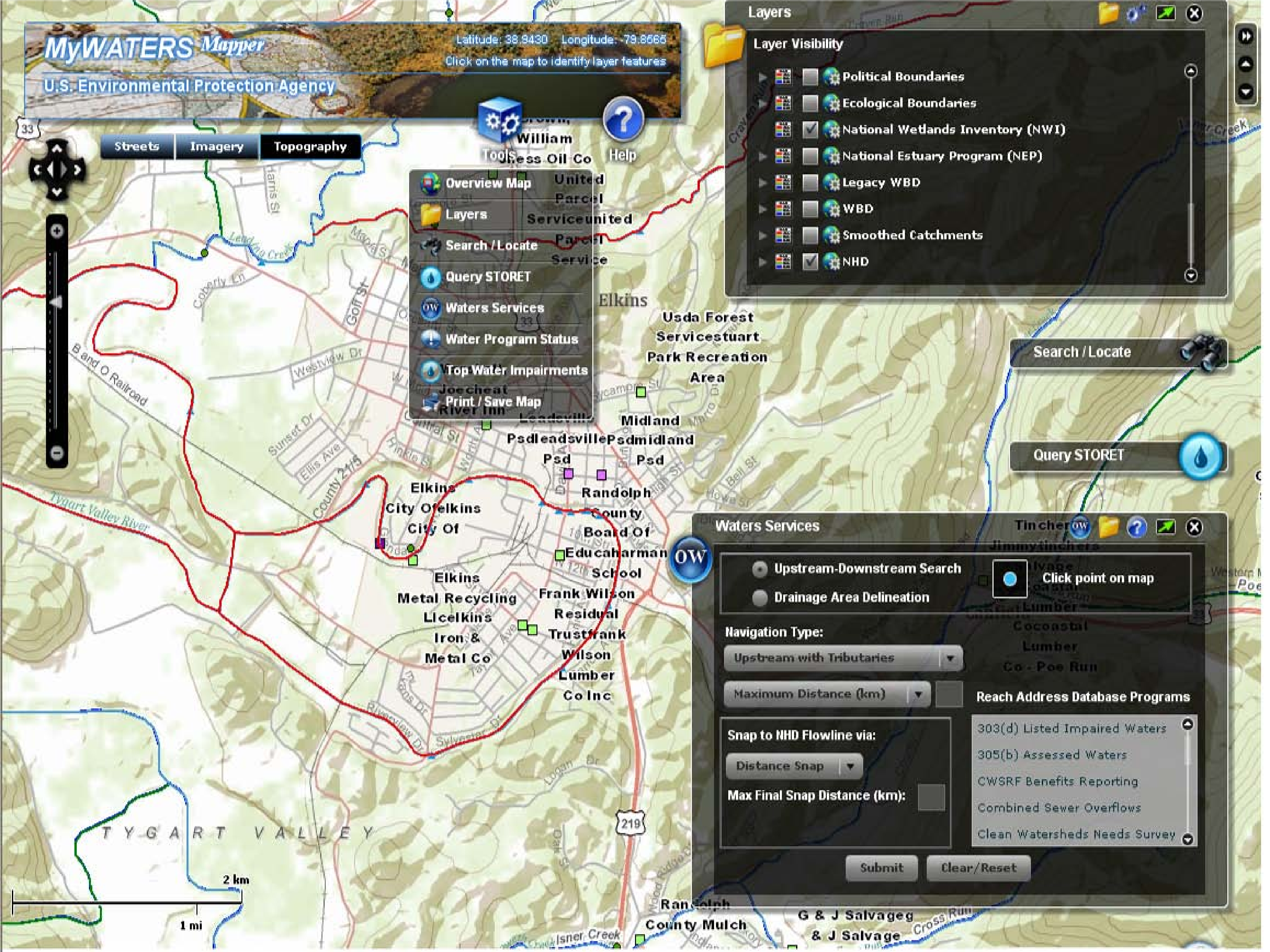
Viewing WATERS Data in Google Earth

- Access to framework geospatial datasets stored in the WATERS Database and to general purpose interactive service panels.

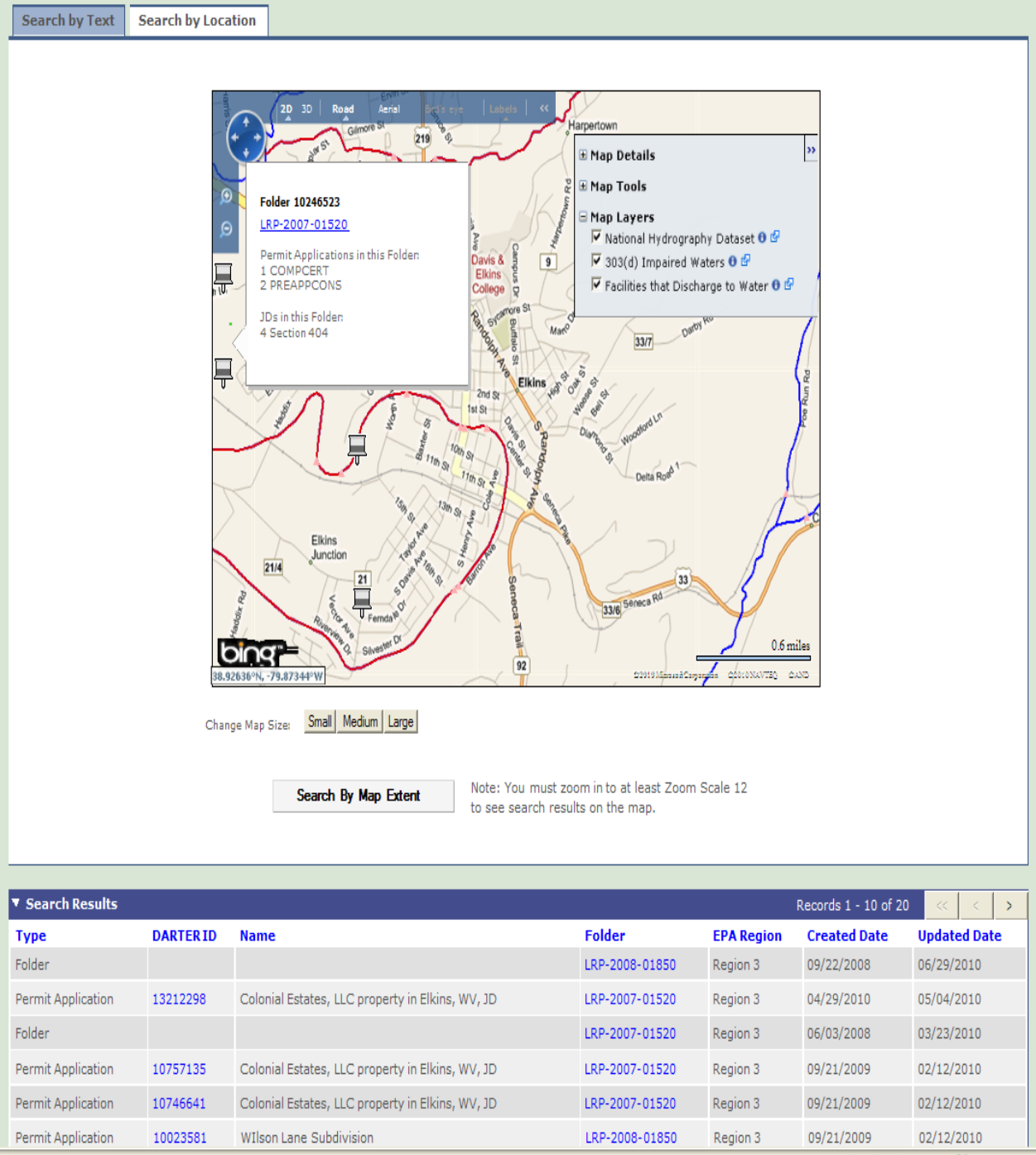
- Dialog boxes providing access to tools, services, and information, such as NHD feature name query, total waters, up/downstream navigation, watershed reports, ATTAINS reports, etc.

- Access to indexed water program features, with hyperlinks to additional attributes, and context sensitive analysis services, such as up/downstream navigation and watershed reports.

www.epa.gov/waters/tools



MyWATERS Mapper
U.S. Environmental Protection Agency
Latitude: 38.9430 Longitude: -79.8565
Click on the map to identify layer features
Streets
Imagery
Topography
Tools
Help
Overview Map
Layers
Search / Locate
Query STORET
Waters Services
Water Program Status
Top Water Impairments
Print / Save Map
Layers
Layer Visibility
Political Boundaries
Ecological Boundaries
National Wetlands Inventory (NWI)
National Estuary Program (NEP)
Legacy WBD
WBD
Smoothed Catchments
NHD
Search / Locate
Query STORET
Waters Services
Upstream-Downstream Search
Drainage Area Delineation
Click point on map
Navigation Type:
Upstream with Tributaries
Maximum Distance (km)
Reach Address Database Programs
303(d) Listed Impaired Waters
305(b) Assessed Waters
CWSRF Benefits Reporting
Combined Sewer Overflows
Clean Watersheds Needs Survey
Snap to NHD Flowline via:
Distance Snap
Max Final Snap Distance (km):
Submit
Clear/Reset
Elkins
Tygart Valley River
T Y G A R T V A L L E Y
B and O Railroad
2 km
1 mi



DARTER

Displaying

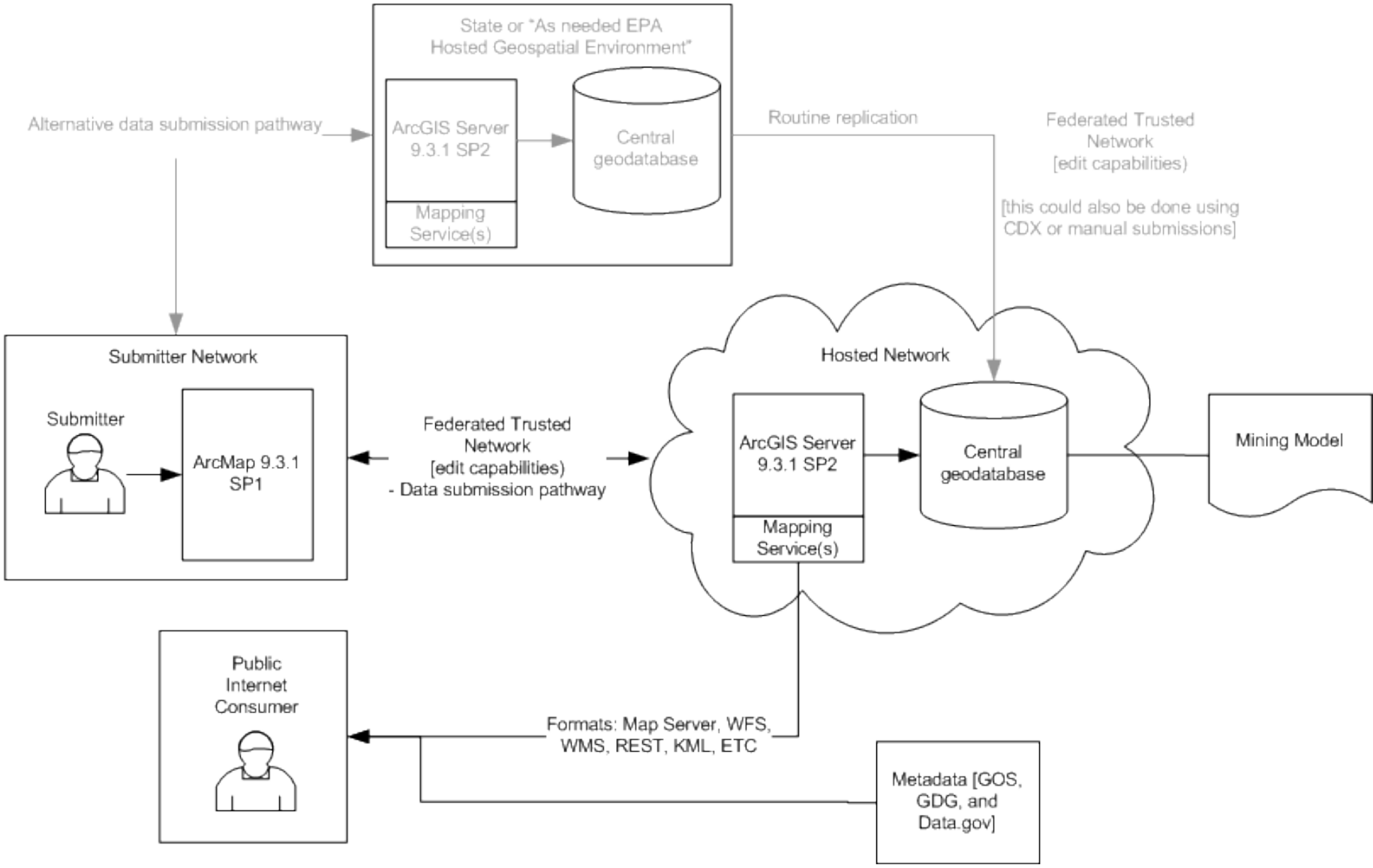
- NHD
- 303(d)
- Facilities that discharge
- Corps 404 Projects

Tools:

- Identify on the Map
- Link to Metadata
- Add more layers
- Link to additional documents

Potential Mining Information Exchange #2

ArcGIS Server based solution using a Federated Trust Authentication Scheme



Potential Mining Information Exchange #1

Central Data Exchanged based solution using an NAAS Authentication Scheme

Exchange Network Hosted Mining Schema

Data Collection

ArcMap 9.3.1 SP1

ArcMap 2 CDX

Custom system

Submitter

Central Data Exchange (node and/or client)

Internet

EPA CDX Node 2.0

Central Data Exchange 2.0 [Test or Submit]

EPA CDX unzips and extracts headers and passes zip to QA Server

CDX QA Server unzips the payload and validates against schema (XSD)

CDX QA Server uses SchemaTron to validated payload based on defined rules

Pass/Fail notification delivered to submitter

CDX sends payload to data store & calls SP

External Mashups

Google Earth, Google maps, Bing Maps, OpenLayers

Custom geographic viewing application

Deployed to Data.gov or other AGS 9.3.1 (SP2) resource

Extract QC'ed data to file geodatabases

Quality Control and reproject

Central Mining Data store

Metadata to GOS, GDG, and Data.gov

Data Entry Collection (Comments, Info - Possible VGI)

Diagram Notes

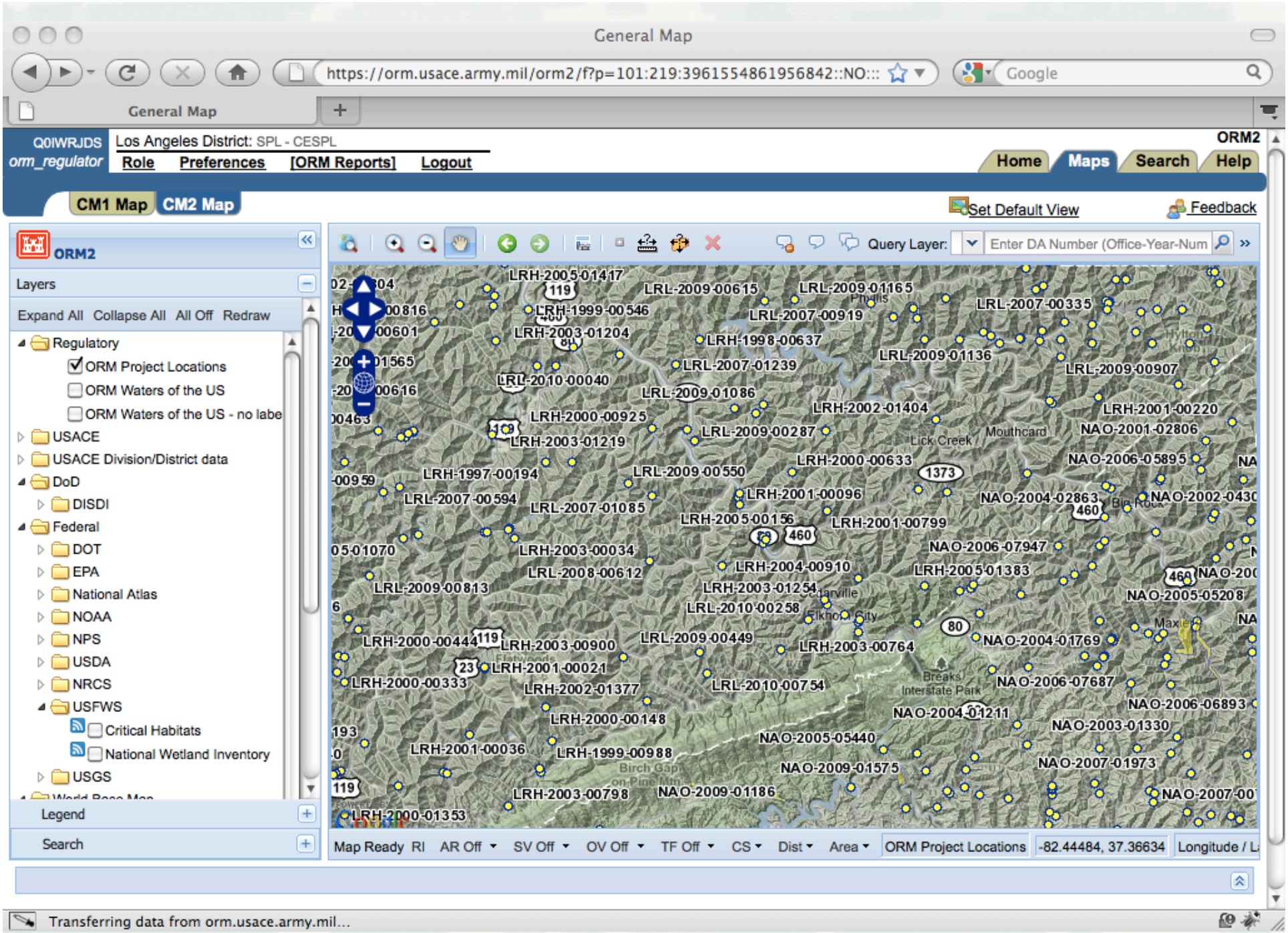
1. A mining based Exchange Network schema will be created and agreed upon by stakeholders.
2. Stakeholders will provide information via ArcMap or some custom application that follows the approved mining schema structure.
3. Stakeholders will submit mining related data via an approved communication channel. The diagram assumes CDX as the transfer mechanism. CDX usage will leverage the existing CDX infrastructure and State based NAAS accounts.
4. Either CDX and/or the mining data store should have spatial capabilities to support the project. Based on EPA HQ's involvement, the INDUS team assumes the mining data store will reside in either the WATERS database or another OEI database. Those databases already contain the necessary spatial components to support the project.
5. Once the data is submitted; a set of quality control routines will be developed to validate and process the incoming data.
6. Valid data will be extracted to file based geodatabases to support cloud service deployment. Those file geodatabases will then be service enabled for client consumption. INDUS assumes an ArcGIS Server 9.3.1 SP2 instance(s) will be used to expose the datasets; similar to the services hosted on http://watersgeo.epa.gov/ArcGIS/rest/services.
7. Centralized FGDC compliant metadata will be created to support the datasets. Metadata will be listed on the GDG, GOS, and Data.gov.
8. Besides schema based data submissions, INDUS assumes a simple data collection application will be written to allow comments and other valuable information to be added to the datasets. INDUS assumes either an EPA IAM/Portal or Exchange Network NAAS authentication will be used to support the data entry application.
9. Based on that architecture, a custom viewing application will be written to consume and display mapping, metadata, and data entry system data. The data will be exposed in an open fashion to support the creation of NON-EPA based mashups.

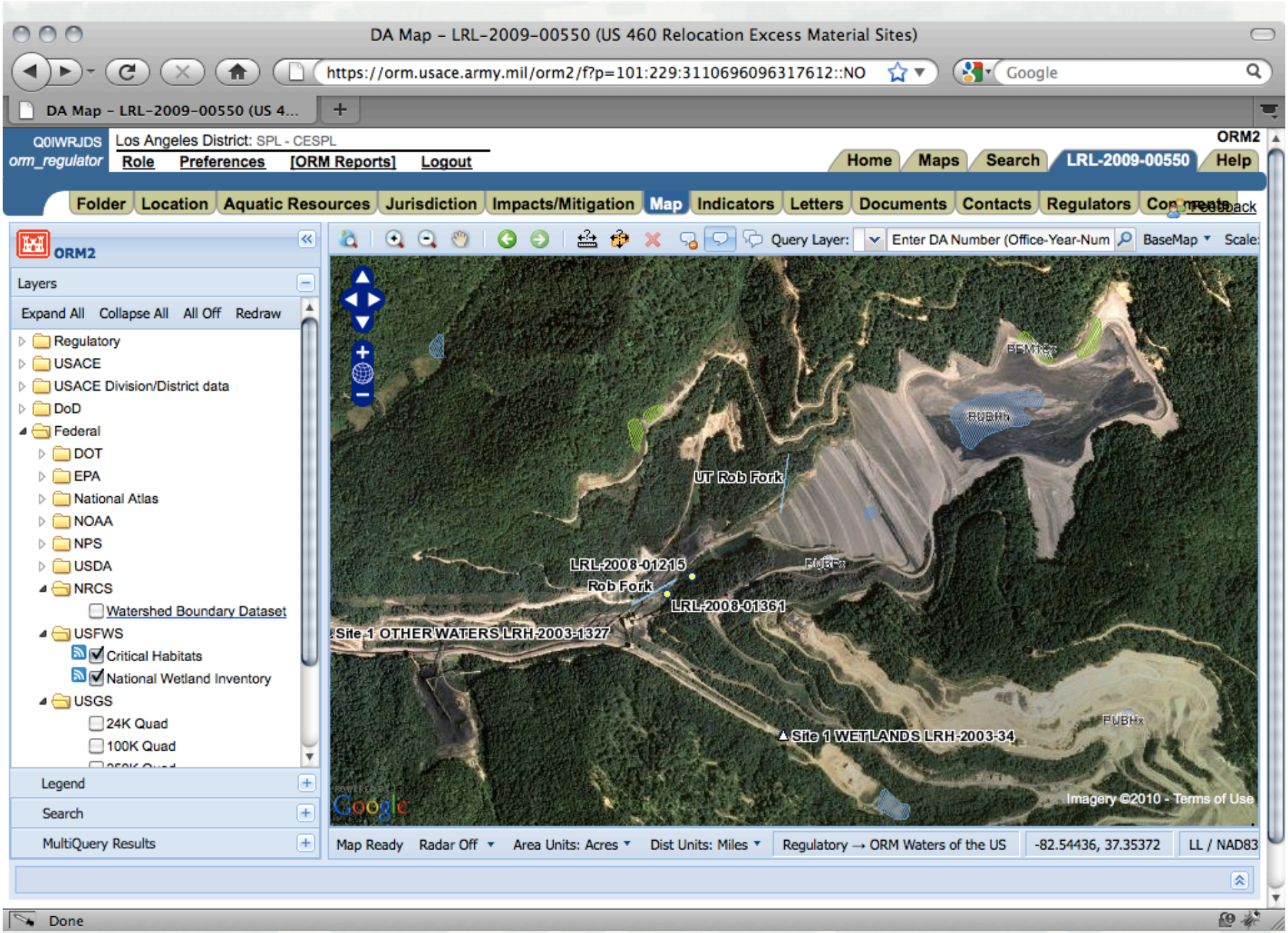
GeoMine Pilot Project
Conceptual Approach to Data Sharing

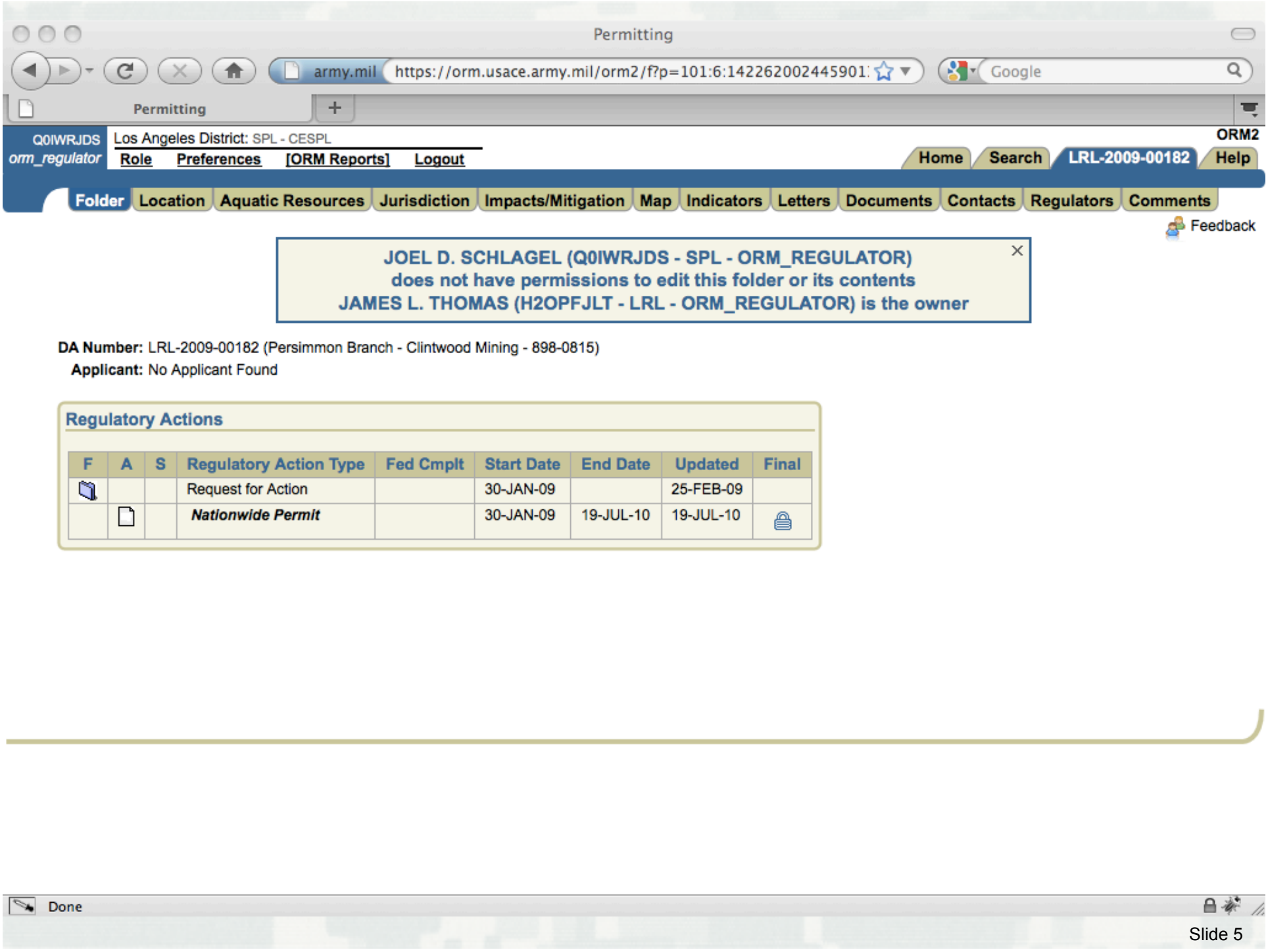
Joel Schlagel,
US Army Engineer Institute for Water Resources
www.iwr.usace.army.mil

Overview

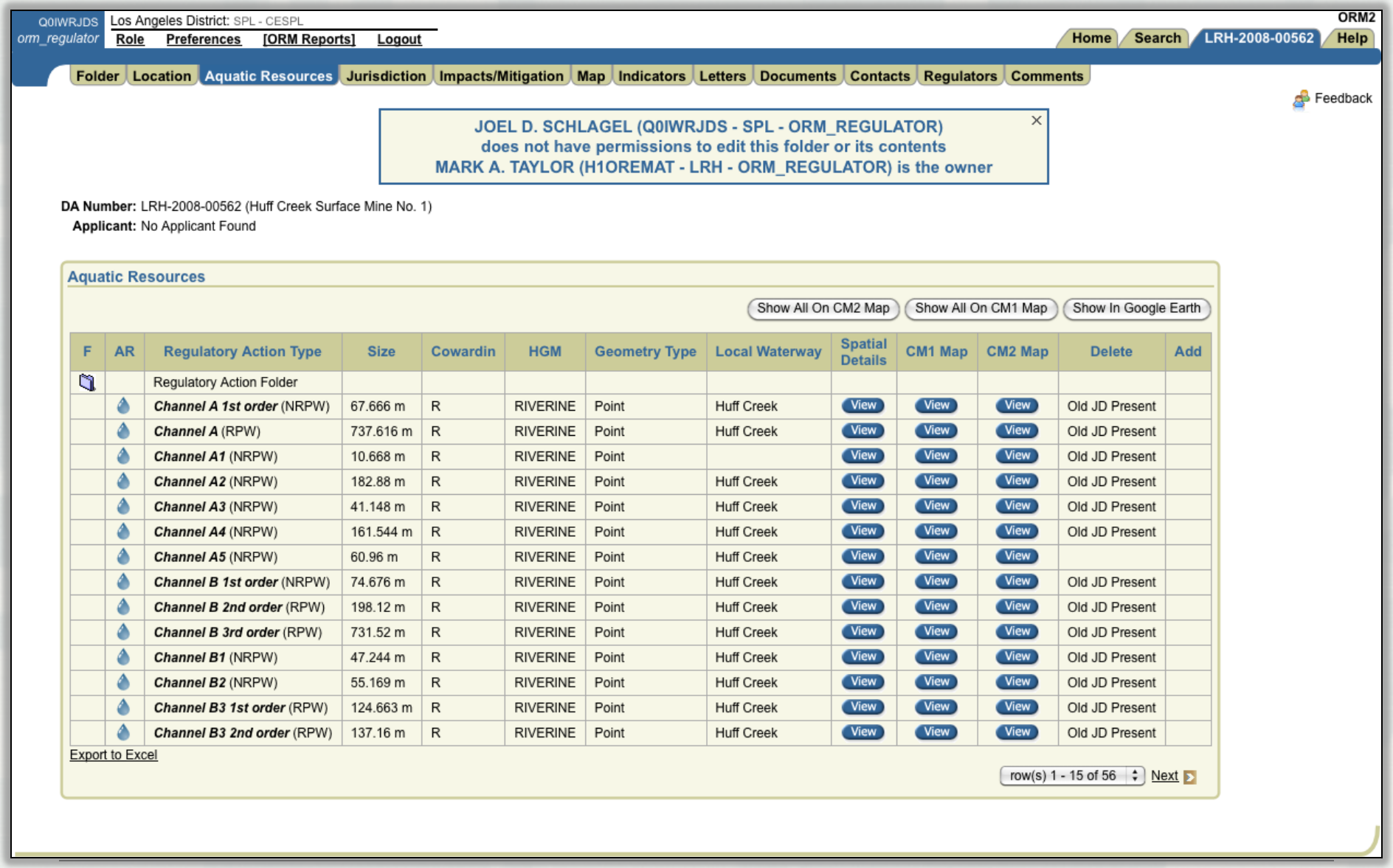
- USACE Regulatory Data Management
- USACE Regulatory Data Sharing
- Federated Approach
- Semantics
- Datums


General Map
https://orm.usace.army.mil/orm2/f?p=101:219:3961554861956842::NO:::
Google
Q0IWRJDS
orm_regulator
Los Angeles District: SPL - CESPL
Role
Preferences
[ORM Reports]
Logout
ORM2
Home
Maps
Search
Help
CM1 Map
CM2 Map
Set Default View
Feedback
ORM2
Layers
Expand All
Collapse All
All Off
Redraw
Regulatory
ORM Project Locations
ORM Waters of the US
ORM Waters of the US - no labe
USACE
USACE Division/District data
DoD
DISDI
Federal
DOT
EPA
National Atlas
NOAA
NPS
USDA
NRCS
USFWS
Critical Habitats
National Wetland Inventory
USGS
Legend
Search
Query Layer:
Enter DA Number (Office-Year-Num
LRH-2005-01417
LRL-2009-00615
LRL-2009-01165
LRL-2007-00335
LRH-1999-00546
LRL-2007-00919
LRH-2003-01204
LRH-1998-00637
LRL-2009-01136
LRL-2009-00907
LRL-2007-01239
LRL-2010-00040
LRL-2009-01086
LRH-2002-01404
LRH-2001-00220
LRH-2000-00925
LRL-2009-00287
NAO-2001-02806
LRH-2003-01219
LRH-2000-00633
NAO-2006-05895
LRH-1997-00194
LRL-2009-00550
LRH-2001-00096
NAO-2004-02863
LRL-2007-00594
LRL-2007-01085
LRH-2005-00156
LRH-2001-00799
LRH-2003-00034
NAO-2006-07947
LRL-2008-00612
LRH-2004-00910
LRH-2005-01383
LRL-2009-00813
LRH-2003-01254
NAO-2005-05208
LRL-2010-00258
LRH-2000-00444
LRH-2003-00900
LRL-2009-00449
LRH-2003-00764
NAO-2004-01769
LRH-2001-00021
LRH-2000-00333
LRH-2002-01377
LRL-2010-00754
NAO-2006-07687
NAO-2006-06893
LRH-2000-00148
NAO-2004-01211
NAO-2003-01330
NAO-2005-05440
LRH-2001-00036
LRH-1999-00988
NAO-2009-01575
NAO-2007-01973
LRH-2003-00798
NAO-2009-01186
LRH-2000-01353
Map Ready
RI
AR Off
SV Off
OV Off
TF Off
CS
Dist
Area
ORM Project Locations
-82.44484, 37.36634
Transferring data from orm.usace.army.mil...


DA Map - LRL-2009-00550 (US 460 Relocation Excess Material Sites)
https://orm.usace.army.mil/orm2/f?p=101:229:3110696096317612::NO
Google
DA Map - LRL-2009-00550 (US 4...
Q0IWRJDS
orm_regulator
Los Angeles District: SPL - CESPL
Role
Preferences
[ORM Reports]
Logout
ORM2
Home
Maps
Search
LRL-2009-00550
Help
Folder
Location
Aquatic Resources
Jurisdiction
Impacts/Mitigation
Map
Indicators
Letters
Documents
Contacts
Regulators
Comments
Feedback
ORM2
Layers
Expand All
Collapse All
All Off
Redraw
Regulatory
USACE
USACE Division/District data
DoD
Federal
DOT
EPA
National Atlas
NOAA
NPS
USDA
NRCS
Watershed Boundary Dataset
USFWS
Critical Habitats
National Wetland Inventory
USGS
24K Quad
100K Quad
Legend
Search
MultiQuery Results
Query Layer:
Enter DA Number (Office-Year-Num
BaseMap
Scale:
UT Rob Fork
LRL-2008-01215
Rob Fork
LRL-2008-01361
Site 1 OTHER WATERS LRH-2003-1327
Site 1 WETLANDS LRH-2003-34
PUBHx
Google
Imagery ©2010 - Terms of Use
Map Ready
Radar Off
Area Units: Acres
Dist Units: Miles
Regulatory → ORM Waters of the US
-82.54436, 37.35372
LL / NAD83
Done


Permitting
army.mil
https://orm.usace.army.mil/orm2/f?p=101:6:142262002445901
Google
Permitting
Q0IWRJDS
orm_regulator
Los Angeles District: SPL - CESPL
Role
Preferences
[ORM Reports]
Logout
ORM2
Home
Search
LRL-2009-00182
Help
Folder
Location
Aquatic Resources
Jurisdiction
Impacts/Mitigation
Map
Indicators
Letters
Documents
Contacts
Regulators
Comments
Feedback
JOEL D. SCHLAGEL (Q0IWRJDS - SPL - ORM_REGULATOR)
does not have permissions to edit this folder or its contents
JAMES L. THOMAS (H2OPFJLT - LRL - ORM_REGULATOR) is the owner
DA Number: LRL-2009-00182 (Persimmon Branch - Clintwood Mining - 898-0815)
Applicant: No Applicant Found
Regulatory Actions
F
A
S
Regulatory Action Type
Fed Cmplt
Start Date
End Date
Updated
Final
Request for Action
30-JAN-09
25-FEB-09
Nationwide Permit
30-JAN-09
19-JUL-10
19-JUL-10
Done

Overview of Aquatic Resources in ORM



F	AR	Regulatory Action Type	Size	Cowardin	HGM	Geometry Type	Local Waterway	Spatial Details	CM1 Map	CM2 Map	Delete	Add
		Regulatory Action Folder										
		Channel A 1st order (NRPW)	67.666 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel A (RPW)	737.616 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel A1 (NRPW)	10.668 m	R	RIVERINE	Point		View	View	View	Old JD Present	
		Channel A2 (NRPW)	182.88 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel A3 (NRPW)	41.148 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel A4 (NRPW)	161.544 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel A5 (NRPW)	60.96 m	R	RIVERINE	Point	Huff Creek	View	View	View		
		Channel B 1st order (NRPW)	74.676 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel B 2nd order (RPW)	198.12 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel B 3rd order (RPW)	731.52 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel B1 (NRPW)	47.244 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel B2 (NRPW)	55.169 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel B3 1st order (RPW)	124.663 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	
		Channel B3 2nd order (RPW)	137.16 m	R	RIVERINE	Point	Huff Creek	View	View	View	Old JD Present	

Detailed Data on Aquatic Resources

Add/Update Aquatic Resource Items

1.	**Aquatic Resource Name***	Channel A2
2.	**Cowardin System***	Riverine
3.	**Cowardin Class***	R-RIVERINE
4.	**Aquatic Resource Type**	Non-RPWs that flow directly or indirectly into TNWs
5.	**HGM Class**	Riverine
6.	**Local Waterway Name**	Huff Creek
7.	**Measurement Type***	Linear
8.	**Geometry**	Complete
9.	**Create Site from**	Enter Coordinates

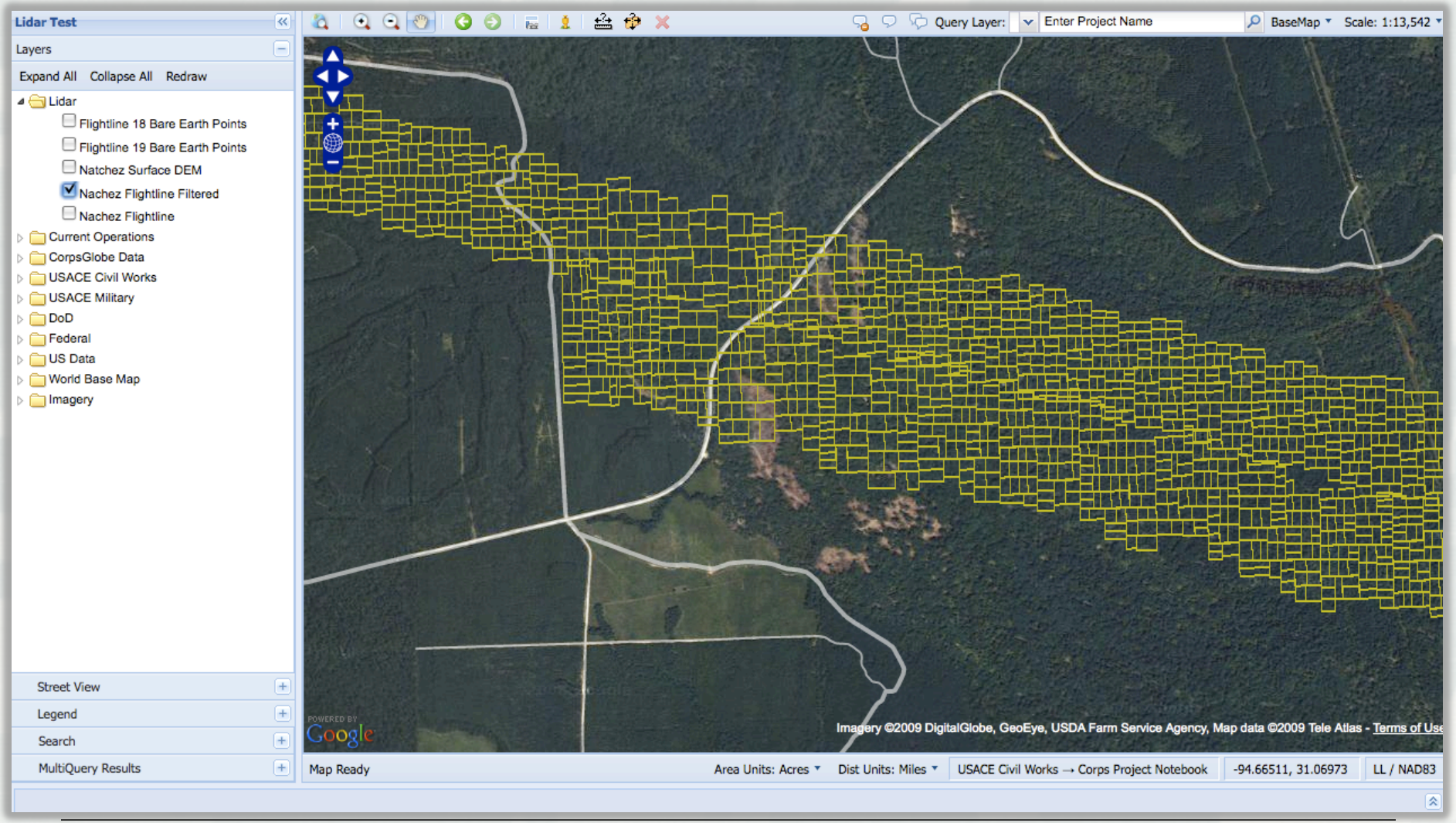
Cancel

Spatial Details

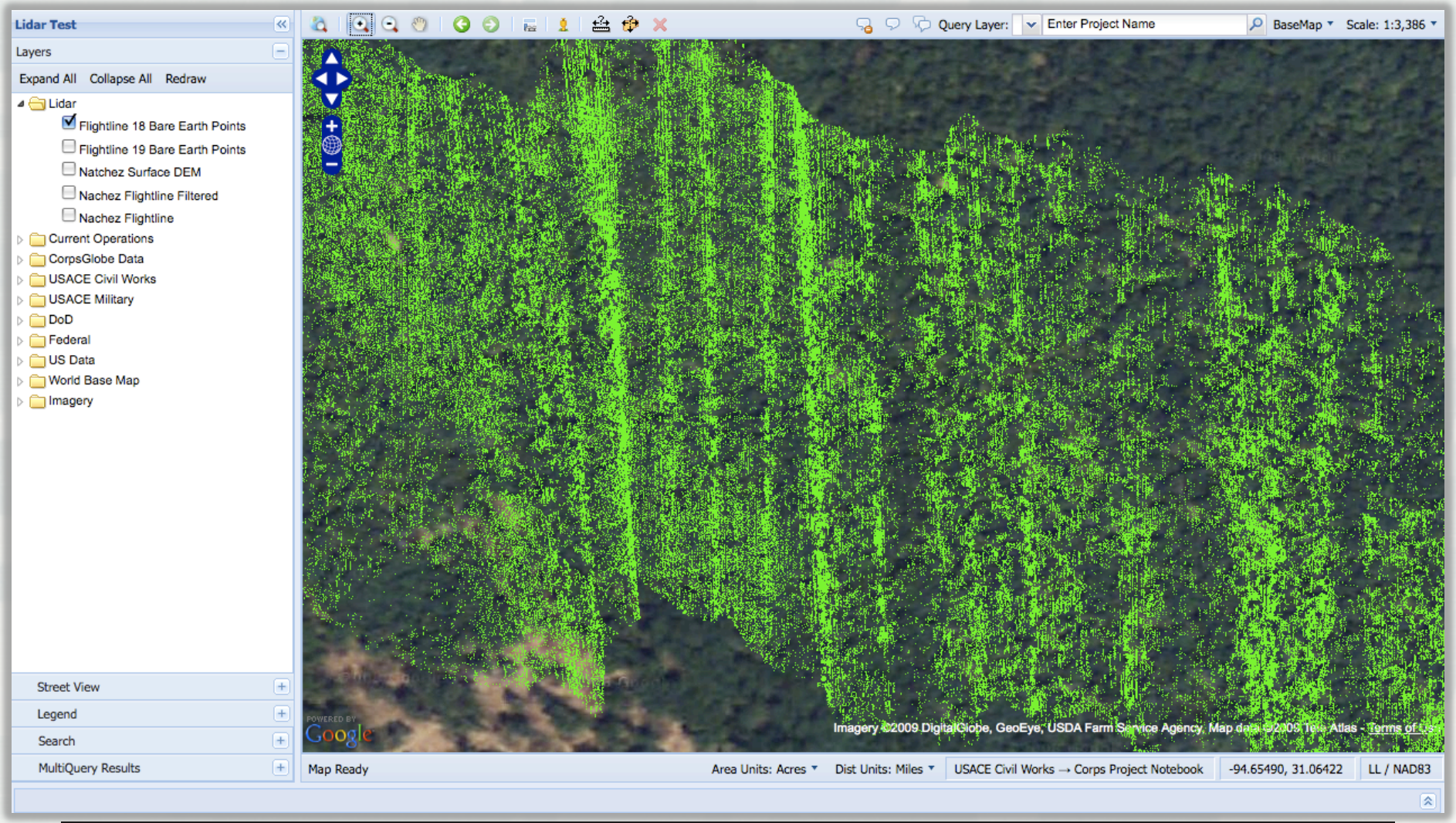
Site Name	Channel A5
County State	Wyoming, WV
Congressperson	Nick J. Rahall, II (D)
Congressional District	WV-03
Regulatory District	Huntington
Zip Code	24827
Closest GNIS Waterway	Sycamore Creek
Approx. straightline dist to waterway	.624 mi
HUC Region Name	Ohio Region
HUC Subregion Name	Big Sandy-Guyandotte
HUC Acc Name	Guyandotte
HUC Cat Name	Upper Guyandotte. West Virginia.
8 Digit Huc	5070101
Latitude (NAD83)	37.76167
Longitude (NAD83)	-81.65500
UTM Zone	17
UTM X Coordinate	442306.82
UTM Y Coordinate	4179574.30
PLSS Meridian	-
PLSS Township	-
PLSS Range	-
PLSS Section	-
USGS 1:24K Quad Name	WV-LORADO
River Mile and Distance	-
EPA Surf	EPA Surf your Watershed

Cancel

Advanced Support for Airborne and Ground Based LIDAR



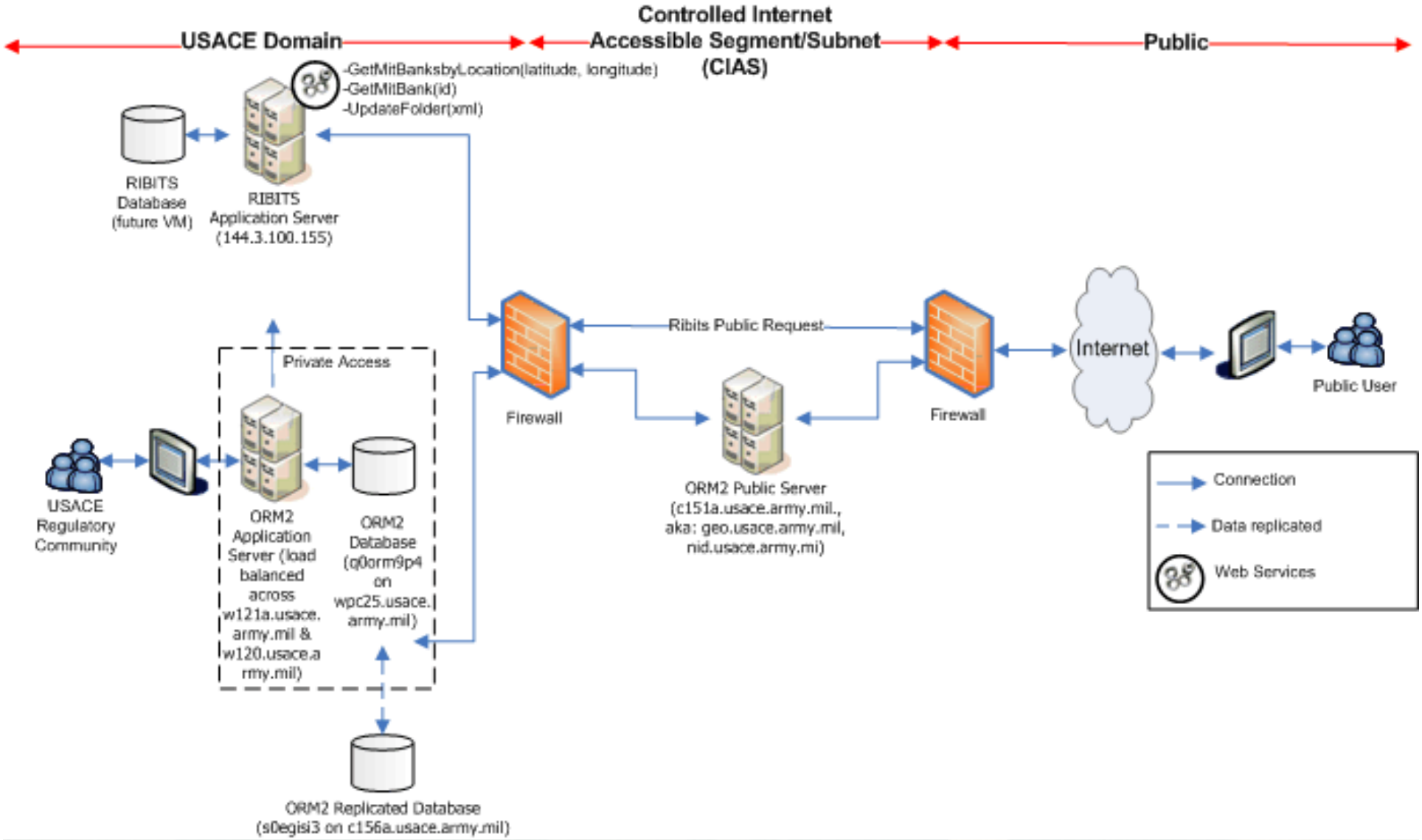
Bare Earth individual Points from SDO_PC



"One Door to the Corps"

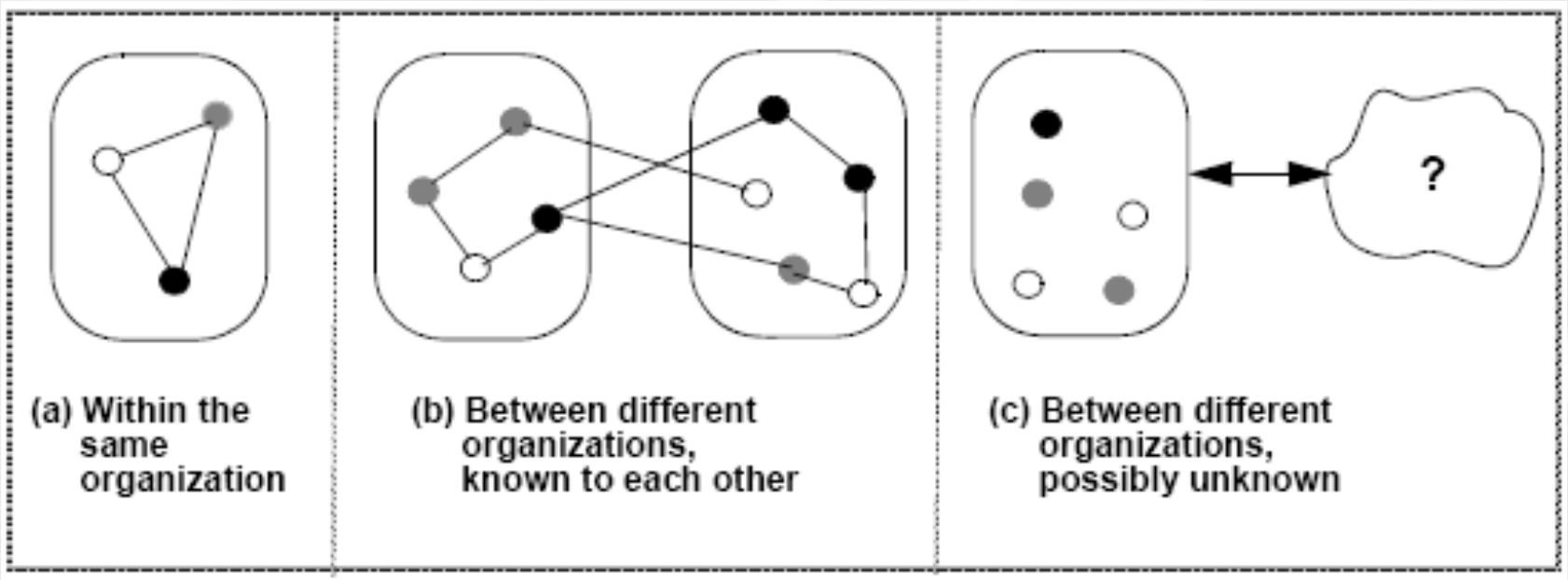
- USACE Regulatory Program through ORM System can provide a single consistent point of access to USACE Data.

ORM2/RIBITS Architecture



Data Exchange Approaches

- Service Architecture – REST, SOAP, CORBA
- Consumer – KML, GeoRSS
- Old School – Files on FTP Site



Note: Different acquisition *functions* are denoted by the symbols ○ ● ●

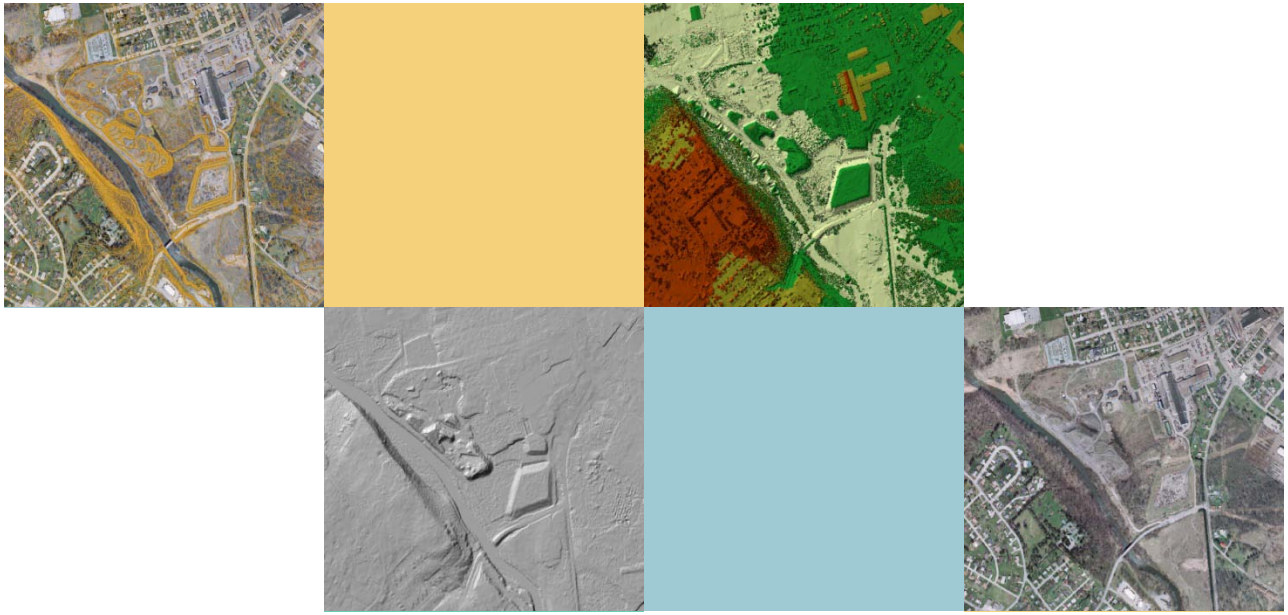
Data is not difficult Semantics is

- Project Area
- Applicant
- Work Type
- Start Date

Datums

- Verical & Horizontal Datum Documentation

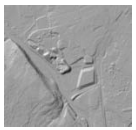
Business Cases for SMCRA Geospatial Information in West Virginia



August 3, 2010

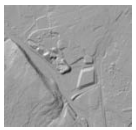
GIS Public Empowerment Program

- In 1995 TAGIS created the **FIRST** interactive mapping application capable of displaying statewide extent geospatial data on the Internet.
  - Dai, Q., and L. Evans, 1996, An On-line Interactive GIS Application for the Surface Water Pollution Analysis. In Proceedings of a Specialty Conference Sponsored by the Air & Water Management Association, Reno, Nevada, pp. 185-195.
  - Dai, Q., Evans, L. and Shank, M., 1997, Internet Interactive GIS and Public Empowerment. In Proceedings of GIS'97, Vancouver (Fort Collins: GIS World Inc.), pp. 555 – 559.

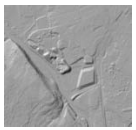

2nd Generation

- See WVDEP Enviromap Explorer
  - Permit boundaries
  - AML features
- Web Mapping Service
- Division of Mining and Reclamation Datasets
  - Mining Permit Boundaries (updated daily)
    Underground Mining Limits (updated daily)
  - Mining-related fills, Southern West Virginia as of September, 2003.


Fast Forward to Today's Tools

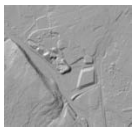
- ArcGIS Server site
  - Services directory
  - Resource Extraction Data Viewer
  - Trend Station Analysis Dashboard


What do you do when you get THE call?

"Just wanted to let you know we're upping the number of Ricoh 500SEs we're buying from 24 to a total of 124. We need you TAGIS guys to come up with a geotagged photo

You brainstorm ... allot!


Documentation for each photo …

Category	What will be documented	IT solution
Who	Collected and uploaded the photo	Require input of user ID once a year
What	Keywords specific to what the users does → flavor based on logon data	Build database of keywords → become GIS attributes
	Date and time stored in each photo's EXIF header	Ricoh camera
	Compass orientation of person taking the photo and area of coverage of each photo	Mine camera's digital compass data written in each photo's EXIF header
Where	GPSed coordinates	Ricoh Capito 500SE camera's GPS stores coordinates in each photo's EXIF header
	Geoprocessing based on coordinates → quad, watershed	
	Geospatial analysis based on coordinates and logon data → an GIS layer	
When	Date and time photo was taken	Ricoh camera stores in each photo's EXIF header

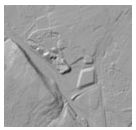
Queries → Person taking photograph's WVDEP affiliation

- DMR → SMCRA permit number where EVERY photo is taken.
- OOG → API number nearest photo
- DWW → WAP number
- OAML&R → PAD number

EXAMPLES:

Find all the photos taken on SMCRA permit number XXXXXXX

Find photos take within 5 miles of API number YYYYYYYY

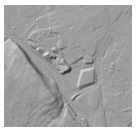




Queries → ArcGIS Server geoprocessing done automatically based on GPS location

- What is the quadrangle on which the photo was taken?
- What is the watershed in which the photo was taken?
- What WVDEP permitted facility is closest to where the photo was taken?

EXAMPLES:

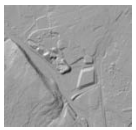
Find all the photos taken on the Williams Mountain quadrangle
Find photos taken on the Williams Mountain quadrangle within 5 miles of the town of .....


Queries → Keywords entered by person uploading the photo

- DMR → valley fill, refuse impoundment, violation, fly rock, etc.
- OOG → complaint, tank, reclamation, etc.
- DWW → discharge, AMD, etc.
- OAML&R → subsidence, underground fire.

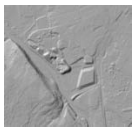
EXAMPLES:
Find all the photos taken on SMCRA permit number WVXXXXX showing valley fills
Find photos take in the Guyandotte River watershed of OOG storage tanks → water
Find photos of acid seeps taken between May of 2010 and May of 2015.


The automated workflow for GPSed cameras

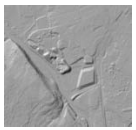
(... AND GPSed cell phones)

Digital Asset Management (DAM) DEMO

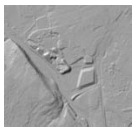

Current design criteria for the app

- Upload multiple photos straight from camera at the same time
- Automatically strip out EXIF header info
  - Get coordinates
  - Get compass data for photo orientation
  - Get GPS fix quality data → PDOP
- Create an ArcSDE point layer on-the-fly
- Allow user to select keywords to merge with point data attributes.

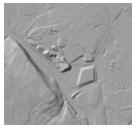



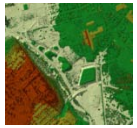

Planned V2.0 design enhancements

- Automated geoprocessing
  - What quad, county, watershed, etc.
  - Nearest cemetery, school, violation, etc.
- Baskin Robbins the app → permitting vs. I&E vs. AML flavors via login.
- Engineer a new Adobe Flex 4/ESRI API 2.0 *"query my photos"* widget.
- Integrate Ricoh 500SE sound files, AVIs.
- On-the-fly viewshed analysis → camera location, camera viewing angle & topography.


The end





SMCRA Agency geospatial data business use cases, information products needed, issues, and concerns -

What are the needs?

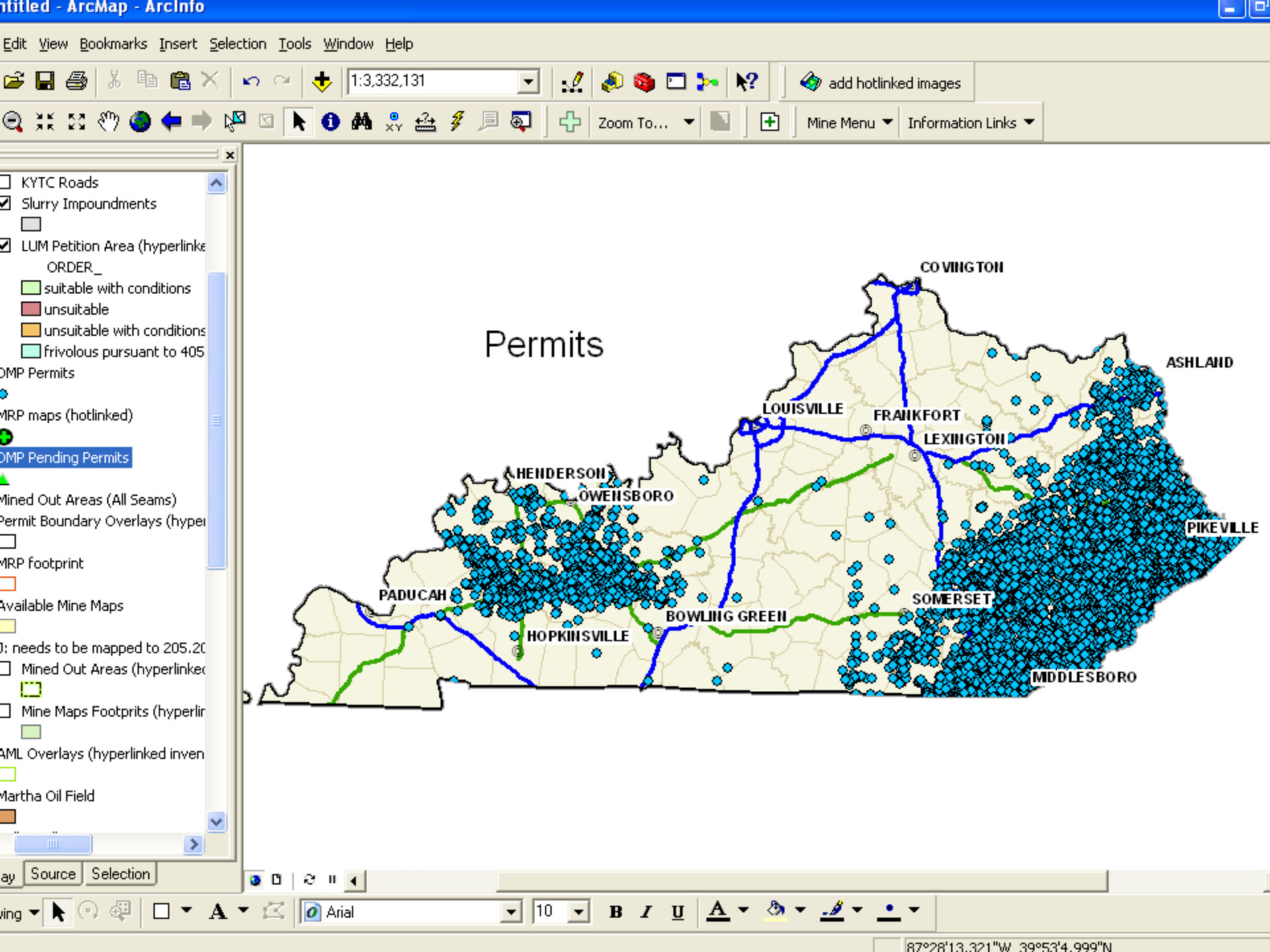
- Permit Reviewers
- Field Staff- terminal server
- Public- internet
- Sister Agencies

Kentucky-

- 2,000 active permits
- 20,000 total
- 100 issued a month

KY GIS MODEL

- GIS TIED TO DATA BASE
- LEVERAGE ENTERPRISE
- IMAGING PROCESS
- CUSTOM TOOLS
- CAPTURE HISTORIC DATA
- LISTEN TO CONSUMERS
- COMMIT TO NEW DATA CREATION RESPONSIBLY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add hotlinked images
Zoom To...
Mine Menu
Information Links
KYTC Roads
Slurry Impoundments
LUM Petition Area (hyperlinke
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suitable with conditions
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frivolous pursuant to 405
OMP Permits
MRP maps (hotlinked)
OMP Pending Permits
Mined Out Areas (All Seams)
Permit Boundary Overlays (hype
MRP footprint
Available Mine Maps
: needs to be mapped to 205.20
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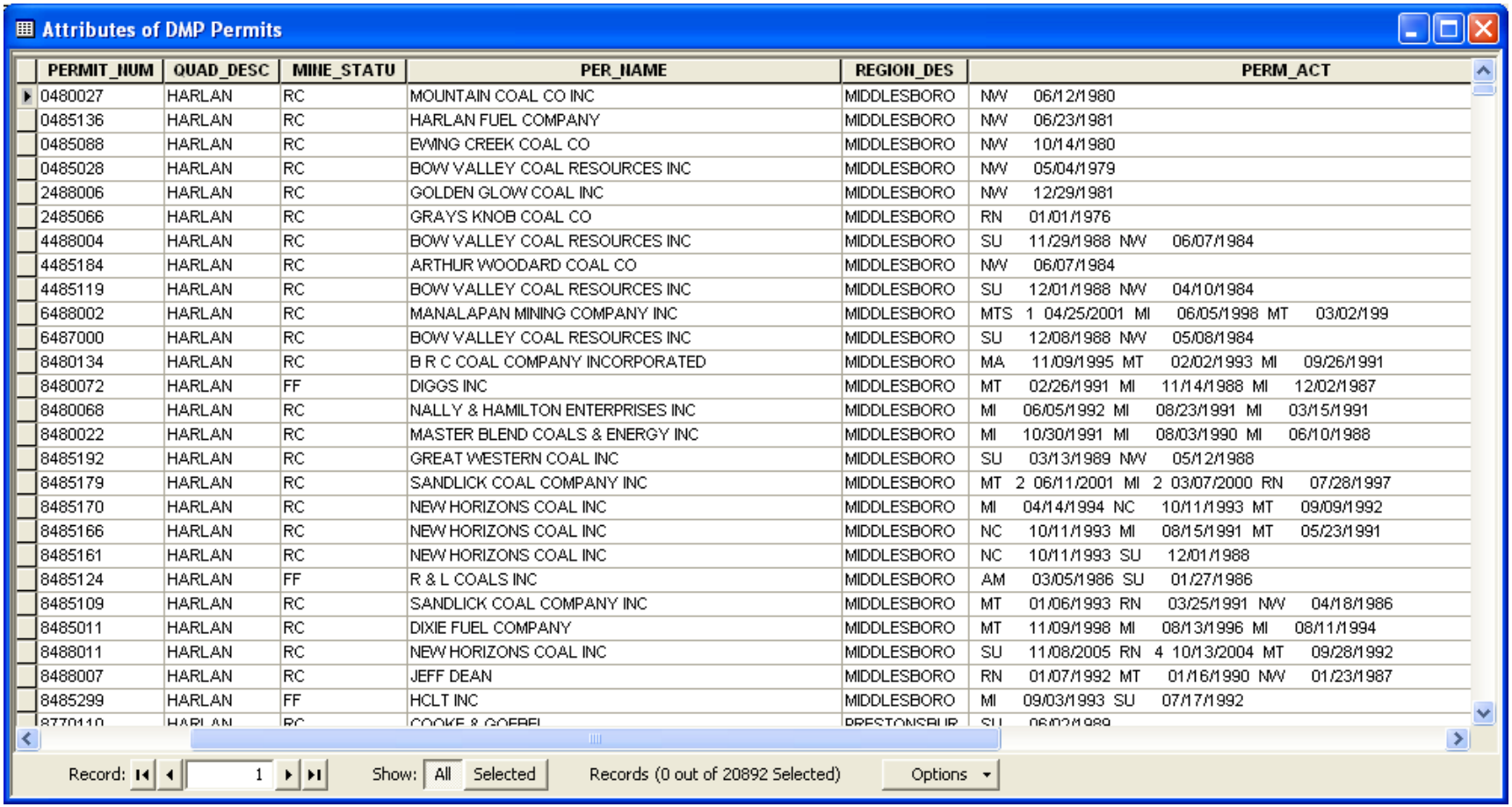
Permits
COVINGTON
ASHLAND
LOUISVILLE
FRANKFORT
LEXINGTON
HENDERSON
OWENSBORO
PIKEVILLE
PADUCAH
SOMERSET
BOWLING GREEN
HOPKINSVILLE
MIDDLESBORO
Arial
10
87°28'13.321"W 39°53'4.999"N

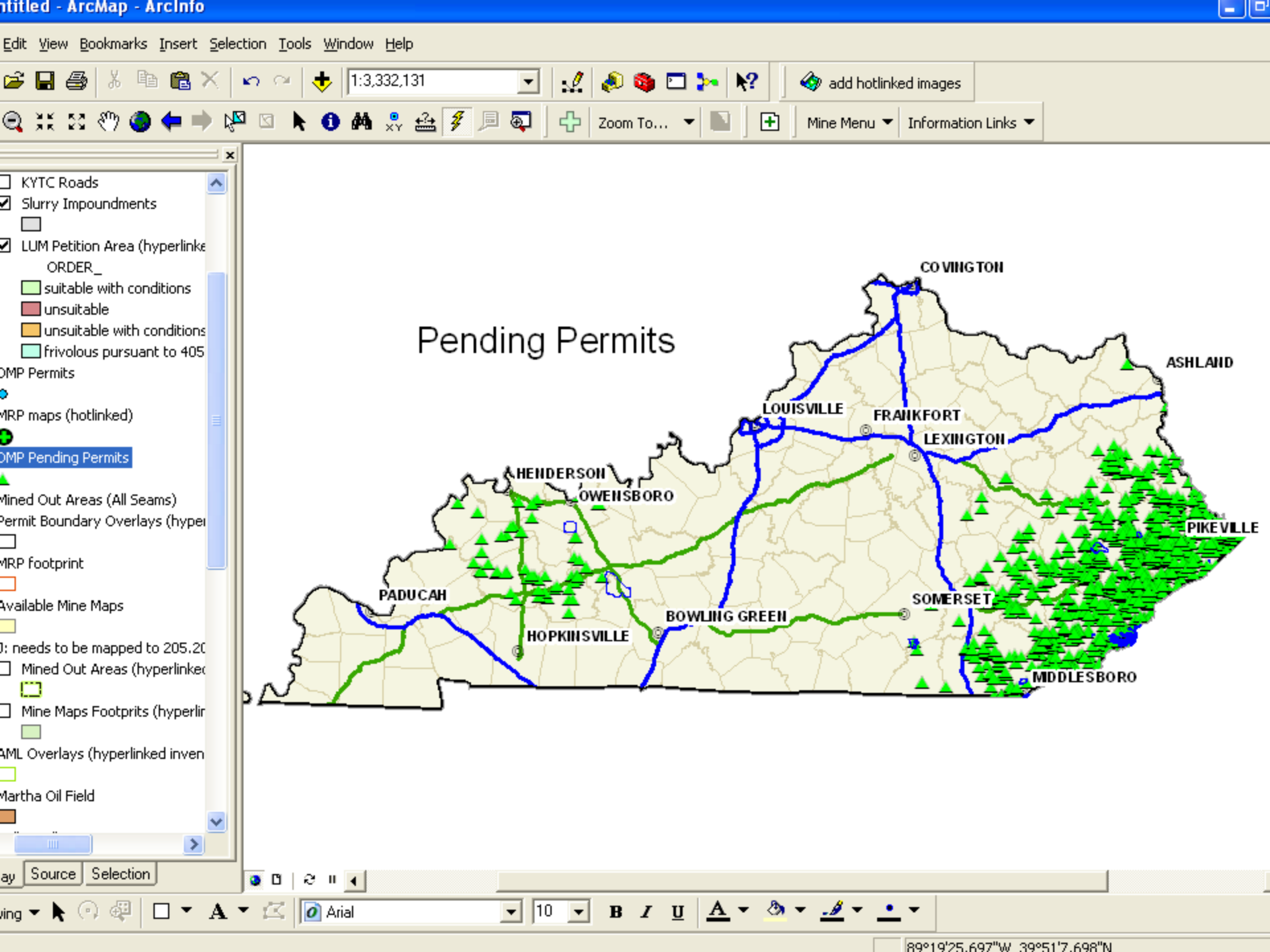
~ 20,000 Permits



Attributes of DMP Permits

PERMIT_NUM	QUAD_DESC	MINE_STATU	PER_NAME	REGION_DES	PERM_ACT
0480027	HARLAN	RC	MOUNTAIN COAL CO INC	MIDDLESBORO	NW 06/12/1980
0485136	HARLAN	RC	HARLAN FUEL COMPANY	MIDDLESBORO	NW 06/23/1981
0485088	HARLAN	RC	EWING CREEK COAL CO	MIDDLESBORO	NW 10/14/1980
0485028	HARLAN	RC	BOW VALLEY COAL RESOURCES INC	MIDDLESBORO	NW 05/04/1979
2488006	HARLAN	RC	GOLDEN GLOW COAL INC	MIDDLESBORO	NW 12/29/1981
2485066	HARLAN	RC	GRAYS KNOB COAL CO	MIDDLESBORO	RN 01/01/1976
4488004	HARLAN	RC	BOW VALLEY COAL RESOURCES INC	MIDDLESBORO	SU 11/29/1988 NW 06/07/1984
4485184	HARLAN	RC	ARTHUR WOODARD COAL CO	MIDDLESBORO	NW 06/07/1984
4485119	HARLAN	RC	BOW VALLEY COAL RESOURCES INC	MIDDLESBORO	SU 12/01/1988 NW 04/10/1984
6488002	HARLAN	RC	MANALAPAN MINING COMPANY INC	MIDDLESBORO	MTS 1 04/25/2001 MI 06/05/1998 MT 03/02/199
6487000	HARLAN	RC	BOW VALLEY COAL RESOURCES INC	MIDDLESBORO	SU 12/08/1988 NW 05/08/1984
8480134	HARLAN	RC	B R C COAL COMPANY INCORPORATED	MIDDLESBORO	MA 11/09/1995 MT 02/02/1993 MI 09/26/1991
8480072	HARLAN	FF	DIGGS INC	MIDDLESBORO	MT 02/26/1991 MI 11/14/1988 MI 12/02/1987
8480068	HARLAN	RC	NALLY & HAMILTON ENTERPRISES INC	MIDDLESBORO	MI 06/05/1992 MI 08/23/1991 MI 03/15/1991
8480022	HARLAN	RC	MASTER BLEND COALS & ENERGY INC	MIDDLESBORO	MI 10/30/1991 MI 08/03/1990 MI 06/10/1988
8485192	HARLAN	RC	GREAT WESTERN COAL INC	MIDDLESBORO	SU 03/13/1989 NW 05/12/1988
8485179	HARLAN	RC	SANDLICK COAL COMPANY INC	MIDDLESBORO	MT 2 06/11/2001 MI 2 03/07/2000 RN 07/28/1997
8485170	HARLAN	RC	NEW HORIZONS COAL INC	MIDDLESBORO	MI 04/14/1994 NC 10/11/1993 MT 09/09/1992
8485166	HARLAN	RC	NEW HORIZONS COAL INC	MIDDLESBORO	NC 10/11/1993 MI 08/15/1991 MT 05/23/1991
8485161	HARLAN	RC	NEW HORIZONS COAL INC	MIDDLESBORO	NC 10/11/1993 SU 12/01/1988
8485124	HARLAN	FF	R & L COALS INC	MIDDLESBORO	AM 03/05/1986 SU 01/27/1986
8485109	HARLAN	RC	SANDLICK COAL COMPANY INC	MIDDLESBORO	MT 01/06/1993 RN 03/25/1991 NW 04/18/1986
8485011	HARLAN	RC	DIXIE FUEL COMPANY	MIDDLESBORO	MT 11/09/1998 MI 08/13/1996 MI 08/11/1994
8488011	HARLAN	RC	NEW HORIZONS COAL INC	MIDDLESBORO	SU 11/08/2005 RN 4 10/13/2004 MT 09/28/1992
8488007	HARLAN	RC	JEFF DEAN	MIDDLESBORO	RN 01/07/1992 MT 01/16/1990 NW 01/23/1987
8485299	HARLAN	FF	HCLT INC	MIDDLESBORO	MI 09/03/1993 SU 07/17/1992
8770110	HARLAN	RC	COOKE & GOEBEL	PRESTONSBUR	SU 06/02/1989

Record: 1 Show: All Selected Records (0 out of 20892 Selected) Options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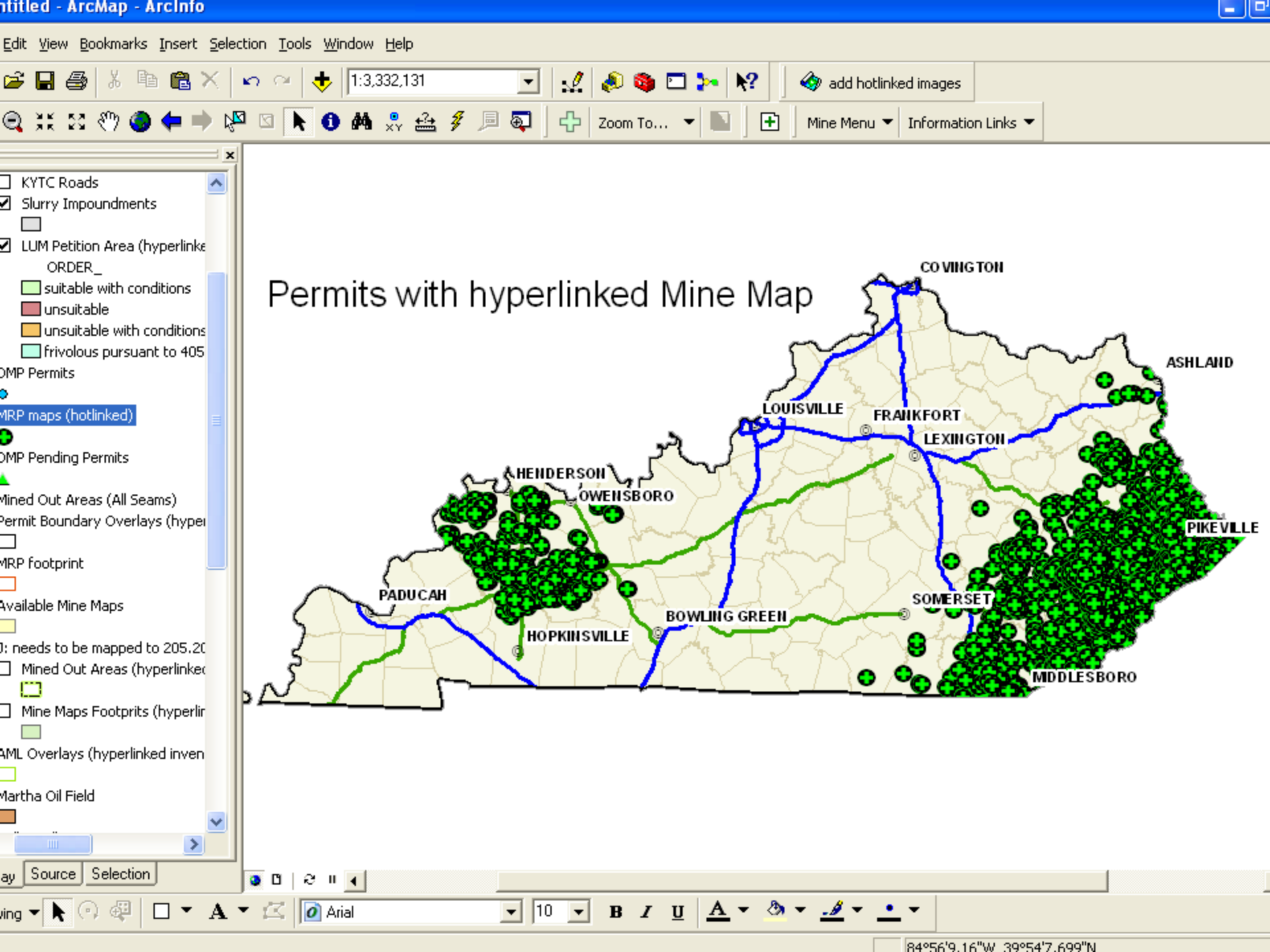
PADUCAH
SOMERSET
BOWLING GREEN
HOPKINSVILLE
MIDDLESBORO
Arial
10
89°19'25.697"W 39°51'7.698"N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Edit View Bookmarks Insert Selection Tools Window Help
1:3,332,131
add hotlinked images
Zoom To...
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OMP Permits
MRP maps (hotlinked)
OMP Pending Permits
Mined Out Areas (All Seams)
Permit Boundary Overlays (hype
MRP footprint
Available Mine Maps
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Martha Oil Field
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Permits with hyperlinked Mine Map
COVINGTON
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LOUISVILLE
FRANKFORT
LEXINGTON
HENDERSON
OWENSBORO
PIKEVILLE
PADUCAH
SOMERSET
BOWLING GREEN
HOPKINSVILLE
MIDDLESBORO
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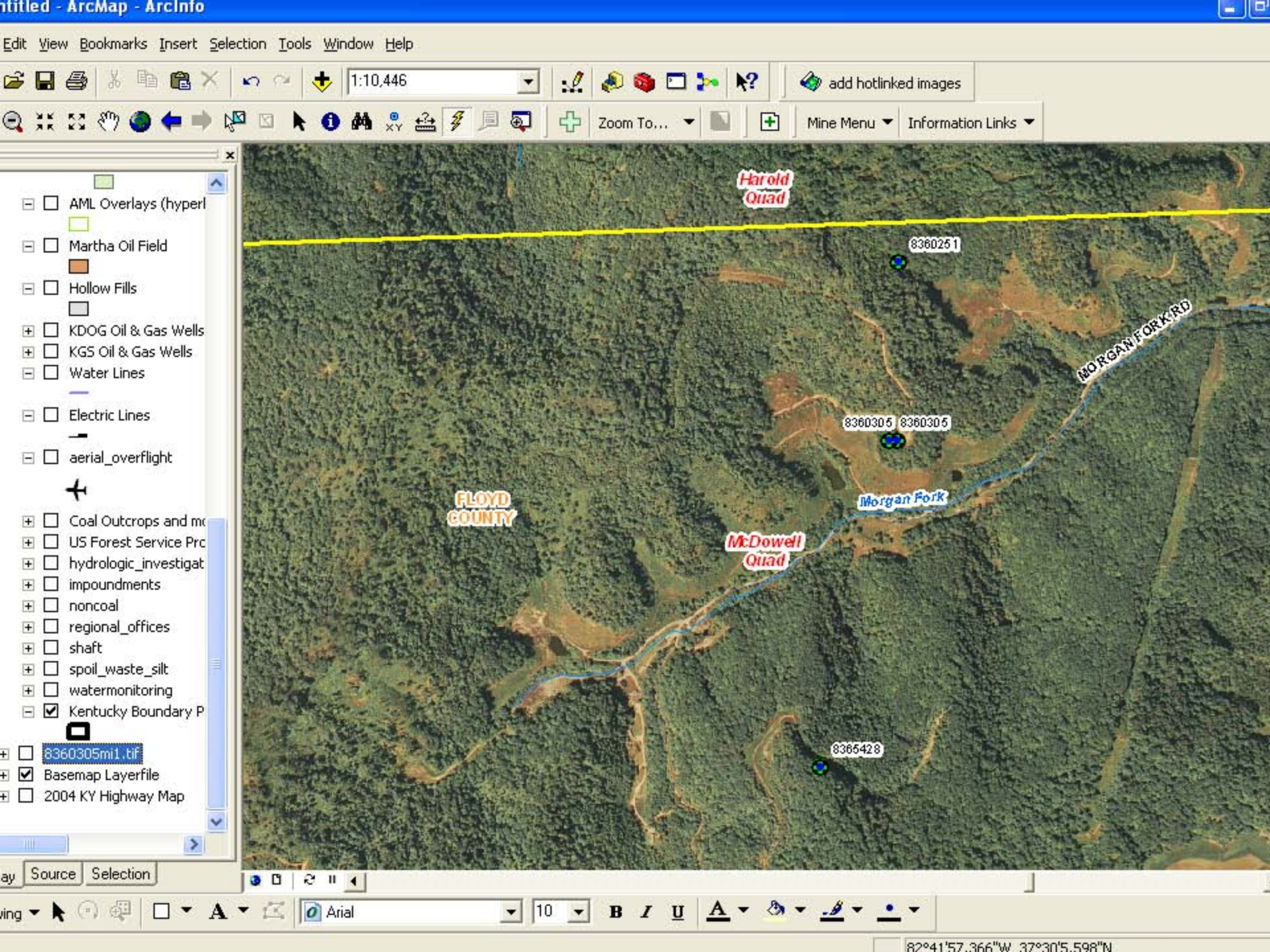
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Hollow Fills
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KGS Oil & Gas Wells
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Harold Quad
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McDowell Quad
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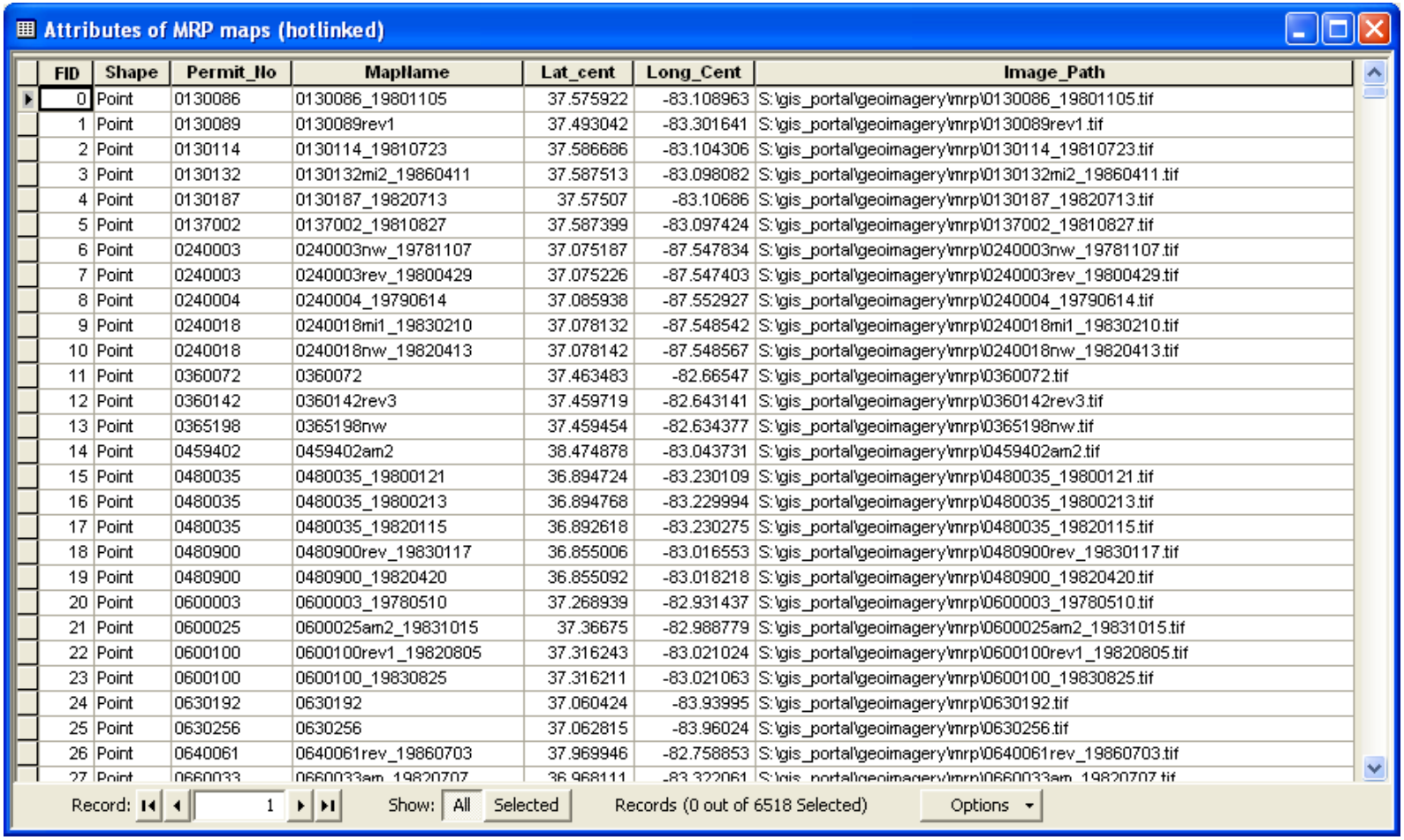
Mine Map linked to points



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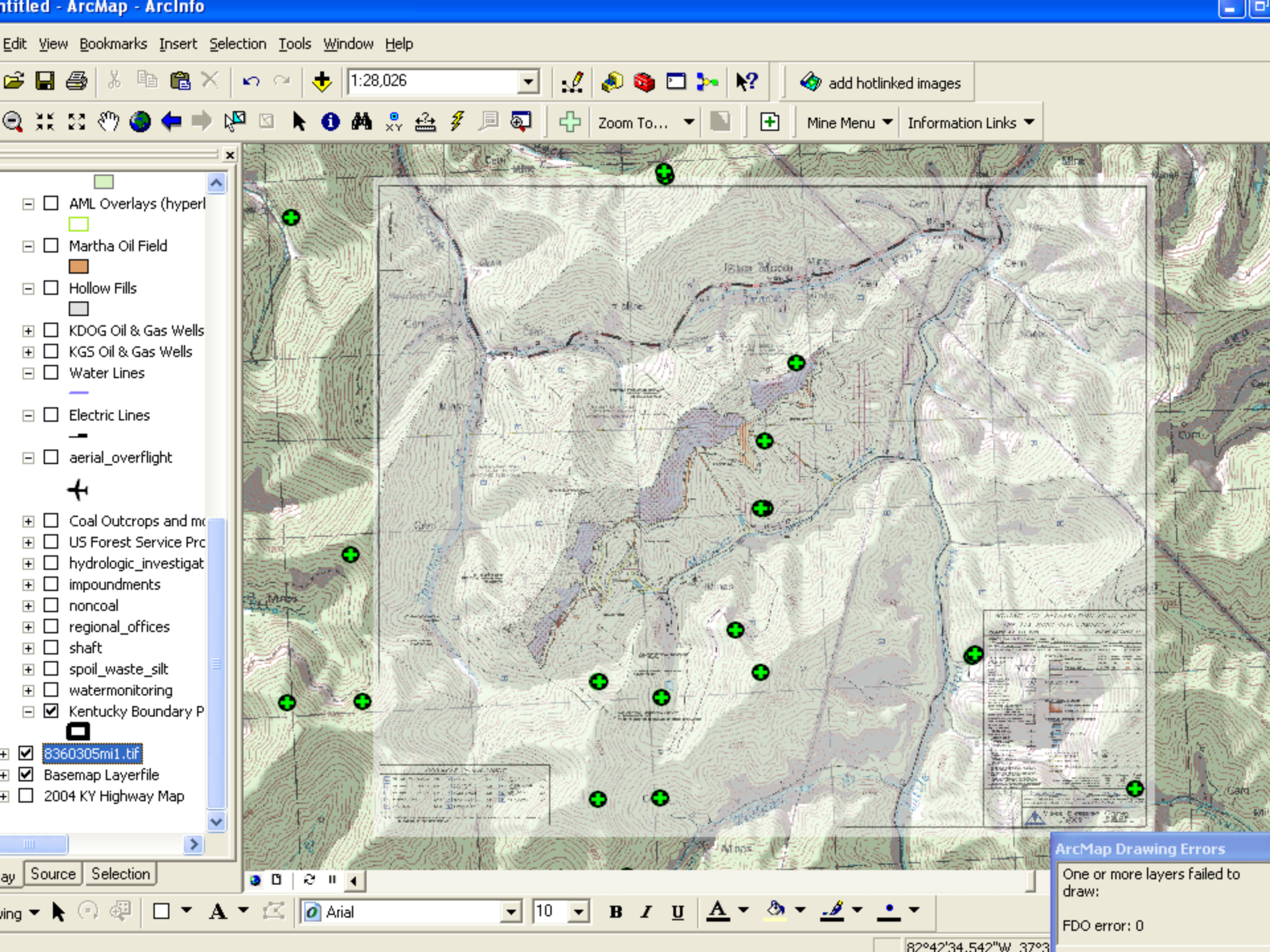
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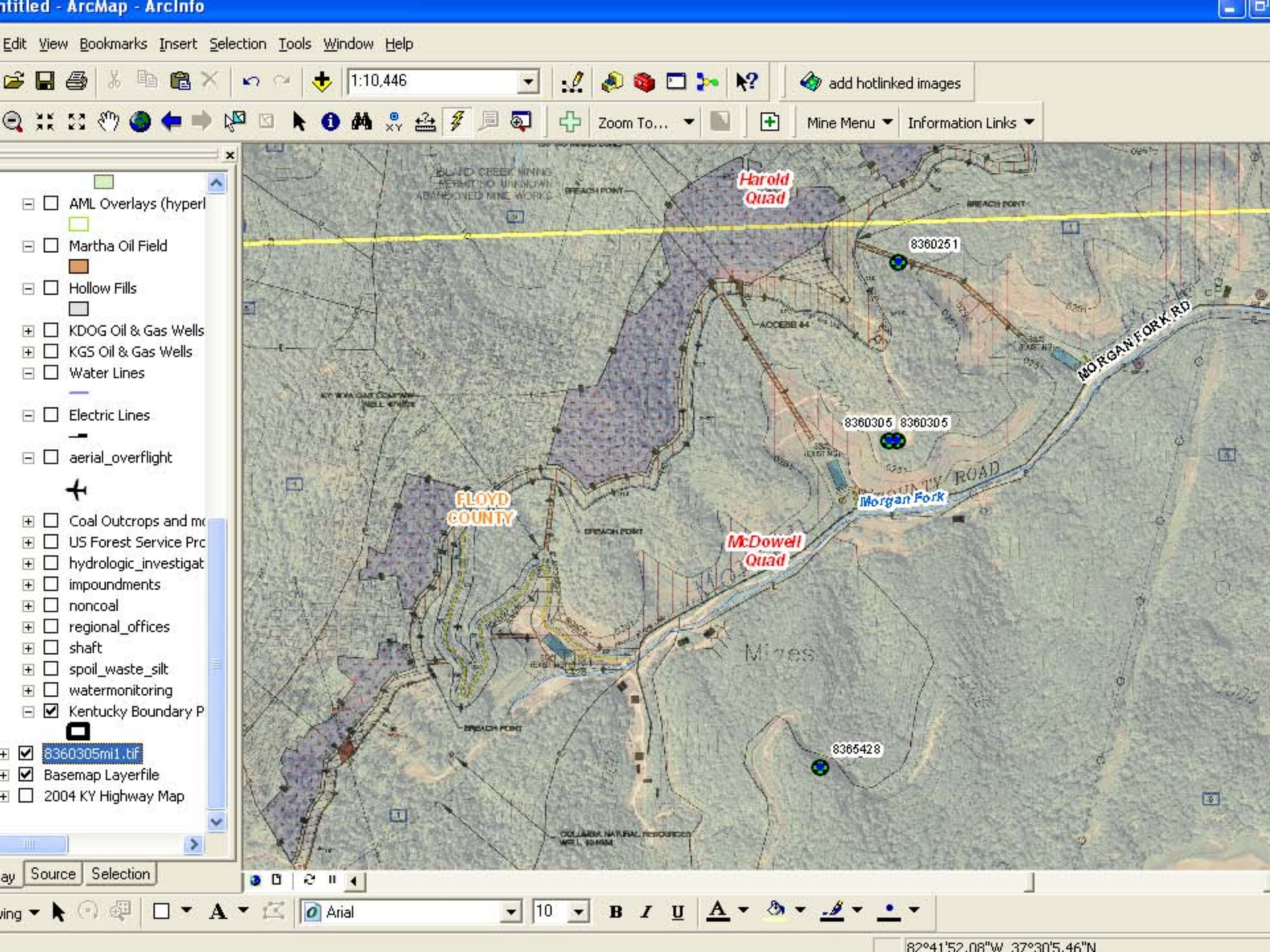
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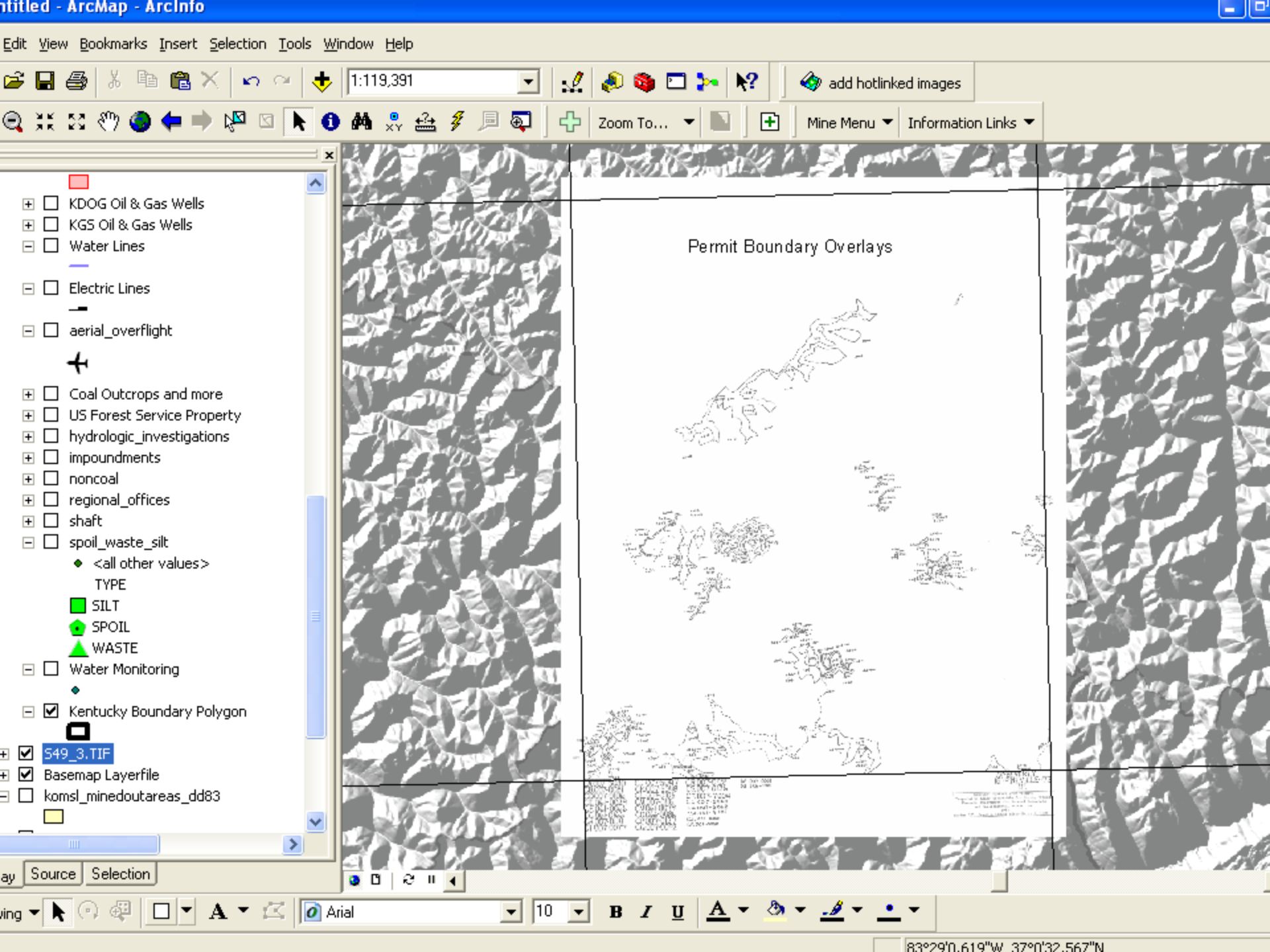
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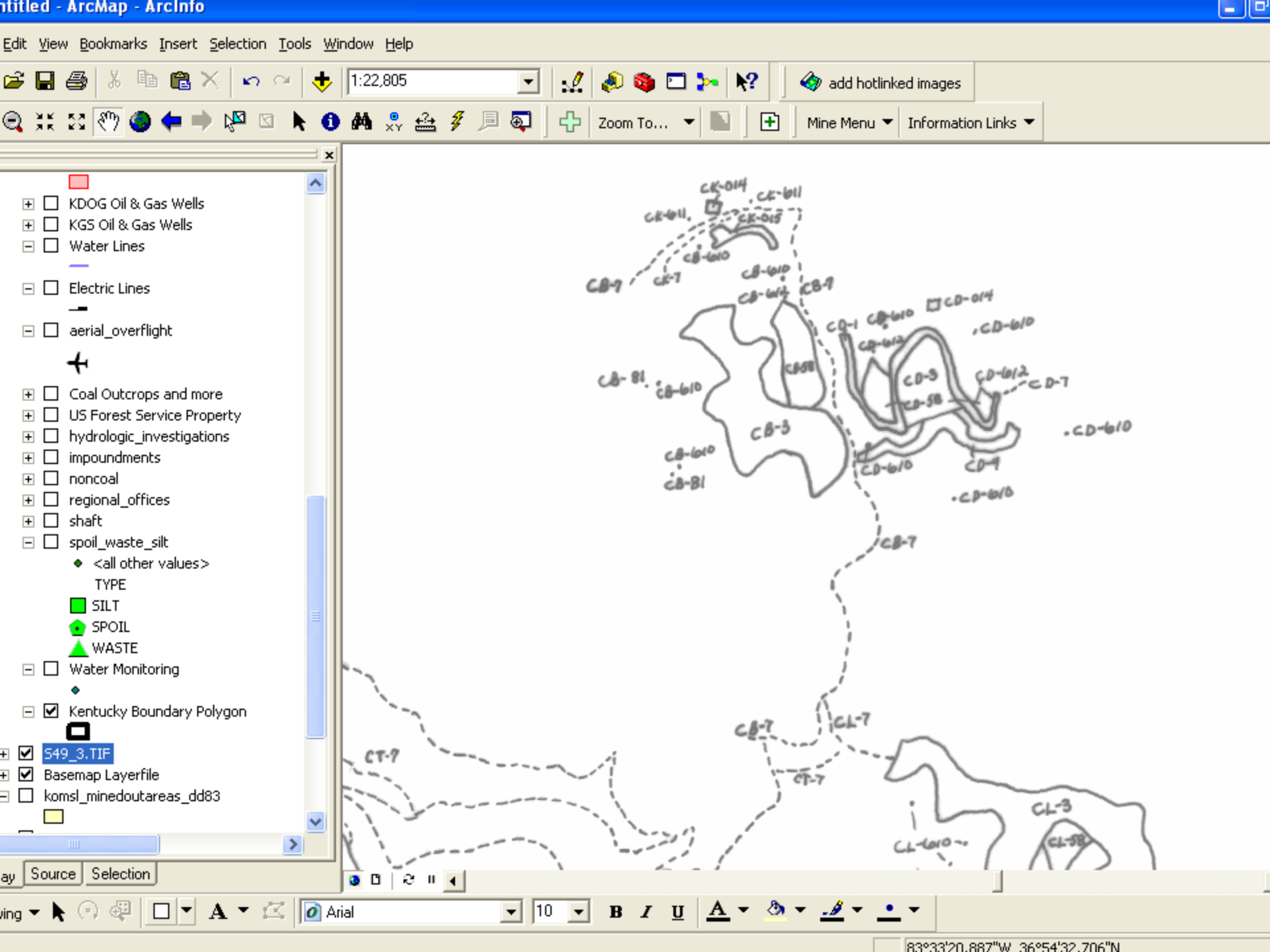
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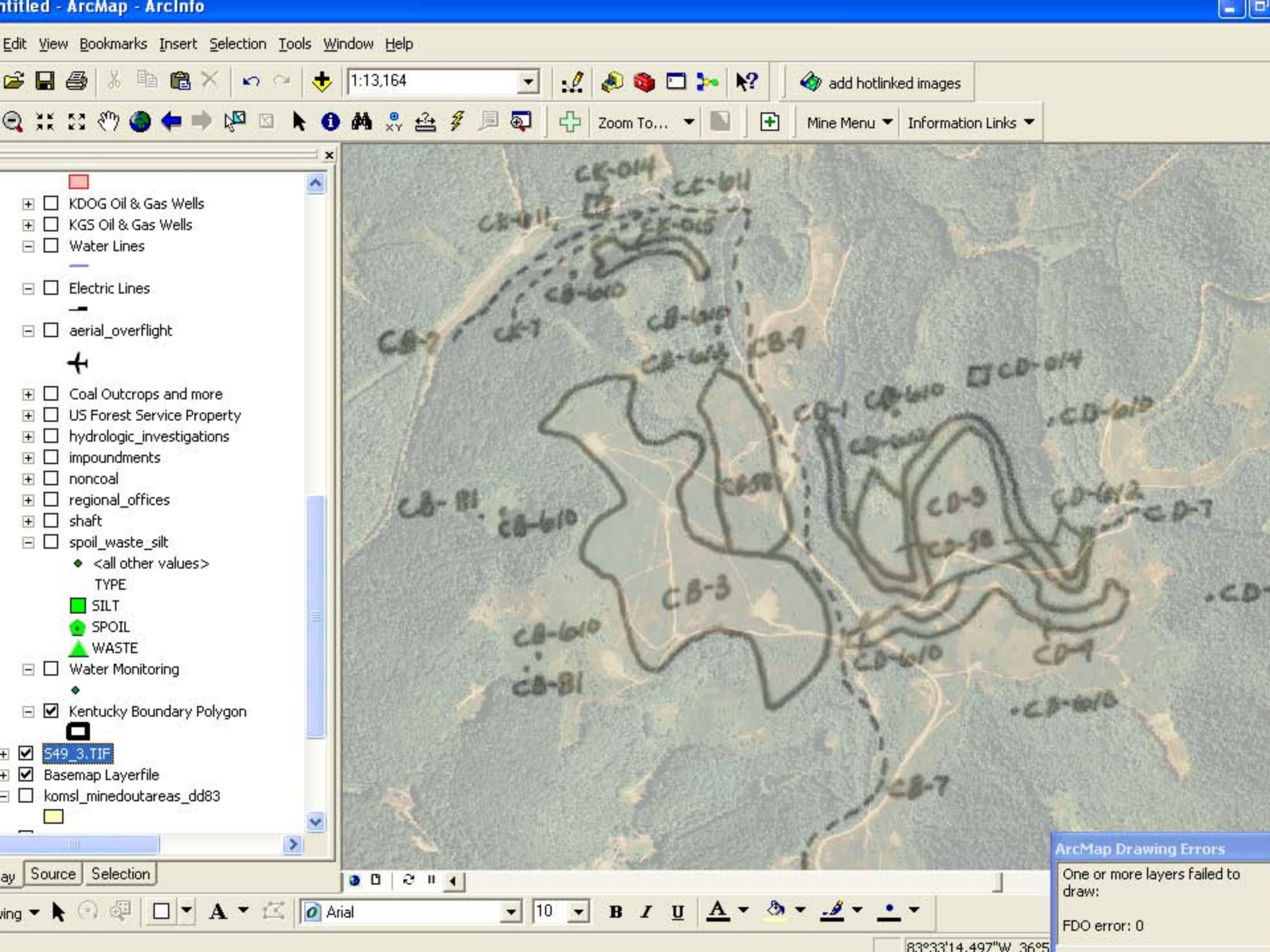
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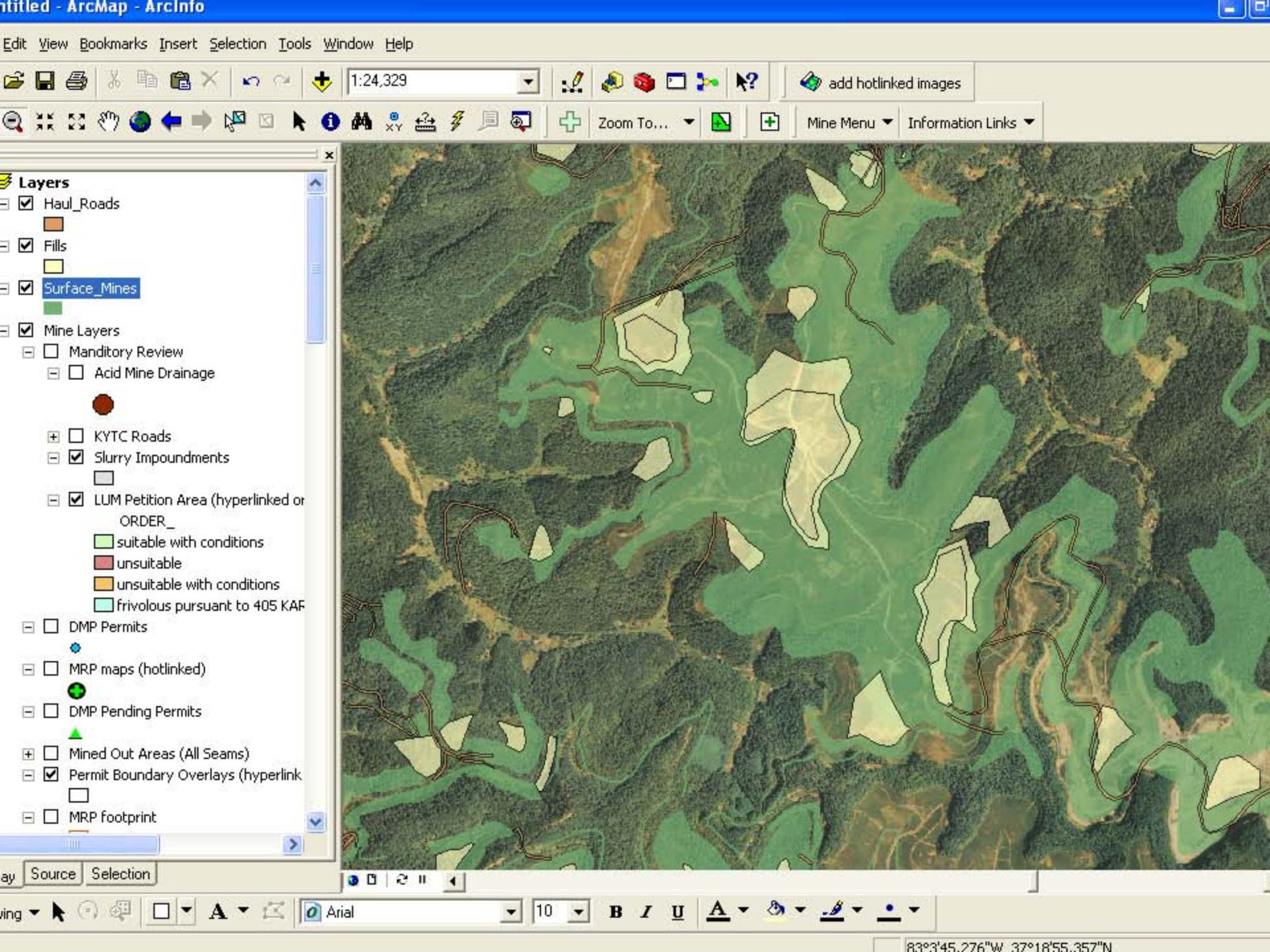
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Mined Out Areas (All Seams)
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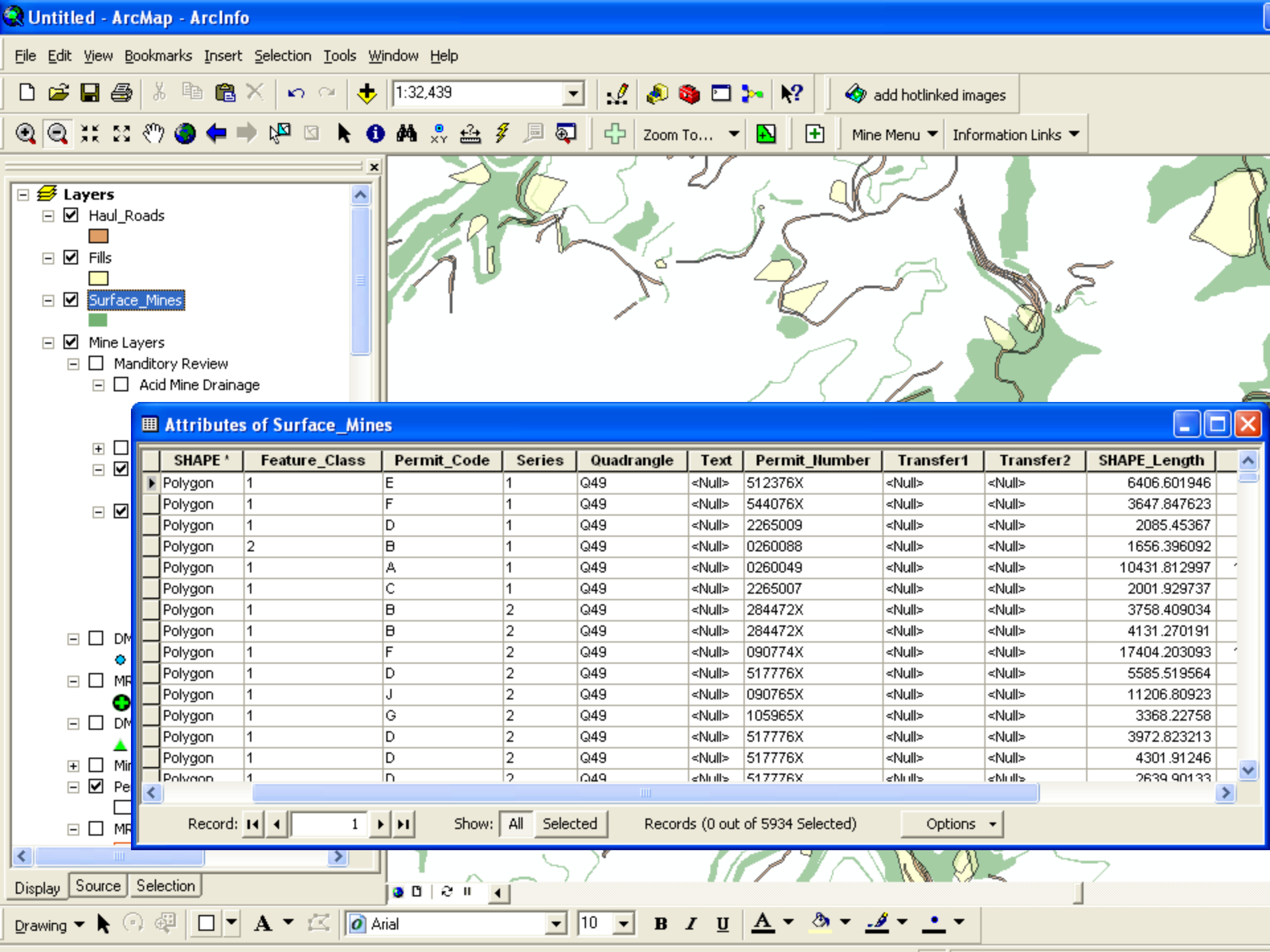
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Kentucky Department for Surface Mining Reclamation and Enforcement

DSMRE Overlay Maps
Permit Mapping Codes

1—Contour Mining Area

2—Area Mining Area

3—Mountaintop Removal Area

4—Augering Area

5—Fill area

57 – General Fill/Spoil Storage Area/Refuse Area

58 –Hollowfill

59—Topsoil Storage

510—General/Temporary/Equipment Storage Area

6—Sediment Structure

69—Sediment Type

610—Embankment Type

611—Dugout

612—Rock Check Dam

613—Diversion Ditch

616—Combination Diversion Ditch

618—Pole Structure

620—Earth Dam

7—Access/Haul Road

8—Monitoring Point

81—Surface Water Monitoring Point

82—Biology Monitoring Point

83—Groundwater Monitoring Point

84—Geologic Sampling Point

85—Surface/Biology Monitoring Point

9—Permit Boundary Area

0—Other Features

06—Underground Mine Opening

Adits [Y] - leg of Y in direction of mine opening

Air shafts [V]

014—Reference Area

015—Face-Up Area / Re-grade Area

017—Wildlife Habitat

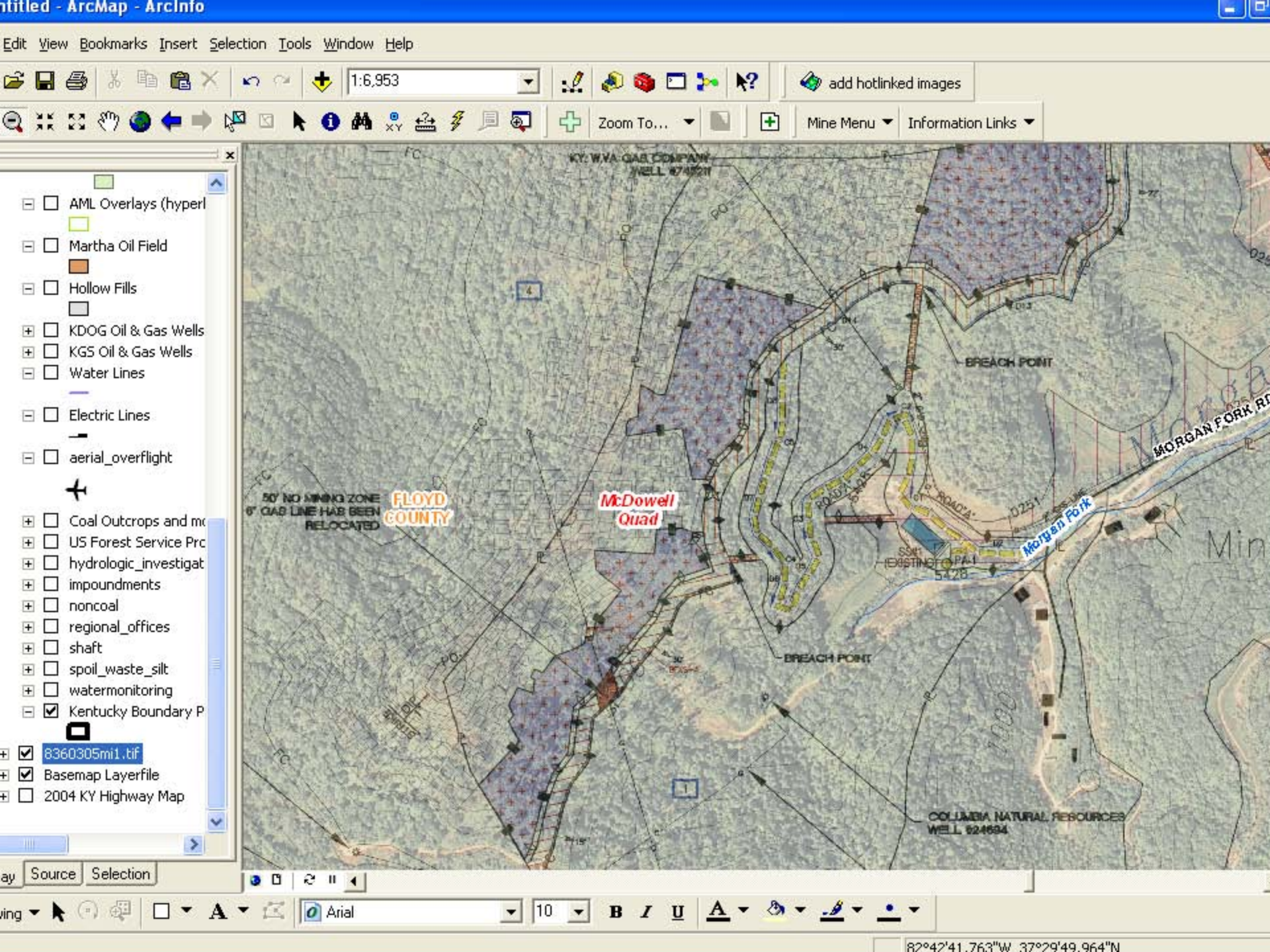
019—Railroad

021—Coal Stockpile

030—Underground Mine Area

040—Mine Management Area

050—Prep Plant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50' NO MINING ZONE
6" GAS LINE HAS BEEN
RELOCATED
FLOYD
COUNTY
McDowell
Quad
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Morgan Fork
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EXISTING PA-1
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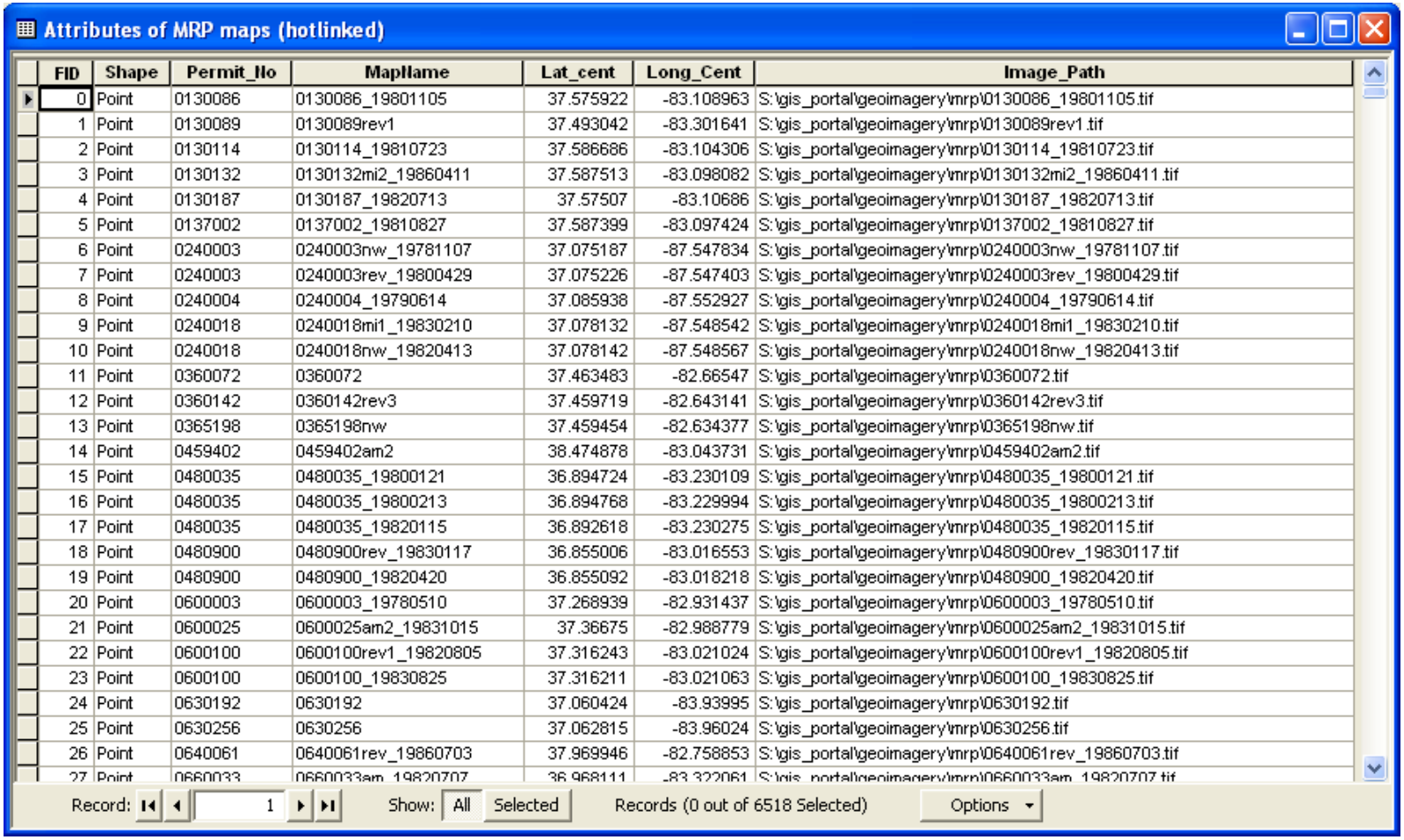
Mine and Reclamation maps



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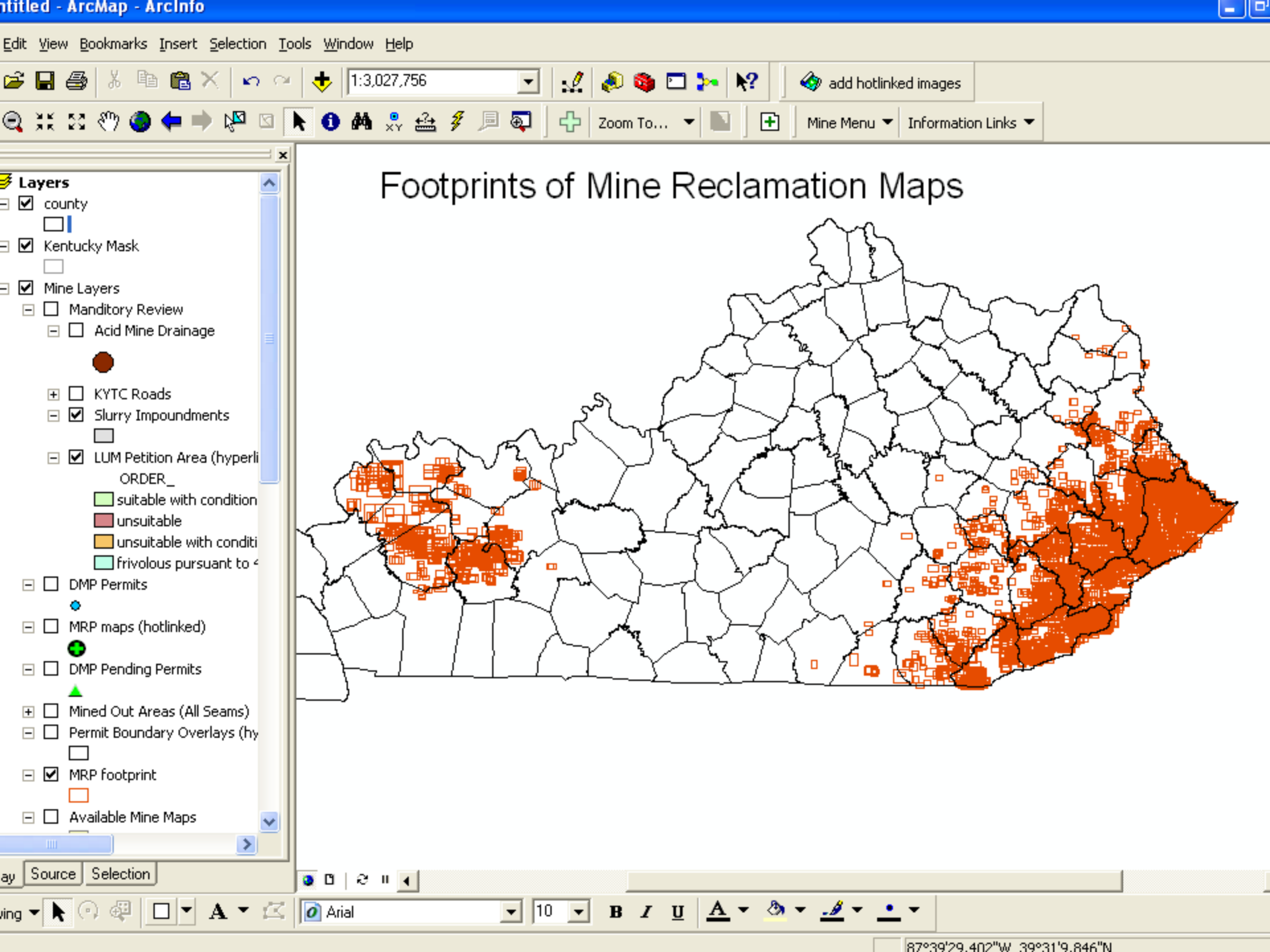
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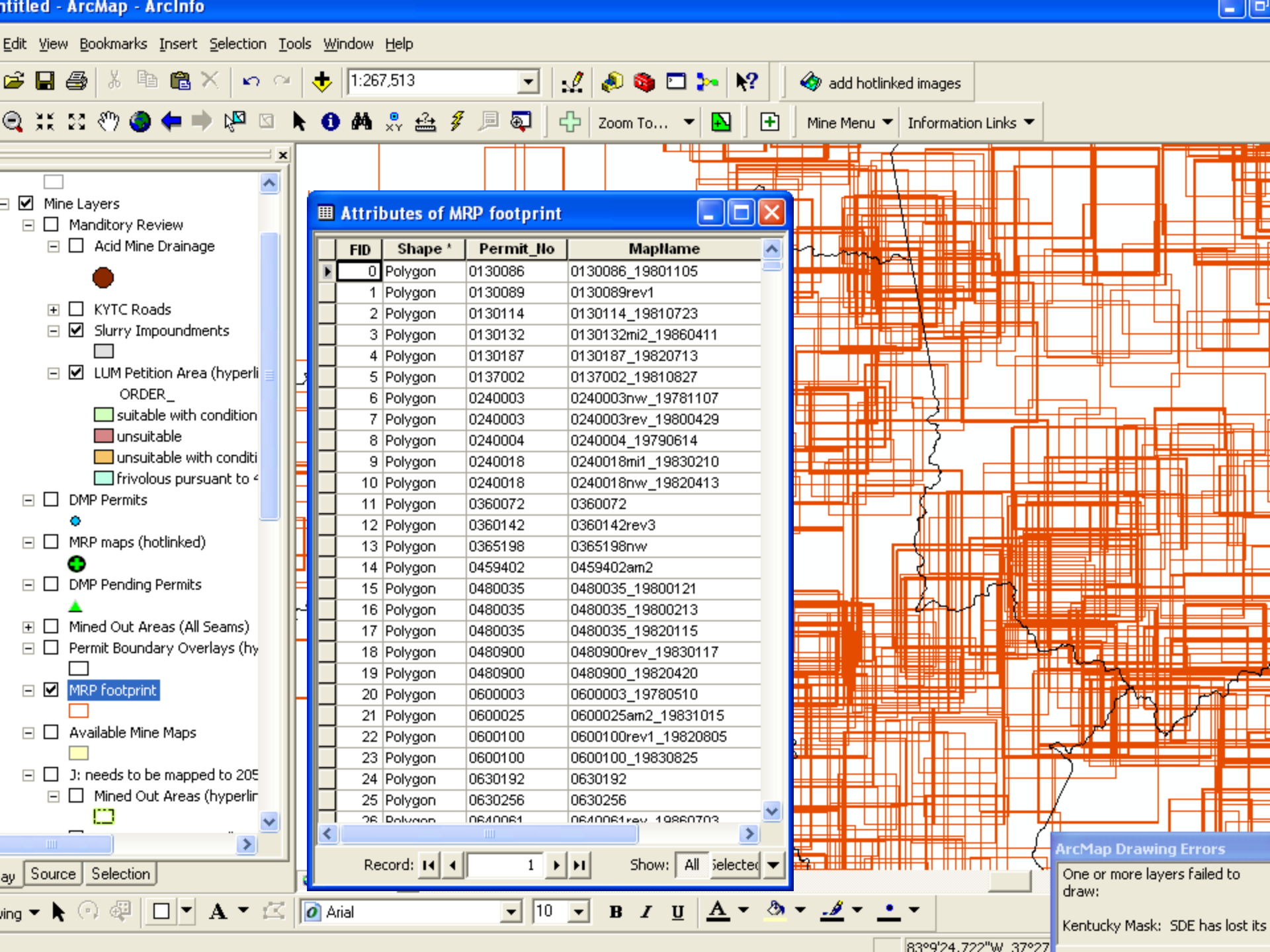
Manditory Review
Acid Mine Drainage
KYTC Roads
Slurry Impoundments
LUM Petition Area (hyperli
ORDER_
suitable with condition
unsuitable
unsuitable with conditi
frivolous pursuant to
DMP Permits
MRP maps (hotlinked)
DMP Pending Permits
Mined Out Areas (All Seams)
Permit Boundary Overlays (hy
MRP footprint
Available Mine Maps
Source
Selection
Arial
10
87°39'29.402"W 39°31'9.846"N


ntitled - ArcMap - ArcInfo
Edit View Bookmarks Insert Selection Tools Window Help
1:267,513
add hotlinked images
Zoom To...
Mine Menu
Information Links
Mine Layers
Manditory Review
Acid Mine Drainage
KYTC Roads
Slurry Impoundments
LUM Petition Area (hyperli
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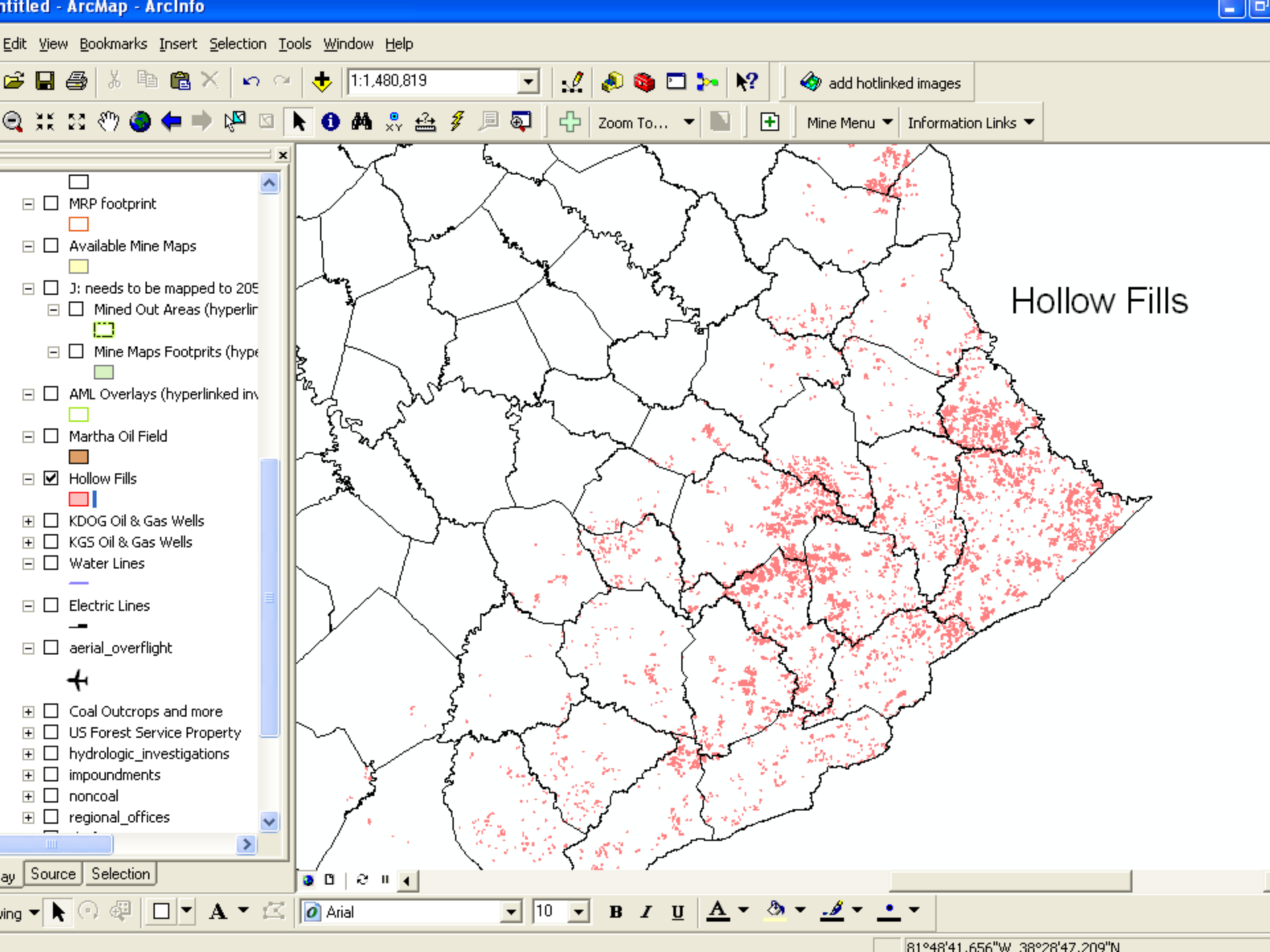
unsuitable with conditi
frivolous pursuant to
DMP Permits
MRP maps (hotlinked)
DMP Pending Permits
Mined Out Areas (All Seams)
Permit Boundary Overlays (hy
MRP footprint
Available Mine Maps
J: needs to be mapped to 205
Mined Out Areas (hyperlir
Source
Selection
Attributes of MRP footprint
FID | Shape * | Permit_No | MapName
0 | Polygon | 0130086 | 0130086_19801105
1 | Polygon | 0130089 | 0130089rev1
2 | Polygon | 0130114 | 0130114_19810723
3 | Polygon | 0130132 | 0130132mi2_19860411
4 | Polygon | 0130187 | 0130187_19820713
5 | Polygon | 0137002 | 0137002_19810827
6 | Polygon | 0240003 | 0240003nw_19781107
7 | Polygon | 0240003 | 0240003rev_19800429
8 | Polygon | 0240004 | 0240004_19790614
9 | Polygon | 0240018 | 0240018mi1_19830210
10 | Polygon | 0240018 | 0240018nw_19820413
11 | Polygon | 0360072 | 0360072
12 | Polygon | 0360142 | 0360142rev3
13 | Polygon | 0365198 | 0365198nw
14 | Polygon | 0459402 | 0459402am2
15 | Polygon | 0480035 | 0480035_19800121
16 | Polygon | 0480035 | 0480035_19800213
17 | Polygon | 0480035 | 0480035_19820115
18 | Polygon | 0480900 | 0480900rev_19830117
19 | Polygon | 0480900 | 0480900_19820420
20 | Polygon | 0600003 | 0600003_19780510
21 | Polygon | 0600025 | 0600025am2_19831015
22 | Polygon | 0600100 | 0600100rev1_19820805
23 | Polygon | 0600100 | 0600100_19830825
24 | Polygon | 0630192 | 0630192
25 | Polygon | 0630256 | 0630256
Record: 1
Show: All Selected
ArcMap Drawing Errors
One or more layers failed to draw:
Kentucky Mask: SDE has lost its
Arial
10
83°9'24.722"W 37°27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Edit View Bookmarks Insert Selection Tools Window Help
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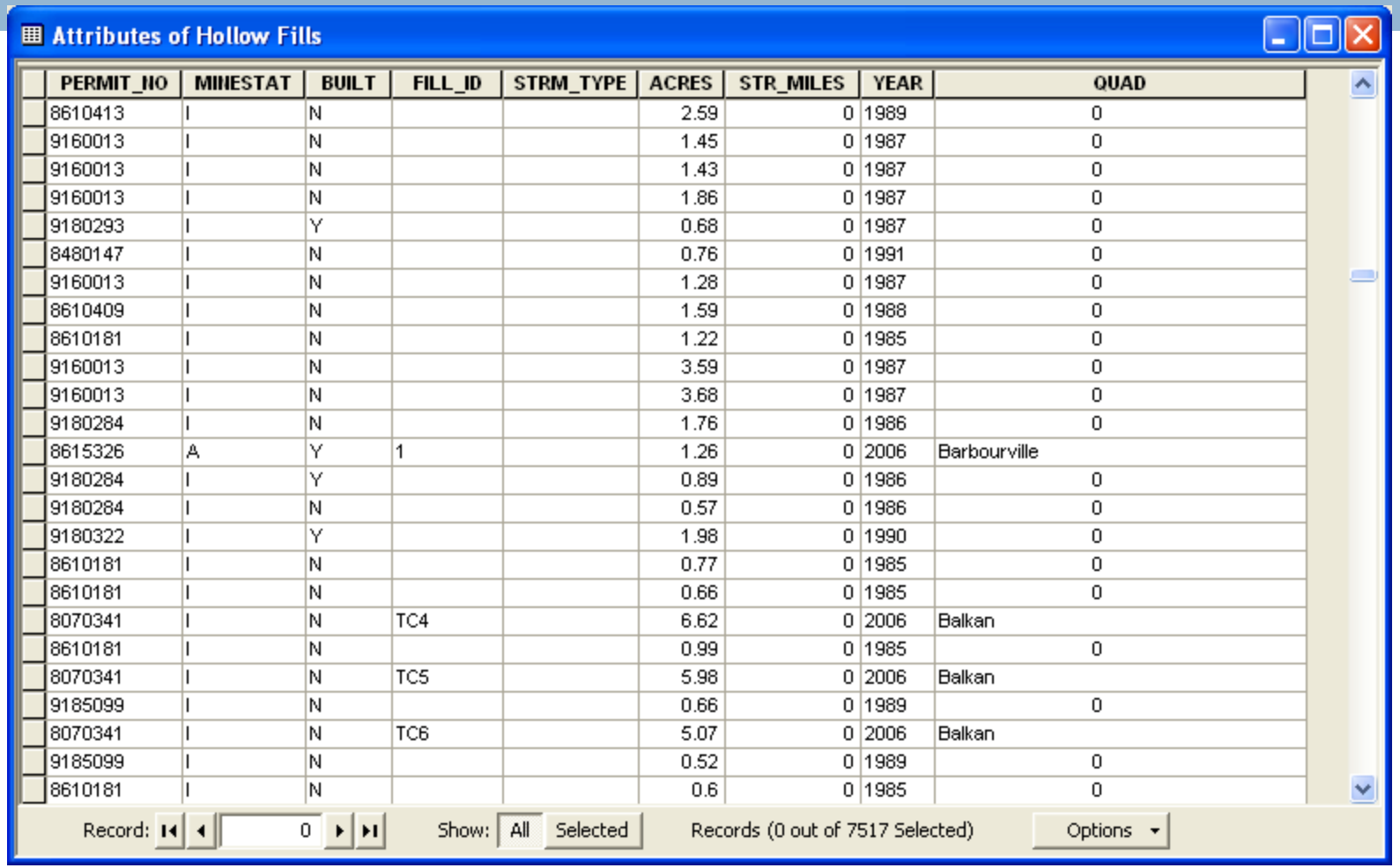
Zoom To...
Mine Menu
Information Links
MRP footprint
Available Mine Maps
J: needs to be mapped to 205
Mined Out Areas (hyperlir
Mine Maps Footprits (hype
AML Overlays (hyperlinked inv
Martha Oil Field
Hollow Fills
KDOG Oil & Gas Wells
KGS Oil & Gas Wells
Water Lines
Electric Lines
aerial_overflight
Coal Outcrops and more
US Forest Service Property
hydrologic_investigations
impoundments
noncoal
regional_offices
Source
Selection
Hollow Fills
Arial
10
81°48'41.656"W 38°28'47.209"N

Hollow Fills



Attributes of Hollow Fills

PERMIT_NO	MINESTAT	BUILT	FILL_ID	STRM_TYPE	ACRES	STR_MILES	YEAR	QUAD
8610413	I	N			2.59	0	1989	0
9160013	I	N			1.45	0	1987	0
9160013	I	N			1.43	0	1987	0
9160013	I	N			1.86	0	1987	0
9180293	I	Y			0.68	0	1987	0
8480147	I	N			0.76	0	1991	0
9160013	I	N			1.28	0	1987	0
8610409	I	N			1.59	0	1988	0
8610181	I	N			1.22	0	1985	0
9160013	I	N			3.59	0	1987	0
9160013	I	N			3.68	0	1987	0
9180284	I	N			1.76	0	1986	0
8615326	A	Y	1		1.26	0	2006	Barbourville
9180284	I	Y			0.89	0	1986	0
9180284	I	N			0.57	0	1986	0
9180322	I	Y			1.98	0	1990	0
8610181	I	N			0.77	0	1985	0
8610181	I	N			0.66	0	1985	0
8070341	I	N	TC4		6.62	0	2006	Balkan
8610181	I	N			0.99	0	1985	0
8070341	I	N	TC5		5.98	0	2006	Balkan
9185099	I	N			0.66	0	1989	0
8070341	I	N	TC6		5.07	0	2006	Balkan
9185099	I	N			0.52	0	1989	0
8610181	I	N			0.6	0	1985	0

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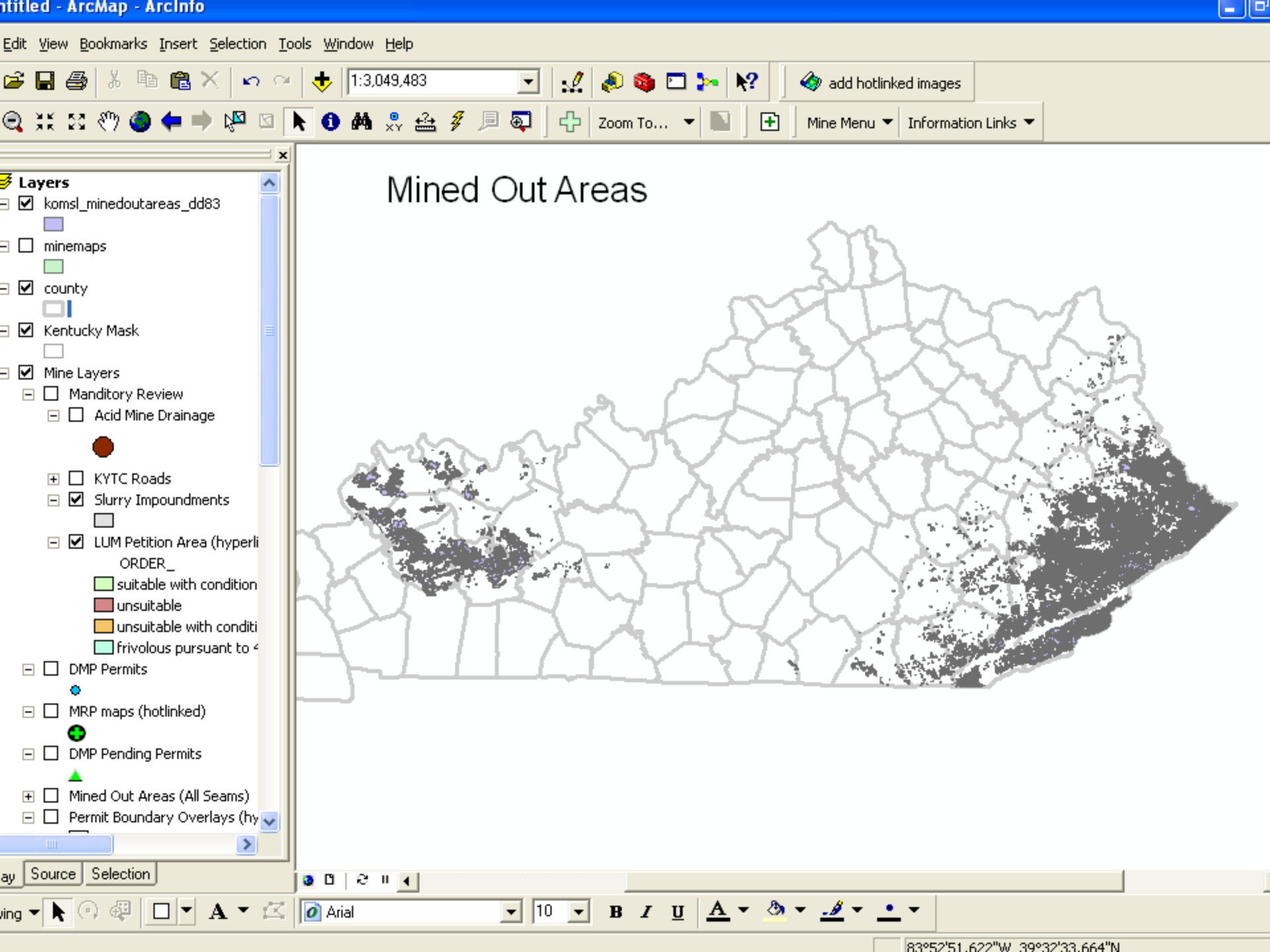
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Edit View Bookmarks Insert Selection Tools Window Help
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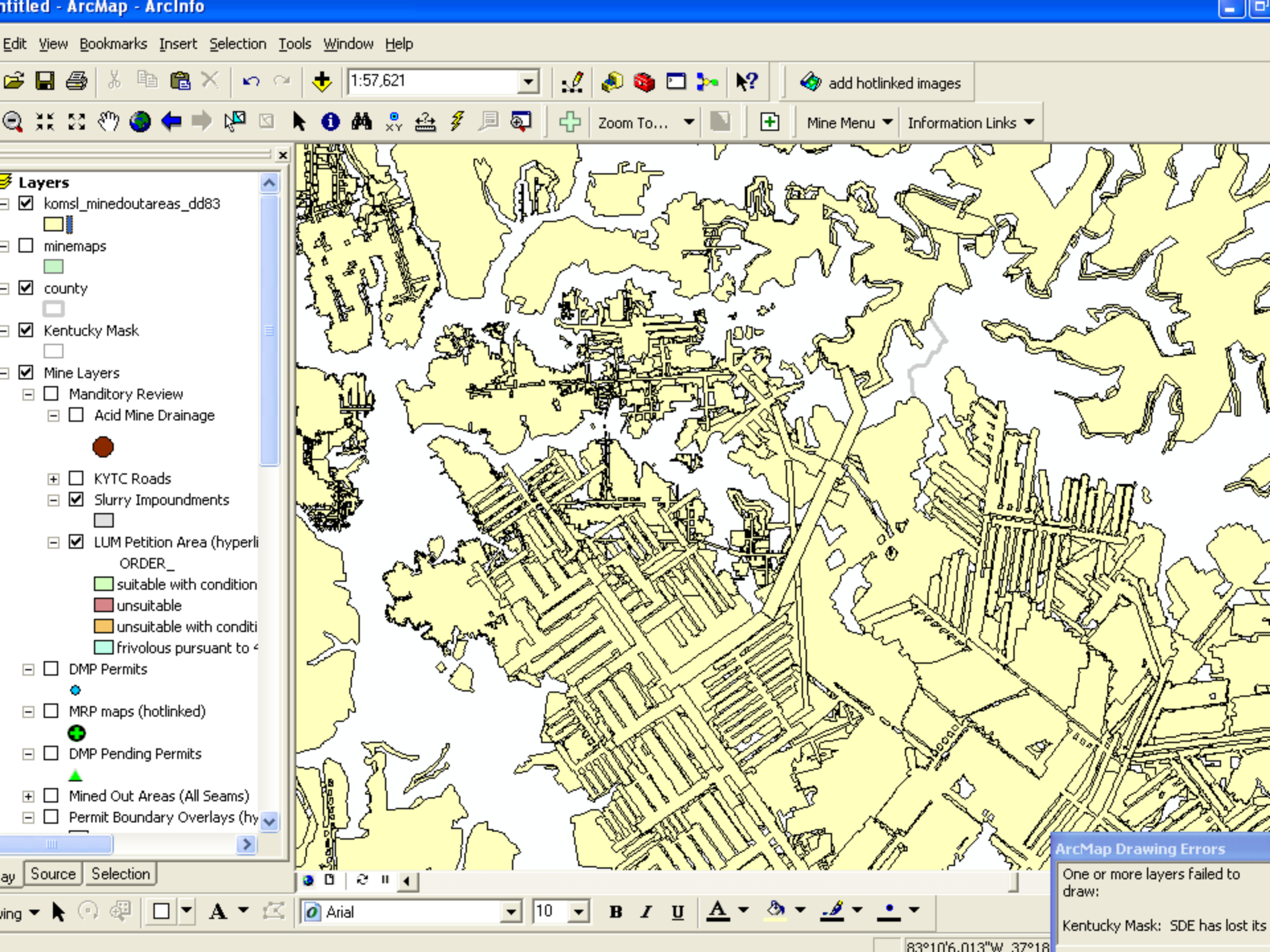
add hotlinked images
Zoom To...
Mine Menu
Information Links
Layers
komsl_minedoutareas_dd83
minemaps
county
Kentucky Mask
Mine Layers
Manditory Review
Acid Mine Drainage
KYTC Roads
Slurry Impoundments
LUM Petition Area (hyperli
ORDER_
suitable with condition
unsuitable
unsuitable with conditi
frivolous pursuant to
DMP Permits
MRP maps (hotlinked)
DMP Pending Permits
Mined Out Areas (All Seams)
Permit Boundary Overlays (hy
Source
Selection
Mined Out Areas
Arial
10
83°52'51.622"W 39°32'33.664"N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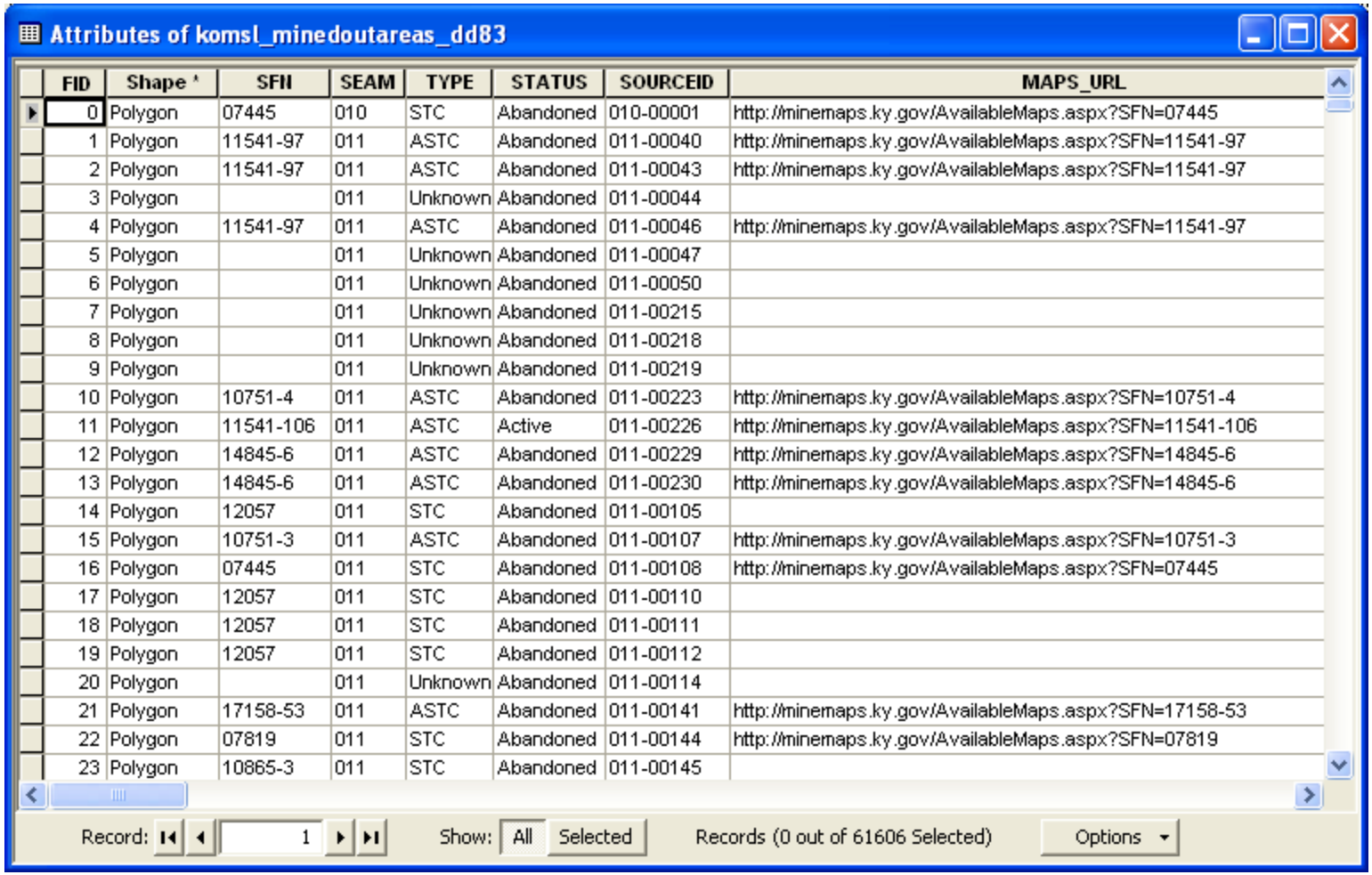
Edit View Bookmarks Insert Selection Tools Window Help
1:57,621
add hotlinked images
Zoom To...
Mine Menu
Information Links
Layers
komsl_minedoutareas_dd83
minemaps
county
Kentucky Mask
Mine Layers
Manditory Review
Acid Mine Drainage
KYTC Roads
Slurry Impoundments
LUM Petition Area (hyperli
ORDER_
suitable with condition
unsuitable
unsuitable with conditi
frivolous pursuant to
DMP Permits
MRP maps (hotlinked)
DMP Pending Permits
Mined Out Areas (All Seams)
Permit Boundary Overlays (hy
Source
Selection
Arial
10
ArcMap Drawing Errors
One or more layers failed to draw:
Kentucky Mask: SDE has lost its

Mined Out Areas



Attributes of komsl_minedoutareas_dd83

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1	Polygon	11541-97	011	ASTC	Abandoned	011-00040	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=11541-97
2	Polygon	11541-97	011	ASTC	Abandoned	011-00043	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=11541-97
3	Polygon		011	Unknown	Abandoned	011-00044	
4	Polygon	11541-97	011	ASTC	Abandoned	011-00046	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=11541-97
5	Polygon		011	Unknown	Abandoned	011-00047	
6	Polygon		011	Unknown	Abandoned	011-00050	
7	Polygon		011	Unknown	Abandoned	011-00215	
8	Polygon		011	Unknown	Abandoned	011-00218	
9	Polygon		011	Unknown	Abandoned	011-00219	
10	Polygon	10751-4	011	ASTC	Abandoned	011-00223	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=10751-4
11	Polygon	11541-106	011	ASTC	Active	011-00226	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=11541-106
12	Polygon	14845-6	011	ASTC	Abandoned	011-00229	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=14845-6
13	Polygon	14845-6	011	ASTC	Abandoned	011-00230	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=14845-6
14	Polygon	12057	011	STC	Abandoned	011-00105	
15	Polygon	10751-3	011	ASTC	Abandoned	011-00107	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=10751-3
16	Polygon	07445	011	STC	Abandoned	011-00108	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=07445
17	Polygon	12057	011	STC	Abandoned	011-00110	
18	Polygon	12057	011	STC	Abandoned	011-00111	
19	Polygon	12057	011	STC	Abandoned	011-00112	
20	Polygon		011	Unknown	Abandoned	011-00114	
21	Polygon	17158-53	011	ASTC	Abandoned	011-00141	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=17158-53
22	Polygon	07819	011	STC	Abandoned	011-00144	http://minemaps.ky.gov/AvailableMaps.aspx?SFN=07819
23	Polygon	10865-3	011	STC	Abandoned	011-00145	

Record: 1 Show: All Selected Records (0 out of 61606 Selected) Options

CHIA Data Needed

Disturbances (historic, active, pending)

type of disturbance?

which seams?

above drainage?

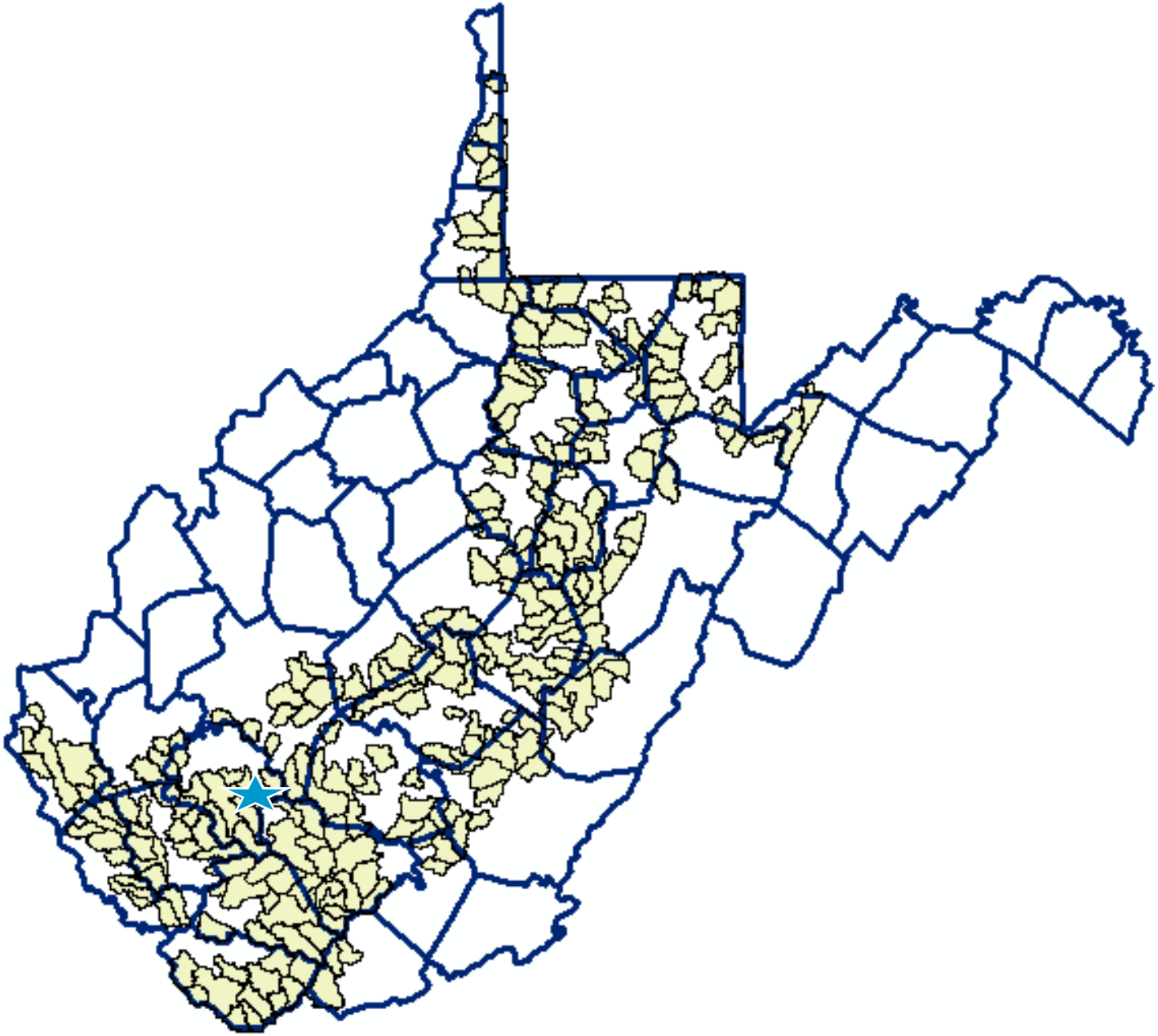
(use mined out area layer)

Water Data...

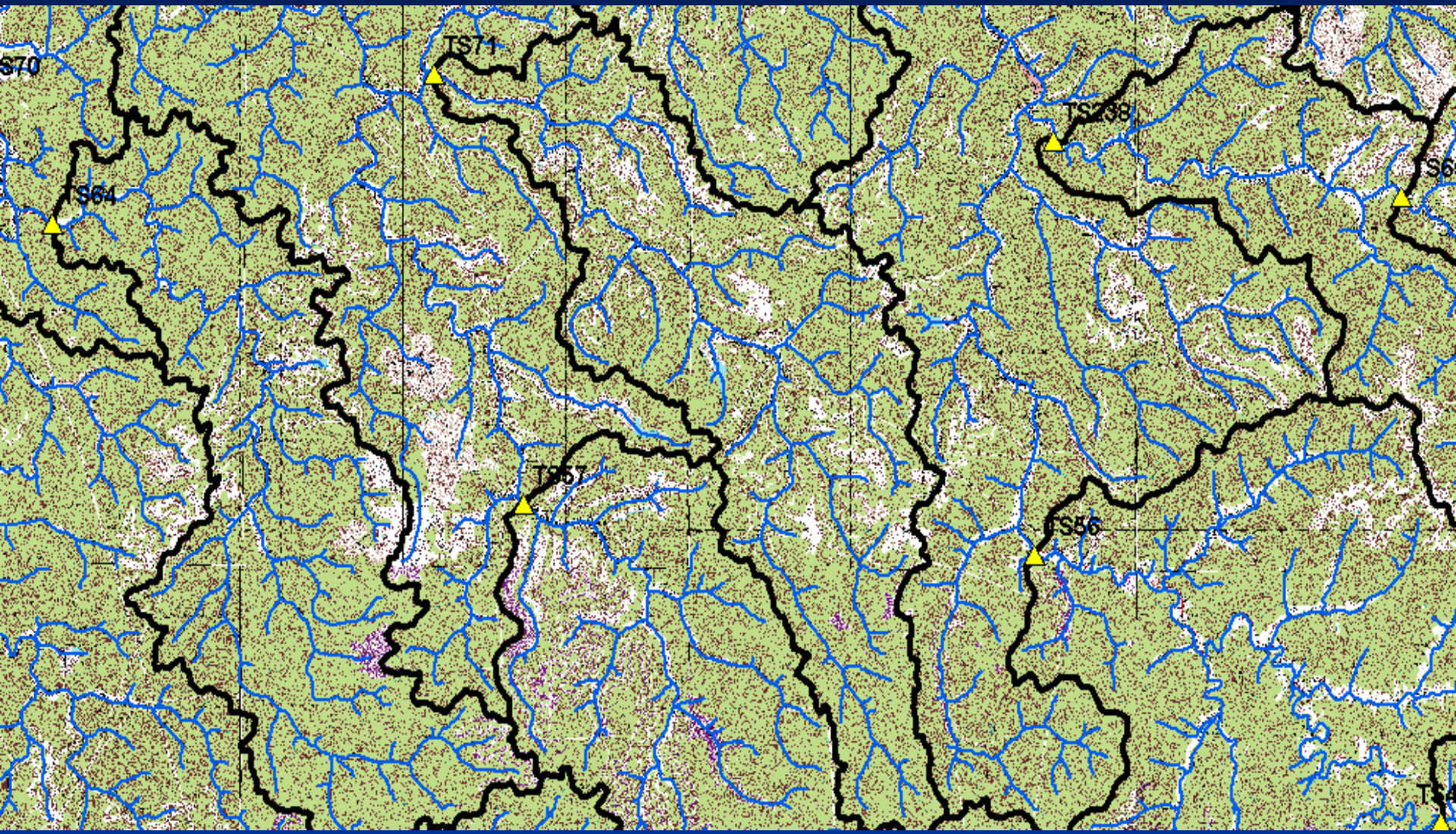
Complexities of WV Geospatial Coal Mining Data

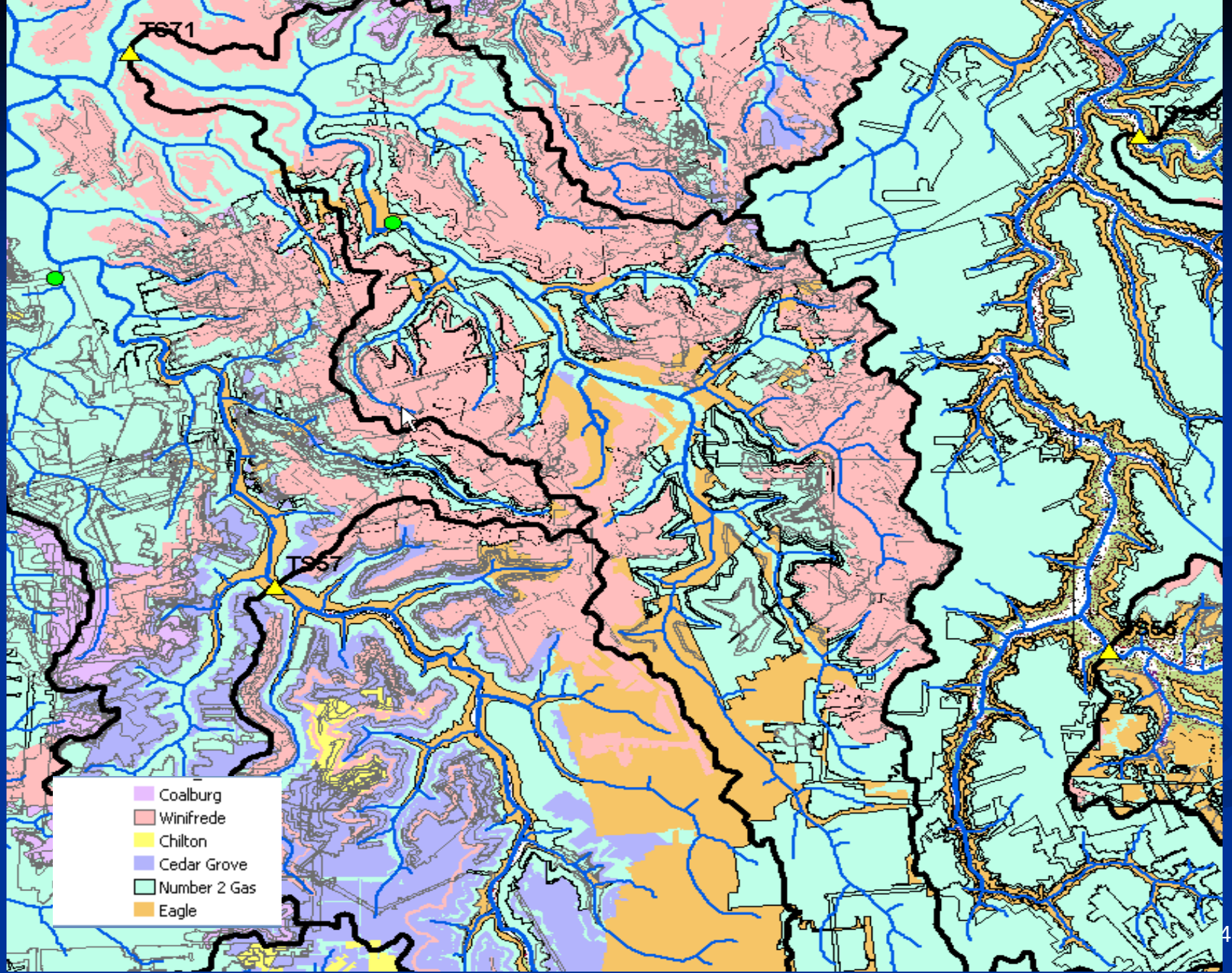
GeoMine Pilot Project
State/Federal Agencies Meeting
August 3-4, 2010

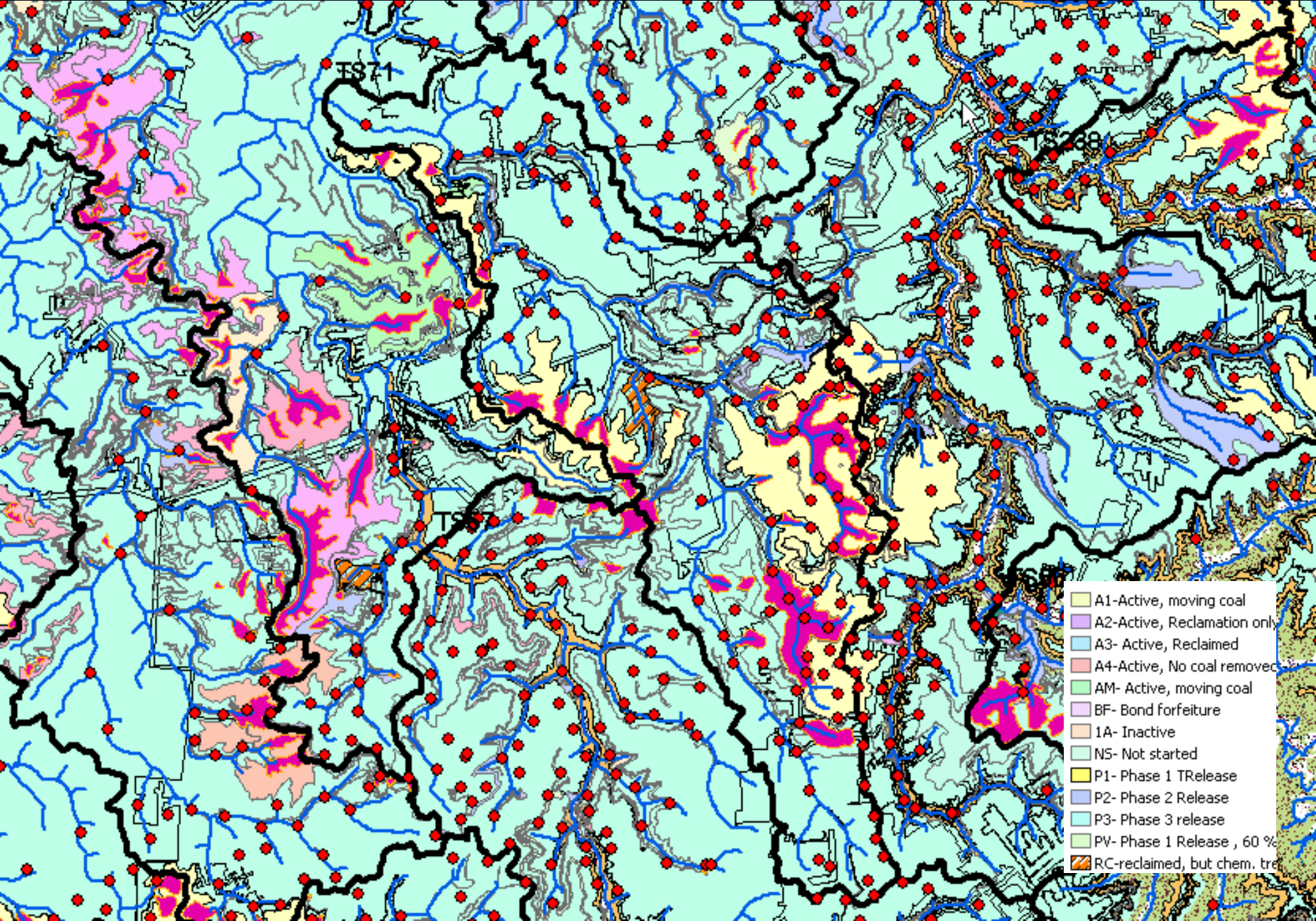
Tom Galya
Physical Scientist-Hydrology
Office of Surface Mining-CHFO
Charleston, WV

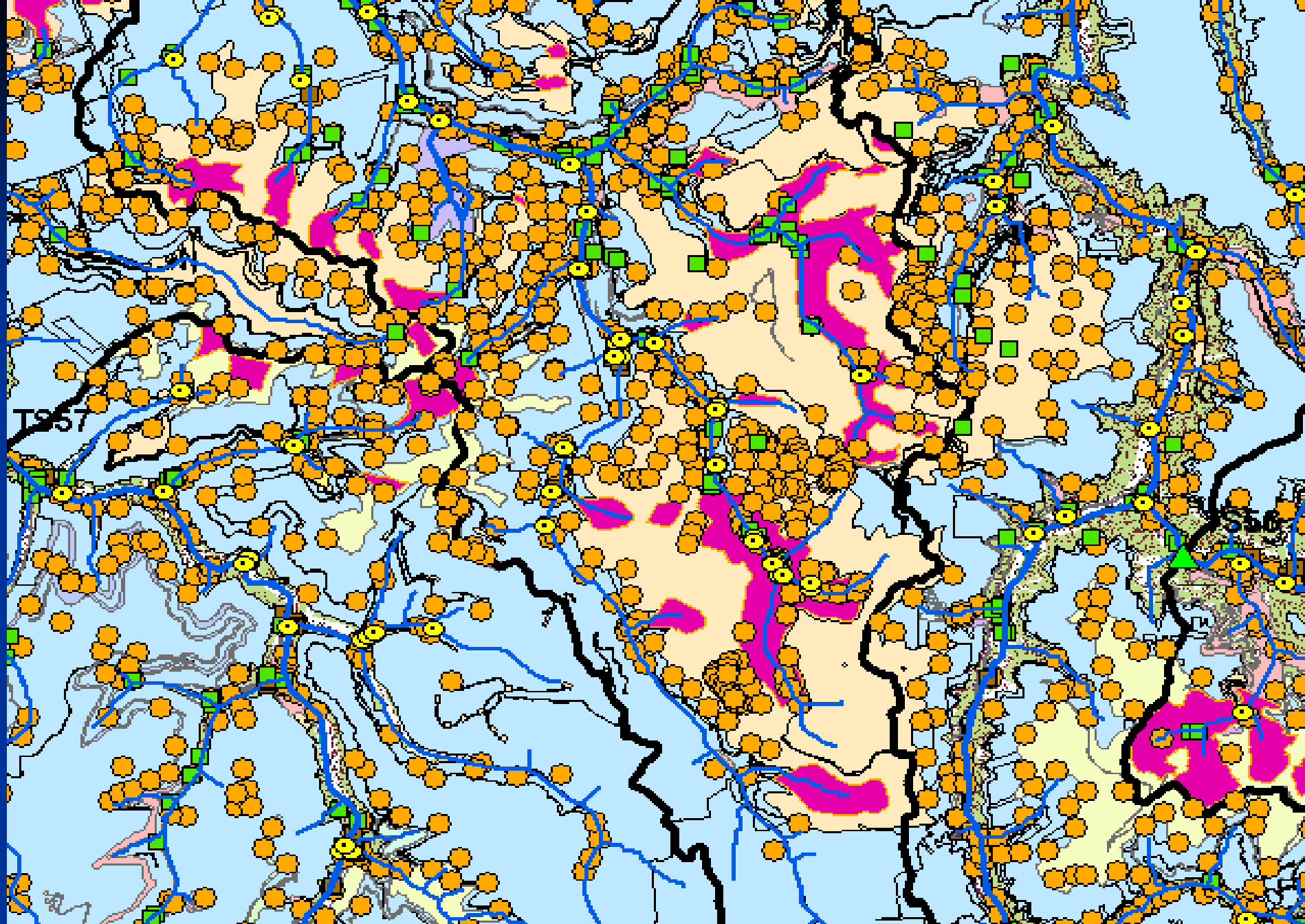


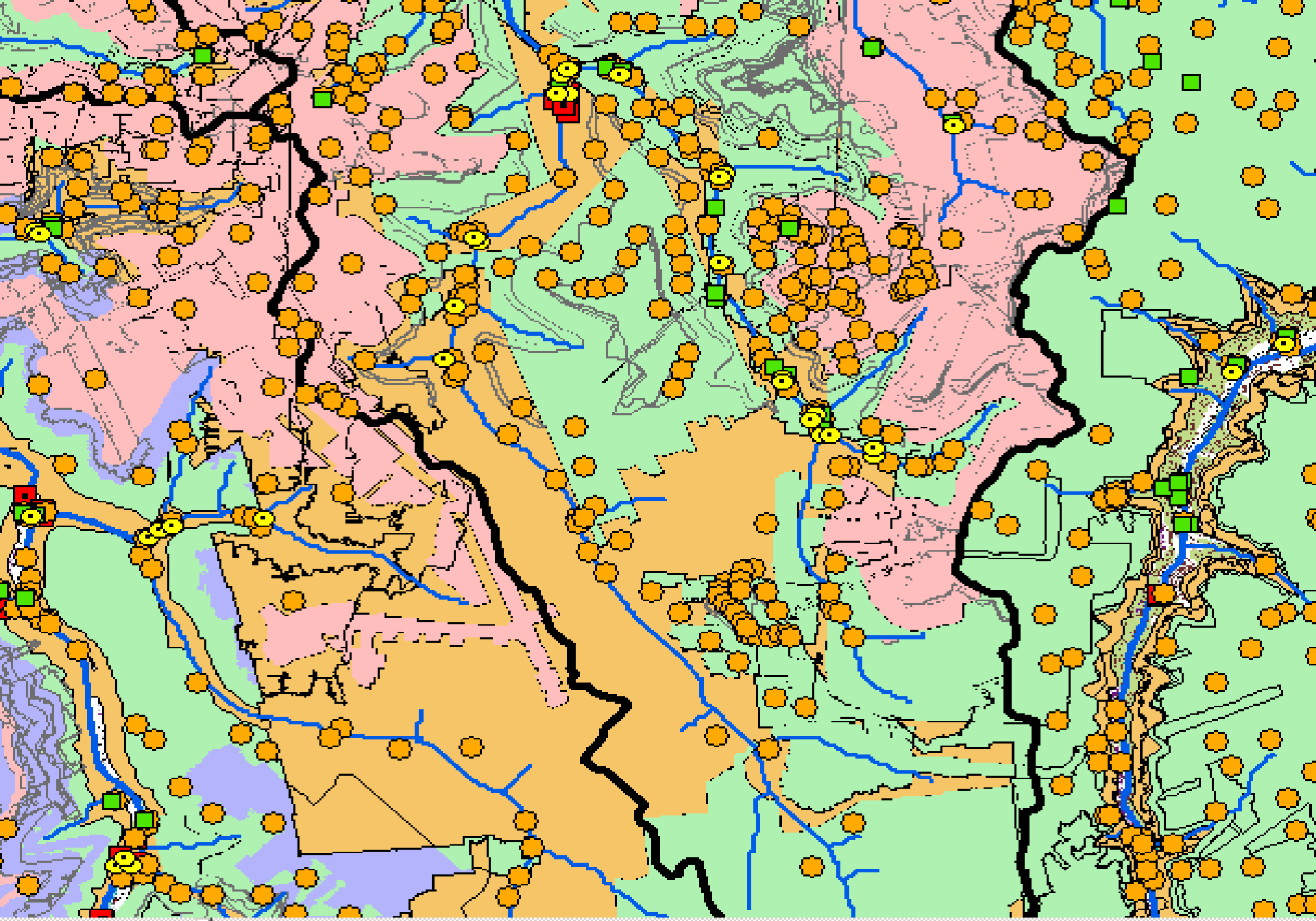
WVDEP Trend Station 71

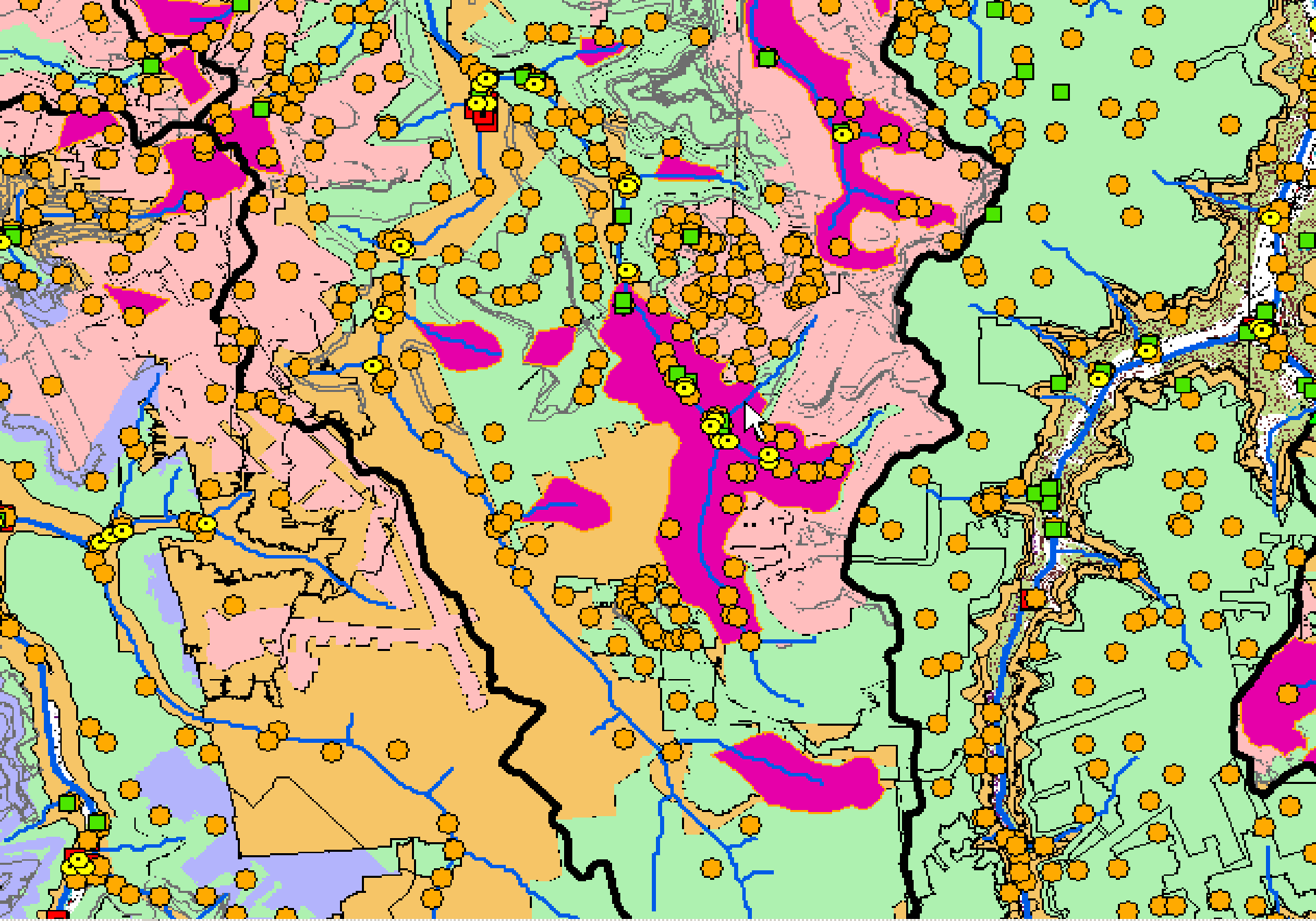


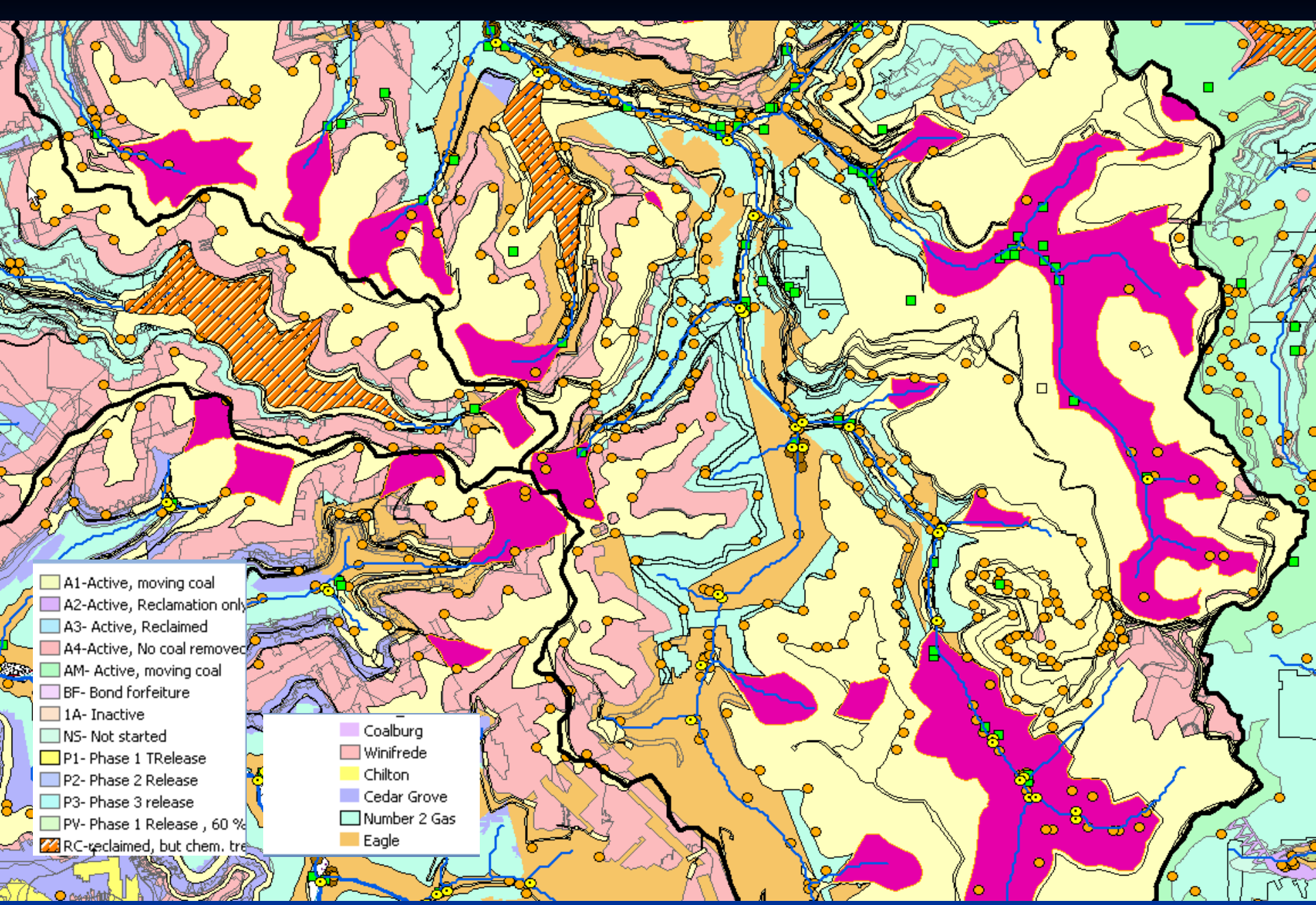

TS71
TS67
Coalburg
Winifrede
Chilton
Cedar Grove
Number 2 Gas
Eagle

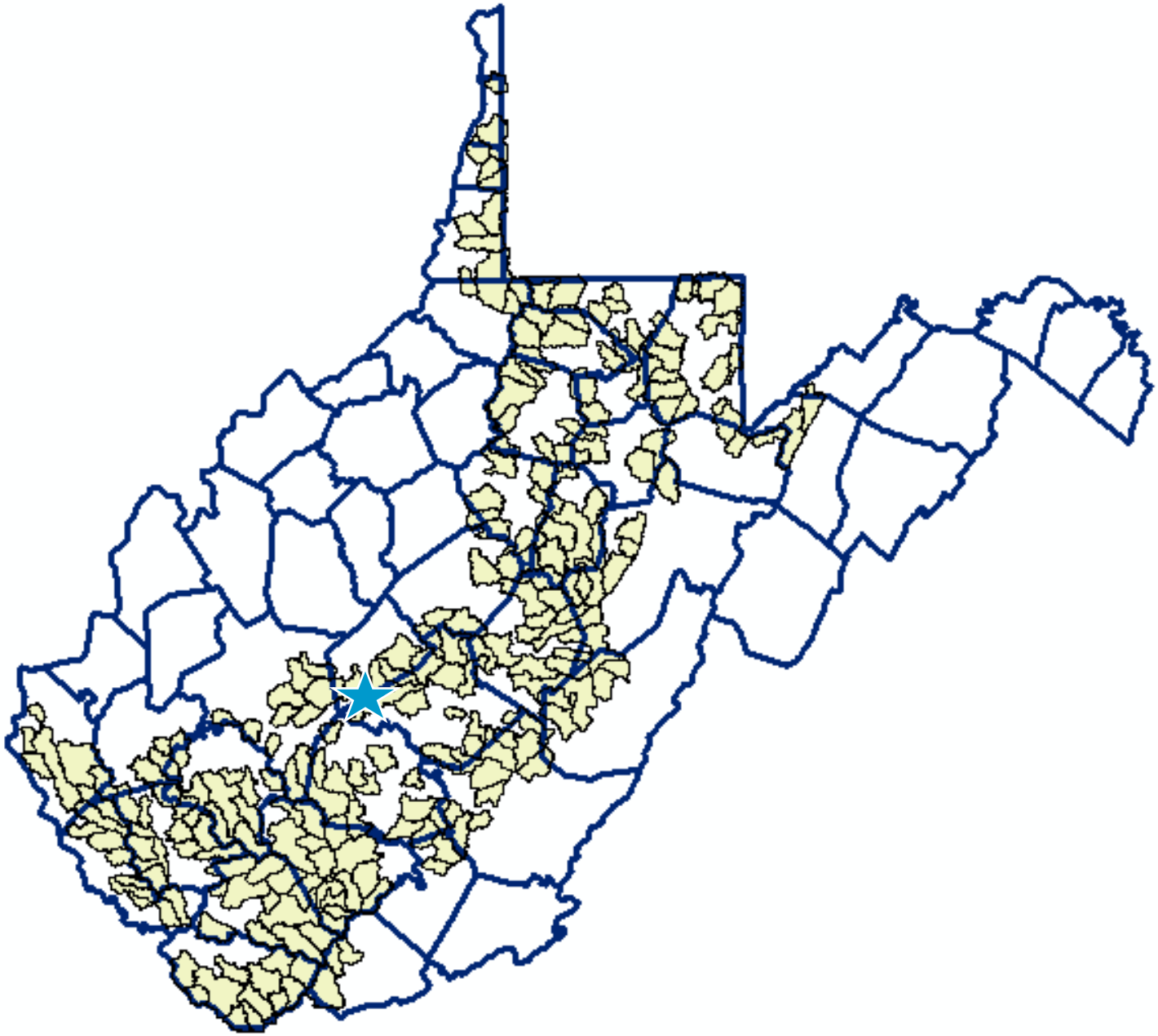

TS71
TS68
TS67
A1-Active, moving coal
A2-Active, Reclamation only
A3- Active, Reclaimed
A4-Active, No coal removed
AM- Active, moving coal
BF- Bond forfeiture
1A- Inactive
NS- Not started
P1- Phase 1 TRelease
P2- Phase 2 Release
P3- Phase 3 release
PV- Phase 1 Release , 60 %
RC-reclaimed, but chem. tre


T957

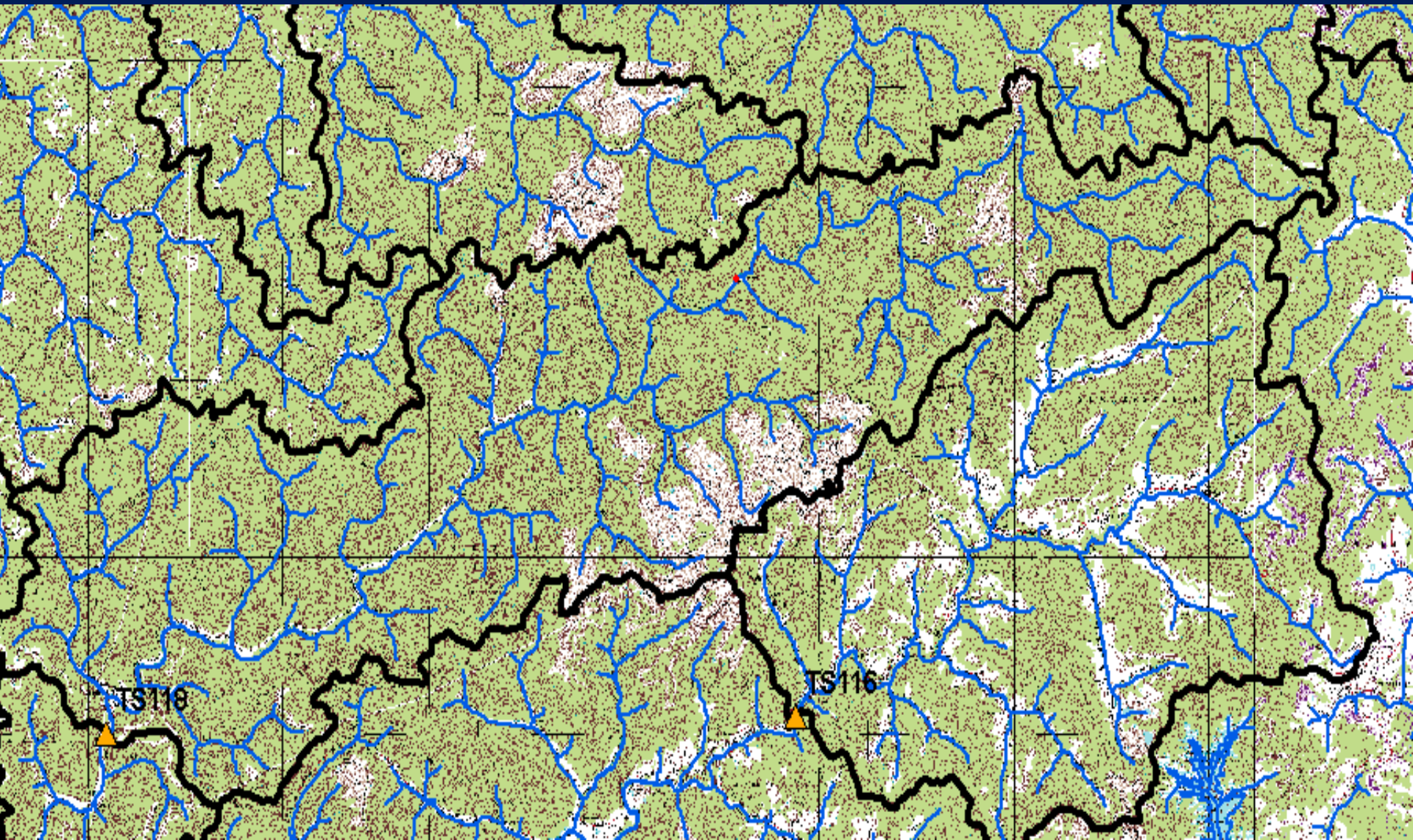


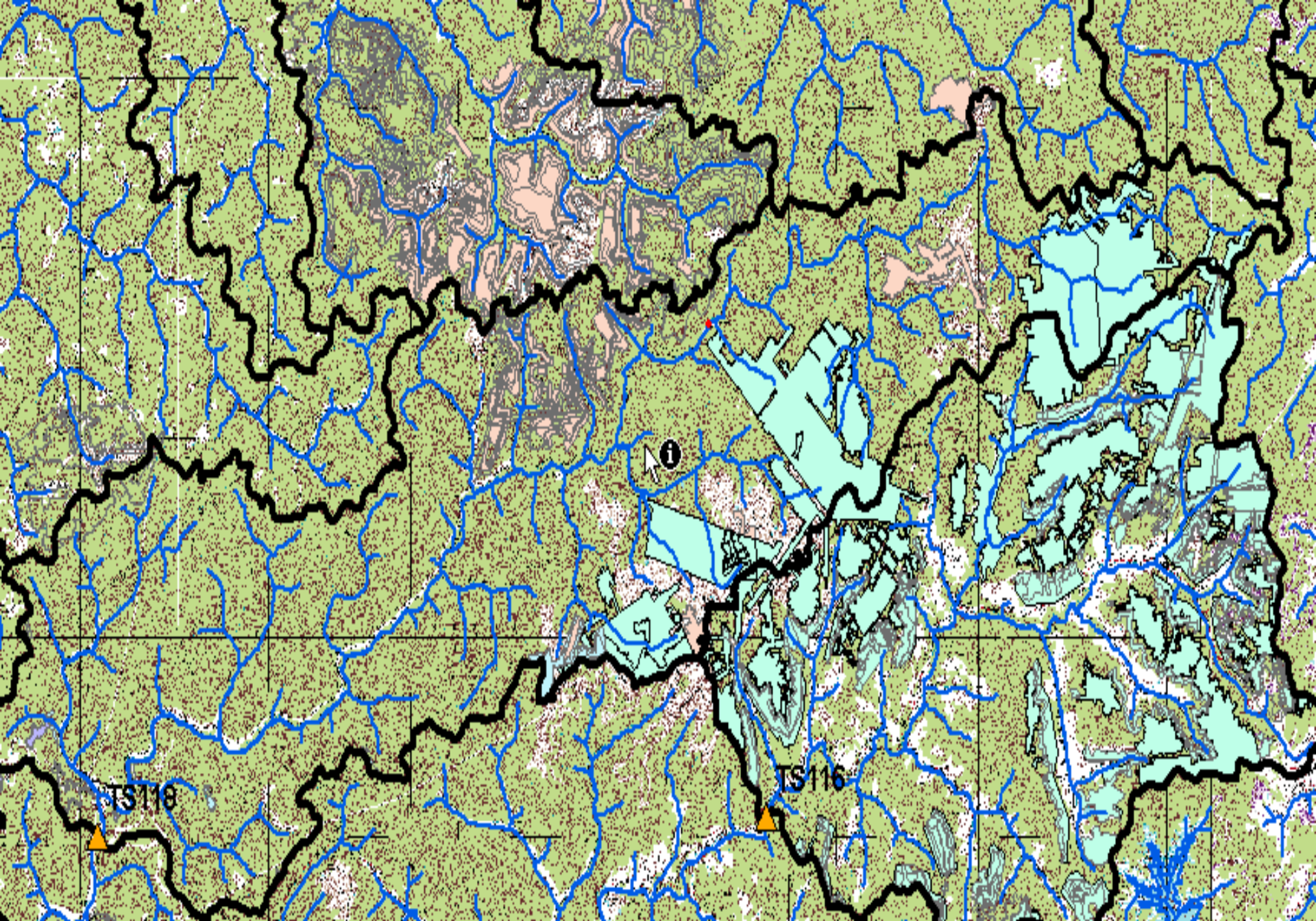


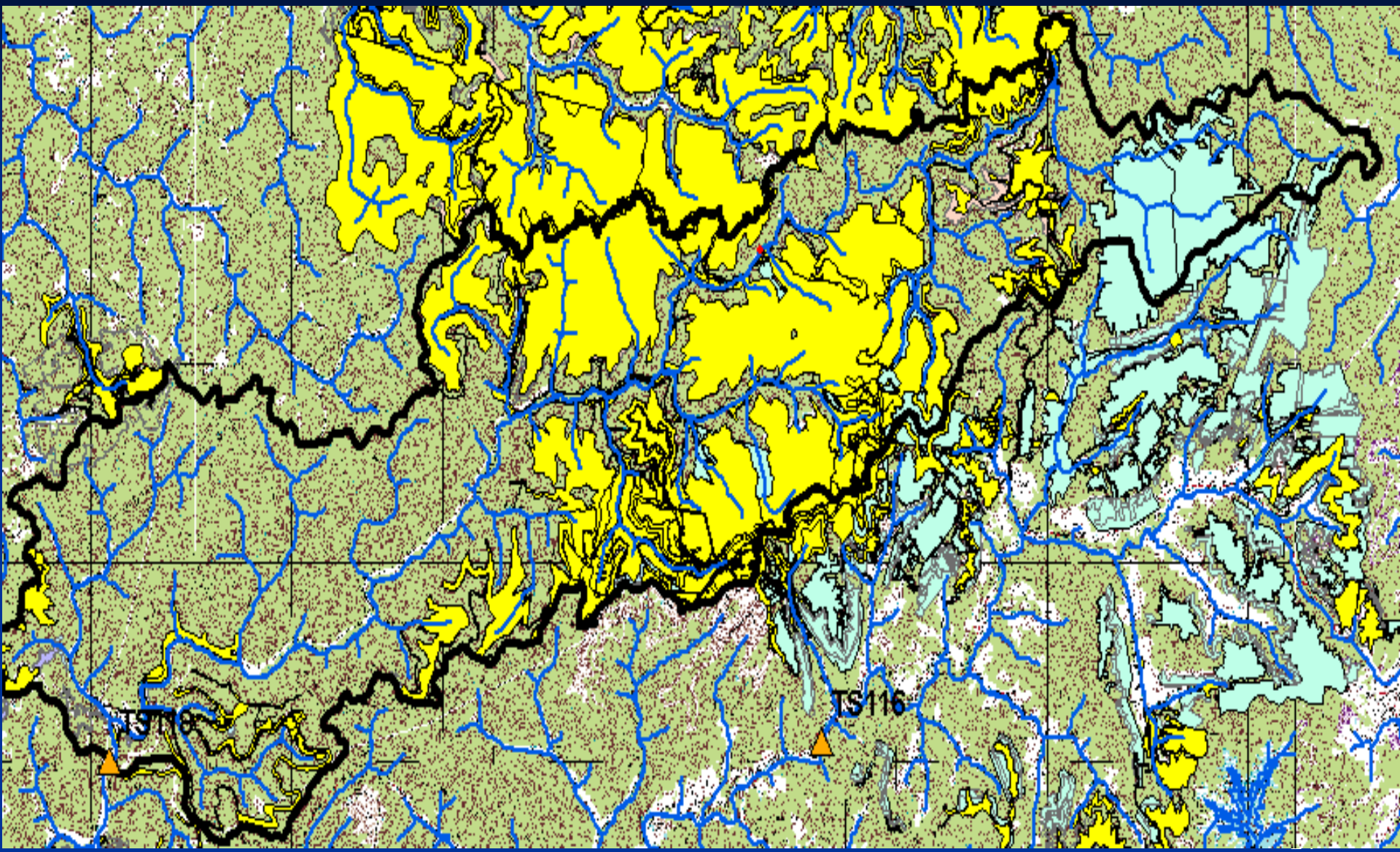

A1-Active, moving coal
A2-Active, Reclamation only
A3- Active, Reclaimed
A4-Active, No coal removed
AM- Active, moving coal
BF- Bond forfeiture
1A- Inactive
NS- Not started
P1- Phase 1 TRelease
P2- Phase 2 Release
P3- Phase 3 release
PV- Phase 1 Release , 60 %
RC-reclaimed, but chem. tre
Coalburg
Winifrede
Chilton
Cedar Grove
Number 2 Gas
Eagle

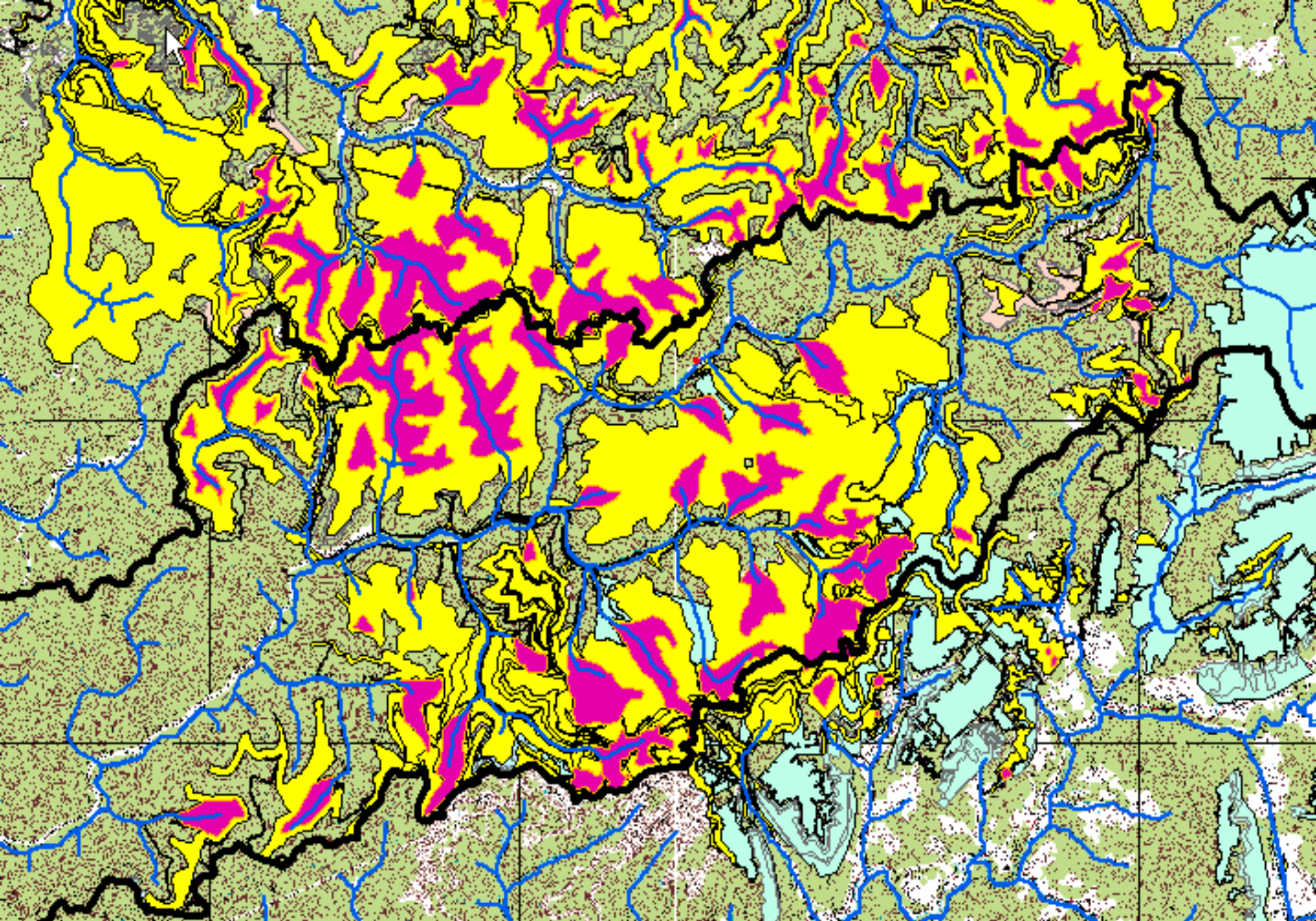


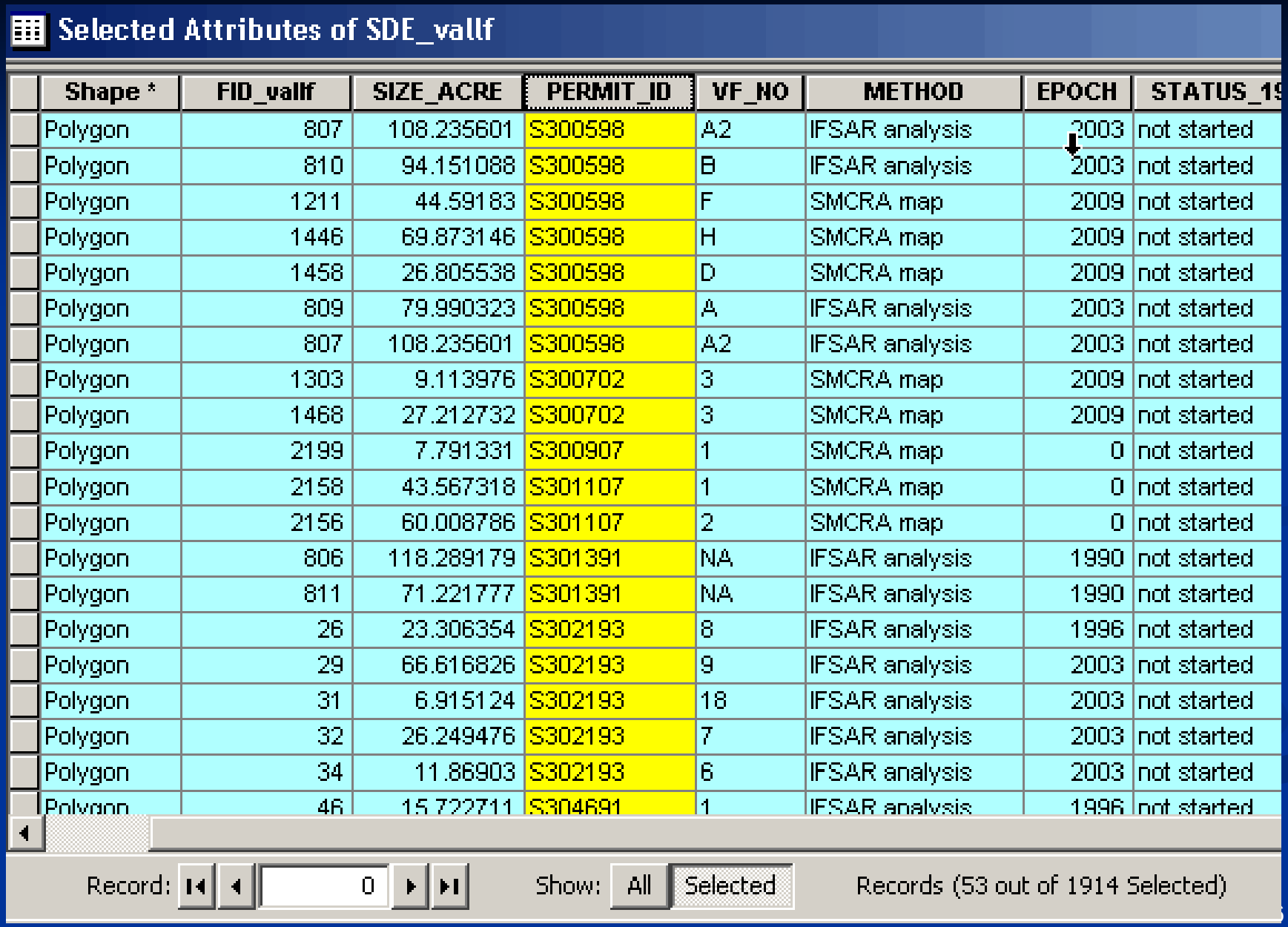
WVDEP Trend Station 118




TS118
TS116


TS116

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Shape * | FID_vallf | SIZE_ACRE | PERMIT_ID | VF_NO | METHOD | EPOCH | STATUS_19
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Polygon | 810 | 94.151088 | S300598 | B | IFSAR analysis | 2003 | not started
Polygon | 1211 | 44.59183 | S300598 | F | SMCRA map | 2009 | not started
Polygon | 1446 | 69.873146 | S300598 | H | SMCRA map | 2009 | not started
Polygon | 1458 | 26.805538 | S300598 | D | SMCRA map | 2009 | not started
Polygon | 809 | 79.990323 | S300598 | A | IFSAR analysis | 2003 | not started
Polygon | 807 | 108.235601 | S300598 | A2 | IFSAR analysis | 2003 | not started
Polygon | 1303 | 9.113976 | S300702 | 3 | SMCRA map | 2009 | not started
Polygon | 1468 | 27.212732 | S300702 | 3 | SMCRA map | 2009 | not started
Polygon | 2199 | 7.791331 | S300907 | 1 | SMCRA map | 0 | not started
Polygon | 2158 | 43.567318 | S301107 | 1 | SMCRA map | 0 | not started
Polygon | 2156 | 60.008786 | S301107 | 2 | SMCRA map | 0 | not started
Polygon | 806 | 118.289179 | S301391 | NA | IFSAR analysis | 1990 | not started
Polygon | 811 | 71.221777 | S301391 | NA | IFSAR analysis | 1990 | not started
Polygon | 26 | 23.306354 | S302193 | 8 | IFSAR analysis | 1996 | not started
Polygon | 29 | 66.616826 | S302193 | 9 | IFSAR analysis | 2003 | not started
Polygon | 31 | 6.915124 | S302193 | 18 | IFSAR analysis | 2003 | not started
Polygon | 32 | 26.249476 | S302193 | 7 | IFSAR analysis | 2003 | not started
Polygon | 34 | 11.86903 | S302193 | 6 | IFSAR analysis | 2003 | not started
Polygon | 46 | 15.722711 | S304691 | 1 | IFSAR analysis | 1996 | not started
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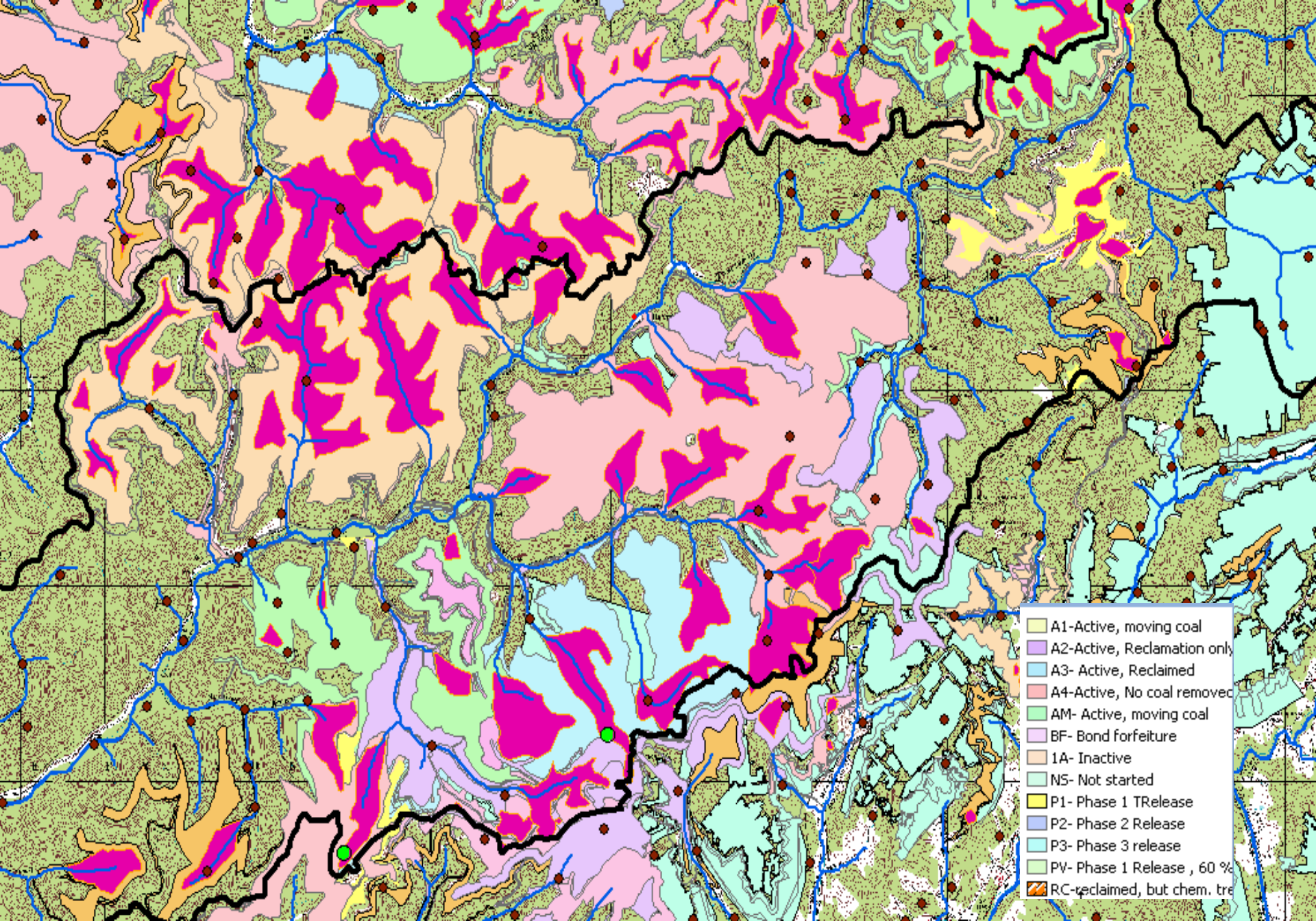
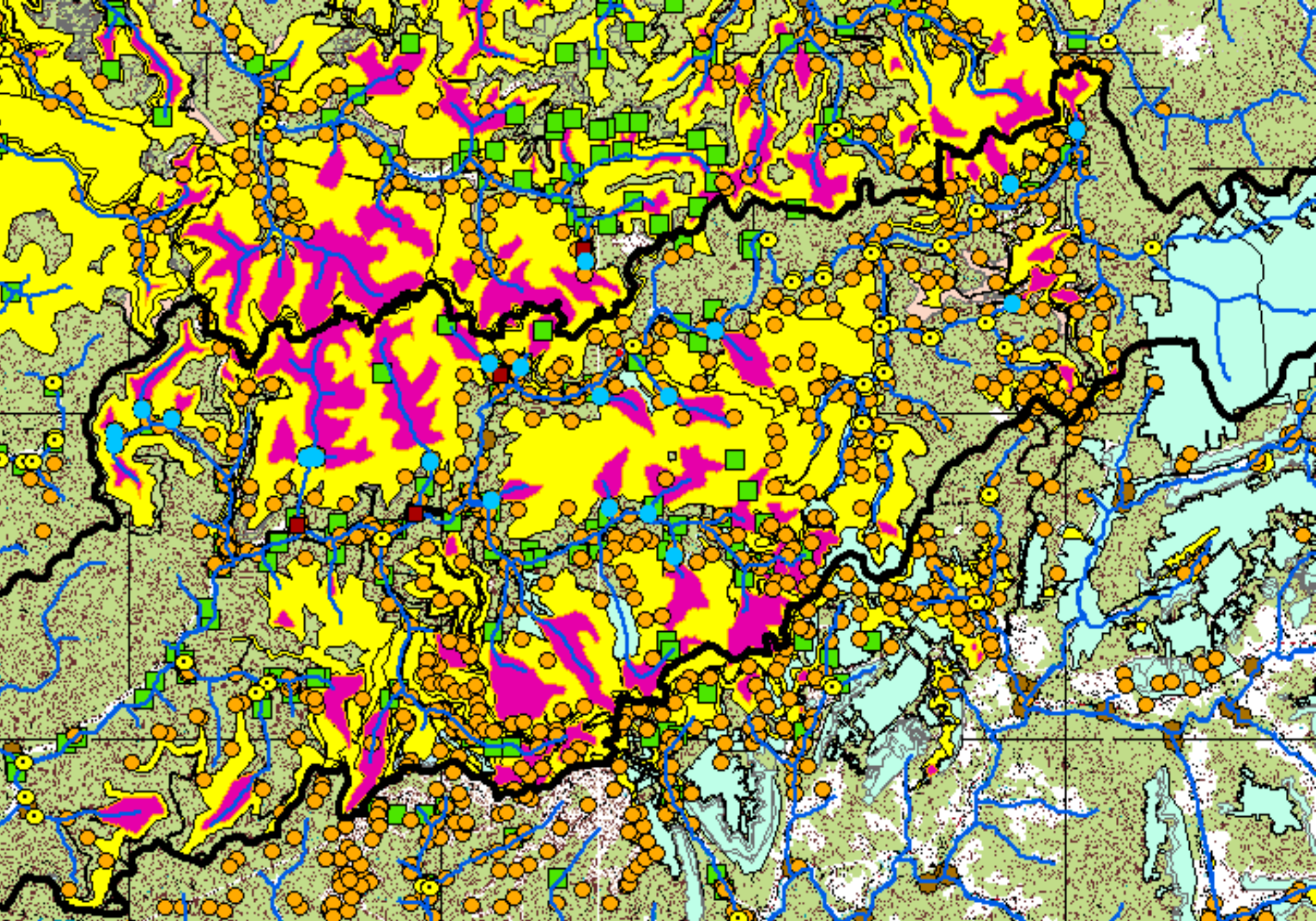
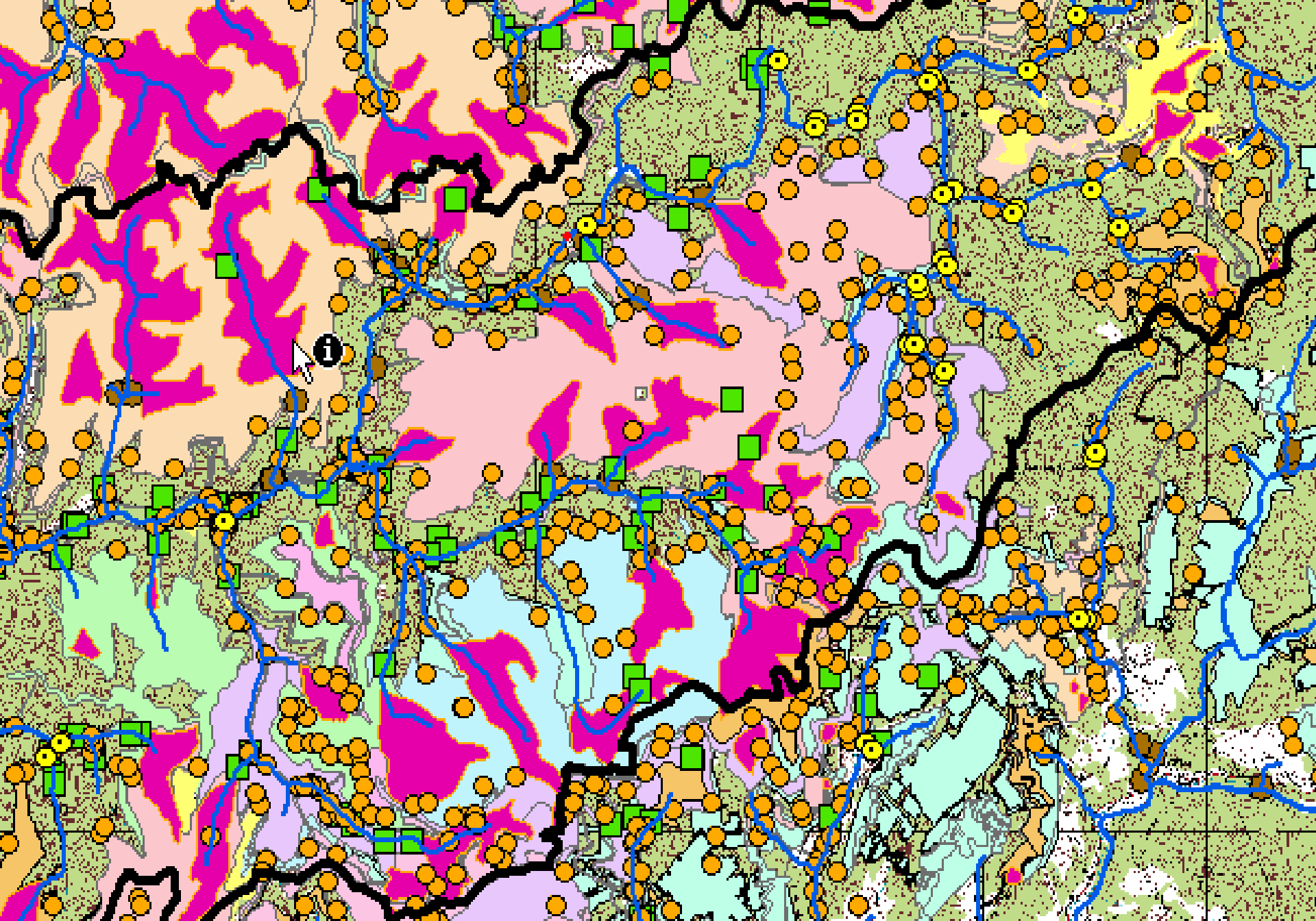
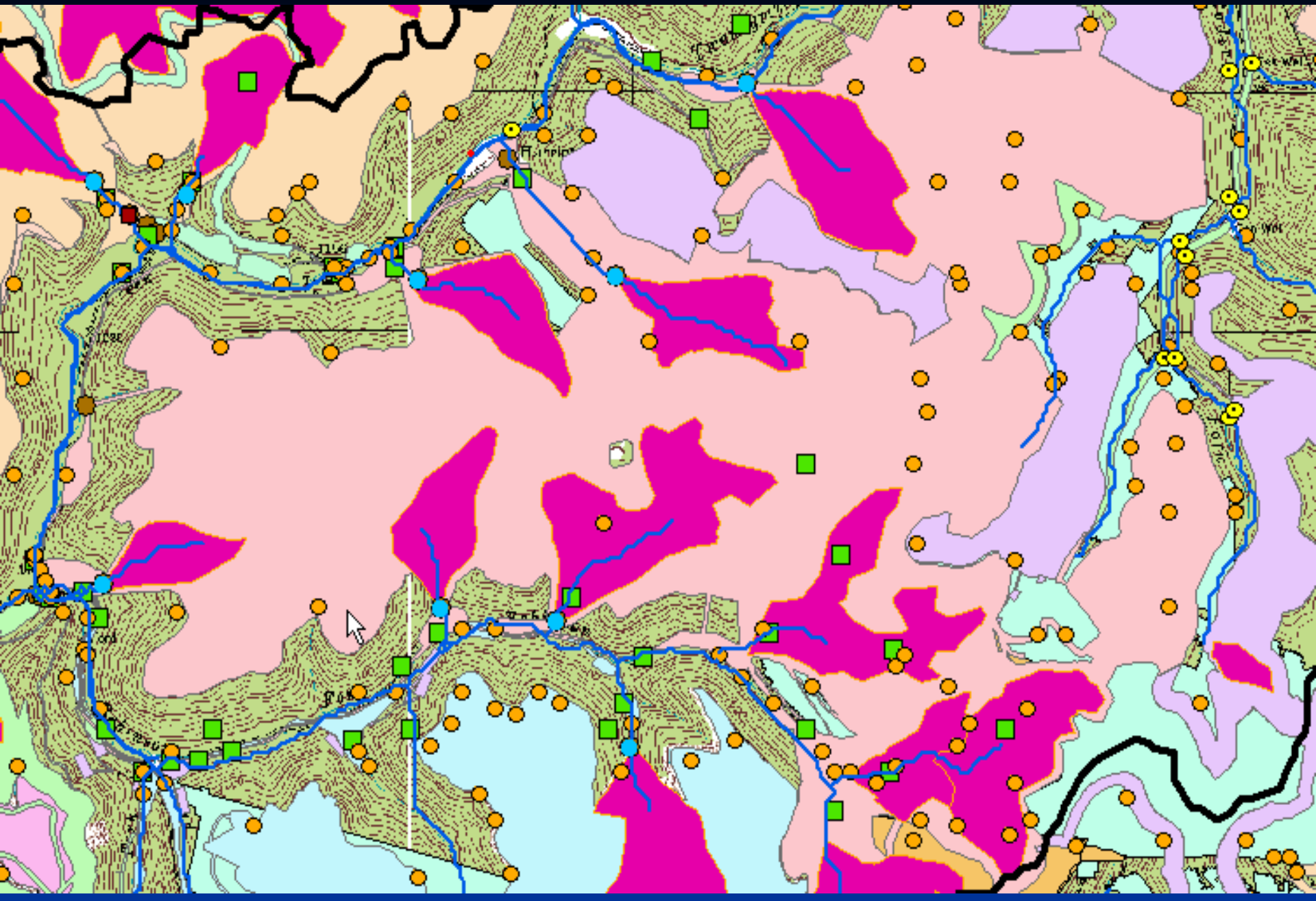
Show: All Selected
Records (53 out of 1914 Selected)

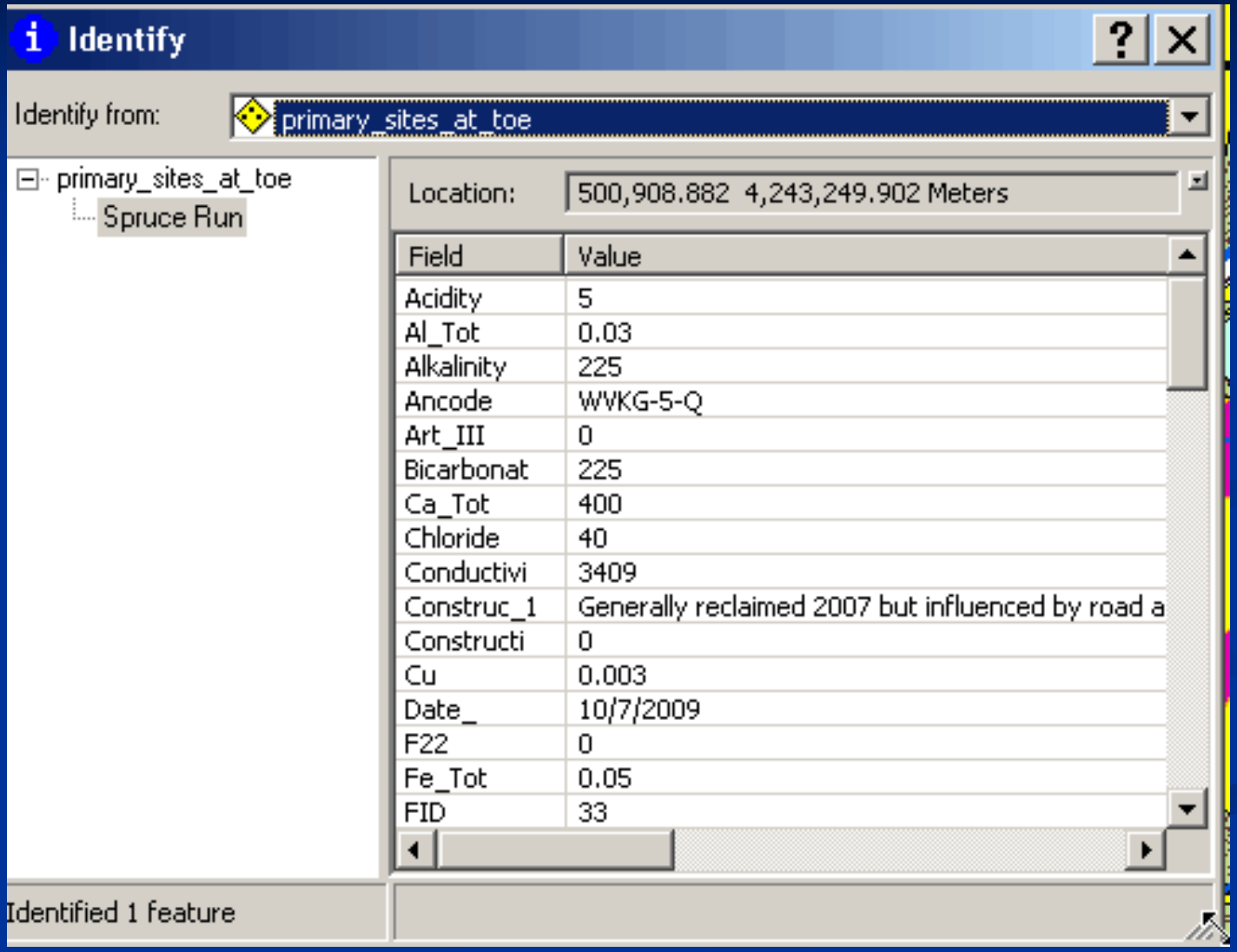

A1-Active, moving coal
A2-Active, Reclamation only
A3- Active, Reclaimed
A4-Active, No coal removed
AM- Active, moving coal
BF- Bond forfeiture
1A- Inactive
NS- Not started
P1- Phase 1 TRelease
P2- Phase 2 Release
P3- Phase 3 release
PV- Phase 1 Release , 60 %
RC-reclaimed, but chem. tre







MTR valley fill information



Questions?

Understanding Coal Mining Spatial Data

Bill Card

August 3, 2010

Coal Mining Data Themes

As requested by EPA*:

- Proposed mines
- Active mines
- Reclaimed mines
- Abandoned mines

*Categories are assumed to be mutually exclusive

Proposed Mine

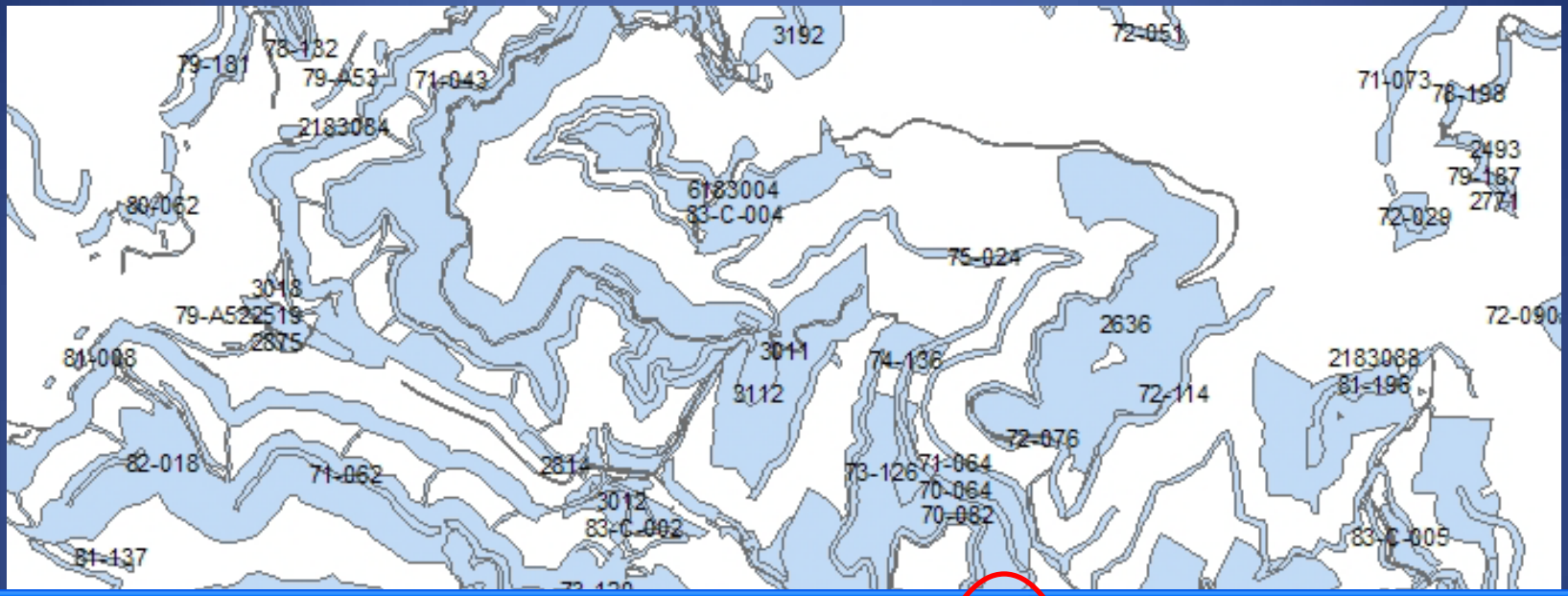

Proposed Mine

Active Mine

Reclaimed Mine


Abandoned Mine
(Title V – “Forfeited & Reclaimed”)

Modeling Mines with Permits



Attributes of kfogis.SDE.permits_all

PERMIT	COMP_NAME	MINE_NAME	ACRES	INSP_ID	MINE_STAT	REGULATION	STATUS	FAC_TYPE	BOND_STAT
3062	U S COAL INC	DEEP MINE NO. 9	47.3	98	AP	PP	A	B	FB
3064	PREMIUM COAL CO. INC	REFUSE AREA #3	59.2	100	TC	PP	IN	E	FB
3065	CUMBERLAND COAL CO LLC	NO. 1	22	416	AP	PP	A	B	FB
3066	TENNESSEE MINING INC	SRS SURFACE MINE	66.2	12	NM	PP	A	A	FB
3106	BELL COUNTY COAL CORP	CABIN HOLLOW MINE #1	16.8	171	AN	PP	A	B	FB
3107	GREGORY COAL COMPANY INC	MINE NO. 2	414	86	AP	PP	A	AB	FB
3108	PHIL MAC ENTERPRISES INC	AREA #1	35.7	98	NM	PP	A	A	FB
3110	MOUNTAINSIDE COAL COMPANY	LEACH MOUNTAIN 6C+6D	521	98	MC	PP	A	A	FB
3111	TENNESSEE MINING INC	HOLLOWFILL AREA #15	218.7	12	P2	P	IN	A	RS

Record: 2664 Show: All Selected Records (1 out of 2664 Selected) Options

Permit Boundaries – Joining Attributes

Geometry

Attributes of kfogis.SDE.permits

OBJECTID*	FEATURE	PERMIT	ACRES	Shape*	SHAPE.area	SHAPE.len
709	permitbnd	1183040	77.070615	Polygon	3357196.009186	18977.763316
710	permitbnd	2181257	59.221190	Polygon	2579675.038858	24302.271764
760	permitbnd	2182210	159.372008	Polygon	6942244.669647	68398.925073
761	permitbnd	2182306	58.610910	Polygon	2553091.255270	9027.270190
762	permitbnd	2183035	49.395429	Polygon	2151664.883755	13329.343233
711	permitbnd	2183051	7.440634	Polygon	324114.021600	12699.210029
712	permitbnd	2183052	77.975315	Polygon	3396604.701003	25474.893795

New dataset with geometry plus external attributes

Attributes of kfogis.SDE.p_all

OBJECTID*	FEATURE	PERMIT	ACRES	IU_NO	COMP_NO	SITE_NO	MOD_NO	COMP_NAME
708	permitbnd	1183040	77.070615	1183040	0003	0555	02	A + W AUGER CORP
709	permitbnd	2181257	59.221190	2181257	0537	0507	01	PREMIUM COAL CO. INC
759	permitbnd	2182210	159.372008	2182210	0615	0475	01	SHEMCO INC
760	permitbnd	2182306	58.610910	2182306	0649	0158	00	TENNESSEE RESOURCE DEV
761	permitbnd	2183035	49.395429	2183035	0419	0353	00	LOG MOUNTAIN MINING CO
710	permitbnd	2183051	7.440634	2183051	0171	0544	00	CROSS MTN COAL INC
711	permitbnd	2183052	77.975315	2183052	0430	0545	00	LUEKING COAL CO

External database

Site Status	Name	Description
AN	Active Non-Producing	Active non-producing facility such as a tipple or preparation plant.
AP	Active Coal Producing	Coal surface mining activities are occurring.
EX	Coal Exploration	Coal exploration operations have started and where coal mining operations have not begun.
FO	Abandoned Site	Abandoned site that is permitted but there is no bond.
FP	Forfeiture Pending	The RA is pursuing actions to revoke the permit, collect the performance bond(s), and/or reclamation of forfeited site is in progress.
FR	Forfeited and Reclaimed	Forfeiture reclamation completed.
MC	Minir	phase bond
ND	No Di	n started.
NM	No M	essation, no
NS	Non-	
P1	Phase I Release	At least Phase I bond release granted for entire permitted area. For interim permits, partial bond release.
P2	Phase II Release	At least Phase II bond release for the entire permitted area.
P3	Phase III Release	Reclamation completed and the RA has released all bond.
TC	Temporary Cessation	The RA has granted cessation of mining pursuant to 30 CFR 816/817.131(b).
WC	Wildcat	Coal mining and reclamation operations have or are taking place and the activity is not covered by the required permits from the RA.

OSMRE Directive INE-23

Translating INE-23 Site Status Codes

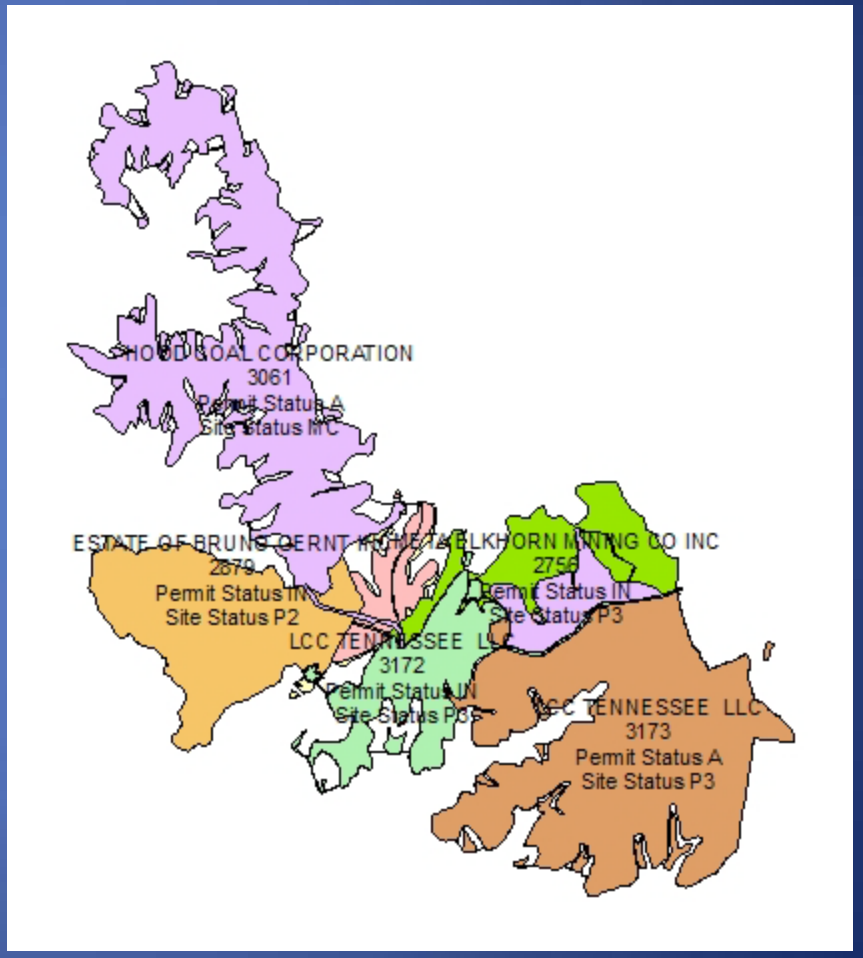
Site Status	Name	Condition
AN	Active Non-Producing	Active
AP	Active Coal Producing	Active
EX	Coal Exploration Permits	Active
FO	Abandoned Site	Abandoned
FP	Forfeiture Pending	Abandoned
FR	Forfeited and Reclaimed	Reclaimed
MC	Mining Complete	Active
ND	No Disturbance	Proposed
NM	No Mining	Active
NS	Non-Site Visit	Active
P1	Phase I Release	Active
P2	Phase II Release	Inactive
P3	Phase III Release	Reclaimed
TC	Temporary Cessation	Active
WC	Wildcat	Abandoned

Translating ADS Site Status Codes

Site Status	Count	Code Description	Code Value Status	Condition
<NULL>	41	No information	None	To be determined
AB	16	Abandoned	Legacy, 1st gen.	To be determined
AN	35	Active non-producing	Current	Active
AP	34	Active coal producing	Current	Active
AR	4	All coal removed, recl. only	Legacy, 2nd gen.	To be determined
BR	158	Bond release, reclamation completed	Legacy, 1st gen.	Reclaimed
EX	1	Coal Exploration	Current	Active
F	11	Operating facility not a mine	Legacy, 2nd gen.	To be determined
FO	153	Abandoned site	Current	Abandoned
FP	11	Forfeiture pending	Current	Abandoned
FR	113	Forfeited and reclaimed	Current	Reclaimed
I	204	Inactive (temporary cessation)	Legacy, 1st gen.	To be determined
MC	43	Mining complete	Current	Active
NA	1,322	No information	State of TN paper lists	To be determined
ND	14	No disturbance	Current	Proposed
NM	95	No mining	Current	Active
NS	0	Non-site visit	Current	To be determined
P1	57	Phase 1 release	Current	Active
P2	32	Phase 2 release	Current	Inactive
P3	259	Phase 3 release	Current	Reclaimed
RC	2	Abandoned; recl. agrmnt. full compliance	Legacy, 2nd gen.	Reclaimed
RP	2	Abandoned, recl. agrmnt. partial compliance	Legacy, 2nd gen.	To be determined
RR	2	Recl. agrmnt. site reclaimed to PL 95-87	Legacy, 2nd gen.	Reclaimed
TC	72	Temporary cessation	Current	Active
WC	0	Wildcat	Current	Abandoned

Permitting History in a Sample Area

- 80-124
- 81-128 replaces 80-124
- 82-139 replaces most of 81-128
- 2756 overlaps part of 82-139
- 2808 overlaps part of 82-139
- 2879 replaces most of 2808
- 2952 overlaps part of 2756
- 2987 replaces most of 2952
- 2994 overlaps part of 2987
- 3010 overlaps part of 2756 & 2879
- 3036 replaces 2987
- 3037 replaces 2994
- 3061 replaces 3010
- 3172 replaces 3036
- 3173 replaces 3037



Last Recorded Status of Sample Sites

Permit Number	Permit Status	Site Status	History
80-124	Unknown	Unknown	Repermitted to 81-128
81-128	Expired	No Mining	Repermitted to 82-139
82-139	Expired	P3 Release	Reclaimed
2756	Inactive	P3 Release	Reclaimed
2808	Expired	Inactive	Repermitted to 2879
2879	Inactive	P2 Release	Active IUL
2952	Active	Active Coal Prod.	Repermitted to 2987
2987	Active	P1 Release	Repermitted to 3036
2994	Active	Active Coal Prod.	Repermitted to 3037
3010	Active	Active Coal Prod.	Repermitted to 3061
3036	Active	P1 Release	Repermitted to 3172
3037	Active	P1 Release	Repermitted to 3173
3061	Active	Mining Complete	Active IUL
3172	Inactive	P3 Release	Reclaimed
3173	Active	P3 Release	Reclaimed

Problem Codes

Site Status	Count Total	Code Description	Count Active	Condition (if active)	Count Retired	Condition (if retired)
<NULL>	41	No information		To be determined	41	To be determined
AB	16	Abandoned		Abandoned	16	To be determined
AN	35	Active non-producing	18	Active	17	To be determined
AP	34	Active coal producing	13	Active	21	To be determined
AR	4	All coal removed, recl. only		Active	4	To be determined
BR	158	Bond release, reclamation completed		Reclaimed	158	Reclaimed
EX	1	Coal Exploration	1	Active		To be determined
F	11	Operating facility not a mine		To be determined	11	To be determined
FO	153	Abandoned site (OSM forfeiture)	136	Abandoned	17	Abandoned
FP	11	Forfeiture pending	10	Abandoned	1	Abandoned
FR	113	Forfeited and reclaimed	15	Reclaimed	98	Reclaimed
I	204	Inactive (temporary cessation)		Active	204	To be determined
MC	43	Mining complete	25	Active	18	To be determined
NA	1322	No information		To be determined	1322	To be determined
ND	14	No disturbance	2	Proposed	12	To be determined
NM	95	No mining	6	Active	89	To be determined
NS	0	Non-site visit		Active		To be determined
P1	57	Phase 1 release	37	Active	20	To be determined
P2	32	Phase 2 release	14	Inactive	18	To be determined
P3	259	Phase 3 release		Reclaimed	259	Reclaimed
RC	2	Abandoned; recl. agrmnt. full compliance		Reclaimed	2	Reclaimed
RP	2	Abandoned, recl. agrmnt. partial compliance		Abandoned	2	To be determined
RR	2	Recl. agrmnt. site reclaimed to PL 95-87		Reclaimed	2	Reclaimed
TC	72	Temporary cessation	18	Active	54	To be determined
WC	0	Wildcat		Active		To be determined

Proposed Mines

Coal mining operations for which the regulatory authority has either:

a) received an administratively complete permit application but has not granted the application, or

b) issued a permit under which mining activity has not occurred.

Active Mines

Coal mining operations on which:

a) mining activity has occurred,
b) all applicable reclamation requirements have not been completed
c) permit has not received Phase II bond release, and
d) bond forfeiture has not been initiated.

Inactive Mines

Coal mining operations on which:

a) permit has received Phase II bond release, and

b) bond forfeiture has not been initiated.

Reclaimed Mines

Coal mining operations for which all applicable reclamation requirements have been completed

Abandoned Mines

Coal mining operations for which under either

Title 5:

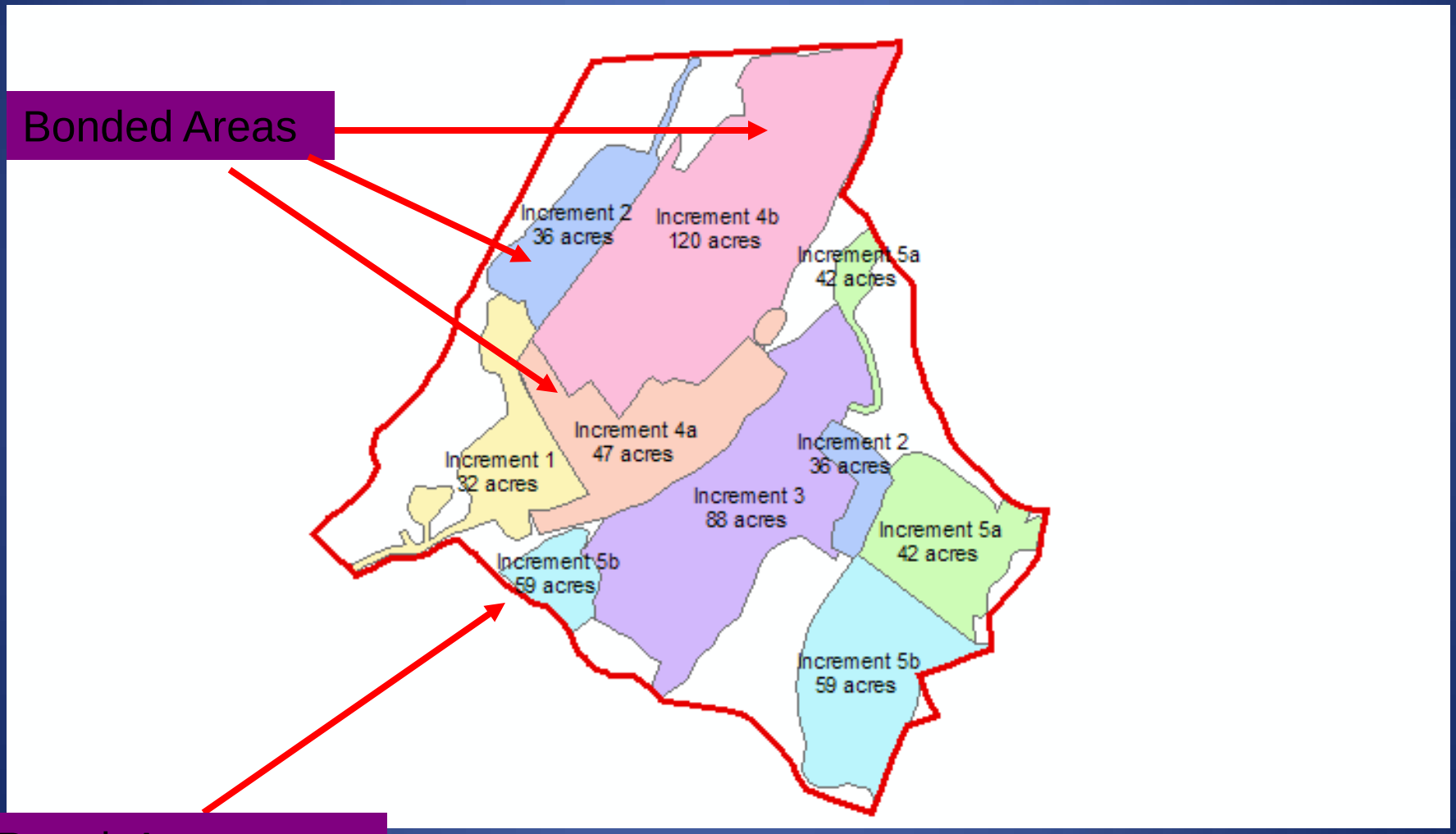
1. all applicable reclamation requirements have not been completed, and
2. bond forfeiture has been initiated.

or

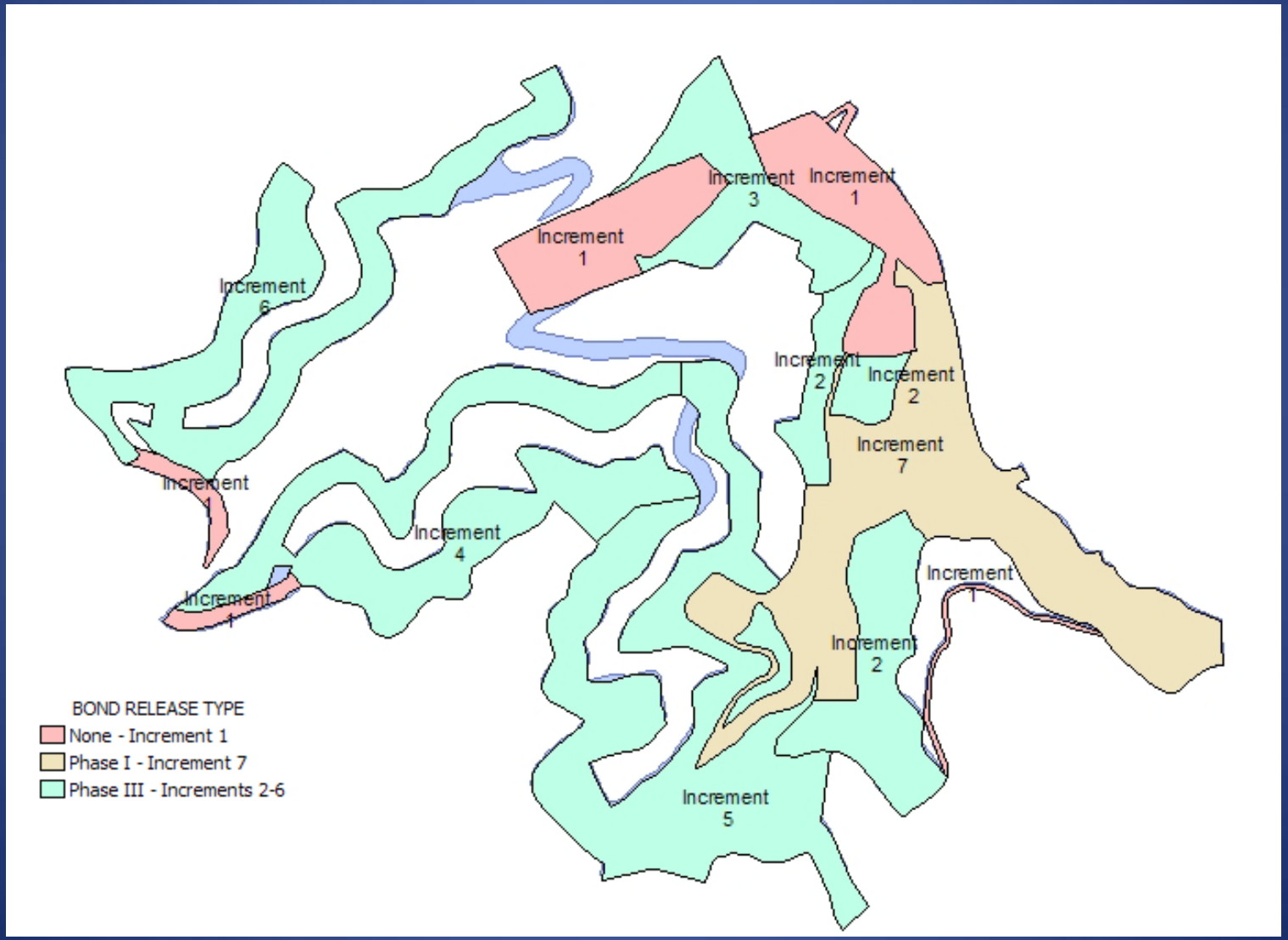
Title 4:

1. are in the Abandoned Mine Land Inventory System (AMLIS) as keyword features, and
2. have not been reclaimed.

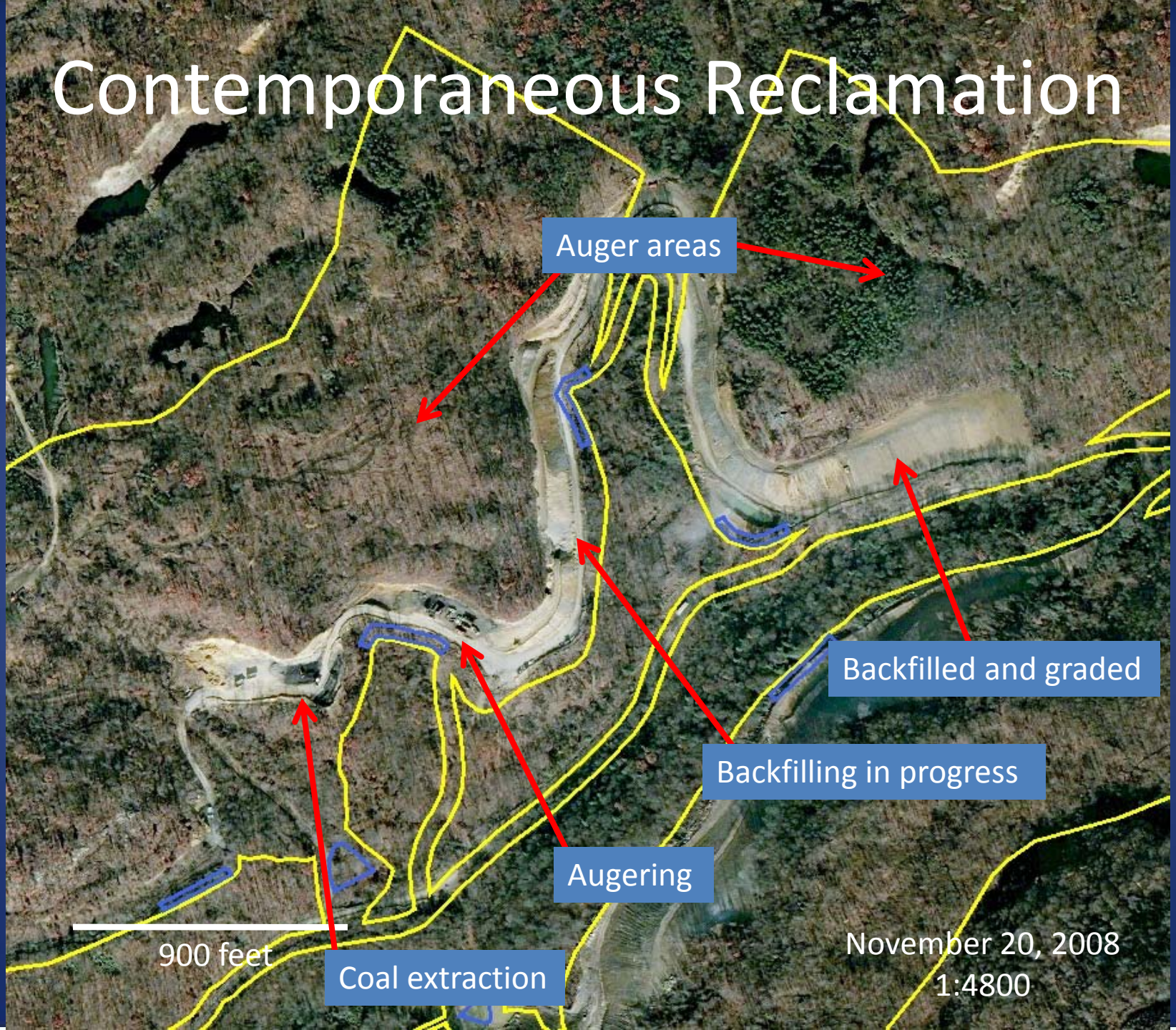
Permitted Area vs. Bonded Area



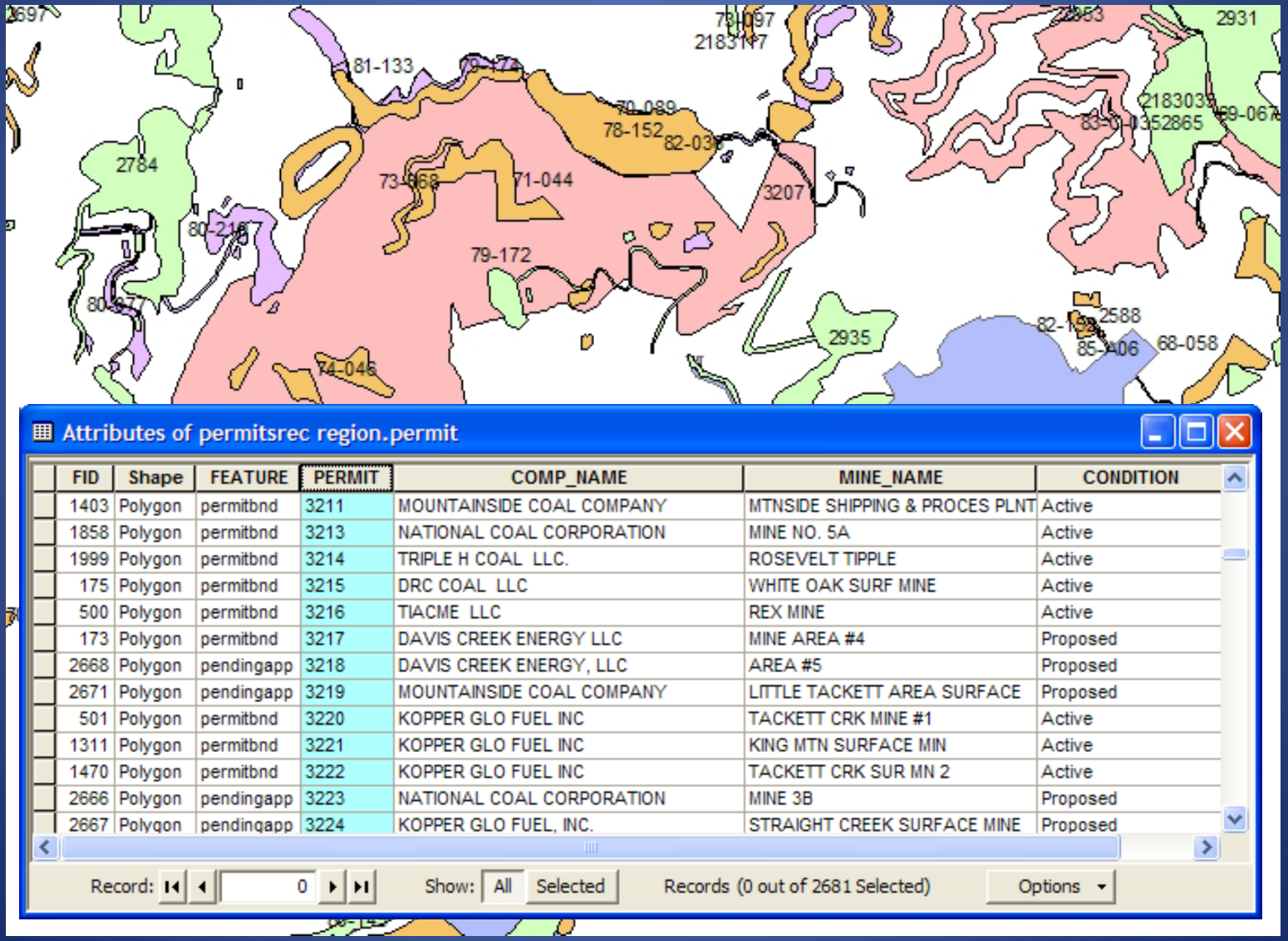
Reclamation Status of Bonded Areas



Contemporaneous Reclamation



Categorizing Permits



FID	Shape	FEATURE	PERMIT	COMP_NAME	MINE_NAME	CONDITION
1403	Polygon	permitbnd	3211	MOUNTAINSIDE COAL COMPANY	MTNSIDE SHIPPING & PROCES PLNT	Active
1858	Polygon	permitbnd	3213	NATIONAL COAL CORPORATION	MINE NO. 5A	Active
1999	Polygon	permitbnd	3214	TRIPLE H COAL LLC.	ROSEVELT TIPPLE	Active
175	Polygon	permitbnd	3215	DRC COAL LLC	WHITE OAK SURF MINE	Active
500	Polygon	permitbnd	3216	TIACME LLC	REX MINE	Active
173	Polygon	permitbnd	3217	DAVIS CREEK ENERGY LLC	MINE AREA #4	Proposed
2668	Polygon	pendingapp	3218	DAVIS CREEK ENERGY, LLC	AREA #5	Proposed
2671	Polygon	pendingapp	3219	MOUNTAINSIDE COAL COMPANY	LITTLE TACKETT AREA SURFACE	Proposed
501	Polygon	permitbnd	3220	KOPPER GLO FUEL INC	TACKETT CRK MINE #1	Active
1311	Polygon	permitbnd	3221	KOPPER GLO FUEL INC	KING MTN SURFACE MIN	Active
1470	Polygon	permitbnd	3222	KOPPER GLO FUEL INC	TACKETT CRK SUR MN 2	Active
2666	Polygon	pendingapp	3223	NATIONAL COAL CORPORATION	MINE 3B	Proposed
2667	Polygon	pendingapp	3224	KOPPER GLO FUEL, INC.	STRAIGHT CREEK SURFACE MINE	Proposed

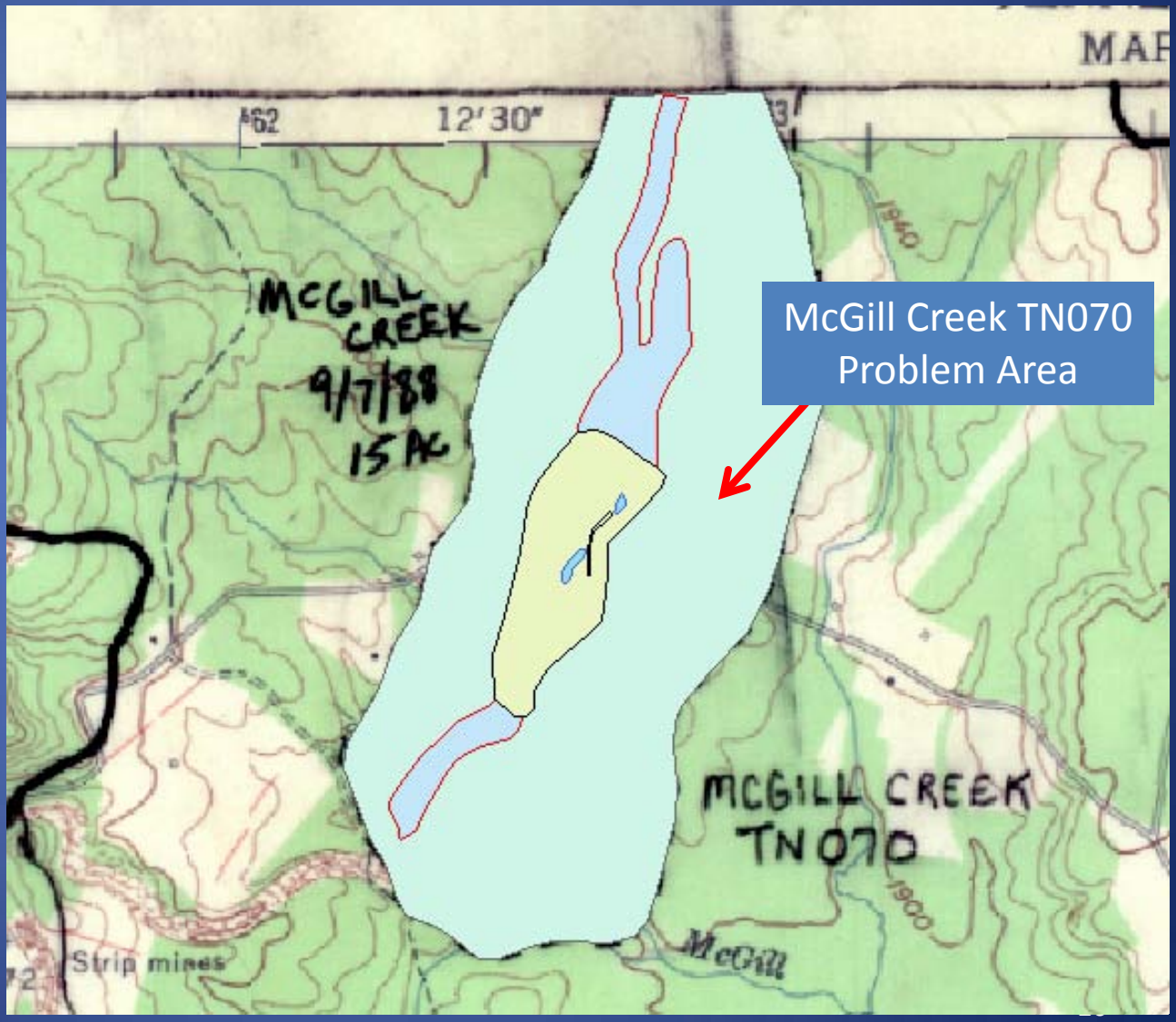
Record: 0 Show: All Selected Records (0 out of 2681 Selected) Options

All Tennessee Permits

Category	Number of Permits
Proposed	19
Active	118
Inactive	14
Reclaimed	541
Abandoned	164
To be determined	1,825
Total	2,681

Abandoned Mine Land (AML)

- Planning Units
- Problem Areas
- Project Areas
- Keyword Features



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