Database of Abandoned Industrial Minerals Quarries in Indiana

COMPUTER DATABASE 2

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By Walter A. Hasenmueller and Curtis H. Ault

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INTRODUCTION

The more than 1,200 abandoned rock quarries in Indiana are a long-lasting record of road building, public and private building construction, railroad construction, burned-lime production, and many other activities. For that, geologists and modern quarriers can be thankful. Many of these quarries provide accessible rock sections that can be studied to determine the extent and quality of economically important mineral resources and to unravel the geologic history of the state. They can provide attractive settings for parks or industrial buildings and activities. In other places, reclamation efforts are needed to return the quarries to useful purposes. For whatever reason the quarries draw our attention, it is advantageous to know their locations, their exposed rock formations, and their environmental conditions. This database provides easily accessible DOS-formatted files of these quarries and allows for computer searches of many aspects of the quarry data.

HISTORY OF QUARRYING

If we consider the digging of rock for foundations of homes and other buildings and the liming of fields as the impetus for the first significant quarrying, then the history of quarrying in Indiana started with early pioneers. These quarries were small and most traces of them were reclaimed by nature. The only records available are vague locations and descriptions; a few are included in the database.

Road building and railroad construction were the real impetus for quarrying crushed stone in Indiana. Beginning in the early 1900s small roadside quarries supplied crushed stone for road construction, which was transported by horse and wagon and broken into smaller pieces at the construction site. An interesting aspect in the growth of quarrying is the role of the U.S. Postal Service which refused to deliver rural mail unless adequate roads were built, a strong spur for road improvement and the opening of numerous small quarries.

Railroad quarries, from which much railroad ballast and other crushed-stone products were produced, were among the largest quarries in the early 1900s. Many of them have well-exposed rock sections. Although many of the smaller roadside quarries were located and field-checked, some are overgrown or have been filled in and lost. Where literature references were available, although the quarries may not have been accurately located on the ground, the information was included in the database. Most of the larger quarries were field-checked and are well documented.

Transportation improved as more roads of higher quality were constructed, and the need for numerous small quarries decreased. After the early 1900s, fewer but larger quarries were needed to provide the crushed stone for most uses, and the number of modern quarries, many of which operated for decades, has remained nearly constant for more than 20 years. Thus, the abandoned crushed-stone quarries are generally more than 20 years old. The database is the only source of combined information for these quarries.

By far, most of the crushed-stone quarries are in limestone and dolomite, and most are in Silurian, Devonian, and Mississippian rocks (fig. 1). Limestones and dolomites of these ages are at or near the surface in only parts of the state, and therefore most of the abandoned quarries in the state are concentrated in those areas. The few sandstone quarries and shale quarries (usually called pits) that were included are probably only a small percentage of those that were actually mined. The shale pits, in particular, weather rapidly.

Indiana's famous building stone, known in the industry as Indiana Limestone, was quarried in south-central Indiana from the Salem Limestone (Mississippian) since the early 1800s. Indiana has been a leading producer of dimension stone in the United States since that time, and building stone from the Salem is shipped to many distant places in the United States and overseas. Most of Indiana's dimension stone came from the Salem, but much smaller amounts were produced mostly for local use from flaggy carbonate rock of several other formations. The abandoned quarries in the Salem are commonly rectangular with smooth faces that distinguish them from abandoned crushed-stone quarries. Most of the abandoned dimension stone quarries are in Monroe and Lawrence Counties in south-central Indiana, where much field-checking was accomplished, but numerous other Salem quarries are located northward and southward in other parts of the outcrop area.

From an environmental standpoint, the largest abandoned quarries present a problem of reclamation if it is required that the land be returned to its former state; however, if it is recognized that the abandoned quarries may have other, more valuable uses, the onus is not as great. Abandoned quarries in Indiana were used, among other things, as swimming pools, city parks, industrial sites, housing sites, and water sources. The quarries have been inviting spots to dump trash, but dumping laws over the years have reduced this practice significantly. Time does not affect many of the older dimension-stone quarries as much as the small crushed-stone quarries; the large piles of waste dimension stone look as if they will last forever. Major reclamation efforts would be necessary if the waste stone is to be used or discarded.

System	Group	Formation	Member or Bed
Pennsylvanian	McLeansboro	Bond	
			Carthage Ls.
		Patoka	
		Shelburn	West Franklin Ls.
	Carbondale	Dugger	Universal Ls.
	Raccoon Creek	Staunton	Holland Ls.
		Mansfield	Lead Creek Ls.
Mississippian	Buffalo Wallow	Kinkaid Ls.	
		Menard Ls.	
		Tar Springs	
	Stephensport	Glen Dean Ls.	
		Hardinsburg	
		Haney Ls.	
		Beech Creek Ls.	
	West Baden	Elwren	
		Beaver Bend Ls.	
		Bethel	
	Blue River	Paoli Ls.	
		Ste. Genevieve Ls.	Bryantsville Breccia Bed
			Levias
			Fredonia
		St. Louis Ls.	
	Sanders	Salem Ls.	
		Harrodsburg Ls.	
	Borden	Edwardsville	
		New Providence Sh.	
		Rockford Ls.	
		New Albany Sh.	

	Northern Indiana			Southern Indiana		
System	Group	Formation	Member	Group	Formation	Member
Devonian	Muscatatuck			Muscatatuck	New Albany Sh.	
		Traverse			North Vernon Ls.	Beechwood
						Silver Creek
						Speed
		Detroit River			Jeffersonville Ls.	Geneva Dol.
Silurian	Salina	Wabash	Liston Creek Ls. / Kenneth Ls.		Wabash	Liston Creek Ls.
			Liston Creek Ls. / Kokomo Ls.			
			Mississinewa Sh.			Mississinewa Sh.
		Pleasant Mills			Louisville Ls.	
					Waldron Sh.	
		Salamonie Dol.			Salamonie Dol.	Laurel
						Osgood
		Brassfield Ls.			Brassfield Ls.	

System	Group	Formation	Member
Ordovician	Maquoketa	Whitewater	
			Saluda
		Dillsboro	

Figure 1. Generalized stratigraphic column showing quarried units.

Many of Indiana's abandoned quarries are not included in this database. Field-checking over the years was concentrated mostly in limited areas, and even in some of those areas, such as Monroe and Lawrence Counties, many smaller quarries were not located or recorded. In some counties and areas, no systematic field-checking was completed; many quarries in these areas may not be recorded. Publishing the database at this time is appropriate, however, because of the great amount of information that has accumulated. As more data are gathered, this database can easily be expanded to encompass the information; updates will be made available to all purchasers of the database.

DISCLAIMER AND REGISTRATION

The database was thoroughly checked for accuracy, completeness, and consistency to insure that it will yield accurate and complete listings when sorted on any of its numerous fields. We cannot guarantee that the database is free of errors. The Indiana Geological Survey (IGS) provides the data "as is" without guarantee or warrantee of any kind, expressed or implied. The Indiana Geological Survey made this database available as a public service, and will not be liable for any damages, losses, or claims consequent to the use of these data. If you, the user, recognize errors, we would appreciate your calling them to our attention so we can include necessary corrections in future versions of the database.

A registration form is included in this publication to allow communication with users of the database. We will notify registered owners when the next version is available. Upon receipt of notification, registered owners may have their copy of the database updated at no charge by returning the original diskettes to the IGS. Updated data diskettes will be returned to the registered owner.

ACKNOWLEDGMENTS

We acknowledge the efforts of past and present geologists at the Indiana Geological Survey, other geologists, land owners, and Indiana residents who contributed information included in this database.

STRUCTURE OF THE DATABASE

The Abandoned Industrial Minerals Quarries Database is a relational database comprising four database tables. Information about abandoned quarries falls into four general categories: 1) location; 2) stratigraphy; 3) operating history; and 4) references to the quarry. The tables making up this database are based on these categories of abandoned quarry information.

The Location Table is the fundamental table in the database and contains a single record for each abandoned quarry included in the database. Each record (abandoned quarry) in the Location Table is assigned a unique database number (**QuaNum**). Records in the Location Table are linked to records in the Stratigraphic, History of Operation, and Bibliographic Tables by this database number. The number of stratigraphic units exposed in a quarry, events in the history of a quarry's operation, and references to a quarry varies so the number of records representing a particular abandoned quarry in the Stratigraphic, History of Operation, or Bibliographic Tables is not fixed. These tables contain as many records as are needed to complete the documentation of each abandoned quarry. Figure 2 is a diagrammatic representation of this database structure.

The two DOS-formatted data diskettes in the back of this publication contain the four database tables that make up the Abandoned Quarry Database. Each line in these ASCII text files is a database record. Variables are delimited with quotation marks ("...") and separated by a comma or a carriage return.

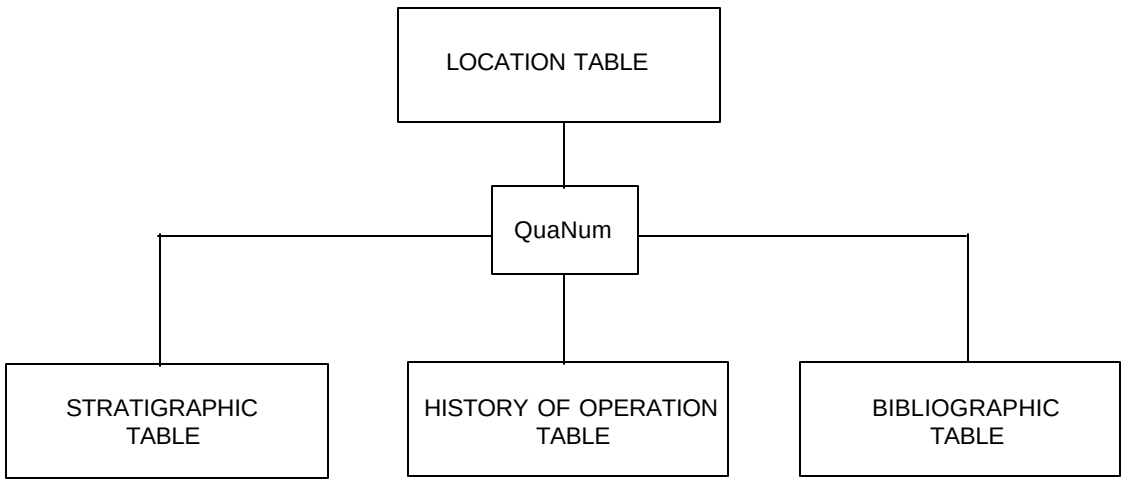

Figure 2. Diagrammatic representation of the database structure.

LOCATION TABLE

The Location Table contains a description of the location of the office, processing area, pit entrance, or pit (if small) for each abandoned quarry or pit included in the database. Variables are the elements of several types of location descriptions that might be used to locate a particular abandoned quarry or group of abandoned quarries. The following variables compose the Location Table.

QuaNum

Definition: Database identification number that links entries in the Location Table to records in the Bibliographic, History of Operation, and Stratigraphic Tables.

Variable Type: Integer number, four characters are required for this field.

Remarks: Numbers were assigned sequentially as the data were processed. The numbers are not intended to represent an organization of the data.

Cty

Definition: County in which the abandoned quarry or pit is located.

Variable Type: Alpha-numeric character string, current database version requires 11 characters for this field.

Remarks: Any Indiana county is a possible value. A "blank" signifies that the county is not known.

Qdr

Definition: U.S. Geological Survey 7½' quadrangle map in which the abandoned quarry or pit is located.

Variable Type: Alpha-numeric character string, current database version requires 14 characters for this field.

Remarks: Any Indiana, U.S. Geological Survey 7½' quadrangle map name is a possible value for this variable. A "blank" signifies that the quadrangle is not known.

Qtr

Definition: Subdivision(s) that indicate(s) where the abandoned quarry or pit is located within a land survey unit. Subdivisions are arranged smallest to largest.

Variable Type: Alpha-numeric character string, current database version requires 13 characters for this field.

Remarks: Abbreviations used in the **Qtr** variable are listed and defined below. A "blank" signifies that location within a survey unit is not known.

NE = northeast quarter
SE = southeast quarter
SW = southwest quarter
NW = northwest quarter
N = north half or quarter
E = east half or quarter
S = south half or quarter
W = west half or quarter
C = center
CNL = center of the north line
CEL = center of the east line
CSL = center of the south line
CWL = center of the west line
CNEL = center of the northeast line
CSEL = center of the southeast line
CSWL = center of the southwest line
CNWL = center of the northwest line
NC = north corner
EC = east corner
SC = south corner
WC = west corner
NEC = northeast corner
SEC = southeast corner
SWC = southwest corner
NWC = northwest corner

SecTyp

Definition: The type of land survey unit in which the quarry is located.

Variable Type: Alpha-numeric character string, current version of the database requires five characters for this field.

Remarks: Possible values for this variable are listed below. A "blank" signifies that the survey subdivision is not known.

CMG = Clark Military Grant
Don. = Donation
Grant = Grant
Res. = Reserve
Sec. = Section

SecNum

Definition: Numerical designation of the land survey unit.

Variable Type: Integer number, three characters are required for this field.

Remarks: A "blank" indicates that the **SecNum** number is not known.

Sec?

Definition: Variable to indicate uncertainty regarding the **SecTyp** or **SecNum** variables.

Variable Type: Alpha-numeric character string, one character is required for this field.

Remarks: Two values are possible:

? = **SecTyp** or **SecNum** is uncertain.
"blank" = **SecTyp** and **SecNum** are regarded as correct.

TwpNum

Definition: Township number.

Variable Type: Integer number, two characters are required for this field.

Remarks: A "blank" signifies that **TwpNum** is not known.

TwpDir
Definition: Direction of the township relative to the regional baseline for Indiana (Buckingham's Baseline).
Variable Type: Alpha-numeric character string, one character is required for this field.
Remarks: Three values are possible:
N = north of the regional baseline.
S = south of the regional baseline.
"blank" = township direction not known.

Twp?
Definition: Variable to indicate uncertainty regarding the **TwpNum** or **TwpDir** variables.
Variable Type: Alpha-numeric character string, one character is required for this field.
Remarks: Two values are possible:
? = **TwpNum** or **TwpDir** value is uncertain.
"blank" = **TwpNum** and **TwpDir** variables are regarded as correct.

RngNum
Definition: Range number.
Variable Type: Integer number, two characters are required for this field.
Remarks: A "blank" signifies that **RngNum** is not known.

RngDir
Definition: Direction of the range relative to the regional meridian (Second Principal Meridian).
Variable Type: Alpha-numeric character string, one character is required for this field.
Remarks: Three values are possible:
E = east of the regional meridian.
W = west of the regional meridian.
"blank" = direction of range not known.

Rng?
Definition: Variable to indicate uncertainty regarding the **RngNum** or **RngDir** variables.
Variable Type: Alpha-numeric character string, one character is required for this field.
Remarks: Two values are possible:
? = **RngNum** or **RngDir** value is uncertain.
"blank" = **RngNum** and **RngDir** variables are regarded as correct.

Elev
Definition: The elevation of a reference point in or near the quarry used as the starting point for stratigraphic measurements reported in the Stratigraphic Table.
Variable Type: Floating point number, current version of the database requires four characters for this field.
Remarks: A "blank" means a reference elevation is not available.

AvgThk
Definition: The average thickness of the quarried rock unit.
Variable Type: Floating point number, current version of the database requires four characters for this field.
Remarks: A "blank" means that the average thickness of the quarried rock was not recorded.

Area
Definition: Area (in acres) of the quarry.
Variable Type: Floating point number, current version of the database requires four characters for this field.
Remarks: A "blank" means that the area of the quarry was not available.

TotPrd
Definition: Total known production of the quarry (short tons).
Variable Type: Floating point number, current version of the database requires eight characters for this field.
Remarks: A "blank" means that production is not available.

STRATIGRAPHIC TABLE

The Stratigraphic Table contains information about bedrock and unconsolidated deposits observed in or near an abandoned quarry or pit. Each record in the Stratigraphic Table contains a rock description and stratigraphic classification for a unit in a stratigraphic section recorded in or near an abandoned quarry or pit. Any number of units (records) can compose a stratigraphic section. Variables in the Stratigraphic Table represent components of the rock-unit description and stratigraphic classification useful in sorting and retrieving stratigraphic data.

Stratigraphic names in the Stratigraphic Table conform with current IGS usage (Shaver and others, 1986). Rock-unit names used in the Stratigraphic Table are shown in figure 1.

QuaNum
Definition: The database identification number that links entries in the Stratigraphic Table with the Location, History of Operation, and Bibliographic Tables.
Variable type: Integer number, four characters are required for this field.

Unit
Definition: Stratigraphic unit number in a measured section or drill hole.
Variable Type: Integer number, current version of the database requires two characters for this field.

Thk
Definition: Thickness of the stratigraphic unit in feet and decimal feet.
Variable Type: Floating point number, current version of the database requires five characters for this field.
Remarks: If the abandoned quarry or pit was not field-checked (see Bibliographic Table) thicknesses may be approximate.

LthMod
Definition: Modifier for the rock type (**Lth** variable).
Variable Type: Alpha-numeric character string, current version of the database requires 13 characters for this field.
Remarks: If the abandoned quarry or pit was not field-checked (see Bibliographic Table) terminology may be nonstandard.

Lth
Definition: Rock type.
Variable Type: Alpha-numeric character string, current version of the database requires 22 characters for this field.
Remarks: If the abandoned quarry or pit was not field-checked (see Bibliographic Table) terminology may be nonstandard.

Col
Definition: Rock color.
Variable Type: Alpha-numeric character string, current version of the database requires 14 characters for this field.
Remarks: One rock color is allowed for each stratigraphic unit. Color terms are generalized from original descriptions. If the abandoned quarry or pit was not field-checked (see Bibliographic Table) terminology may be nonstandard.

Mod1
Definition: A rock property not included in the **LthMod**, **Lth**, or **Col** variables.
Variable Type: Alpha-numeric character string, current version of the database requires 17 characters for this field.
Remarks: Any primary or secondary rock property can be recorded in this variable. If the abandoned quarry or pit was not field-checked (see Bibliographic Table) terminology may be nonstandard.

Mod2
Definition: A second rock property not included in the **LthMod**, **Lth**, or **Col** variables.
Variable Type: Alpha-numeric character string, current version of the database requires 14 characters for this field.
Remarks: Any primary of secondary rock property can be recorded in this variable. If the abandoned quarry or pit was not field-checked (see Bibliographic Table) terminology may be nonstandard.

Sys
Definition: Chronostratigraphic system to which the unit described in the record belongs.
Variable Type: Alpha-numeric character string, current version of the database requires 26 characters for this field.
Remarks: Any system name or combination of system names is an acceptable value.

Fm
Definition: Lithostratigraphic group or formation to which the unit described in the record belongs.
Variable Type: Alpha-numeric character string, current version of the database requires 25 characters for this field.
Remarks: Any Indiana formation or group name recognized by the IGS is an acceptable value for this variable. A group name is used when the formation name is not certain.

Mbr
Definition: Lithostratigraphic member to which the unit described in the record belongs.
Variable Type: Alpha-numeric character string, current version of the database requires 30 characters for this field.
Remarks: Any Indiana member name recognized by the IGS is an acceptable value for this variable.

Smp
Definition: Identification numbers for channel or grab samples from the unit.
Variable Type: Alpha-numeric character string, current version of the database requires seven characters for this field.
Remarks: Sample numbers refer to chemical samples, petrographic samples, and so on. Sample data is stored in IGS files or computer databases.

HISTORY OF OPERATION TABLE

Each record in the History of Operation Table documents an event in the operating history of the abandoned quarry or pit. Every known event, such as opening, closing, yearly production, change in ownership, and so on was included in the History of Operation Table. Variables in the History of Operation Table document the date and nature of the events and make it possible to sort or retrieve the data by date or event.

QuaNum
Definition: The database identification number that links entries in the History of Operation Table with data in the Location, Stratigraphic, and Bibliographic Tables.
Variable type: Integer number, four characters are required for this field.

QuaNme
Definition: Name(s) of the quarry or pit.
Variable type: Alpha-numeric character string, current database version requires 41 characters for this field.
Remarks: Generally a quarry has a single name at any given time. Occasionally, however, a quarry is known by more than one name at the same time. In these cases the first occurring name or the name believed to be correct is listed first in the **QuaNme** variable and all other names are listed in parenthesis following the first.

SeqNum

Definition: A sequencing code number to force the **Sts** codes to sort in correct order when date information is not adequate to establish the order of events.

Variable type: Integer number, one character is required for this field.

Remarks: Four values are possible:

1 = opening date
2 = operating or idle
3 = closing date
"blank" = status not known.

Sts

Definition: Operating status of the quarry or pit during the time period specified in the date fields.

Variable type: Alpha-numeric character string, six characters are required for this field.

Remarks: Four values are possible in this field:

opened = Quarry or pit began operation during the time period specified in the date fields.
active = Quarry or pit was operating during the time period specified in the date fields.
idle = Quarry or pit was temporarily inactive during the specified period of time.
closed = Quarry or pit ceased operation during the time period specified in the date fields.

Mod

Definition: First date field. Modifier term to clarify the data reported in the date fields that follow.

Variable type: Alpha-numeric character string, nine characters are required for this field.

Remarks: Six values are possible in this field:

after = The event occurred after the time period specified in the date fields.
before = The event occurred before the time period specified in the date fields.
early = The event occurred early in the time period specified in the date fields.
late = The event occurred late in the time period specified in the date fields.
mid = The event occurred midway in the time period specified in the date fields.
uncertain = The event probably occurred in the time period specified in the date fields.

Cen

Definition: The century in which the event occurred.

Variable type: Integer number, two characters are required for this field.

Remarks: First of three variables documenting the date of an event. A **Cen** value accompanied by blanks in the **Dec** and **Yr** variables indicates the date is known to the nearest century.

Dec

Definition: The decade in which the event occurred.

Variable type: Integer number, one character is required for this field.

Remarks: Second of three variables documenting the date of an event. A **Cen** and **Dec** value accompanied by a blank in the **Yr** variable indicates the date is known to the nearest decade.

Yr

Definition: The year in which the event occurred.

Variable type: Integer number, one character is required for this field.

Remarks: Third of three variables documenting the date of an event. A **Cen**, **Dec**, and **Yr** value indicates the date is known to the nearest year.

Opr

Definition: The name of the company or individual operating the quarry or pit during the time period specified in the date variables.

Variable type: Alpha-numeric character field, current version of the database requires 41 characters for this field.

Remarks: This field is blank when the operator of the quarry or pit during the time period specified in the date variables is not known.

Prd1

Definition: The primary product produced during the time period specified in the date fields.

Variable type: Alpha-numeric character string, 15 characters are required for this field.

Remarks: Possible values for this variable and the **Prd2** variable are:

"blank" = Product(s) not known.
crushed stone = Crushed stone of any size or composition.
dimension stone = Any dimension stone product.
limestone = Unspecified limestone product(s) probably crushed limestone.
veneer = Veneer stone of any size or composition.

Prd2

Definition: A secondary product produced during the time period specified in the date variables.

Variable type: Alpha-numeric character string, 15 characters are required for this field.

Remarks: Possible values are the same as those listed with the **Prd1** variable.

BIBLIOGRAPHIC TABLE

Each record in the Bibliographic Table is a bibliographic citation. Bibliographic citations are linked to abandoned quarries or pits by the **QuaNum** variable to allow retrieval of all references to an abandoned quarry or pit, a selected group of quarries or pits, or all of the quarries and pits referred to in a selected reference or list of references. The variables in the Bibliographic Table represent the elements of a bibliographic citation one is likely to use in sorting or retrieving bibliographic data. Punctuation and capitalization within variables approximates the bibliographic style used by the IGS. Minor variations in the punctuation and organization of citations is incorporated into this database table to facilitate database searches and allow the citation of sources such as aerial photographs, field notebooks, field checks, and so on.

QuaNum

Definition: The database identification number that links entries in the Bibliographic Table with data in the Location, Stratigraphic, and History of Operation Tables.

Variable Type: Integer number, four characters are required for this field.

Aut

Definition: Author(s) of the reference to a quarry.

Variable Type: Alpha-numeric character string, current version of the database requires 46 characters for this field.

Remarks: An author's initials and surname are given in reversed order. Multiple authors are listed in the **Aut** variable as a string punctuated in standard bibliographic style.

Day

Definition: Day in the date of a reference to a quarry or pit.

Variable Type: Integer number, two characters are required for this field.

Remarks: First of three variables documenting the date of a reference. A "blank" means the day in the date of a reference was not available.

Mon

Definition: Month in the date of a reference to a quarry or pit.

Variable Type: Alpha-numeric character string, nine characters are required for this field.

Remarks: Second of three variables documenting the date of a reference. A "blank" means the month in the date of a reference date was not available.

Yr

Definition: Year in the date of a reference to a quarry or pit.

Variable Type: Integer number, four characters are required for this field.

Remarks: Third of three variables documenting the date of a reference. A "blank" means the year in the date of a reference was not available.

Tle

Definition: Title of a reference to an abandoned quarry or pit.

Variable Type: Alpha-numeric character string, current database version requires 230 characters for this field.

Remarks: Titles are cited as they occur in the original published or informal source. A person's name is reported in the **Tle** variable when the source is a personal communication. The **Tle** variable is blank when the title of the source is not known.

Src

Definition: Source of reference to a quarry (publication, field notebook, aerial photo number, and so on).

Variable Type: Alpha-numeric character string, current version of the database requires 82 characters for this field.

Remarks: Sources of information about abandoned quarries and pits are cited in standard bibliographic style in the **Src** variable. A source that does not have formal title, such as a field note, field reconnaissance, personal communication, or aerial photograph, is not capitalized. The **Src** variable is blank when the source is not known.

Pgs

Definition: Pages where a reference to a quarry was found.

Variable Type: Alpha-numeric character string, current version of the database requires 31 characters for this field.

Remarks: Pages are cited in standard bibliographic style. Variable is blank when the pages are not known or pagination is not relevant.

REFERENCE CITED

Shaver, R. H., Ault, C. H., Burger, A. M., Carr, D. D., Droste, J. B., Eggert, D. L., Gray, H. H., Harper, D., Hasenmueller, N. R., Hasenmueller, W. A., Horowitz, A. S., Hutchison, H. C., Keith, B. D., Keller, S. J., Patton, J. B., Rexroad, C. B., and Wier, C. E., 1986, Compendium of Paleozoic rock-unit stratigraphy in Indiana: Indiana Geological Survey Bulletin 59, 203 p.