



Digital data for construction material sources reported by the Arizona Department of Transportation in 1977 for Maricopa County, Arizona

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**U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY**

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Contents

Contents	1
Preface	3
Disclaimer	3
Introduction	3
Pit Data Sheets	4
Engineering Characteristics	6
Overview	6
Plasticity Index (PI)	6
Los Angeles Abrasion Test	7
Volume Change--Swell (24 hours)	7
Grain-size Analysis	7
Digital Data	8
Introduction	8
Data Sources	11
Data Processing and Accuracy	12
Obtaining Digital Data	12
Setting up the GIS database for use in Arc/Info	13
Querying the GIS data	13
Displaying the data on-screen or to a file for plotting	16
Obtaining Paper Maps	16
References Cited	16
Appendix 1. List of files included in the Open-File Report	18
Appendix 2. FGDC metadata for the digital data	19
Appendix 3. ArcInfo macro language program to create ArcInfo coverages	29
Appendix 4. ArcInfo macro language to draw a map of the general distribution of pits, Maricopa County, Ariz. (map250k.aml).	30

Preface

Data are important products of the U.S. Government. Aggregate is an important national resource. Data describing aggregate resources needs to be released, distributed and safeguarded to insure its future availability to state and federal land managers, private entrepreneurs and researchers to guide in land exchange decisions, and resource exploration and management, as well as to provide data for material sciences research. In addition to this release, the data given here are also available from the Arizona Department of Mines and Mineral Resources, 1502 West Washington St., Phoenix, AZ 85007 (<http://www.admmr.state.az.us/> and from the U.S. Geological Survey Minerals Resource Data System (MRDS) data set that is described at <http://edc.usgs.gov/glis/hyper/guide/mrds>. Paper copies of the Arizona Materials Inventory for Maricopa County and other inventories for some of the other counties of Arizona are available from the Arizona Department of Transportation (ADOT), Materials Group, 1221 N. 21 St., Phoenix, AZ 85009.

Disclaimer

The description and test results of samples found in this digital copy of the aggregate inventory of Maricopa County (fig. 1) by ADOT (1977) represent only the aggregate and fill material that was present at the pit or sample site in Maricopa County at the time of sampling and may not be representative of all the material available. The test results and other data in this inventory do not guarantee that material produced from any of these pits or sample sites met or meet any standards of acceptability for any use. No claim is made that the digital information is complete or accurate. This information is provided for historical background and should be used with care.

Introduction

Material inventories for prospective sources of material for use in building roads and associated structures were prepared by Arizona for several counties including Maricopa County. The inventories provide information about pit locations, materials classification and type, and measures of some characteristics used to determine suitability for aggregate.

The digital data given in this release was published by the (ADOT, 1977) in cooperation with the Federal Highway Administration. This is one of a series of material inventories prepared for Arizona's counties by ADOT since compilation began in 1959. The data set developed here faithfully follows the data given in ADOT (1977) with minimal changes. Names of variables used in the digital data set are shown in Table 2.

Pit Data Sheets

Data extracted from these sheets (ADOT, 1977, p. 57-88) are keyed by pit. Pits can represent a relatively small disturbance in the surface to large production sites with significant area and depth worked using heavy equipment, and have an associated processing plant and material stacking yard. Some pits contributed material used in cement and asphalt; others were borrow pits that contributed materials to make up for short falls in fill need to construct road foundations. Data extract from the sheets include pit number; map sheet number (on which the pit is located); data on public land survey location including quarter section, section, township, and range; highest classification for material found in the pit (listed below); material types (clay, sand, gravel, caliche, etc. (see Table 1)); plasticity index (PI); Los Angeles (LA) abrasion test (500 rotations); swell (24 hours); and percent material passing the 3/4 inch, no. 4, no. 8, no. 40, and no. 200 sieves. Items found in the pit data sheets and not included in this digital release are route number, milepost, location by station, and status of pit photographs.

The following are the highest-class designations for test data representing at least half or more of the total depth of the pit:

- MA**--mineral aggregate (max. passing sieve no. 8 is 50 percent; sieve no. 200 is 8 percent and PI of 3 or less; expectation that 50 percent of the total depth represented in a pit must be usable at the indicated material class; this is also required of all other classes listed below);
- AB**--aggregate base (max. passing no. 8 is 60 percent; no. 200 is 10 percent and PI of 5 or less);
- SM**--select material (max. passing no. 8 is 70 percent; no. 200 is 15 percent and PI of 7 or less);
- BR**--borrow, no limits set;
- CM**--cover material (no specification provided);
- SB**--special backfill (no specification provided);
- SS**--subgrade seal; and
- UK**--unknown.

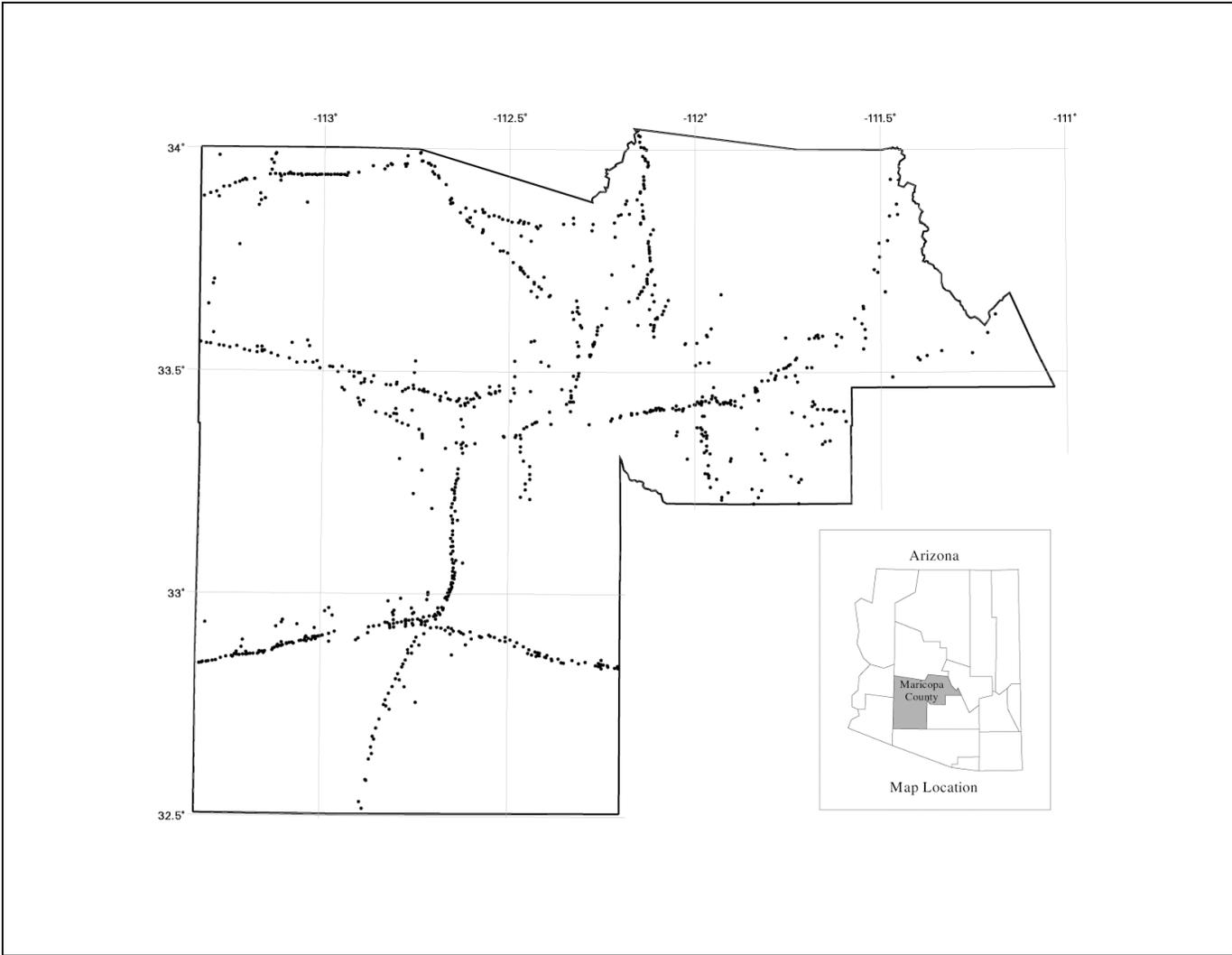


Figure 1. Location of Maricopa County, Arizona and the general distribution of pit locations in the digital data

Table 1. Codes used for various materials found in each pit.

[Classification scheme includes a mix of material types (ash, caliche, cinder, and clay) and classification of material by size (boulders, silty). Some abbreviations are not found in the Maricopa County data; the list is applicable to all counties with data.]

ASH--ash	COB--cobble	RCK--rock
AND--andesite	DEC--decomposed	RHY--rhyolite
BLDR--boulders	DIRT--dirt	SH--shale
BST--basalt, malpais (lava flows)	GTE--granite	SLT--silt
CAL--caliche	GVL--gravel	SLTY--silty
CDR--cinders	GYP--gypsum	SND--sand
CGM--conglomerate	LAV--lava	SS--sandstone
CKR--clinkers	LOM--loam	TRAV--travertine
CLY--clay	LST--limestone	
	PUM--pumice	

Engineering Characteristics

Overview

Some pits are identified by location but lack all other data. Specifications found below are from an earlier material inventory (1972) for Yavapai Co. and may or may not have been in effect at the time the data found in this data set were prepared. See Arizona Highway Department (AHD, 1972). Current specifications are found in ADOT (1990).

Plasticity Index (PI)

PI is reported in one half of the pits listed in the inventory. PI is a measure of the sensitivity of aggregate to moisture change and is important when aggregate is used in Portland cement or asphalt concrete. White (1991, p. 13-42) defines PI as “the difference in the Atterberg liquid limit and plastic limit moisture contents.” The Atterberg liquid limit is the boundary between material performing as a liquid and as a plastic and the Atterberg plastic limit is the boundary between material performance as plastic and a semi-solid state (Marek, 1991). PI is a variable without a unit. A PI of 4 is the maximum allowed as stipulated in American Society of Testing Material (ASTM) test D 3515 for materials used in asphalt concrete mixtures (White, 1991).

The AHD (1972) used several PI standards. Some aggregate classes require that PI not be detectable; other classes require PI be less than 5 or 10. Results given in this data set is from testing executed in accordance with the requirements of American Association of State Highway and Transportation Officials (AASHTO) test T 90 (AHD,

1972). Maximum allowable PI values are dependent on which of the 50 categories of aggregate types are in effect. When testing determined no PI, a “NP” (no plasticity) was entered in the ADOT (1977) table. We have changed all these “NP” to zero and entered -999 when values were missing.

Los Angeles Abrasion Test

The test used to evaluate the resistance of a coarse aggregate to degradation by abrasion and impact is the Los Angeles abrasion test (Meyer and Zeinak 1991). In accordance with ADOT (1990, p. 718) standard specifications “the percent of wear of coarse aggregate at 500 revolutions, when tested in accordance with the requirements of AASHTO test T 96, shall not exceed 40.” The same requirement is also specified for some subbases and bases (ADOT, 1990, p. 140). Some aspects of Los Angeles abrasion testing procedures may have changed so the results found in this data release may not be consistent with current specifications. Los Angeles abrasion test results are found in just 8 percent of the pits listed in the inventory.

Volume Change--Swell (24 hours)

Aggregate that does not undergo changes in volume is most desired. Most volume changes are related to changes in moisture content-- either as expansion or shrinkage. Volume changes are dependent on the number and nature of permeable pores, and may also result from the breakdown of grains during wetting and drying, particularly when aggregates are in unbound use (Marek, 1991). Some clay may also be involved.

Just slightly less than a quarter of the pits listed in the inventory have results of the 24-hour swell test. Data are available giving maximum 24-hour volume change (AHD, 1972). Procedures and standards applicable at the time of the test are not stated in the inventory but most likely was AASHTO 101, Method B (AHD, 1972, Table 703-1 and 704-1). This specification set the maximum allowed volume increase to 0.06. This is the maximum for all classes of mineral aggregate and one class of aggregate used for cover materials and slurry seal.

Grain-size Analysis

Size distribution from sieve analysis is found in 18 percent of the pits listed in the inventory. It appears that all material tested has been crushed to pass the one-inch sieve (25 mm or less) and is reflected in the pit results. Materials passing the 3/4 inch mesh sieve are 19 mm or less; no. 4 mesh sieve are 4.75 mm or less; no. 8 mesh sieve are 2.338 mm or less; no. 40 mesh sieve are 0.42 mm or less; and no. 200 mesh sieve are less than 0.074 mm.

Digital Data

Introduction

Variables contained in the digital data are summarized in table 2. Details about data format are summarized below as well as in greater detail in the metadata. Note that a number of items were not taken from the source document pit data sheets in this database: project number, route number, milepost, location by station, availability of pit photographs, and R-value. These items were not captured to insure that available funds and available staff could be used most effectively to capture the data types considered most important for use in future aggregate assessment. R-value was not captured as it contained little data.

Table 2. Variable name in the pit data sheets (ADOT, 1977), abbreviated variable name, width of the column, output width, variable type, and number of decimals, (ADOT, 1977).

[Variable types: C--character or text; I--integer; and N--decimal. N/A--not applicable. Order--sequence of data as reported on pit data sheets (ADOT, 1977). Highest class--see Table 1. High use class--see text above. Material type--see Table 1 for abbreviations used]

Variable name	Abbrev. in database	Column width	Output column width	Variable type	Number of decimals
Pit number	PITNUM	5	6	C	N/A
Numeric order	ORDER	4	5	I	N/A
Map sheet in source	MAP	2	3	C	N/A
Quarter section	QTR	2	3	C	N/A
Section	SEC	2	3	C	N/A
Township	TWP	3	4	C	N/A
Range	RNG	3	4	C	N/A
Highest use class	HI_CLASS	4	5	C	N/A
Material type	MATERIAL	30	31	C	N/A
Plastic Index	PI	4	5	C	N/A
Abrasion, LA, (500)	ABR_500	4	5	I	N/A
Swell, 24-hr.	SWELL_24	7	8	N	2
Sieve no. 3/4"	THR_QTR	4	5	I	N/A
Sieve no. 4	NUM_4	4	5	I	N/A
Sieve no. 8	NUM_8	4	5	I	N/A
Sieve no. 40	NUM_40	4	5	I	N/A

Variable name	Abbrev. in database	Column width	Output column width	Variable type	Number of decimals
Sieve no. 200	NUM_200	4	5	I	N/A
See Marpits1.ref	Source	4	4	I	N/A

As would be expected in any large data set, some inconsistencies occur. Some pits were present on the maps but not in the pit data sheets and visa versa. Actions were taken to insure there was a one-to-one correspondence between the two (table 3). Pit numbers were added to the digital data if found on maps but not on the pit data sheets. Public land survey descriptions were read directly from the map and entered into the digital data. Multiple pits assigned a single number were separated. Other corrections were taken as needed.

Table 3. Actions taken to insure data consistency.

[PITNUM-NEW--pit number used in the digital data set; PITNUM-ORG--pit number found in ADOT (1977); MAP--map number found in ADOT (1977); QTR--quarter section; SEC--section; TWP--township; RNG--range]

PITNUM-NEW	PITNUM-ORG	ACTION	MAP	QTR	SEC	TWP	RNG
215	-	added; not in pit data sheets	7	NW	15	1N	4E
500	-	added; not in pit data sheets	8	N2	31	5S	4W
501	-	added; not in pit data sheets	9	SE	31	5S	5W
669A	669	edited; appended a letter to make unique	6	SE	11	1S	5W
669B	-	added; not in pit data sheets	6	SE	2	2S	5W
1163	-	added; not in pit data sheets	4	NW	2	6N	9W
1804	-	added; not in pit data sheets	11	NE	12	7S	1E
2085	2085	updated location description based on plot	8	NW	36	6S	2W
2145	-	added; not in pit data sheets	6	NE	21	3N	1E
2161	-	added; not in pit data sheets	3	SE	7	7N	4W
2345	-	added; not in pit	6	NE	35	1N	2W

PITNUM-NEW	PITNUM-ORG	ACTION	MAP	QTR	SEC	TWP	RNG
		data sheets					
3321	-	added; not in pit data sheets	3	NE	29	5N	2W
3341	-	added; not in pit data sheets	3	SE	18	7N	4W
3460	3460	updated location description based on plot	8	NW	36	6S	2W
3468	3468	updated location description based on plot	1	SW	11	5N	8E
3469	3469	updated location description based on plot	1	SW	23	5N	8E
5521	5521	updated location description based on plot	1	SW	23	5N	8E
5522	5522	updated location; used that of pitno 5222	7	NE	18	1N	4E
5732	5732	updated location description based on plot	1	NW	21	3N	8E
5733	5733	updated location description based on plot	1	NE	17	3N	8E
5753A	5753	edited; add letter to make unique	9	NE	7	6S	8W
5753B	-	added; not in pit data sheets	9	N2	7	6S	7W
5965	5965	updated location from plot	1	NW	11	2N	9E
6020A	6020	edited; appended a letter to make unique	2	NE	15	4N	2E
6020B	-	added; not in pit data sheets	2	NW	2	4N	2E
6882A	6882	edited; appended a letter to make unique	2	NW	22	4N	2E
6882B	-	added; not in pit	2	W2	22	4N	2E

PITNUM-NEW	PITNUM-ORG	ACTION	MAP	QTR	SEC	TWP	RNG
		data sheets					
7503	7503	updated location description based on plot	1	SE	34	5N	8E
7504	7504	updated location description based on plot	1	NE	12	5N	8E
7559A	7559	edited; appended a letter to make unique	5	SW	36	3N	8W
7559B	-	added; not in pit data sheets	5	SE	26	3N	8W

Data Sources

See the section on “Obtaining Digital Data” below for the files discussed here. The data set **marpits1** is an ArcInfo coverage of point features representing pit locations and attribution data captured from a hardcopy atlas of map sheets and pit data sheets titled "A Materials Inventory of Maricopa County" (hereafter referred to as the Source) by the Arizona Highway Department (AHD), now the Arizona Department of Transportation (ADOT).

The data set **marbase** is an ArcInfo coverage of arc features representing the generalized Maricopa County boundary, major roadways and major hydrography. It was produced from U. S. Geological Survey 1:2,000,000-scale Digital Line Graph data available over the Internet at:

<http://edcftp.cr.usgs.gov/pub/data/DLG/2M/AZ/>

The marbase data set has been included to give a generalized, though not exact reference of pit location in proximity to natural and man-made features.

Both data sets, marpits1 and marbase, are available in an ArcInfo interchange format. These data and map files produced from them are in a Transverse Mercator projection, State Plane Coordinates, with the following parameters:

SPCS Zone: 3176
 Fips Zone: 202
 Units: Feet
 Scale Factor at Central Meridian: 0.9999
 Longitude of Central Meridian: -111 55 00
 Latitude of Projection Origin: 31 00 00
 Horizontal Datum: North American Datum of 1927

Data Processing and Accuracy

The digital editor and digital compilers of the GIS data set made certain adjustments to the data to make them complete and usable in a GIS. These adjustments include adding points locations for records in the accompanying Source pit data sheets where no point representation existed on the Source map sheets, adding attribution data to the furthest extent possible for points on the Source map sheets without entries in the accompanying Source pit data sheets, appending a letter to the pit number of repeated (duplicate) pit numbers to make them unique and correspond one-to-one with a record in the Source pit data sheets, and adding a '-999' to represent 'No data' or 'No observation' for blank entries in the pit data sheets. Table 3 describes the actions taken to insure data consistency and uniqueness of the individual points.

Locational accuracy was checked by overlaying a plot of the digitized points on the Source map sheets and comparing point locations. The test showed that the location accuracy for the digitized points is no better than 1175 feet or 358 meters. This inaccuracy is in addition to any errors already existing in the Source map sheets. The data present in the marpits1 data set should not to be used at scales greater than 1:176,306 (e.g., 1:24,000 or 1:100,000). The accuracy of the marbase data set has not been determined as it is being provided only for general base map reference.

Obtaining Digital Data

To obtain copies of the digital data and other files for the Open-File Report do one of the following:

- (1) Download the digital files from the USGS public access on the World Wide Web:

URL = <http://geopubs.wr.usgs.gov/open-file/of01-122>

or

- (2) Anonymous FTP from **geopubs.wr.usgs.gov**, in the directory

pub/open-file/of01-122

The Internet sites contain the database for the “Digital data for construction material sources reported by the Arizona Department of Transportation in 1977 for Maricopa County, Arizona”. To manipulate these data in a geographic information system (GIS), you must have a GIS that is capable of reading ArcInfo interchange-format files.

Setting up the GIS database for use in Arc/Info

Create an ArcInfo workspace, move to it, and download all the files from the Open-File Report into that workspace. Start ArcInfo and run the import.aml program (i.e., Arc: &run import, see Appendix 3) to import the ArcInfo interchange format files (.e00). This procedure must be performed prior to using data in ArcInfo. To open the interchange files for use in ArcView, one needs to run "Import71" for each file.

Querying the GIS data

To access source information for each point feature in the data set **marpits1** in ArcInfo a "relate" must be established between the **marpits1** data set and the INFO look-up table **marpits1.ref** which contains the Source citation. An INFO table, **marpits1.rel**, has been provided with the digital data to establish a relate between the data set point attribute table (.pat) and associated INFO table.

One relate (relation) is defined in **marpits1.rel**. Table 4 shows the relation between the point attribute table item 'source' in marpits1.pat and the INFO look-up table marpits1.ref. Table 5 shows the attribute descriptions of marpits.ref, which contains information about the source of the point features in the marpit1 data set.

Table 4. Relate between the marpits1.pat (point attribute table) and attributes found in file marpits1.ref.

MARPITS1.REL						
RELATION	TABLE-ID	DATABASE	ITEM	COLUMN	TYPE	ACCESS
sources	marpits1.ref	info	source	source	ordered	rw

Table 5. Descriptions for items in the **marpits1.ref** data source INFO look-up table

MARPITS1.REF			
ITEM NAME	ITEM TYPE	ITEM LENGTH	ATTRIBUTE DESCRIPTION
source	integer	4	Numeric code used to identify the data source. (This item also occurs in the MARPITS1.PAT file.)
scale	integer	8	Scale of source map. (This value is the denominator of the proportional fraction that identifies the scale of the map that was digitized or scanned to produce the digital map.)
authors	character	200	Author(s) or compiler(s) of source map entered as last name, first name or initial, and middle initial, or the source governmental agency.
year	integer	4	Source (map) publication date
reference	character	250	Remainder of reference in USGS reference format.

To establish (restore) the relate (relation), see the ‘relate’ command usage in the respective ArcInfo module. Once you have restored the relate you can query the source INFO look-up table.

An example of querying the marpits1 data set and the look-up table marpits1.ref in ArcInfo-ArcEdit:

(text between |> and <| represents what was typed in at the prompt. Some words are in boldface for emphasis)

```
Arcedit: |> mapextent marpits1 <|
Arcedit: |> editcoverage marpits1 <|
Arcedit: |> editfeature point <|
Arcedit: |> drawenvironment point <|
Arcedit: |> draw <|
```

```
Arcedit: |>items marpits1.pat <|
COLUMN  ITEM NAME      WIDTH  OUTPUT  TYPE  N.DEC  ALTERNATE NAME  INDEXED?
    1   AREA              4     12     F     3       -              -
    5  PERIMETER         4     12     F     3       -              -
    9  MARPITS1#         4      5     B     -       -              -
   13  MARPITS1-ID       4      5     B     -       -              -
   17  PITNUM            5      6     C     -       -              -
   22  ORDER             4      5     I     -       -              -
   26  MAP                2      3     C     -       -              -
   28  QTR                2      3     C     -       -              -
   30  SEC                2      3     C     -       -              -
   32  TWP                3      4     C     -       -              -
   35  RNG                3      4     C     -       -              -
   38  HI_CLASS          4      5     C     -       -              -
   42  MATERIAL          30     31     C     -       -              -
   72  PI                 4      5     C     -       -              -
   76  ABR_500           4      5     I     -       -              -
```

```

80 SWELL_24      7      8      N      2      -
87 THR_QTR      4      5      I      -      -
91 NUM_4        4      5      I      -      -
95 NUM_8        4      5      I      -      -
99 NUM_40       4      5      I      -      -
103 NUM_200     4      5      I      -      -
107 SOURCE      4      4      I      -      -

```

```
Arcedit: >relate restore marpits1.rel <|
```

```
Arcedit: >show relates <|
SOURCES
```

```
Arcedit: >show relate sources <|
marpits1.ref,info,SOURCE,source,ORDERED,RW
```

```
Arcedit: >items marpits1.rel <|
```

COLUMN	ITEM NAME	WIDTH	OUTPUT	TYPE	N.DEC	ALTERNATE NAME	INDEXED?
1	RELATION	8	8	C	-		-
9	TABLE-ID	128	128	C	-		-
137	DATABASE	8	8	C	-		-
145	ITEM	16	16	C	-		-
161	COLUMN	32	32	C	-		-
193	TYPE	16	16	C	-		-
209	ACCESS	4	4	C	-		-
213	ASDBASE#	4	5	B	-		-
217	ASLCKID#	4	5	B	-		-
221	WHERE	320	320	C	-		-

```
Arcedit: >items marpits1.ref <|
```

COLUMN	ITEM NAME	WIDTH	OUTPUT	TYPE	N.DEC	ALTERNATE NAME	INDEXED?
1	SOURCE	4	4	I	-		-
5	SCALE	8	8	I	-		-
13	AUTHORS	200	200	C	-		-
213	YEAR	4	4	I	-		-
217	REF	320	320	C	-		-

```
Arcedit: >select pitnum = '2339' <|
1 element(s) now selected
```

(**SOURCE** is the key field in the relate between the marpits1 point attribute table, **marpits1.pat** and **marpits1.ref** using the relation "**sources.**" At this time there is only one source for the pit locations but future versions may have other sources.)

```
Arcedit: >list source sources//scale sources//year <|
422
```

```

SOURCE          = 8
SOURCES//SCALE  = 176306
SOURCES//YEAR   = 1977

```

Displaying the data on-screen or to a file for plotting

An ArcInfo macro file, map250k.aml (see Appendix 4), has been included for displaying the data represented in the database. The macro allows the user to draw a map composition on-screen (see the Arcplot map composition commands) or to create an ArcInfo output file, which can be plotted directly or processed into a file for plotting (see the 'display' command in Arcplot).

The file map250k.gra included with the Open-File Report, is an ArcInfo map composition graphics file of the digital database generated by running map250k.aml with the value of the Arcplot: 'display' command, device argument set to 1040 with an option of 1 (.gra, the default). The dimensions of the map250k.gra file are 36.5" wide by 30" tall (landscape format).

A raster transfer language (.rtl) version of the ArcInfo graphics file called map250k.rtl was made using the ArcInfo 'rtl' command. The map250k.rtl file was made from a version of map250k.gra that had been rotated 90 degrees counter-clockwise. The following arguments were used in the rtl command in ArcInfo: Model: 650c (Hewlett-Packard 650c Design Jet plotter), Scale: 1.0, no opaque, no banner, and static colors: 0. For each of the rest of the arguments the default value was used.

Obtaining Paper Maps

Paper copies of the digital geologic map are not available from the U.S. Geological Survey. However, with access to the Internet and access to a large-format color plotter that can interpret graphics metafiles or RTL files, a 1:250,000-scale paper copy of a map of the point data can be made by downloading, processing, and plotting map250k.gra, or by downloading and plotting the map250k.rtl (described above).

References Cited

- Arizona Department of Transportation, 1977, A materials inventory of Maricopa County: Materials Services, Arizona Highway Division, Arizona Department of Transportation, 88 p.
- Arizona Department of Transportation, 1990, Standard specifications for road and bridge construction: Arizona Department of Transportation, Highway Division, 800 p.
- Arizona Highway Department, 1972, A materials inventory of Yavapai County: Arizona Highway Department and Federal Highway Administration, 65 p.
- Beeman, W.R., 1993, Mapbar.aml: U.S. Geological Survey Website, unpublished data, URL: greenwood.cr.usgs.gov.
- Marek, C.R., 1991, Basic properties of aggregate, *in* Barksdale, R.D., ed., The aggregate handbook: Washington, D.C., National Stone Association, p. 3-1 to 3-81.
- Meyer, D.A., and Zeinak, S.P., Jr., S.P., 1991, Structure and economics, *in* Barksdale, R.D., ed., The aggregate handbook: Washington, D.C., National Stone Association, p. 2-1 to 2-17.

White, T.D., 1991, Aggregate as a component of portland cement and asphalt concrete, *in* Barksdale, R.D., ed., The aggregate handbook: Washington, D.C., National Stone Association, p. 13-1 to 13-69.

Appendix 1. List of files included in the Open-File Report

Indented file names are coverages (an ArcInfo vector dataset type) produced upon importing the ArcInfo interchange file listed just above it. All the accompanying files that the ArcInfo GIS software produces and maintains are not listed. Files that ship with ArcInfo (such as linesets and markersets) are not listed. No custom symbol sets or fonts were produced for this Open-File Report.

Abbreviations used:

AI - ArcInfo GIS software program

MS - Microsoft

RTL - Raster Transfer Language

<u>NAME</u>	<u>TYPE</u>	<u>BRIEF DESCRIPTION</u>
disclaim.txt	text	USGS disclaimer
geo_dd.prj	text	AI projection parameters file
import.aml	text	AI macro to import interchange files
indxmap.gra	AI graphics file	Location index map figure
line.key	text	AI line key file
map250k.aml	text	AI macro to draw map composition
map250k.gra	AI graphics	Map of digital data, 36.5" x 30" (landscape)
map250k.rtl	RTL	Map of digital data , rotated 90° (30" X 36.5")
mapbar.aml	text	AI macro to draw a scalebar graphic
mapcred.txt	text	Map/digital data credits
mapproj.txt	text	Information on projection of data sets
marbase.e00 marbase	AI interchange file AI arc coverage	Exported version of marbase coverage Maricopa base map themes (county boundaries, roadways, hydrography)
marpits.met	text	metadata for digital data
marpits1.e00 marpits1	AI interchange file AI point coverage	Exported version of marpits1 coverage Maricopa County pit locations
of01-122.pdf	Adobe Acrobat PDF	Open-File Report (OFR) Text
point.key	text	ArcInfo point key file
readme.txt	text	About files in Open-File Report (this file)
statepln.prj	text	ArcInfo Projection parameters
usgslogo.gra	AI graphics	USGS Logo

Appendix 2. FGDC metadata for the digital data

Identification_Information:

Citation:

Citation_Information:

Originator: Hirschberg, Douglas M. (Digital Compiler)

Originator: Pitts, G. Stephen (Digital Compiler)

Originator: Melcher, Henry L. (Digital Compiler)

Originator: Bliss, James D. (Digital Editor)

Publication_Date: 20010420

Title:

Digital data for construction material sources reported by the Arizona Department of Transportation in 1977 for Maricopa County, Arizona

Edition: Version 1.0, April 20, 2001

Geospatial_Data_Presentation_Form: map

Series_Information:

Series_Name: U.S. Geological Survey Open-File Report

Issue_Identification: 01-122

Publication_Information:

Publication_Place: Tucson, AZ

Publisher: U.S. Geological Survey

Online_Linkage: <<http://geopubs.wr.usgs.gov/open-file/of01-122>>

Description:

Abstract:

The data set marpits1 is an ArcInfo coverage of point features representing pit locations and attribution data captured from an atlas of map sheets and pit data sheets titled "A Materials Inventory of Maricopa County [Arizona]" by the Arizona Highway Department (AHD), now named the Arizona Department of Transportation (ADOT), hereafter referred to as the 'Source'.

Pit locations were represented by point symbols in the Source map sheets. Points were digitized from the Source map sheets. Selected attribute data were collected from the Source pit data and map sheets. In the Source introduction it states:

- > "The pit location maps show the location of all
- > pits bearing Materials Services serial numbers.
- > Other sources are not shown. The plotted locations
- > are as close as possible to the true location
- > as the scale of the map will allow."

The point attribute data, captured from the Source pit data sheets are

- > "designed to show test results (sieve analysis,
- > plasticity index, and abrasion) for the usable
- > material within each ADOT pit."

Purpose:

U. S. Geological Survey scientists desired to have the data presented in the Source in a digital format to use in GIS and spreadsheet software programs for aggregate models and aggregate assessment.

Supplemental_Information:

The digital editor and digital compilers of the GIS data set made certain adjustments to the data to make them complete and usable in a GIS. These adjustments include adding points locations for records in the accompanying Source pit data sheets where no point representation existed on the Source map sheets, adding attribution data to the furthest extent possible for points on the Source map sheets without entries in the accompanying Source pit data sheets, appending a letter to the pit number of repeated (duplicate) pit numbers to make them unique and correspond one-to-one with a record in the Source pit data sheets, and adding a '-999' to represent 'No data' or 'No observation' for blank entries in the pit data sheets. Table 3 in the Open-File Report text describes the actions taken to insure data consistency and uniqueness of the individual points. An accompanying ArcInfo arc coverage called marbase of the generalized Maricopa County boundary, and generalized major roadways and generalized major hydrography of Maricopa County has been included to give a general reference of pit location in proximity to natural and man-made features.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 1977

Currentness_Reference: 1974 to 1977

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None Planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -113.4

East_Bounding_Coordinate: -111.1

North_Bounding_Coordinate: 34.0

South_Bounding_Coordinate: 32.5

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: geology

Theme_Keyword: aggregate

Theme_Keyword: industrial materials

Theme_Keyword: materials survey

Theme_Keyword: engineering properties

Theme_Keyword: physical properties

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Maricopa County

Place_Keyword: State of Arizona

Access_Constraints: none

Use_Constraints:

These data are not to be used at scales greater than 1:176,306. Any data sets or hardcopies utilizing these data sets shall clearly indicate their source. If the user has modified the data in any way he or she is obligated to describe the types of modifications he or she has performed. User specifically agrees not to misrepresent these data sets, nor to imply that changes he or she made were approved by the U.S. Geological Survey or the Arizona Department of Transportation (ADOT).

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: James D. Bliss

Contact_Organization: U.S. Geological Survey

Contact_Position: Geologist

Contact_Address:

Address_Type: mailing and physical address

Address: 520 N. Park Ave., Suite 355

City: Tucson

State_or_Province: AZ

Postal_Code: 85719-5035

Country: USA

Contact_Voice_Telephone: (520) 670-5502

Contact_Facsimile_Telephone: (520) 670-5571

Contact_Electronic_Mail_Address: jbliss@usgs.gov

Data_Set_Credit:

The authors wish to thank Michelle Perez for helping in the capture of the attribution data and Richard Ahern, Arizona State Land Department, for reviewing the data presented in the marpits1 data set with the data in the Source pit data sheets.

Native_Data_Set_Environment:

SunOS, 5.6, sun4u UNIX

ARC/INFO version 7.2.1

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

Attribution data captured from the Source pit data sheets were compared to the Source to check for typographical errors. Hard copy maps were produced with the pit number labeled for each pit location and manually checked.

Pit locations were infrequently found to have legal descriptions in the Source pit data sheets inconsistent with the displayed pit location on the Source map sheets. No attempt was made to update the legal descriptions shown in the Source pit data sheets.

Logical_Consistency_Report:

Point features present. Points were digitized at the center of each symbol representing a pit location on the Source map sheet. Where two or more pit number labels pointed to the same symbol a point was added for each of the labels, thus some points will overlap when displayed at the scale at which the data were digitized (1:176,306). In some cases one of the points may have been digitized slightly off-center.

Completeness_Report:

All pit locations depicted on the Source map sheets or with a record in the Source pit data sheets were captured.

Positional_Accuracy:

Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report:

Maps prepared using the digitized points overlain on the Source map sheets on a light table and suggest that the locational accuracy for the digitized points is no better than 2 millimeters (1175 feet or 358 meters at scale). Plots of the pit locations over a Public Land Survey sections GIS data set available from the Arizona State Land Department produced maps to display pit locations within PLSS sections. The result showed consistent locational fidelity between pit location and PLSS quarter-section in the digital data as compared to the Source.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Originator:

Materials Services, Arizona Department of
Transportation, Highway Division

Publication_Date: 1977

Title: A Materials Inventory of Maricopa County (Arizona)

Geospatial_Data_Presentation_Form: atlas

Series_Information:

Series_Name: Arizona Materials Inventory

Issue_Identification: none

Publication_Information:

Publication_Place: Phoenix, Arizona

Publisher:

Reproduction Section, Arizona Department
of Transportation

Source_Scale_Denominator: 176306

Type_of_Source_Media: paper

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 1977

Source_Currentness_Reference: 1977, date of publication

Source_Citation_Abbreviation: Source

Source_Contribution: pit locations and attributes

Process_Step:

Process_Description:

Data from the Source pit data sheets were entered into an Microsoft Excel spreadsheet.

The Source map sheets of pit locations consisted of 11 sheets bound in an atlas. Since the data was to be captured via a digitizer tablet, photocopies were made of each of the Source map sheets. The digitizer was coordinated to within a RMS error of 0.004 for each digitizing session.

At least four tic locations were determined and labeled on each map photocopy. The Source map sheets did not always have known locations to use for control points (tics), requiring that a control point be added along a known longitude-latitude line or State-Plane grid line.

Pit locations on the Source map sheet were digitized on-center of the pit location symbol or in some cases very slightly off-center (see the logical consistency section), and the pit number was attributed. If a pit number was used more than once a letter was appended to make each pit number unique. Table 3 in the Open-File Report text describes the actions taken to insure data consistency and uniqueness of the individual points.

Each of the digital data sets of the Source map sheets were transformed into a common projection then joined together to form one data set for the county.

Process_Date: 1997

Process_Step:

Process_Description:

Check plots were produced for each map sheet data set to proof for locational fidelity to the maps and to proof for pit number attributional correctness. Corrections and additions were made as needed.

Process_Date: 2000

Process_Step:

Process_Description:

First draft of metadata created by D. M. Hirschberg using FGDCMETA.AML ver. 1.2 05/14/98 on ARC/INFO data set marpits1

Process_Date: 20001122

Process_Step:

Process_Description:

Downloaded SDTS-DLG data 1:2,000,000 of boundaries, roadways, and hydrography from USGS web site to create base map data layer. Created an ArcInfo coverage and coded arcs as needed.

Process_Date: 2001

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Point

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: Point

Point_and_Vector_Object_Count: 916

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: State Plane Coordinate System 1927

State_Plane_Coordinate_System:

SPCS_Zone_Identifier: 3176

Transverse_Mercator:

Scale_Factor_at_Central_Meridian: 0.9999

Longitude_of_Central_Meridian: -111 55 00

Latitude_of_Projection_Origin: 31 00 00

False_Easting: 152400.30480

False_Northing: 0

Planar_Coordinate_Information:

Planar_Coordinate_Encoding_Method: coordinate pair

Coordinate_Representation:

Abscissa_Resolution: 65.249909375

Ordinate_Resolution: 65.249909375

Planar_Distance_Units: Feet

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1927

Ellipsoid_Name: Clarke 1866

Semi-major_Axis: 6378206.4

Denominator_of_Flattening_Ratio: 294.98

Entity_and_Attribute_Information:

Overview_Description:

Entity_and_Attribute_Overview:

>

>ITEMS IN MARPITS1.PAT:

>

>	<u>COLUMN</u>	<u>ITEM NAME</u>	<u>WIDTH</u>	<u>OUTPUT</u>	<u>TYPE</u>	<u>N.DEC</u>	<u>ALTERNATE NAME</u>
>	1	AREA	4	12	F	3	
>	5	PERIMETER	4	12	F	3	
>	9	MARPITS1#	4	5	B	-	
>	13	MARPITS1-ID	4	5	B	-	
>	17	PITNUM	5	6	C	-	
>	22	ORDER	4	5	I	-	
>	26	MAP	2	3	C	-	
>	28	QTR	2	3	C	-	
>	30	SEC	2	3	C	-	
>	32	TWP	3	4	C	-	
>	35	RNG	3	4	C	-	
>	38	HI_CLASS	4	5	C	-	
>	42	MATERIAL	30	31	C	-	
>	72	PI	4	5	C	-	
>	76	ABR_500	4	5	I	-	
>	80	SWELL_24	7	8	N	2	
>	87	THR_QTR	4	5	I	-	
>	91	NUM_4	4	5	I	-	
>	95	NUM_8	4	5	I	-	
>	99	NUM_40	4	5	I	-	
>	103	NUM_200	4	5	I	-	

> 107 SOURCE 4 4 I -

>

> BRIEF EXPLANATION OF ITEMS ADDED BY THE AUTHORS TO THE

> MARPITS1 POINT DATA SET:

> (items automatically generated by ArcInfo not detailed)

>-----

> PITNUM -The pit number of the location.

>

> ORDER -The ascending numeric order of the pit number.

>

> MAP -The map sheet (from Source) of the pit.

>

> QTR -Public Land Survey quarter-section or half-section of

> the pit location. nw = northwest, ne = northeast,

> sw = southwest, se = southeast, w2 = western-half,

> n2 = northern-half and so on.

>

> SEC -Public Land Survey section of the pit location.

>

> TWP -Public Land Survey township of the pit location.

>

> RNG -Public Land Survey range of the pit location.

>

> HI_CLASS -Highest classification for material found in the pit.

> The following are the highest class designations for

> test data representing at least half or more of the

> total depth of the pit:

> MA--mineral aggregate

> AB--aggregate base

> SM--select material

> BR--borrow, no limits set

> CM--cover material (no specification provided)

> SB--special backfill (no specification provided)

> SS--subgrade seal

> UK--unknown

>

> MATERIAL -Material types (clay, sand, gravel, caliche, etc.

> Abbreviations used for various materials found in

> each pit: [Classification scheme includes a mix of

> material types (ash, caliche, cinder, clay) and

> classification of material by size (boulders, silty)]

> ASH--ash; AND--andesite; BLDR--boulders;

> BST--basalt, malpais; CAL--caliche; CDR--cinders;

> CGM--conglomerate; CKR--clinkers; CLY--clay;

> COB--cobble; DEC--decomposed; DIRT--dirt;

> GTE--granite; GVL--gravel; GYP--gypsum; LAV--lava;

> LOM--loam; LST--limestone; PUM--pumice; RCK--rock;

> RHY--rhyolite; SH--shale; SLT--silt; SLTY--silty;

> SND--sand; SS--sandstone; TRAV--travertine

> *Note that many of these abbreviations may not be

> found in the data as this list is applicable to data

> for all counties for which data has been collected.

>

> PI -(Plasticity Index) A measure of sensitivity that aggregate

> has to moisture change and is important when aggregate is

- > used in Portland cement or asphalt concrete. White (1991,
- > p. 13-42) defines PI as "the difference in the Atterberg
- > liquid limit and plastic limit moisture contents." It is a
- > value without a unit. A PI of 4 is the maximum allowed as
- > stipulated in American Society of Testing Material (ASTM)
- > test D 3515 for materials used in asphalt concrete mixtures
- > (White, 1991). The Arizona Highway Department (1972) used
- > several PI standards. These include ones where PI was not
- > detected or was to be less than 5 or 10 depending on
- > aggregate classification. Testing was to be executed in
- > accordance with the requirements of American Association
- > of State Highway and Transportation Officers T 90
- > (AHD, 1972). Maximum allowable PI values are dependent on
- > which of the 50 categories of aggregate types are in effect.
- > When testing determined no PI, a "NP" (no plasticity) was
- > entered in the ADOT (1977) table. The Open-File Report
- > authors have changed all these "NP" to zero and entered
- > -999 when fields were without values.
- >
- > ABR_500 -Los Angeles (LA) abrasion test (500 rotations).
- > The test used to evaluate the resistance of a coarse
- > aggregate to degradation by abrasion and impact is the
- > Los Angeles abrasion test (Meyer and Zeinak 1991).
- > In accordance with ADOT (1990, p. 718) standard
- > specifications "the percent of wear of coarse aggregate
- > at 500 revolutions, when tested in accordance with the
- > requirements of American Association of State Highway
- > Transportation Officials (AASHTO) test T 96, shall not
- > exceed 40." The same requirement is also specified for
- > the class of aggregate 1 to 4 for material used in
- > subbases and bases (ADOT, 1990, p. 140). The detail of
- > Los Angeles abrasion testing procedures may have
- > changed so the results found in this data release may
- > not be consistent with current specifications.
- > Los Angeles abrasion test results are found in just 8
- > percent of the pits listed in the inventory.
- >
- > SWELL_24 -Volume change--swell (24 hours).
- > Data are available giving maximum 24-hour volume
- > change (AHD, 1972). Procedures and standards
- > applicable at the time of the test are not given in
- > the inventory but likely may have been AASHTO 101,
- > Method B (AHD, 1972, Table 703-1 and 704-1). These
- > specifications set the maximum allowed volume increase
- > to 0.06. This is the maximum for all classes of
- > mineral aggregate and one class of aggregate used for
- > cover materials and slurry seal.
- >
- > THR_QTR -Percent material passing the 3/4 inch sieve. Materials
- > passing the 3/4 inch mesh sieve are 19 mm or less.
- >
- > NUM_4 -Percent material passing the no. 4 sieve. Materials
- > passing the no. 4 mesh sieve are 4.75 mm or less.
- >
- > NUM_8 -Percent material passing the no. 8 sieve. Materials

- > passing the no. 8 mesh sieve are 2.338 mm or less.
- >
- > NUM_40 -Percent material passing the no. 40 sieve. Materials
- > passing the no. 40 mesh sieve are 0.42 mm or less.
- >
- > NUM_200 -Percent material passing the no. 200 sieve. Materials
- > passing the no. 200 mesh sieve are less than 0.074 mm.
- >
- > SOURCE -Numeric value that relates to marpits1.ref look-up
- > table giving information on the Source.
- >

Entity_and_Attribute_Detail_Citation: none

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey Information Services

Contact_Address:

Address_Type: mailing address

Address: Open-File Reports, Box 25286

City: Denver

State_or_Province: CO

Postal_Code: 80225

Country: USA

Contact_Voice_Telephone: 1-303-202-4200

Contact_Facsimile_Telephone: 1-303-202-4693

Standard_Order_Process

Digital_Form

Digital_Transfer_Information

Format_Name: ArcInfo Export format, Adobe PDF

Format_Version_Number: ArcInfo 7.2.1

Format_Information_Content: Attributed point data

File-Decompression_Technique: No compression applied

Transfer_Size: 0.3 MB

Digital_Transfer_Option

Online_Option

Computer_Contact_Information

Network_Address

Network_Resource_Name:

<<http://geopubs.wr.usgs.gov/open-file/of01-122>>

Fees: none

Distribution_Liability:

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These data are not meant to be used or displayed at any scale larger than 1:176,306 (e.g. 1:100,000 or 1:24,000).

Metadata_Reference_Information:

Metadata_Date: 20010103

Metadata_Review_Date: March-April 2001

Metadata_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Contact_Person: G. Stephen Pitts

Contact_Position: GIS Lab coordinator

Contact_Address:

Address_Type: mailing and physical address

Address: 520 N. Park Ave, Suite 355

City: Tucson

State_or_Province: AZ

Postal_Code: 85719

Country: USA

Contact_Voice_Telephone: (520) 670-5511

Contact_Facsimile_Telephone: (520) 670-5571

Contact_Electronic_Mail_Address: bear@usgs.gov

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998

Metadata_Access_Constraints: none

Metadata_Use_Constraints: none

Appendix 3. ArcInfo macro language program to setup ArcInfo coverages (import.aml)

```
/**=====
/**----- 1) PRIMARY AML INFORMATION
/**      NAME: import.aml
/**      TITLE: Import ArcInfo interchange files
/**      LATEST: Feb-01-2001
/**      PURPOSE: Imports the ArcInfo interchange files listed in the body of this file
/**                to create ArcInfo coverages and INFO Tables for the GIS database.
/**      USAGE: Arc: &run import.aml
/**      OUTPUT: two ArcInfo coverages created from interchange (.e00) files.
/**
/**----- 2) REQUIRES AND VARIABLES:
/**      FILES: marpits1.e00, marbase.e00
/**      VARIABLES: (none)
/**
/**----- 3) AML HISTORY AND SECONDARY INFO.
/**      CREATED: By: Doug Hirschberg   Date: Jan-30-2001
/**      PLATFORM: Run successfully on Arc/Info 7.2.1, Sun Solaris 2.6 OS.
/**      CATEGORY: Arc
/**      DISCLAIMER: This program has been tested and has worked to perform the
/**                    specified purpose. No warranty is expressed or implied as
/**                    to its performance on any other system.
/**=====
/*&echo &on
/***** BAILOUT SETUP *****/
&severity &error &routine bail.rou

/***** IMPORT SEQUENCE *****/
import cover marpits1.e00 marpits1

import cover marbase.e00 marbase

/***** NORMAL END PROGRAM *****/
&return \ %AML$FILE% has ended successfully! \

/***** BAILOUT ROUTINE *****/
&routine bail.rou
&return \ Error in: %AML$FILE% line: %AML$ERRORLINE%, stopping! \

/** end of import.aml program **/
```

Appendix 4. ArcInfo macro language program to draw a map of the general distribution of pits, Maricopa County, Ariz. (map250k.aml).

```
/**=====
/**----- 1) PRIMARY AML INFORMATION
/**      NAME: map250k.aml
/**      TITLE: Map at 1:250,000-scale
/**      LATEST: May-23-2001
/** OTHER NAME: -
/**      PURPOSE: Draw a map of the Maricopa County, AZ. pit data at 1:250,000-scale for USGS
/**              Open-File Report 01-122.
/**      USAGE: Arcplot: &run map250k.aml
/**      OUTPUT: A map to the screen display or to a file; designed for the user to set
/**              the type of output prior to running. (See the Arcplot 'display 1040'
/**              command and map composition commands in ArcInfo version 7.2.1)
/**
/**----- 2) REQUIRES AND VARIABLES
/** (Files shipped with ArcInfo 7.2.1 are not listed)
/**      AMLS: mapbar.aml
/**      DATASETS: marpits1, marbase
/**      FAT ITEMS: marbase.aat-major1;
/**      GRAPHICS: indxmap.gra
/**      KEY FILES: line.key, point.key
/**      LOOKUPS: (none)
/**      SYMBOLSETS: (no custom symbolsets)
/**      TEXT FILES: disclaim.txt, geo_dd.prj, mapcred.txt, mapprj.txt, statepln.prj
/**      VARIABLES: pntcov -Name of point coverage to plot
/**
/**----- 3) AML HISTORY AND SECONDARY INFO.
/**      CREATED: By: Doug Hirschberg   Date: Jan-30-2001
/**      PLATFORM: ArcInfo 7.2.1, Solaris 2.6
/**      LINEAGE: first
/**      UPDATE: May-15-2001, By: DH
/**              Made fixes to map per review; Added OFR number and approval date.
/**      CATEGORY: Arcplot
/**      COMMENTS: This AML can be used to make a map composition, a graphics
/**              file, or other file types. See 'display 1040' and map
/**              composition commands in Arcplot.
/**      EXECUTION: User runs this AML in the Arcplot module of ArcInfo.
/**              A bailout routine is designed to stop execution of the
/**              program and report the line number of the error. When the
/**              program ends you will still be in Arcplot.
/**      DISCLAIMER: This program has been tested and has worked to perform the
/**              specified purpose. No warranty is expressed or implied as
/**              to its performance on any other system.
/**=====
/******* ARC PLOT BAILOUT SETUP *****
&severity &error &routine apbail.rou

/******* COVERAGE VARIABLE ASSIGNMENT *****
&sv pntcov marpits1
```

```

/***** MAP PARAMETERS *****/
pageunits inches
pagesize 36.5 30
mappos cen 17.8,14.2
mapunits feet
mapextent tic %pntcov%
mapscale 250000
maplimits 0.5 0.5 36 29.5
mapprojection statepln.prj statepln.prj
/*!mapinfo

/***** SYMBOLSETS *****/
linedelete all; lineset plotter.lin
markerdelete all; markerset plotter.mrk
textdelete all; textset font.txt
&call makeline.rou  /**(1) Create Custom symbols routine

/**+++++++ M A P ++++++
&call mar_roads.rou  /**(2) Draw Major Roadways (arcs)

&call mar_hydro.rou  /**(3) Draw Major Hydrography (arcs)

&call mar_cnty.rou  /**(4) Draw County Boundary (arcs)

&call mar_pits.rou  /**(5) Draw Pit Locations (points)

/**+++++++ C O L L A R ++++++
linesymbol 1
box 0.05 0.05 36.45 29.95  /** Page outline

&call topcol.rou  /**(6) USGS logo, OFR info.

&call botcol.rou  /**(7) Titles, scalebar, proj. info, index map

&call neatline.rou  /**(8) Draw neatline hatch

&call yada.rou  /**(9) Credits-Disclaimer-Approval Date

/**+++++++ E N D ++++++

/***** END PROGRAM NORMALLY *****/
&call cleanup.rou
&return \ %AML$FILE% has ended successfully! \

/***** BAILOUT ROUTINE *****/
&routine apbail.rou
&call cleanup.rou
&return \ Error in: %AML$FILE% line: %AML$ERRORLINE%, stopping! \

/***** CLEANUP ROUTINE *****/
&routine cleanup.rou
clipmape off; &echo &off; &wat &off

```

```
&fullscreen &off; clearsel; &dv *
linescale 1; markerscale 1
mapshift none; mapwarp off
&return
```

```
/**+++++ R O U T I N E S +++++
```

```
/****** (1) MAKE SYMBOLS ROUTINE *****/
```

```
&routine makeline.rou
linetype wide; linesize 0.02; linecolor gray
lineput 999
linetype wide; linesize 0.02; linecolor cyan
lineput 998
```

```
markerfont 24
markerpattern 72
markersize .08 .08
markercolor red
markerput 999
&return
```

```
/****** (2) DRAW MAJOR ROADS ROUTINE *****/
```

```
&routine mar_roads.rou
linesymbol 999
resel marbase arc major1 = '170'
arcs marbase
clearsel
&return
```

```
/****** (3) DRAW HYDROGRAPHY ROUTINE *****/
```

```
&routine mar_hydro.rou
linesymbol 998
resel marbase arc major1 = '050'
arcs marbase
clearsel
&return
```

```
/****** (4) DRAW COUNTY BOUNDS ROUTINE *****/
```

```
&routine mar_cnty.rou
linesym 5
resel marbase arc major1 = '090'
arcs marbase
clearsel
&return
```

```
/****** (5) DRAW MARICOPA PITS ROUTINE *****/
```

```
&routine mar_pits.rou
markersymbol 999
points %pntcov%
&return
```

```
/****** (6) TOP COLLAR *****/
```

```
&routine topcol.rou
```

```
/** Left **
```

```

plot usgslogo.gra box 0.5 28.5 4.5 29.5
textsymbol 14
textstyle typeset
textquality prop
textspacing 1.1
textsize 0.3 0.3
textoffset 0,0
textjust ul
move 3.7 29.5
text 'DEPARTMENT OF THE INTERIOR'
move 3.7 29.1
text 'U.S. GEOLOGICAL SURVEY'

/**** Right ****
textjust ur
move 36 29.5
text 'OPEN-FILE REPORT 01-122'
move 36 29.1
text [quote SHEET 1 OF 1, VERSION 1.0]
&return

/***** (7) BOTTOM COLLAR *****/
&routine botcol.rou

/**** TITLEAGE
textsymbol 16
textjust lc
textoffset 0,0
textsize 0.5 0.5
move 26.7 10.6
text [quote Digital data for construction material sources reported by the]
move 26.7 9.9
text [quote Arizona Department of Transportation in 1977 for Maricopa County, Arizona]

/****BYLINE
textsymbol 14
textjust lc
textoffset 0,0
textsize 0.2 0.2
move 26.7 9.2
text 'by'
textsize 0.27 0.27
move 26.7 8.7
text [quote D.M. Hirschberg, G.S. Pitts, H.L. Melcher, and J.D. Bliss ]

/****INDEX MAP
plot indxmap.gra box 30 2 34 6 /** 4" x 4"

linesymbol 1
textsymbol 14
textjust ll
textsize 0.18 0.16
textoffset -0.1 0.05

/****POINT LEGEND

```

keyposition 21.6 6.6
keybox 0.1 0.1
keyseparation 0.2 0.1
keymarker point.key nobox

/***/LINE LEGEND
keyposition 21.2 6.3
keybox 0.5 0.1
keyseparation 0.2 0.1
keyline line.key nobox

/***/MAP PROJECTION INFO
textsize 0.1 0.1
textjust ll
move 23.3 1.9
textfile mapproj.txt

/***/SCALEBAR
textsiz 0.12 0.12
textoffset 0 0
textjust ll
&r mapbar.aml 21 3 [show mapscale] /**Usage: <X> <Y> <mapscale>
/** uses plotter.lin, linesymbol 1
&return

/***/ (8) DRAW NEATLINE ROUTINE /***/
&routine neatline.rou
textsymbol 1
textsize 0.14 0.14
textstyle typeset
&format 0

/***/BOX 1:
linesymbol 0
neatline 59080,544900,417413,1111566 statepln.prj
textjust lc; textoffset -0.1,0; textangle 90
neatlinelabels 0.5 LEFT all geo_dd.prj DMS
textjust lc; textoffset 0,0.1; textangle 0
neatlinelabels 0.5 TOP all geo_dd.prj DMS
linesymbol 1; linecolor cmyk 40 40 40 0
neatlinegrid 0.5 0.5 geo_dd.prj

/***/BOX 2:
linesymbol 0
neatline 417413,796983,780038,1111566 statepln.prj
textjust lc; textoffset 0,0.1
neatlinelabels 0.5 TOP 1 2 geo_dd.prj DMS
textjust lr; textoffset 0.1,0.1
neatlinelabels 0.5 TOP 3 geo_dd.prj DMS
linesymbol 1; linecolor cmyk 40 40 40 0
neatlinegrid 0.5 0.5 geo_dd.prj

linesymbol 1; linecolor 1
&return

```
/****** (9) CREDITS/DISCLAIMER/APPROVAL ROUTINE *****/
```

```
&routine yada.rou  
textsymbol 14  
textsize 0.1 0.1  
textjust ll
```

```
/***MAP CREDIT  
move 31.5 17.3  
textfile mapcred.txt
```

```
/***DISCLAIMER  
move 31.5 16.7  
textfile disclaim.txt
```

```
/***MANUSCRIPT APPROVAL  
move 31.5 15.8  
text 'Manuscript approved on April 20, 2001'  
&return
```

```
/*** end **
```