

(200)

R290

no. 81-1047



UNITED STATES DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

ANAYLTICAL METHOD CODES AND DESCRIPTIONS FOR WELL
AND OUTCROP SAMPLES:

EASTERN GAS SHALES PROJECT DATA SYSTEM

T.S. DYMAN

L.A. WILCOX

and

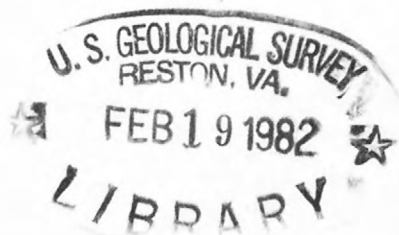
M.R. FOSTER

Open-file report
United States
Geological Survey

the anal ✓

OPEN-FILE REPORT

81-1047



This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

321759

TABLE OF CONTENTS

Introduction.....	1
Analytical Method Codes and Descriptions.....	4
Appendix A: EGSP Card Classes and Descriptions.....	37
Appendix B: EGSP Contractor and Laboratory Codes.....	42

INTRODUCTION

The United States Geological Survey and Petroleum Information Corporation (PI) of Denver have created a large computerized file of sample data for the Eastern Gas Shales Project (EGSP) as a responsibility to the U.S. Department of Energy (DOE), Morgantown Energy Technology Center (METC), Morgantown, West Virginia. The EGSP was initiated in 1976 by METC to investigate gas resources in Devonian shales found in the Appalachian basin. An objective of the EGSP is to accumulate a data base characterizing these shale units which can be used to assess future development of the gas resource. More than 30 government and industry participants served as contractors and contributed data from their research.

Sample data which was gathered from EGSP contractors in card-image formats developed for the EGSP, falls into 3 categories: (1) geochemical, (2) physical character, and (3) lithology. The EGSP Sample Data File contains more than 50,000 fixed-length records of information on cored wells, other special wells, and outcrops throughout the Appalachian basin. Each record (or card) contains a 4-column card class, an alphanumeric identifier, that distinguishes it from every other record (Dyman and Wilcox, 1979), and space for a 2- to 4- column alphanumeric method code describing analytical methods and preparation procedures for samples processed by an EGSP contractor. Appendix A contains a description of each EGSP card class. Table 1 contains the format of a typical geochemical record to store elemental analysis data. Here KER1, in card-columns 1-4, is the card class. Six different fields are also

CARD 35

ELEMENTAL ANALYSIS OF KEROGEN, FOR
OXYGEN, SULFUR, CARBON, HYDROGEN, NITROGEN

<u>Card Column</u>	<u>Data Type</u>	<u>Field Description</u>
1 - 4	KER1	Card Class - KER2 to KER9 can be added as needed.
5 - 12	AAAAAAAA*	Sample number
13 - 17	XX.XX**	Weight percent Oxygen
18 - 19	AA*	Method code
20 - 24	XX.XX	Weight percent Sulfur
25 - 26	AA	Method code
27 - 31	XX.XX	Weight percent Carbon
32 - 33	AA	Method code
34 - 38	XX.XX	Weight percent Hydrogen
39 - 40	AA	Method code
41 - 45	XX.XX	Weight percent Nitrogen
46 - 47	AA	Method code (general)
48 - 49	AA	Method code (kerogen extraction)
50 - 80		Blank

* Letter A represents an alphanumeric character.

** Letter X represents numeric characters (decimal points inserted).

TABLE 1. GEOCHEMICAL RECORD FOR ELEMENTAL-ANALYSIS DATA.

provided for methods to determine elemental weight percents and kerogen extraction procedures.

Because several EGSP contractors using slightly different analytical techniques may have contributed data for the same card class, different codes were established for each contractor and laboratory from which data was received (Appendix B). Method codes and descriptions were compiled from information supplied directly by each contractor.

The purpose of this report is to present method codes and descriptions of analytical procedures to METC for each EGSP contractor. The following section contains these codes and procedures in tabular form for each contractor, laboratory, and card class. The file has been made available to METC on digital tape for future processing with the Sample Data File (Dyman, 1981).

This report has been prepared as part of the U.S. Geological Survey responsibility to the Department of Energy under Contract E(49-18)-2287.

ANALYTICAL METHOD CODES AND DESCRIPTIONS

MORGANTOWN ENERGY TECHNOLOGY CENTER
MORGANTOWN, WEST VIRGINIA 26505

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
ME		VI	LITH	VISUAL INSPECTION. REFER TO MORGANTOWN ENERGY TECHNOLOGY CENTER (METC) FIELD AND LABORATORY PROCEDURES MANUAL FOR ORIENTED CORE ANALYSIS OF DEVONIAN SHALES, JUNE 1977, METC, MORGANTOWN, WEST VIRGINIA 26505
ME		VIN	PALO	VISUAL INSPECTION. REFER TO METC FIELD AND LABORATORY PROCEDURES MANUAL FOR ORIENTED CORE ANALYSIS OF DEVONIAN SHALES, JUNE 1977, METC, MORGANTOWN, WEST VIRGINIA 26505
ME		TOP	DITS	TINIUS OLSON PRESS. REFER TO METC FIELD AND LABORATORY PROCEDURES MANUAL FOR ORIENTED CORE ANALYSIS OF DEVONIAN SHALES, JUNE 1977, METC, MORGANTOWN, WEST VIRGINIA 26505. CYLINDRICAL SPECIMENS WERE CUT FROM THE ORIENTED CORE TO ACHIEVE DISKS HAVING A DIAMETER/THICKNESS RATIO OF ABOUT 2. TENSILE STRENGTH WAS MEASURED BY THE DIAMETRIC OR LINE LOAD TECHNIQUE. IN THIS TEST, SPECIMENS WERE PLACED ON THEIR EDGE BETWEEN HALF CYLINDERS WELDED TO THE PLATENS OF THE LOADING MACHINE AND A COMPRESSIVE LOAD WAS APPLIED ACROSS THE DIAMETER. TENSILE STRENGTH NORMAL TO THE AXIS OF LOADING WAS DETERMINED FROM THE MAGNITUDE OF THE APPLIED LOAD AT FAILURE BY THE FORMULA:

$$S_T = \frac{2P}{DT} \text{ or } 2P/DT$$

*CON = CONTRACTOR

MORGANTOWN ENERGY TECHNOLOGY CENTER
MORGANTOWN, WEST VIRGINIA 26505

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
ME		TOP	DITS	<p>WHERE S_T = TENSILE STRENGTH, PSI, P = APPLIED LOAD OF FAILURE, POUNDS, D = DIAMETER OF DISK, INCHES T = THICKNESS OF DISK, INCHES.</p> <p>IN THIS MANNER, SPECIMENS WERE TESTED FOR EACH OF SIX DIRECTIONS REPRESENTING 30 DEGREE INTERVALS SO THAT A STATISTICAL EVALUATION OF TENSILE STRENGTH VARIATION COULD BE OBTAINED. RESULTS WERE DISPLAYED IN A HISTOGRAM IN ORDER TO DETERMINE STATISTICALLY SIGNIFICANT MINIMUMS WHICH USUALLY OCCUR IN AZIMUTHS NORMAL TO THE PREFERRED DIRECTION OF FRACTURE. IN THOSE TESTS, COMPARATIVE RATHER THAN ABSOLUTE VALUES ARE THE DESIRED QUANTITIES FOR THE PURPOSE OF PREDICTING FRACTURE ORIENTATION.</p>
ME		SHM	PDEN	<p>SCLEROSCOPE HARDNESS MEAN IS COMPUTED AS THE MEAN OF MINIMUM AND MAXIMUM VALUES OF SCLEROSCOPE HARDNESS. PERMEABILITY MEASUREMENTS WERE MADE IN A HASSLER CELL USING ROUTINE WHOLE CORE PERMEABILITY TECHNIQUES WITH DRY NITROGEN AS THE FLOW MEDIUM. PERMEABILITIES WERE MEASURED: (1) IN A DIRECTION PASSING THROUGH THE PRIMARY ORIENTATION GROOVE, (2) IN A DIRECTION 120 DEGREES CLOCKWISE FROM THE INITIAL</p>

MORGANTOWN ENERGY TECHNOLOGY CENTER
MORGANTOWN, WEST VIRGINIA 26505

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
ME		SHM	PDEN	MEASUREMENT, AND (3) IN A DIRECTION 240 DEGREES CLOCKWISE FROM THE INITIAL MEASUREMENT. EACH MEASUREMENT WAS REPEATED SEVERAL TIMES TO DETECT ANY POSSIBLE LEAKAGE AND TO CONFIRM VALUES. NO DIFFICULTIES WERE ENCOUNTERED. FROM METC FIELD AND LABORATORY PROCEDURES MANUAL FOR ORIENTED CORE ANALYSIS OF DEVONIAN SHALES, JUNE 1977, METC, MORGANTOWN, WEST VIRGINIA 26505.
ME		P/T	PL0D	HEMISPHERICAL PLATES, TINNIUS OLSON SCALE. REFER TO METC FIELD AND LABORATORY PROCEDURES MANUAL FOR ORIENTED CORE ANALYSIS OF DEVONIAN SHALES, JUNE 1977, METC MORGANTOWN, WEST VIRGINIA 26505.
ME		PZ	SON1	SIX TEST SPECIMENS, ABOUT 5 INCHES LONG, WERE SELECTED FROM THE ORIENTED CORE FOR MEASUREMENTS OF SONIC VELOCITY VERSUS DIRECTION. THE SPECIMENS WERE ORIENTED WITH RESPECT TO TRUE NORTH AND OUTLINED AROUND THE CIRCUM-FERENCE INTO SIX EQUAL SEGMENTS, 30 DEGREES APART. INSPECTION MEASUREMENTS WERE MADE AT ATMOSPHERIC PRESSURE USING THE THROUGH TRANSMISSION ARRANGEMENT OF TRANSDUCERS. THE MECHANICAL PULSE GENERATED BY A 500 KHZ PIEZOELECTRIC PZT-5 CERAMIC TRANSDUCER WAS TRANSMITTED DIAMETRICALLY THROUGH THE TEST SPECIMEN AT A PULSE AMPLITUDE OF 5,000 VOLTS AND DETECTED BY A RECEIVER-

MORGANTOWN ENERGY TECHNOLOGY CENTER
MORGANTOWN, WEST VIRGINIA 26505

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
ME		PZ	SON1	<p>TRANSDUCER. TRANSIT TIME BETWEEN THE TRANSMITTING AND RECEIVING UNITS WAS DETECTED BY AN INTERVAL TIMER WHICH WAS SET TO DISPLAY THE AVERAGE OF 100 PULSES. DURING EACH TEST, READINGS WERE MADE FOR 30 DEGREE INTERVALS UNTIL AT LEAST THREE MEASUREMENTS WERE OBTAINED AT EACH POINT. THE READINGS WERE AVERAGED AND CORRECTED FOR SYSTEM DELAY. VELOCITIES WERE DETERMINED BY DIVIDING THE LENGTH TRAVELLED BY THE TRANSIT TIME AND ARE EXPRESSED IN KM/SEC. MINIMUM VALUES OF SONIC VELOCITY SHOULD BE INDICATIVE OF INTERVALS OF MINIMUM STRENGTH AND BOTH USUALLY OCCUR NORMAL TO THE PREFERRED DIRECTION OF FRAC-TURING. FROM METC FIELD AND LABORATORY PROCEDURES MANUAL FOR ORIENTED CORE ANALYSIS OF DEVONIAN SHALES, JUNE 1977, METC, MORGANTOWN, WEST VIRGINIA 26505.</p>
ME		GON	FRAC	<p>GONIOMETER. FRACTURE TYPES WERE DETERMINED BY VISUAL INSPECTION.</p>

NEW YORK STATE COLLEGE OF CERAMICS
ALFRED, NEW YORK 14802

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
AU	WB	WC	ELM1- ELM8	WET CHEMISTRY. ANALYSES DETERMINED FOR SILICON, ALUMINUM, IRON, MAGNESIUM, CALCIUM, TITANIUM, PHOSPHOROUS, AND BORON. BORON WAS COLORIMETRICALLY DETERMINED BY CURCUMIN COMPLEX. A DETAILED EXPLANATION OF THE WET CHEMISTRY PROCEDURE IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	AA	ELM1- ELM9	ATOMIC ABSORPTION SPECTROSCOPY. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	SI	ELM2- ELM3	SPECIFIC-ION-ELECTRODE METHOD. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	LE	ELM2 ELM5 ELM7	LECO TECHNIQUE. FOR SULFUR, CARBON, AND NITROGEN. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF

NEW YORK STATE COLLEGE OF CERAMICS
ALFRED, NEW YORK 14802

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
AU	WB	LE	ELM2 ELM5 ELM7	DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	FP	ELM4 ELM6	FLAME PHOTOMETRY. FOR LITHIUM, SODIUM AND POTASSIUM. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	XD	MIN1	X-RAY DIFFRACTION. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	P	DITS	POUNDS PER SQUARE INCH. ATOMIC ABSORPTION.
AU	WB	DTS	DITS	DIRECTIONAL TENSILE STRENGTH. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGAN- TOWN, WEST VIRGINIA 26505.
AU	WB	PLF	PL0D	POINT LOAD FRACTURE. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC,

NEW YORK STATE COLLEGE OF CERAMICS
ALFRED, NEW YORK 14802

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
AU	WB	PLF	PLOD	MORGANTOWN, WEST VIRGINIA 26505
AU	WB	DEC	SHER	AVERAGE SHEAR MODULUS. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES. EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	SON	SON1	DIRECTIONAL SONIC VELOCITY. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	DEN	PDEN	NITROGEN ABSORPTION. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.
AU	WB	YNG	YUNG	YOUNG'S MODULUS. A DETAILED EXPLANATION IS AVAILABLE IN THE ALFRED UNIVERSITY FINAL REPORT TO METC, THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF DEVONIAN GAS SHALES, EGSP REPORT 18 JANUARY 1978, METC, MORGANTOWN, WEST VIRGINIA 26505.

JUNIATA COLLEGE
DEPARTMENT OF CHEMISTRY
HUNTINGDON, PENNSYLVANIA 16652

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
JC	PS	GDA	DIF1	<p>GASEOUS DIFFUSION ANALYSIS. REFER TO JUNIATA COLLEGE REPORTS SUBMITTED TO THE DEPARTMENT OF ENERGY, METC, STUDY OF HYDROCARBON-SHALE INTERACTION PROGRESS REPORTS (ORO-5197), METC, MORGANTOWN, WEST VIRGINIA 26505. MEASUREMENTS WERE MADE USING A SEMIAUTOMATED VOLUMETRIC GAS ABSORPTION SYSTEM. CALIBRATION OF THE GAS BURET IS REPRODUCIBLE TO $\pm .01$ PERCENT. TEMPERATURE CONTROL OF THE ENTIRE APPARATUS IS OBTAINED BY MOUNTING ALL PARTS ON A $1/4$" COPPER PLATE, THE BACK OF WHICH HAS COPPER COILS WHICH CIRCULATE THERMOSTATED WATER MAINTAINED WITH $\pm .01^{\circ}\text{C}$ (SHORT TERM STABILITY) AS DETERMINED BY A THERMOMETER WITH CALIBRATION TRACEABLE TO NBS. THE PRESSURE TRANSDUCER IS A DATAMETRICS 570D, 1000T 2A1 H5 WITH 1173-A5A-10A1-A1 SIGNAL CONDITIONER, THE SIGNAL FROM WHICH IS DIGITIZED BY A 16-BIT ANALOG AN5800 SYSTEM WITH A DATA-TAKING RATE OF 40 KZ. DATA PROCESSING IS CONDUCTED BY A NOVA 3 COMPUTER SO AS TO TAKE THE GREATEST POSSIBLE ADVANTAGE OF THE HIGH DATA ACQUISITION RATE. THE COMPUTER RUNS THE APPARATUS VIA SKINNER MAGNA LATCH SOLENOID PULSE VALVES (WHICH DO NOT CHANGE THE TEMPERATURE OF THE SYSTEM).</p> <p>SAMPLE PREPARATION: 2" SECTIONS OF CORE WERE RECEIVED IN CANS PROTECTED FROM EXTENDED ATMOSPHERIC CONTAMINATION. SAMPLES FROM THE CORE ARE CUT INTO SLABS PERPENDICULAR TO</p>

JUNIATA COLLEGE
DEPARTMENT OF CHEMISTRY
HUNTINGDON, PENNSYLVANIA 16652

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
JC	PS	GDA	DIF1	<p>THE BEDDING PLANES. ONE SLAB IS THEN CRUSHED WITH A PERCUSSION MORTAR, SIEVED TO 700-1000 MICRONS IN A MANNER DESIGNED TO MINIMIZE DUST CONTAMINATION.</p> <p>DENSITY: IN ORDER TO TAKE FULL ADVANTAGE OF THE ACCURACY OF ABSORPTION APPARATUS, THE DENSITY OF EACH SAMPLE MUST BE DETERMINED PRIOR TO A RUN. THE DENSITY IS MEASURED FROM 1G OF PREPARED SAMPLE BY TOLUENE DISPLACEMENT USING A 5 ML GAY-LUSSAC PYCNOMETER IN ASSOCIATION WITH A .01 MG METTLER H₂O ANALYTICAL BALANCE (CALIBRATION CHECKED 1976, 1978, 1980). MEASUREMENTS ARE MADE AT AMBIENT TEMPERATURE (18-25°C) WITH COMPENSATION FOR THE VARIATION OF DENSITY OF TOLUENE WITH TEMPERATURE. REPRODUCIBILITY IS TYPICALLY <u>+1 PERCENT.</u></p> <p>DEGASSING: AFTER ATTACHMENT OF THE CELL TO THE SORPTION APPARATUS BY GLASS-BLOWING, BUT BEFORE COMMENCING MEASUREMENTS, AND AT SPECIFIED INTERVALS IN THE MEASUREMENT SEQUENCE, THE SAMPLE IS DEGASSED BY EVACUATION WITH A WELCH DUO SEAL 1402 PUMP (.1 MICRON ULTIMATE VACUUM). CONTAMINATION DUE TO BACK DIFFUSION OF OIL IS PREVENTED BY 2 COLD TRAPS IN SERIES MAINTAINED AT -80°C and -196°C. THE SAMPLE IS DEGASSED AT A TEMPERATURE OF 80°C-100°C UNTIL THE MEASURED DEGASSING</p>

JUNIATA COLLEGE
DEPARTMENT OF CHEMISTRY
HUNTINGDON, PENNSYLVANIA 16652

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
JS	PS	GDA	DIF1	<p>RATE IS LESS THAN $.5 \times 10^{-5}$ ML GAS STP PER CM³ OF SAMPLE/ MIN.</p> <p>HELIUM ISOTHERM: AFTER DEGASSING, THE SAMPLE IS MAINTAINED AT 0°C WITH AN ICE BATH. THE AMOUNT OF GAS SORBED ONTO THE SAMPLE IS DETERMINED AT 240, 520, 820 910 TORR (STP ML PER CM³ OF ROCK) AND VARIES LINEARLY WITH PRESSURE. THE VALUE REPORTED IS THE SLOPE OF THIS LINE. THE SLOPE CAN BE INTERPRETED IN TERMS OF A POROSITY OR HELIUM DENSITY.</p> <p>METHANE ISOTHERM: AFTER THE HELIUM DATA HAS BEEN TAKEN. THE PROCEDURE ABOVE IS RE- INSTITUTED FROM METHANE AT THE SAME TEMPERATURE AND PRESSURE VALUES. DATA IS INTERPRETABLE IN TERMS OF "EFFECTIVE" OR "METHANE POROSITY".</p> <p>METHANE DIFFUSION: AFTER THE METHANE ISOTHERM IS DETERMINED, THE PRESSURE IS DROPPED DIS- CONTINUOUSLY FROM 910 TORR TO 200 TORR AND THE RATE OF GAS DESORPTION IS FOLLOWED BY MONITORING SUBSEQUENT PRESSURE BUILDUP. GRAPHS OF THE RAW DATA ARE AVAILABLE AND ARE INTERPRETABLE IN TERMS OF THE DIFFUSION CONSTANT, PERMEABILITY OR SPECIFIC DEGASIBILITY.</p> <p>BET: AFTER THE METHANE DIFFUSION RUN AND AFTER DE- GASSING, A LOW TEMPERATURE</p>

JUNIATA COLLEGE
DEPARTMENT OF CHEMISTRY
HUNTINGDON, PENNSYLVANIA 16652

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
JC	PS	GDA ₂	DIF1	<p>NITROGEN ISOTHERM WAS DETERMINED AT -196° C BY DETERMINING THE AMOUNT OF NITROGEN SORBED AT 6 PRESSURES DISTRIBUTED BETWEEN 0 AND 250 TORR. TEMPERATURE WAS MAINTAINED BY IMMERSING THE SAMPLE IN LIQUID NITROGEN THROUGH WHICH NITROGEN GAS WAS BUBBLED. THE RESULTING ISOTHERM WAS INTERPRETED IN TERMS OF THE BET EQUATION WHICH CALCULATED THE INTERNAL SURFACE AREA AVAILABLE FOR SORPTION.</p> <p>NITROGEN DIFFUSION: AFTER THE BET WAS RUN THE PRESSURE WAS DROPPED AND THE RESULTING PRESSURE BUILDUP WAS FOLLOWED AS DESCRIBED UNDER "METHANE DIFFUSION." THE RESULTS ARE REPORTED IN TERMS OF THE DIFFUSION CONSTANT.</p>

U.S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225
JAMES SCHMOKER

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
US	JS	GRA	GRAV	LACOSTE AND ROMBERG BOREHOLE GRAVIMETER. REFER TO SCHMOKER, J.W., 1976, PRINCIPAL FACTS FOR BOREHOLE GRAVITY STATIONS IN THE COLUMBIA GAS NO. 20402 WELL, LINCOLN CO., WEST VIRGINIA, U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 76-593, 4 P.; SCHMOKER, J.W., AND KOSOSKI, B.A., 1977, PRINCIPAL FACTS FOR BOREHOLE GRAVITY STATIONS IN THE COLUMBIA GAS TRANSMISSION CORP. 4771 WELL, KANAWHA CO., WEST VIRGINIA, U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 77-267, 6P.; AND SCHMOKER, J.W., ROBBINS, S.L., CLUTSON, F.G., AND MARTINEZ, R.J., 1977, PRINCIPAL FACTS FOR BOREHOLE GRAVITY STATIONS IN THE COLUMBIA GAS TRANSMISSION CORP. 4982, 5016, AND 6871 WELLS, JACKSON AND KANAWHA COUNTIES, WEST VIRGINIA, U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 77-852, 10P.
US	JS	GRI	GAMM	REFER TO SCHMOKER, J.W., 1979, DETERMINATION OF ORGANIC CONTENT OF APPALACHIAN-DEVONIAN SHALES FROM FORMATION DENSITY LOGS, AAPG BULLETIN, VOL. 63, NO. 9, P. 1504-1509; AND SCHLUMBERGER LIMITED, 1977, LOG INTERPRETATION CHARTS, 83 P.

U.S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225
JOEL LEVENTHAL

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
US	JL	WT	ELM2	THE WET OXIDATION TECHNIQUE WAS USED FOR ORGANIC CARBON. REFER TO LEVENTHAL, J.S., AND OTHERS, 1978, PRELIMINARY ANALYTICAL RESULTS FOR A NEW USGS DEVONIAN OHIO SHALE STANDARD SDO-1 U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 78-447.
US	JL	CT	ELM2	CARBONATE CARBON WAS DETERMINED BY A MODIFIED VAN SLYKE METHOD. REFER TO LEVENTHAL, J.S., AND OTHERS. 1978, PRELIMINARY ANALYTICAL RESULTS FOR A NEW USGS DEVONIAN OHIO SHALE STANDARD SDO-1, U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 78-447; RADER, L.F., AND GRIMALDI, F.S., 1961, CHEMICAL ANALYSIS FOR SELECTED MINOR ELEMENTS IN PIERRE SHALE, U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 391-A, 45 P.
US	JL	LC	ELM7	LECO COMBUSTION-IODOMETRIC TITRATION METHOD. A 0.3 G SAMPLE IS MIXED WITH 1.5 G OF Cu ACCELERATOR AND 2 G OF V ₂ O ₅ OXIDIZER AND COMBUSTED AT 1800 DEGREES C. THE RESULTING SULFUR OXIDES ARE DETERMINED BY MEASUREMENT OF THE AI FORMED.
US	JL	TT	ELM2	WET OXIDATION TECHNIQUE. REFER TO LEVENTHAL, J.S., AND OTHERS, 1978, PRELIMINARY ANALYTICAL RESULTS FOR A NEW USGS DEVONIAN OHIO SHALE STANDARD SDO-1, U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 78-447, 11P.

U.S. GEOLOGICAL SURVEY
DEVNER, COLORADO 80225
JOEL LEVENTHAL

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
US	JL	CA	ELM5	COLOROMETRIC TECHNIQUE. REFER TO RADER, L.F., AND GRIMALDI, F.S., 1961, CHEMICAL ANALYSES FOR SELECTED MINOR ELEMENTS IN THE PIERRE SHALE, U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 391-A, 45 P. MOLYBDENUM IS ISOLATED BY PRECIPITATION WITH ALPHA- BENZOINOXIME, USING VANADIUM AS A COLLECTOR. MOLYBDENUM IS DETERMINED COLORIMETRIC- ALLY AS THE THIOCYANATE AFTER REDUCTION WITH STANNOUS CHLORIDE.
US	JL	AA	ELM5	FLAMELESS AA SPECTROSCOPY. SEVERAL TENTHS OF A GRAM OF GROUND SHALE ARE DIGESTED UNDER OXIDIZING CONDITION. MERCURY IS REDUCED TO ITS ELEMENTAL STATE WITH STANNOUS CHLORIDE AND AERATED FROM SOLUTION ONTO A SILVER SCREEN PLACED IN THE VAPOR. THE SILVER SCREEN IS SUBSEQUENTLY HEATED AND THE MERCURY VAPOR IS CARRIED BY AIR STREAM TO AN ABSORPTION CELL, WHERE ITS CONCENTRATION IS DETERMINED BY ATOMIC ABSORPTION SPECTRO- SCOPY. REFER TO HUFFMAN, C., RAHILL, R.L., SHAW, V.E., AND NORTON, D.R., 1972, DETERMIN- ATION OF MERCURY IN GEOLOGIC MATERIALS BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY IN GEOLOGICAL SURVEY RESEARCH, U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 800-C, P. C203-C207.

U.S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225
JOEL LEVENTHAL

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
US	JL	XA	MIN4 MIN6	X-RAY FLUORESCENCE SPECTROSCOPY, GENERAL ELECTRIC VACUUM SPECTROMETER. LEVENTHAL, J.S., AND OTHERS, 1978, PRELIMINARY ANALYTICAL RESULTS FOR A NEW U.S. GEOLOGICAL SURVEY DEVONIAN OHIO SHALE STANDARD SDO-1, U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 78-447, 11 P.
US	JL	XR	ELM1	ATOMIC ABSORPTION SPECTROSCOPY. REFER TO ARUSCAVAGE, P., 1977, DETERMINATION OF AS, SB, AND SE IN COAL BY ATOMIC ABSORPTION SPECTROSCOPY IN GEOLOGICAL SURVEY RESEARCH, U.S. GEOLOGICAL PROFESSIONAL PAPER 800C, P. C203-C207; AND LEVENTHAL, J.S., AND OTHERS, 1978, PRELIMINARY ANALYTICAL RESULTS FOR A NEW U.S. GEOLOGICAL SURVEY DEVONIAN OHIO SHALE STANDARD, U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 78-447, 11 P.
US	JL	SA	ELM2	ATOMIC ABSORPTION SPECTROSCOPY. AS DESCRIBED BY SWANSON, V.E., AND HUFFMAN, C., 1976, GUIDELINES FOR SAMPLE COLLECTING AND ANALYTICAL METHODS USED IN THE U.S. GEOLOGICAL SURVEY FOR DETERMINING CHEMICAL COMPOSITION OF COAL, U.S. GEOLOGICAL SURVEY CIRCULAR 735, 11 P. THESE METHODS FOLLOW RECOMMENDED PROCEDURES OF PERKIN-ELMER.

U.S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225
GEORGE CLAYPOOL

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
US	GC	Ø1	ELM2	CARBONATE CARBON PULVERIZED ROCK REACTED WITH 4N HCL IN EVACULATED VESSEL, EVOLVED CO ₂ COLLECTED AND MEASURED. SEE UNPUBLISHED LABORATORY PROCEDURES MANUAL, CHARLES THRELKELD, U.S. GEOLOGICAL SURVEY, BOX 25046, MS 977, DENVER, COLORADO 80225.
US	GC	Ø2	ELM2	ORGANIC CARBON RESIDUE FROM CARBONATE CARBON REACTION WASHED, DRIED AT 60 DEGREES C. IN DRY NITROGEN STREAM, AND COMBUSTED. SEE UNPUB- LISHED LABORATORY PROCEDURES MANUAL, CHARLES THRELKELD, U.S. GEOLOGICAL SURVEY, BOX 25046, MS 977, DENVER, COLORADO 80225.
US	GC	Ø3	ELM2	TOTAL CARBON ENTIRE PULVERIZED SAMPLE COMBUSTED IN LECO COMBUSTION FURNACE. SEE UN- PUBLISHED LABORATORY PROCEDURES MANUAL, CHARLES THRELKELD, U.S. GEOLOGICAL SURVEY, BOX 25046, MS 977, DENVER, COLORADO 80225.
US	GC	CGA	GRR4	CAPILLARY GAS ANALYSIS PERFORMED ON PERKIN-ELMER GAS CHROMATOGRAPH 900. COLUMN COATING MATERIAL IS OCTADECENE- 1/KEL-F-10 OIL. COLUMN LENGTH 150 FEET. COLUMN INTERNAL DIAMETER 0.01 INCH. HELIUM FLOW 2 ML. HELIUM/MINUTE. DETECTOR IS HYDROGEN.

U.S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225
GEORGE CLAYPOOL

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
US	GC	HGA	HER1	HEWLETT PACKARD 5710A GAS CHROMATOGRAPH. TEN FEET CHROMOSORB 102 (TM) PACKING MATERIAL. FIFTY ML./MIN. HELIUM CARRIER FLOW. THIRTEEN MS. SAMPLE INJECTED, PROGRAM RANGE 20-200 DEGREES C. AT 16 DEGREES C. PER MINUTE.
US	GC	TEA	TEA1	CHROMALYTICS SPEX INDUSTRIES THERMAL CHROMATOGRAPH. AMBIENT 700 DEGREES C. AT 40 DEGREES C. PER MINUTE. HELIUM CARRIER GAS TO A HYDROGEN FLAME DETECTOR.
US	GC	HDA	HED1	NIER TYPE 6 INCH, 60 DEGREE SECTOR ISOTOPE RATIO MASS SPECTROMETER. ACCELERATING VOLTAGE 2600 V. ALL VALUES RELATIVE TO P. BELEMNITE STANDARD EXPRESSED IN PARTS PER THOUSAND. SEE UNPUBLISHED LABORATORY PRO- CEDURES MANUAL, CHARLES THRELKELD, U.S. GEOLOGICAL SURVEY, BOX 25046, MS 977, DENVER, COLORADO 80225.
US	GC	RAM	COM1 COM2	SAME METHOD AS HGA CODE ON HER1, ONLY EXPRESSED AS A PERCENT OF TOTAL GAS. NOT RELATED BACK TO ROCK WEIGHT, AND VOLUME AS IN HGA.

U.S. GEOLOGICAL SURVEY
DENVER, COLORADO 80225
A. LOVE AND N. BOSTICK

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
US	GC	MXAT	VIT1- VIT3	SELECTED LEAST ALTERED VITRINITE. BOSTICK, N.H., AND ALPERN, B., 1977, PRINCIPLES OF SAMPLING, PREPARATION AND CONSTITUENT SELECTION FOR MICROPHOTOMETRY IN MEASURE- MENT OF MATURATION OF SEDIMENTARY ORGANIC MATTER, JOURNAL OF MICROSCOPY, VOL. 109, PART 1, P. 41-47.
US	GC	Ø6	KER1	PERKIN-ELMER 240 FOR ANALYSIS OF NITROGEN, CARBON AND HYDROGEN.
US	GC	Ø8	KER1	EIGHT PLACE CENTRIFUGE, APPROXIMATELY 20 GRAM ROCK SAMPLES, (60-80 MESH). (1) HCL EXTRACTION TO ISOLATE CaCO ₃ , (2) WATER BATH 50 DEGREES C., (3) THOROUGH WASHING TO ELIMINATE CALCIUM IN SOLUTION, (4) ACIDIFY WITH HCL, (5) 47-52 PERCENT HF ADDED, (6) ANOTHER WASHING TO REMOVE HF, (7) ACIDIFY WITH HCL TO PREVENT ZINC HYDROXIDE FROM FORMING, AND (8) FLOAT WITH ZINC BROMIDE. FREEZE DRY KEROGEN BEFORE FLOTATION.
US	GC	Ø5	KER1	PERKIN-ELMER 240 FOR ANALYSIS OF NITROGEN, CARBON AND HYDROGEN.
US	GC	Ø7	KER1	PERKIN-ELMER 240 FOR ANALYSIS OF NITROGEN, CARBON AND HYDROGEN.

U.S. GEOLOGICAL SURVEY
 RESTON, VIRGINIA 22092
 JOHN HOSTERMAN

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
US	JH	XJ	LITH	DOMINANT AND SUBORDINATE LITHOLOGIES DETERMINED BY X-RAY DIFFRACTION. DETERMINATION OF QUARTZ, CALCITE AND CLAY PRESENT, 5 PERCENT ERROR. MUNSELL COLOR DETERMINED BY COMPARING SAMPLE WITH MUNSELL SOIL COLOR CHART.
US	JH	XR	XRA1- XRA3	WHOLE ROCK MINERALOGY DETERMINED BY X-RAY DIFFRACTION AND A LEAST SQUARES COMPUTER PROGRAM (ERROR OF 5 PERCENT NOTED). PHILLIPS MODEL 3500; COPPER K ALPHA 1; GRAPHITE MONOCHROMETER, ONE SECOND COUNTS AT 0.02 DEGREE 2 THETA; CHANGEABLE DIVERGENCE SLIT (AREA OF SAMPLE EXPOSED TO RADIATION IS EQUAL THROUGHOUT EXPOSURE); 0.3 MINUTES/DEGREE; X-RAY HARD WIRED TO TEXAS INSTRUMENTS SILENT 745. SAMPLE PREPARATION: 200 MESH AND PRESSED UNDER 15 TONS P. TO FORM A PILL. REFER TO HOSTERMAN, J.W., AND LOFERSKI, P.J., 1978, PRELIMINARY REPORT ON THE CLAY MINERALOGY OF THE UPPER DEVONIAN SHALES IN THE SOUTHERN AND MIDDLE APPALACHIAN BASIN, U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 78-1084, 19P.

U.S. GEOLOGICAL SURVEY
 FLAGSTAFF, ARIZONA 86001
 W.G. COLTON

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u> .	<u>EXPLANATION</u> (continued)
US	BC	BRN	FRAC	THE MAJORITY OF DATA IN THIS PART OF THE FILE WAS MEASURED WITH THE AID OF A BRUNTON COMPASS. THIS DATA INCLUDES THE STRIKE AND DIP OF THE FRACTURE, AND THE PITCH OR PLUNGE OF SLICKENSIDES OF STRIAE WHEN PRESENT. MINERAL FILLINGS, FACEMARKS ETC. WERE DETERMINED BY OBSERVATION.
US	BC	EB	LITH	ALL OF THESE PARAMETERS WERE DETERMINED VISUALLY. A GRAIN SIZE CHART AND MUNSELL COLOR CHART WERE USED ONLY OCASIONALLY.

WEST VIRGINIA GEOLOGICAL SURVEY
MORGANTOWN, WEST VIRGINIA 26505

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
WV	MB	XR	ELM1-8	X-RAY DIFFRACTION. REFER TO NUHFER, E.B., FLORENCE, J.L., CLAGETT, J.L., AND ROMANOSKY, R.R., 1979, PROCEDURES FOR PETROPHYSICAL, MINERALOGICAL AND GEOCHEMICAL CHARACTER- IZATION OF FINE GRAINED CLASTIC ROCKS AND SEDIMENTS, MORGANTOWN ENERGY TECHNOLOGY CENTER CONTRACTOR REPORT 79/26, 39P; AND RENTON, R.R., 1979, USE OF WEIGHTED X-RAY DIFFRACTION DATA FOR SEMI- QUANTITATIVE ESTIMATION OF MINERALS IN LOW TEMPERATURE ASHES OF BITUMINOUS COAL AND IN SHALE, MORGANTOWN ENERGY TECHNOLOGY CENTER CONTRACTOR REPORT 7915, 22P.
WV	MB	WVD	LOG1 PDEN	FOR DENSITY DETERMINATIONS REFER TO DISCUSSION OF DENSITY AND POROSITY IN NUHFER, E.B., FLORENCE, J.L., CLAGETT, J.L., RENTON, J.J., AND ROMANOSKY, R.R., 1979, PROCEDURES FOR PETROPHYSICAL, MINERALOGICAL, AND GEOCHEMICAL CHARACTERIZATION OF FINE GRAINED CLASTIC ROCKS AND SEDIMENTS, MORGANTOWN ENERGY TECHNOLOGY CENTER CONTRACTOR REPORT 79/26, 39P. FOR GAMMA RADIATION AND RESISTIVITY DATA READINGS.
WV	MB	WVT	LOG2	INTERVAL TRANST TIME
WV	MB	WVP	PCHR	TOTAL POROSITY, REFER TO DISCUSSION BY E.B. NUHFER IN NUHFER, E.B., FLORENCE, J.A., CLAGETT, J.A., RENTON, J.J., AND ROMANOSKY, R.R., 1979, PRO- CEDURES FOR PETROPHYSICAL, MIN- ERALOGICAL AND GEOCHEMICAL

WEST VIRGINIA GEOLOGICAL SURVEY
MORGANTOWN, WEST VIRGINIA 26505

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
WV	MB	WVP	PCHR	CHARACTERIZATION OF FINE GRAINED CLASTIC ROCKS AND SEDIMENTS, U.S. DEPARTMENT OF ENERGY, MORGANTOWN ENERGY TECHNOLOGY CENTER CONTRACTOR REPORT 79/26, 39P.
WV	MB	WVRS	WROK	REFER TO NUHFER, E.B., FLORENCE, J.A., CLAGGETT, J.L., RENTON, J.J., AND ROMANOSKY, R.R., 1979, PRO- CEDURES FOR PETROPHYSICAL, MINERALOGICAL, AND GEOCHEMICAL CHARACTERIZATION OF FINE GRAINED CLASTIC ROCKS AND SEDIMENTS, U.S. DEPARTMENT OF ENERGY, MORGANTOWN ENERGY TECHNOLOGY CENTER CONTRACTOR REPORT 79/26, 39P.

OHIO GEOLOGICAL SURVEY
COLUMBUS, OHIO 43224

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
OH	DS	AA	ELM1- ELM9	ATOMIC ABSORPTION. TETRABORATE OR METABORATE FUSION FOR MAJOR AND MINOR ELEMENTS. HYDROFLUORIC OR PERCHLORIC ACID TREATMENT FOR TRACE ELEMENTS IN SOLUTION.
OH	DS	HE	ELM1- ELM9	HYDRIDE EVOLUTION SYSTEM. PERKIN-ELMER DEVICE.
OH	DS	G	ELM1- ELM9	GRAVIMETRIC.
OH	DS	CO	ELM1- ELM9	COLORIMETRIC. RAPID ROCK ANALYSIS. SPECTRONIC 20. BAUSCH AND LOMB.
OH	DS	FA	ELM1- ELM9	FLAMELESS ATOMIC ABSORPTION, MERCURY ANALYSIS, QUARTZ ABSORPTION TUBE.
OH	DS	EA	ELM1- ELM9	ELEMENTAL ANALYSIS WITH PERKIN- ELMER 240 UNIT.
OH	DS	LC	LITH	DOMINANT AND SUBORDINATE LITHOLOGIES IDENTIFIED BY VISUAL ESTIMATION. COLOR IDENTIFICATION BY GSA ROCK COLOR CHART. WHEN CALCEMAS IS USED AS A LITHOLOGY CODE BY OHIO, IT REPRESENTS 10 PERCENT OR MORE CARBONATE. THE WEIGHT PERCENTS OF CALCEMAS WERE DETERMINED BY PETROGRAPHIC AND X-RAY DATA.
OH	DS	DNP	PCHR	AVERAGE BULK DENSITY (CARD COLUMN 24-29): APPROX. 10G SAMPLES. DRIED AT 105 DEGREES C OVERNIGHT. SPRAYED WITH KRYLON NO.1306. BULK DENSITY= (WA)(SPK)/WA-WK, WHERE WA= WEIGHT OF SAMPLE IN AIR, WK= WEIGHT IN SAMPLE IN KEROSENE, AND SPK=SPECIFIC GRAVITY OF KEROSENE (DETERMINED USING QUARTZ STANDARD WITH SPECIFIC GRAVITY OF

OHIO GEOLOGICAL SURVEY
COLUMBUS, OHIO 43224

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
OH	DS	DNP	PCHR	2.65. TRUE DENSITY (CARD COLUMN 36-41): SAMPLE USED IN BULK DENSITY DETERMINATION IS GROUND TO 94 PERCENT LESS THAN 120 MESH. DRIED AT 105 DEGREES C. OVERNIGHT. TRUE DENSITY=(WA)(SPK)/WA-WK, WHERE WA=WEIGHT OF GROUND SAMPLE IN AIR, WK=WEIGHT OF GROUND SAMPLE IN KEROSENE, AND SPK= SPECIFIC GRIVITY OF KEROSENE. OPEN POROSITY (CARD-COLUMN 42-47): POROSITY = (VB - VNP) (100)/ VB, WHERE VB=VOLUME OF SAMPLE BEFORE PULVERIZING, VNP= VOLUME OF SAMPLE AFTER GRINDING TO 94 PERCENT LESS THAN 120 MESH.
OH	DS	WRC	XRA1- XRA3 WROK	PHILLIPS X-RAY DIFFRACTION UNIT; DETECTOR=PROPORTIONAL COUNTER; RADIATION EQUALS CU35KV, 20MA; PHA EQUALS BASELINE 200, WINDOW 100 DIFFERENTIAL; MONOCHROMETER; SCALE FACTOR EQUALS 1X10; TIME CONSTANT 2 SEC; DIVERGENCE SLIT EQUALS Ø.2MM; DIFFRACTION RATE 1 DEGREE IN 20 MINUTES; CHART RATE EQUALS 1 INCH/MINUTE. SAMPLE PREPARATION FOR WHOLE ROCK X-RAY DIFFRACTION SAMPLES: 325 MESH ON SPEX MILL; MOUNTED ON SILVER FILTERS; UNORIENTED; SCANNED FROM 2 DEGREES 20 MINUTES TO 67 DEGREES 20 MINUTES.
OH	DS	CAB	PHYS	CALCAREOUSNESS (CARD COLUMN 41-43): VISUAL ESTIMATE OF 10 PERCENT HCL REACTIVITY ON SAMPLE. ANGLE OF CROSS-BEDDING (CARD COLUMN 47-48): VISUAL ESTIMATE.

OHIO GEOLOGICAL SURVEY
COLUMBUS, OHIO 43224

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
OH	DS	PAL	PALO	BIOLOGIC CONSTITUENT (CARD COLUMN 13-16): VISUAL IDEN- TIFICATION IN HAND SAMPLE; TRACE FOSSILS (CARD COLUMN 17-20): VISUAL IDENTIFICATION; DENSITY (CARD COLUMN 24-25): VISUAL ESTIMATE USING PETROGRAPHIC MICROSCOPE.
OH	DS	LS LC	ELM1- ELM9	SULFUR BY LECO INSTRUMENT.

MONSANTO RESEARCH CORPORATION
MIAMISBURG, OHIO 45342

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION</u>
ML		MOC	TAI1	PREDRIED SAMPLE; ACIDIFIED (2N HYDROCHLORIC ACID) COLD, HOT; FILTER-DISTILLED WATER WASH; DRY (200°C-4HRS); LECO INDUCTION FURNACE. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MROM	VIT1	DIGESTION 6N HYDROCHLORIC ACID AND 70 PERCENT CONCEN- TRATION HYDROFLUORIC ACID; BIOPLASTIC PLUG MOUNT; POLISHED 0.05MM AL ₂ O ₃ ; ZEISS HIGH RE- SOLUTION MICROSCOPE; MINIMUM 40 VALUES/PLUG; GLASS STANDARD CALIBRATION. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MK	KER1	DIGESTION 6N HYDROCHLORIC ACID AND 70 PERCENT CONCEN- TRATION HYDROFLUORIC ACID; ADDITIONAL METHOD CODES FOR GENERAL ANALYSIS. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		ME	KER1	FOR WEIGHT PERCENT HYDROGEN, NITROGEN, AND CARBON: PERKIN- ELMER 240, CALIBRATION STANDARDS (HIGH PURITY ACETONILIDE). SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MS	KER1	FISHER SULFUR ANALYZER; 1 PERCENT SULFUR COAL STANDARD. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.

MONSANTO RESEARCH CORPORATION
MIAMISBURG, OHIO 45342

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
ML		MAM	ROR1 ROR2 HER1 HER2	VARIAN AEORGRAPH MODEL 1400; PORAPAK Q COLUMN-1/8 INCH ID, 8 INCH LENGTH; HELIUM CARRIER GAS; BIG 3 STANDARD CALIBRATION GAS. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MLC	HNR1	SEE MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MO	ELM	FOR AL ₂ O ₃ , FE ₂ O ₃ , MGO, CAO, NA ₂ O, TIO ₂ , K ₂ O, and MN: LITHIUM METABORATE FUSION; DISSOLVED (DILUTE) HCL; IN- DUCTIVELY COUPLED PLASMA (ICP) OPTICAL EMISSION SPECTROSCOPY. SEE ALSO MOUND LABORATORY DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MS	ELM	FOR SIO ₂ : LITHIUM METABORATE FUSION, ² ATOMIC ABSORPTION SPECTROSCOPY. SEE ALSO MOUND LABORATORY DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MV	ELM	FOR SILVER: STRONTIUM, VAN- ADIUM, BERYLLIUM, BARIUM, PHOSPHOROUS, NICKEL, COPPER, ZINC, CHROMIUM, COBOLT, ARSENIC, ZIRCONIUM, MOLYBDENUM, AND THORIUM: DIGESTED HF, HNO ₃ , HClO ₄ , ACIDS; ATOMIC ABSORPTION SPECTROSCOPY. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.

MONSANTO RESEARCH CORPORATION
MIAMISBURG, OHIO 45342

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
ML		MX	ELM	FOR CESIUM; HAFNIUM, TANTALUM, YTTRIUM: X-RAY FLUORESCENCE. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MN	ELM	FOR TIN: COLORIMETRICALLY WITH GALLEIN REAGENT AFTER FUSION WITH AMMONIUM CHLORIDE. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MCX	SHB2	VARIAN AEROGRAPH MODEL 1400; SOLID INLET PROBE SYSTEM; 304 SS COLUMN (1/8 INCH OD X 20 FEET) PACKED WITH 5 PERCENT EUTECTIC (LiNO ₃ , NaNO ₃ , KNO ₃) ON 60-80 MESH CHROMASORB G; 160 DEGREES C./ MINUTE TO 350 DEGREES C./MINUTE; HELIUM CARRIER GAS. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MAP	API1	LIPKIN BICAPILLARY PYCNOMETER AND MERRLER/PAAR DIGITAL DENSITY METER (DMA-45) WITH METTLER/PAAR MICROSAMPLING CELL (DMA-601M); SPECIFIC GRAVITY DETERMINED AT 100 DEGREES F AND CONVERTED TO 60 DEGREES F. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MAB	COM1	6' PORAPAK Q, 10' MOLECULAR SIEVE 5A, 24' 16 PERCENT BIX-2-

MONSANTO RESEARCH CORPORATION
MIAMISBURG, OHIO 45342

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
ML		MBA	COM1	METHOZYL ADIPATE ON CHROMO- SORB P-AW. 5' 30 PERCENT DC-200 SILICON OIL ON CHROMO- SORB P-AW; HELIUM CARRIER GAS; HEWLETT PACKARD-MODEL 5840 A; ISOTHERMAL 60 DEGREES C; STANDARD: NGPA NATURAL GAS REFERENCE STANDARD-PHILLIPS; MICROPROCESSOR CONTROLLED. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES: MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MU	ELM	FOR URANIUM: DIGESTED (HF, HNO ₃ , HCL ₄ , ACIDS); EXTRACTED IN ETHYL ACETATE; FLUXED (SODIUM CARBONATE, POTASSIUM CARBONATE, SODIUM FLUORIDE); FUSED; JARREL ASH FLUORIMETER. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MB	ELM	FOR ANTIMONY: COLORIMETRICALLY WITH BRILLIANT GREEN REAGENT AFTER FUSION WITH AMMONIUM CHLORIDE. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO, 45342.
ML		MA	ELM	FOR GOLD: DIGESTED (AQUA REGIA); EXTRACTED INTO MLBK; ATOMIC ABSORPTION SPECTRO- SCOPY. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.

MONSANTO RESEARCH CORPORATION
MIAMISBURG, OHIO 45342

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
ML		MP	ELM	FOR LEAD, RUBIDIUM, CESIUM: DIGESTION, ATOMIC ABSORPTION SPECTROSCOPY. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MF	ELM	FOR FLUORINE, CHLORINE: CAUSTIC FUSION; SELECTIVE ION ELECTRODE. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO, 45342.
ML		MW	ELM	FOR TUNGSTON: HCL LEACH; SEPARATION OF ARSENIC AS A HYDRIDE; COLORIMETRIC ANALYSIS. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MC	ELM	FOR CELENIUM, CADMIUM, AND SCANDIUM: ATOMIC ABSORPTION SPECTROSCOPY. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MG	ELM	FOR BORON, GALLIUM, GERMANIUM, LANTHANUM, AND SELENIUM: OPTICAL EMISSION SPECTROSCOPY. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MS	ELM	FISHER SULFUR ANALYZER. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.

MONSANTO RESEARCH CORPORATION
MIAMISBURG, OHIO 45342

<u>*CON CODE</u>	<u>LAB CODE</u>	<u>METHOD CODE</u>	<u>CARD CLASS</u>	<u>EXPLANATION (continued)</u>
ML		MSH	PDEN	SHORE HARDNESS UNIT; STANDARD CALIBRATION BLOCKS; AVERAGE OF MINIMUM OF 10 READINGS PER SAMPLE. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MRB	GRR1- GRR4	VARIAN AEROGRAPH MODEL 1400; HHK COLUMN-0.01 INCH ID, 200 FOOT LENGTH; MIXTURE NUMBER 7 AND MIXTURE NUMBER 2 SCOTT ANALYZED GASES. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MTA	TEA1	MODIFIED UNIT WITH FID SYSTEM, PRECISION TEMPERATURE PROGRAMMER AND PE DATA SYSTEM; HELIUM CARRIER GAS; 40 DEGREES C PER MINUTE HEATING RATE. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MBI	BIT1	BALL MILL EXTRACTION; CH ₂ CL ₂ WASH; FILTER, PRECIPITATE, EVAPORATE, WEIGH ASPHALTINE FRACTION. SEE ALSO MOUND LABORATORIES DETAILED ANALYTICAL PROCEDURES, MOUND LABORATORIES, MIAMISBURG, OHIO 45342.
ML		MLC	HNR1	LIQUID CHROMATOGRAPHY; MICRO-COLUMN (PASTEUR PIPED, 5-3/4 INCH) PACKED WITH DAVISON GRADE 62 (TOP) AND DAVISON GRADE 923 (BOTTOM) ACTIVATED SILICA GEL; SATURATED HYDROCARBONS WITH 3 BED VOLUMES-NC ₅ ; AROMATIC HYDROCARBONS WITH 3 BED VOLUMES-TOLUENE; NON HYDROCARBON WITH 3 BED VOLUMES- 6:4 METHENOL; DRY AND WEIGH.

REFERENCES CITED

Dyman, T.S., 1981, Eastern Gas Shales Project Data File Format Design and Data Gathering, A Final Report to the Department of Energy: U.S. Geological Survey Open-File Report 81-598, 44 p.

Dyman, T.S., and Wilcox, L.A., 1979, Data Encoding Formats For Well and Outcrop Samples: Eastern Gas Shales Project: U.S. Geological Survey Open-File Report 79-1690, 124 p.

APPENDIX A

EGSP CARD CLASSES AND DESCRIPTIONS

GEOCHEMICAL FILE CONTENT

CARD NUMBER	CARD CLASS	DESCRIPTION
1	CHEM	HEADER INFORMATION
2-3	ROR1-2	C1-C7 BLENDED GAS-ROCK, OR HEADSPACE GAS
4-7	GRR1-4 GRO1-4	C4-C7 GASOLINE RANGE OF ROCK OR OIL
8-11	TEB1-4 TEC1-4 TED1-4 TEE1-4 TEF1-4 TEG1-4	C7-C30 THERMAL EXTRACTION AND GAS CHROMATOGRAPHY OF ROCK OR OIL
12	PYR1	C1-C32 PYROLYSIS OF ROCK-GAS CHROMATOGRAPHY OF PRODUCTS EVOLVED
13	TEA1	THERMAL EVOLUTION ANALYSIS (TEA)- FLAME IONIZATION DETECTOR (FID) OF ROCK
14	BIT1	C15 + BITUMEN BY SOLVENT EXTRACTION OF ROCK
15	HNR1	C15 + HYDROCARBON AND NON-HYDRO- CARBON FRACTIONS (ROCK OR OIL)
16-17	SHA1-2 SHB1-2 SHC1-2 SHD1-2	C15 + SATURATED HYDROCARBONS - GAS CHROMATOGRAPHY OF ROCK OR OIL
18-19	VIT1-9	VITRINITE REFLECTANCE OF ROCK
20	TAI1	VISUAL KEROGEN AND THERMAL ALTERA- TION INDEX (TAI)
21-25	MIN1-5	MINERALOGY OF ROCK
26-34	ELM1-ELM9	ELEMENTAL ANALYSIS OF ROCK
35	KER1	ELEMENTAL ANALYSIS OF KEROGEN OF ROCK

GEOCHEMICAL FILE CONTENT (CONTINUED)

CARD NUMBER	CARD CLASS	DESCRIPTION
36	ASP1	DELTA 34S, DELTA 15N, PERCENT NITROGEN OF C15 + ASPHALTIC FRACTION
37	HYD1	DELTA 13C OF C15 + HYDROCARBON FRACTIONS OF ROCK
38	HED1	DELTA 13C of CH ₄ IN HEADSPACE GAS
39	API1	API GRAVITY OF OIL
40	HNH1	C15 + HYDROCARBON AND NON-HYDRO- CARBON FRACTIONS OF OIL
41	WHL1	DELTA 13C OF WHOLE OIL
42	FRA1	DELTA 13C OF C15 + HYDROCARBON FRACTIONS OF OIL
43	DEL1	DELTA 34S, DELTA 15N, PERCENT NITROGEN OF WHOLE OIL
44-45	COM1-2	C1-C7 COMPONENT ANALYSIS OF GAS
46	CGA1	DELTA 13C of CH ₄ and CO ₂ OF GAS
47-48	WAT1-2	MAJOR IONS OF WATER
49	LTA1	DELTA 13C of CO ₂ OF GAS
50	ELT1	DELTA 34S of SO ₄ OF WATER
51	DIF1	GASEOUS DIFFUSION ANALYSIS
52	OFF1	OFFGAS ANALYSIS
53	GSRA	GAS/SHALE RATIO

PHYSICAL CHARACTERIZATION FILE CONTENT

CARD NUMBER	CARD CLASS	DESCRIPTION
1	PHED	HEADER INFORMATION
2	PDEN	DENSITY, SPECIFIC GRAVITY, PERMEABILITY, HARDNESS, PORE SIZE DISTRIBUTION
3	PLOD	POINT LOAD FRACTURE
4	DITS	DIRECTIONAL TENSILE STRENGTH
5-6	SON1-2	DIRECTIONAL SONIC VELOCITY
7	YUNG	DIRECTIONAL DYNAMIC ELASTIC CONSTANTS (YOUNG'S MODULUS)
8	SHER	DIRECTIONAL DYNAMIC ELASTIC CONSTANTS (AVERAGE SHEAR MODULUS)
9	PISN	DIRECTIONAL DYNAMIC ELASTIC CONSTANTS (AVERAGE POISSON'S RATIO)
10	COMP	DIRECTIONAL COMPRESSIVE STRENGTH
11-12	LOG1-2	LOG DATA (GENERAL)
13	GRAV	BOREHOLE GRAVITY
14	GAMM	GAMMA RAY INTENSITY AND FORMATION DENSITY EVALUATION
15	PCHR	PHYSICAL CHARACTERIZATION DATA

LITHOLOGY FILE CONTENT

CARD NUMBER	CARD CLASS	DESCRIPTION
1	HEAD	HEADER INFORMATION
2	LITH	LITHOLOGY
3	WROK	WHOLE ROCK MINERAL ANALYSIS AND SIZE ANALYSIS
4-6	XRA1-3	X-RAY DIFFRACTION
7	LTTM	X-RAY DIFFRACTION-LESS THAN TWO MICRON CLAY ANALYSIS
8	QRTZ	QUARTZ GRAIN SIZE ANALYSIS
9	PHYS	PHYSICAL MEASUREMENTS
10	SED1	SEDIMENTARY FEATURES
11	PALO	PALEONTOLOGY
12-13	FRAC FRC1	FRACTURE DATA
14	INTR INMC	FRACTURE DATA AND INTERSECTED LITHOLOGIES

APPENDIX B
EGSP CONTRACTOR AND LABORATORY CODES

EGSP Contractor and Laboratory Codes

CONTRACTOR	LABORATORY KEY PERSONNEL	CONTRACTOR CODE	LABORATORY CODE
Alfred University New York State College of Ceramics Alfred, NY 14802	Byron Kulander Wayne Brownell	AU	WB
Batelle Columbus Columbus, Ohio 43201	Jack Snyder	BL	JS
University of Cincinnati Department of Geology Cincinnati, OH 45221	Paul Potter Barry Maynard	CI	RB
U.S. Geological Survey Denver, CO 80225	George Claypool	US	GC
U.S. Geological Survey Denver, CO 80225	Joel Leventhal	US	JL
U.S. Geological Survey Denver, CO 80225	James Schmoker	US	JS
U.S. Geological Survey Flagstaff, AZ	G.W. Colton	US	BC
U.S. Geological Survey Reston, VA 22092	John Hosterman	US	JH
Department of Energy METC Morgantown, W. VA 26505	Jan Downey	ME	RG CA RE CG CO KW
Mound Laboratories Miamisburg, OH 45342	Ronald Zielinske	ML	RZ

EGSP Contractor and Laboratory Codes

CONTRACTOR	LABORATORY KEY PERSONNEL	CONTRACTOR CODE	LABORATORY CODE
Pennsylvania Geological Survey Pittsburg, PA 15222	R.G. Piotrowski	PA	JH
Juniata College Department of Chemistry Huntingdon, PA 16652	Paul Shettler	JC	PS
Ohio Geological Survey Columbus, OH 43224	Richard Struble	OH	DS
West Virginia Geological Survey Morgantown, W. VA 26505	Mary Behling	WV	MB
Kentucky Geological Survey Lexington, KY 40506	William Dennen	KY	EW

USGS LIBRARY-RESTON



3 1818 00017952 1