MAP2PDF – PROVIDING EASY ACCESS TO GIS[1]

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Abstract. Map2PDF offers GIS professionals an easy and cost-effective means for sharing complex geospatial information with GIS and non-GIS users. Leveraging the popular Adobe® Acrobat® PDF document standard they can create a portable mapping format, known as a GeoPDF™ to create and publish layered georegistered maps using its GIS application and then export the data to a GeoPDF. Examples of OSMRE CAD and GIS maps will be provided in the presentation.

Non-GIS users can then utilize the free Adobe Reader® in conjunction with the free GeoPDF toolbar to:

- View maps;
- Turn layers on and off;
- Query attributes;
- Add symbols;
- Display coordinates;
- Create redlines and notes

Changes can be exported for review and/or incorporated back into the master GIS database all without the need for GIS applications, databases or any knowledge of how it works.

The free GeoPDF Toolbar plug-in turns Adobe Reader into a robust GIS viewing, markup and enterprise collaboration tool that requires no support and very little training. Most people know how to open and view PDFs and the additional functionality in Map2PDF is intuitive and easy to learn.

Map2PDF Features:
• Integrates with existing GIS infrastructure
• Automatic embedding of projection and datum coordinate systems within PDFs
• Allows display of coordinates in alternate projections and datum
• Displays point, line and area attributes of map feature class data with search and query capabilities
• Displays map coordinates in three different coordinate systems
• Allows for zoom to points and objects by coordinates
• Supports GPS integration
• Replicates ArcMap layers with a layered GeoPDF file
• Allows for measuring of distance, azimuth and bearing in common units
• Allows users to print maps to any desktop printer

Additional Key Words: GeoCollaboration, ArcGIS

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Introduction

Coal mining permits are complex, with potentially thousands of pages covering a variety of technical issues as mandated by Surface Mining Control and Reclamation Act (SMCRA) regulations. Even with electronic permitting supplanting the traditional paper permits, SMCRA programs need a way to organize and access that mass of information. A Geographical Information System (GIS) can provide the solution, and GeoPDFs can be the foundation for the GIS.

What Is a GeoPDF

MAP2PDF enables GIS professionals to share their data and imagery with other GIS users as well as those with no knowledge of GIS applications, databases, or how it works. There is no cost to the recipients of the GeoPDFs, which are created by the Map2PDF software, as the GeoPDFs access the data using the free Adobe Reader.

GIS and imagery data is exported as layered geo-registered maps allowing recipients to turn layers on and off; query attributes; and display coordinates and add comments and features (as shape file entities), see Figure 1 GeoPDF Workflow.

Figure 1. GeoPDF Workflow

Intro to GeoPDF Technology

Map2PDF key features include:

• Integrates with existing GIS infrastructure

• Include a free download of GeoPDF enhancements for the Adobe Acrobat Viewer

• Automatic embedding of projection and datum coordinate systems within PDFs

• Allows display of coordinates in alternate projections and datum

• Displays point, line and area attributes of map feature class data with search and query capabilities

• Displays map coordinates in three different coordinate systems

• Replicates ArcMap layers with a layered GeoPDF file

• Allows users to print maps to any desktop printer

• Allows for field data collection.

• The free GeoPDF Tool Bar provides the following (see Figure 2. GeoPDF Tool Bar):

(a) GeoTool – launches other GeoPDF tools, provides ability to Google a map point, add a GeoNote, and control the visibility of the mini- coordinate display

(b) GeoLocator- zoom to points and objects by coordinates

(c) GeoMeasure – measure of area, distance, azimuth and bearing in common units

(d) GeoTrack - Support GPS integration

Figure 2. GeoPDF Tool Bar

The GeoPDF can be enabled to provide an additional tool bar to add geo-notes, symbols, and markups (redlining) that can then be saved. The added information and features can be exported as a shape file for geocollaboration into the GIS database (see Figure 3. GeoMark Tool Bar).

Figure 3. GeoMark Tool Bar

Integration with SMCRA Requirements

Examples of how GeoPDFs can be used for Coal Mine Reclamation:

- General permit documents showing
    - (a) Permit Boundary
    - (b) Land and mineral interest ownership
    - (c) Location/setting of mine
- Ponds and Impoundments
    - (a) Location polygon with name, ID, ancillary info
    - (b) Link to Pond design AutoCAD drawing
    - (c) Link to document certifying “as-built”
    - (d) Link to pond design SEDCAD calculations
    - (e) Link to letter from State Engineer authorizing a “Permanent Impoundment of greater than 10 Acre-Feet” when required
- Topsoil/Topdressing Stockpiles
    - (a) Location polygon with name, ID, ancillary info
    - (b) Link to Excel spreadsheet containing Mass Balance calculations
    - (c) Link to photo depicting required signage
    - (d) Link to Notice of Violation pertaining to that particular stockpile and failure to maintain sufficient berm around the perimeter
- Seeded areas
    - (a) Location polygon with name, ID, date seeded
    - (b) Link to seed list showing what species were used to establish vegetation
- Surface Hydrology
    - (a) Point layer showing locations of various surface water quality monitoring/sampling stations (Single Stage Sediment sampler, National Pollutant Discharge Elimination System (NPDES) Outfalls, etc.)
    - (b) Link to photo of a particular sampling station
    - (c) Link to NPDES permit document on file
- Bond Release

(a) Location polygon with name, ID, type of release, date released

(b) Link to report from bond release inspection

(c) Link to approval letter granting bond release

GeoPDFs for Abandoned Mine Lands (AML) (Title IV)

The AML Workflow and Components program process can benefit from the use of GeoPDFs (see Figure 4. AML Workflow and Components). Once sites have been identified there are clearly defined National Environmental Policy Act (NEPA) Compliance, environmental, engineering, construction, and maintenance steps.

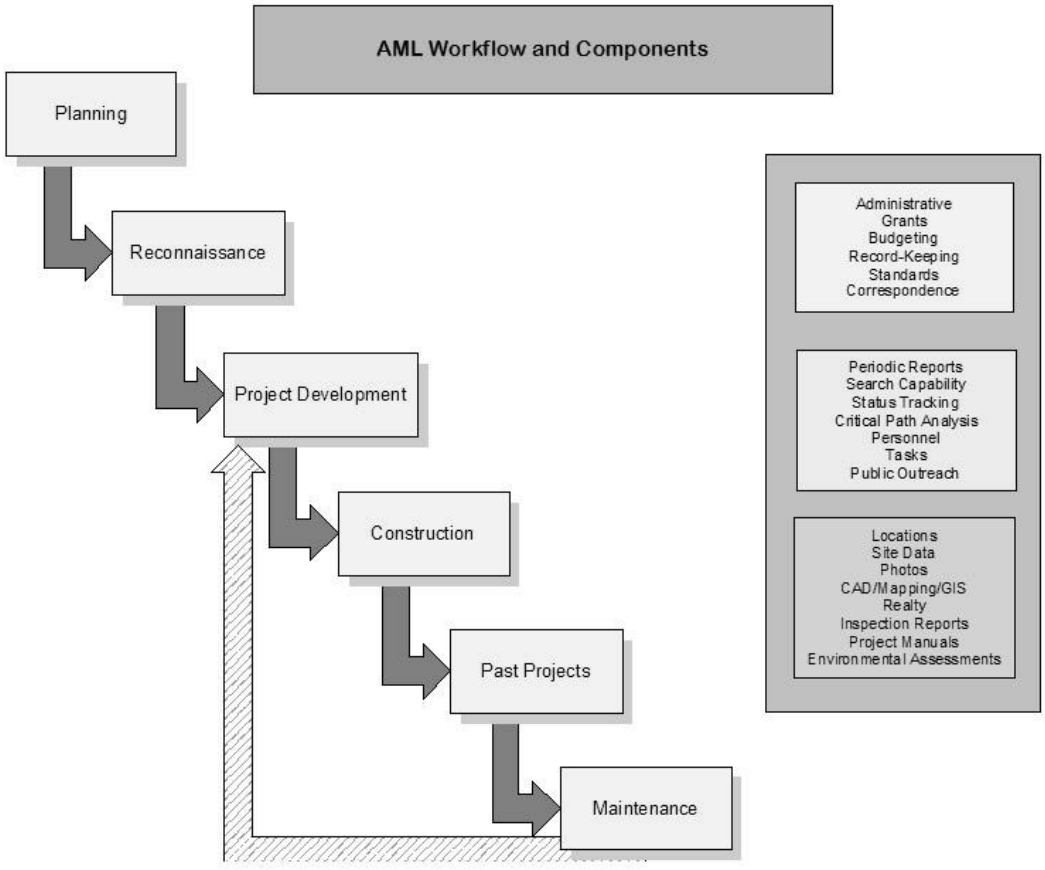

Figure 4. AML Workflow and Components

Some examples of how GeoPDFs can be used in this process include:

• Map of reconnaissance with identified AML sites, point-based with Site ID, mine name, commodity, severity classification, etc.

(a) Link to photos of site (approach shot and up-close view)

(b) Link to generalized surface & mineral interest ownership

• Realty & Right-Of-Entry Information

(a) Map of project sites showing color-coded ownership info and status of ROE (pending, signed, refused, unknown)

(b) Link to signed ROE form for individual site with cover letter

(c) Link to legal instrument (such as Warranty Deed) establishing record of ownership

• Construction-Phase Information

(a) Overview map of project sites

(b) Detail map of site in either AutoCAD or ArcGIS format

(c) Link construction design drawing in AutoCAD

(d) Link to Project Manual

(e) Links to “before, during and after” photos

Summary

The US Department of Interior Office of Surface Mining, Reclamation and Enforcement (OSMRE) created a National Coal Mining Geospatial Committee (NCMGC) to further the cause of GIS in the various SMCRA programs across the country which includes:

Title IV - Abandoned Mine Reclamation

Title V - Control of the Environmental Impacts of Surface Coal Mining

Public Law 95-87, the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

One of the first things considered by the NCMGC was to identify at least one Geospatial Data Steward in every state and field office that had “some” GIS experience and/or an appropriate person who could be a point of contact. Some States do have functioning GIS applications, and

the skilled GIS workers to create and implement the applications but most of the States do not, and are wondering “how to get there”. Some States want a turn-key approach, some want to both build and maintain a SMCRA GIS (database?), and some states just want assistance (a sense of direction & guidelines, software, hardware and training).

The SMCRA system has a good deal of infrastructure in terms of ArcGIS software licenses (shared pool). Non-GIS users who have no knowledge of GIS software or databases but are familiar with Adobe using GeoPDFs can easily access the information for decision-making. The capability to share information is further enhanced with the ability to geo-collaborate with easy to use markup (redlining) capabilities for adding points, lines and polygons. Geonotes can also be linked to the associated objects, entities or features that exist or are created on the GeoPDFs. Imagery and documents can also be linked with the GeoPDF maps created. The Map2PDF solution provides an easy to use cost-effective access (free) to the wealth of information associated with the various SMCRA programs.