Kentucky
Energy and Environment Cabinet
Department for Natural Resources

Reclamation Advisory Memorandum

From: Carl E. Campbell, Commissioner C.E.C 1/19/11

Date: January 19, 2011

Subject: Submission of Shapefiles for Permit Applications

RAM # 148

Introduction

The purpose of RAM # 148 is to provide notice of new Geographic Information System (GIS) mapping requirements to the permitting program for surface coal mining applications in Kentucky. A shapefile, of specific mine features, is a digital vector storage format suitable for use in geographic information systems.

Mine Features within a Geographic Information System (GIS)

Electronic permits have been submitted to the Department since 1999 and the benefits are still being realized. The Department will create a process that allows for the attachment of GIS-ready map features that will facilitate faster and more accurate permit review. Additionally, this process will assist in the development of the Cumulative Hydrologic Impact Assessments (CHIAs), a necessary finding document prepared by the Division of Mine Permits prior to the issuance of a permit. This GIS-ready data will consist of a limited number of mine features that the Department will append to a state wide data set. These GIS mine features will shorten review time, save money, enhance field inspections, and allow for greater accessibility of mine features through live GIS mapping sites for industry, citizens and state/federal agencies. A detailed description of the requirements for the shapefile is in the attached document *Format Specifications of Boundary Features as Part of the Permit Application Process.*

Training and Support

In order to make the process of shapefile submittal as uncomplicated and seamless as possible, the Division of Mine Permits will provide training and support to industry and consulting engineers that may require it. Initially, the Division of Mine Permits (DMP) will conduct several outreach workshops in the coalfields with presentation and reference material provided to the stakeholders. The training will describe in detail how the shapefile can be compiled using either the ESRI ArcGIS v9.x GIS software, or the AutoDesk AutoCAD design software. Subsequent training opportunities are detailed in Section 7.1 Training and Support.

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Benefits to Industry

The primary benefit to industry by submittal of boundary features in shapefile format will be that their permits can be processed faster and with much greater accuracy. There are at least five elements of permit review that will be greatly facilitated through the submission of GIS-ready data. The map features requested by DMP and provided within the shapefile are critical to the review process. Reviewers will no longer need to georeference scanned maps to locate these features, or be subject to delays in correctly interpreting the location, size, and area of these features from maps that are often confused by overlays of features that cannot be turned off. The shapefile gives the reviewer a much more accurate and flexible toolset for making certain critical determinations regarding boundary related data.

An additional benefit to industry will be that this same boundary data will be available to industry to download from the DMP website and use as they wish. This data will be valuable in cases where new boundaries are being compiled next to existing approved boundaries, and so share a common edge. Shapefiles are easily imported into AutoCAD. The DMP will combine all boundary polygons into a single shapefile that industry can use for a variety of analysis tasks, such as determining the locations of permit boundaries within a given watershed or other geographic area.

Effect of this RAM on the Permitting Process

A shapefile that contains certain mine features described in detail in *Format Specifications of Boundary Features as Part of the Permit Application Process* (attached) will be accepted, in addition to the electronic permit, effective March 15, 2011.

If you have any questions about the issues discussed in this RAM, please contact the Director, Division of Mine Permits, # 2 Hudson Hollow, Frankfort, Kentucky 40601 or call (502) 564-2320.

Format Specifications of Boundary Map as Part of the Permit Application Process

Section 1.1 Introduction

In January 2011, the Division of Mine Permits (DMP) will implement the submittal of electronic permit applications. As part of this program, the DMP will require a limited set of map features to be submitted in a format compatible with our geographic information system (GIS). The process of reviewing permit applications has become heavily dependent on GIS technology and its proven ability to enhance the speed and accuracy of these reviews. This document describes in detail the format specifications that industry must adopt in order to meet the new application submittal requirements for GIS-ready map features. Future submissions of GIS-ready map features will significantly decrease the pre-processing labor and costs that DMP currently expends scanning, digitizing, extracting and reformatting, and will provide a much higher degree of map accuracy. As a result, the DMP GIS staff will be able to immediately deploy these GIS features to the reviewers, who will be able to easily cross-reference these features between the GIS and the permit application. The procedure will significantly improve the speed and accuracy of the overall review process.

Section 2.1 Format Specifications

The required GIS-ready format for electronic boundary submittal will be ESRI Shapefile format.

The applicant will submit a single shapefile that contains all the map features listed in the section below (see "Map Features").

All features within the submitted shapefile will be closed polygons. No shapefiles containing point or linear features will be accepted.

Each record (feature) in the shapefile will be fully attributed insofar as attributes apply to the type of polygonal feature included (see section below "Feature Attributes")

Section 2.2 Shapefile Component Files

A "shapefile" is composed of up to five component files of which three are required. A projection file is included as a sixth component file. These files appear with the following file extensions:

Required file types: (if either of the following three files are omitted the shapefile cannot be opened.)

.SHP (contains the geometries)

.SHX (contains the spatial indexes)
.DBF (contains the attribute table)

In addition to the three shapefile component files listed above, the applicant shall ensure that the shapefile is projected into the Kentucky Single Zone system and supply the following projection file. This file is required.

.PRJ (contains coordinate system, ground unit, and projection info)

Depending on how the shapefile is created, two additional index files may exist. These files are not required but it is acceptable to include them in the submittal. Including them may make it easier for the applicant to group them all in the same E-submission folder without having to select some while deselecting others.

.SBN (additional binary spatial indexes that improve performance -
.SBX these are not required)

Section 2.3 Shapefile Coordinate System, Projection, and Ground Units

The submitted shapefile shall be projected in Kentucky Single Zone coordinate system, NAD1983, with ground units in US Survey feet.

If using ESRI's ArcGIS ArcMap application this coordinate system is found as:

NAD 1983 StatePlane Kentucky FIPS 1600 (Feet)

This projection can be found and selected from the predefined projected coordinate systems list in the ArcMap application. For those applicants not using ArcGIS this coordinate system should be available within most other CAD/GIS software systems as it is an established and recognized map projection for Kentucky.

Section 2.4 File Naming Convention

Submitted shapefiles must be named in a consistent manner. The name of the shapefile shall include the permit number followed by an underscore character, followed by the action code. If the permit application includes a permitting action number, then the aforementioned string will be followed by an underscore character followed by the action number. No other special characters or blank spaces can be accepted. The shapefile name will be parsed by computer programs and stored in the GIS. The sequence of the naming elements (permit no., action, action number) must be rigidly adhered to.

For Example:

8605607_NW.shp (this example has no permitting action number)
8605607_NW.dbf
8605607_NW.shx
8605607_NW.prj

Or

8605607_AM_2.shp (this example carries a permitting action number)
8605607_AM_2.dbf
8605607_AM_2.shx
8605607_AM_2.prj

Section 3.1 Required Map Features

This section describes the map features that will be supplied within the submitted shapefile. All features described below are polygonal. The type of features required to be submitted have been held to a minimum in an attempt to reduce the time necessary for the applicant to prepare as well as the time required for the DMP to process. They are comprised of features that have historically been submitted on paper maps and should be familiar to the applicant. Please see the section below entitled "Feature Attributes" for an understanding of how these features will be uniquely identified.

1. The proposed permit boundary. This is a polygon representing an accurate delineation of the proposed permit area. If the proposed area is split or the areas otherwise occupy different, non-contiguous locations, there can be a separate polygon shape representing each component area.
2. The currently approved permit boundary. A polygon describing the currently approved mining area.
3. Fills. One polygon feature for each proposed fill occurrence. If the proposed fill area is described as a polygon on the site plan or MRP map, it must be included in the shapefile. If it is described as a point feature it shall not be included.
4. Haul Roads. One polygon per contiguous haul road feature proposed. This polygon delineates the edges of right of way for the road.
5. Permanent Impoundments. (temporary impoundments are not required) One polygon is required per proposed impoundment feature. If the proposed impoundment area is described as a polygon on the site plan or MRP map, it shall be included in the shapefile.

6. Bond Increments. A polygon outlining the bond increment areas if applicable to the permit. This feature shall not be included for permits not engaged in incremental bonding.

The above map feature descriptions are all that is required for boundary shapefile submission. These features should be identical in geometry to those described on the site plan or MRP maps.

Section 4.1 Feature Attributes

Each polygon feature within the shapefile will have a corresponding feature attribute record. Each feature attribute record shall be populated with descriptive values appropriate to the associated feature. An example of a properly attributed table is shown in the sample provided below. Explanations of the fields and appropriate values in the attribute table are described in detail in paragraphs following the sample table.

Subsection 4.1.1 Sample Attribute Table

FID	Shape	OBJECTID	PermitNo	AppType	AppNum	FeatType	FeatCLS	SMISCode	SubDate
0	Polygon	1	8601883	AM	2	AB	SF		2/4/2011
1	Polygon	2	8601883	AM	2	PB	SF		2/4/2011
2	Polygon	3	8601883	AM	2	HR		1	2/4/2011
3	Polygon	4	8601883	AM	2	IM	EMB	POND3	2/4/2011
4	Polygon	5	8601883	AM	2	IM	DGO	DO2	2/4/2011
5	Polygon	6	8601883	AM	2	FL	HWF	H1	2/4/2011
6	Polygon	7	8601883	AM	2	FL	SBK	H2	2/4/2011
7	Polygon	8	8601883	AM	2	HR		4	2/4/2011
8	Polygon	9	8601883	AM	2	FL	HWF	S5	2/4/2011
9	Polygon	10	8601883	AM	2	BI		1	2/4/2011
10	Polygon	11	8601883	AM	2	BI		2	2/4/2011

Subsection 4.1.2 Field and Record Value Descriptions

As previously stated, all required map features, being polygons, can be collected within a single shapefile. All shapefiles have a single associated attribute table (DBF) included as one of the three mandatory files necessary to make a shapefile readable; and all attribute tables shall have the same format for fields and their approved values. The following are descriptions of the fields that shall exist in every attribute table, as well as a description of the appropriate values for these fields based on the type of feature being described. Refer to the sample table above when reading these descriptions.

1. FID, Shape, and OBJECTID fields. These are the fields shown in gray background in the sample table. They are automatically created by the system when the shapefile is created. The FID (feature ID) and OBJECTID are numeric fields and contain a number value. The Shape field contains the geometry type of the shapefile (point, polyline, or polygon), and for the required shapefile shall always read "Polygon". There is no reason for the applicant to populate or edit the values in these fields as they are automatically created and populated as polygon features are added to the shapefile.

The following fields must be added by the applicant and properly populated with approved values. If creating the shapefile within ArcGIS, it is acceptable to declare all of the following fields as type Text. If exporting to shapefile from another application, simply take the defaults for field types as it is permissible if the fields are a mix of text, numeric, and date types. However, if a date type is used to hold the SubDate value, it must be an industry recognized date format, as shown in the sample table, and not a Julian or binary date. The applicant is encouraged to use whichever method is easiest based on their software to obtain the required resultant shapefile attribute table format.

The field names of the following fields must be rigidly adhered to. No substitutions or alternate spellings of these fields shall be acceptable.

2. PermitNo – the 7 digit permit number of the application.
3. AppType – the application or action type. Acceptable values for this field can be:

AM	(Amendment)
FR	(Field Revision)
MA	(Major Revision)
MI	(Minor Revision)
MT	(Mid-Term Review)
MTS	(Mid-Term Review, Special)
NW	(New)
RP	(Repermit)
RV	(Revision)

4. AppNum – the number of the revision, if applicable. If not applicable, leave blank.
5. FeatType – a two letter code that describes the type of feature in that record. As there are only six feature types that can be included, there are only six code designations. These are:

PB	(Proposed permit boundary)
AB	(Current approved mine boundary)
HR	(Haul road)
IM	(Impoundment)
FL	(Fill)
BI	(Bond Increment)

6. FeatCLS – the classification of the designated feature. This value will apply only to approved and proposed permit boundaries, impoundments, and fill features. Acceptable value lists for this field are presented below.

For Permit Boundary Features:

SF	(Surface Mine)
UG	(Underground or Auger Mine)

For Fill Features:

HWF	(Head of Hollow Fill)
SBK	(Spoil Bank Fill)
VYF	(Valley Fill)

For Permanent Impoundment Features:

CNV	(Unknown)
DGO	(Dugout)
DGP	(Permanent Dugout)
DGX	(Existing Dugout)
DPX	(Existing Permanent Dugout)
EMB	(Embankment)
EMP	(Permanent Embankment)
EMX	(Existing Embankment)
EPX	(Existing Permanent Embankment)
RKC	(Rock Check Dam)

7. SMISCode – This value represents the name or identifier of the feature. It applies only to haul roads, impoundments, bond increments, and fills. This code is completely arbitrary and assigned at the discretion of the applicant. In the sample table example, haul roads are simply numbered 1, 2, etc.; while impoundments and fills have a name of some sort. This name/number is also entered into the DMP's SMIS database from facility and design data supplied by the applicant as part of the electronic application process. The only requirement of the applicant pertaining to the shapefile submission is that the name/number entered for this value exactly matches the one entered into SMIS for this same feature.
8. SubDate – the date of the application submittal. The date can be estimated if the shapefile is created and populated prior to the actual submission of the application but should be as close as possible to the submittal date. As revisions are re-submitted as part of the review process, it is possible that the content of the shapefile will not change for most features, but the dates will change to reflect the resubmission. The date value is critical as it will assist the DMP GIS staff in assuring that our reviewers are looking at the most current map features for a given application. Regardless of the number of records in the table, the date value must be the same for all of them. This field type does not necessarily have to be declared a date field type, as a text field is equally acceptable as long as the date value is

a commonly recognized date format, as appears in the sample table example (mm/dd/yyyy)

Section 5.1 Revisions

In the case where an application is resubmitted, the shapefile will also be resubmitted. The geometries of the features contained in the revised shapefile shall reflect those described on any resubmitted maps or plans or otherwise described elsewhere in the application. If a feature, such as a haul road, has been changed, then its polygonal boundary in the shapefile shall reflect that change. If it has been omitted, then the feature shall be deleted from the revised shapefile. If a new feature is added (an impoundment, fill, or road), then the polygon for that feature shall be added to the shapefile and the attribute record populated with the appropriate values. In all cases of revised submissions of applications, the submitted shapefile attribute records shall have the SubDate field updated to reflect the resubmission date.

Section 6.1 Submission Procedure

Shapefile submission to DMP shall occur as part of the overall electronic application submittal process.

Section 7.1 Training and Support

Training and support includes but is not limited to the items described in the following list:

1. Upon request, DMP will conduct training to assist industry and consulting engineers via seminars and field classes.

2. Complete digital versions of training PowerPoint presentations will be available for download off the DMP website.

3. The DMP will provide a technical support number for assistance in creating the required shapefile from both ArcGIS and AutoCAD that can be used at anytime by industry.

4. A sample shapefile complete with fully attributed examples of each feature type will be available for download from the DMP website. This shapefile can be referenced as an example of a shapefile that meets the specifications.