MASTER

Eastern Gas Shales Project
U.S. Geological Survey - Office of Energy Resources
Shale Characterization and Resource Appraisal of the Devonian black shales of the Appalachian basin
Interagency Agreement #EX-76-C-01-2287
Wallace de Witt, Jr. - Technical Program Coordinator
Quarterly Report - April - June 1978

Objectives:

To characterize the gas-productive black shales and related rocks of Middle and Late Devonian age in the Appalachian basin by use of stratigraphic, paleontologic, geochemical, mineralogic and geophysical data; to assist DOE-MERC by coordinating and evaluating stratigraphic work in shale characterization studies by other DOE - Eastern Gas Shales Cooperators to the limit of available USGS personnel; to develop a data storage and retrieval system to store the data generated in the EGS project, to make a resource appraisal of the hydrocarbon potential of the Devonian black shales of the Appalachian basin using data generated in part by the USGS, in part by DOE-MERC and in part by EGS project contractors; to conduct work shops for other EGS project cooperators in stratigraphy, structure, geochemistry, and mineralogy as the occasion demands; and to assist in technology transfer by participating as panel-of-interest members at DOE - Industry meetings.

Milestones for June:

Management: Branch Chief Richard Mast, all project chiefs and Technical Project Monitor Wallace de Witt met 6/22 in the USGS facility at Denver, Colorado to evaluate the progress in the Devonian black shale Program to date, to consider the reduced budget limits promulgated by DOE-MERC, and to adjust the program task scheduling to produce the data necessary for the most accurate resource appraisal possible within the time allotted by the present scheduling of the Program.

9410-11791 - Stratigraphy

6/6 de Witt attended Lineament Analysis Workshop at Morgantown, W. Va. and participated in the technical discussion.

6/6 de Witt and Arlen Hunt conferred about the austerity budget. MERC sets top limit of $850,000.

de Witt & Roen conferred with Sherman Harris, USGS Publications Division in regard to reformulating a DOE-USGS interagency agreement to publish large sized EGSP maps and charts. Reconsideration of interagency agreement requested by Jeffrey Smith DOE-DC.

REA

Laure Wallace reports that all 6 regional gamma-ray stratigraphic cross sections have been drafted and have passed through the Reston Technical Review Unit. The sections will now move to the Publications Division. However a correlation problem has developed in the central tie line which may require redrafting a segment of this line.

6/26 Roen attended Program meeting and reported progress of work by the stratigraphy project personnel.

Roen, Kepferle, and Wallace spend a week in Eastern Tennessee in the Sequatchie Valley and along the Allegheny Front in southwest Virginia measuring 5 sections of the Chattanooga in great detail and collecting samples of the Center Hill bentonite for the trace element data base. Kepferle reports finding the Foerstia zone in the section at Cumberland Gap, Va.

Kepferle visited the offices of the Cleveland Salt Company, Detroit, Michigan to examin cores and check drilling logs.

Roen assisted Bob Milici of the Tennessee Division of Geology in establishing a drilling and coring program for cutting some slim cores in eastern Tennessee. Roen conferred with Don Rymer and Scott Keys WRD, USGS as to the logging techniques and capabilities of the WRD logging equipment for use in logging slim holes in east Tennessee.

Roen reviewed Kepferle's paper on the correlation of the Chattanooga Formation at Big Stone Gap with the Wise Co. Va. core well.

de Witt reviewed the N.Y. Geological Survey's proposal for continued EGSP work for DOE.

11828 - Geophysics - Borehole Gravity

6/22 Jim Schmoker attended Program meeting and reported on progress of project 11828. It was decided that Schmoker's efforts in log analysis and cross plots of gamma ray/density would supply much needed data for the resource appraisal. Consequently Jim will increase his efforts in this area.

6/23 Schmoker and Roen begin plans for stratigraphy group to select and collect about 600 sets of wire line logs at one or more per county throughout the Appalachian basin for regional coverage in Jim's cross plot work.

Schmoker reports his paper "Accuracy of Borehole Gravity Data" has been printed in Geophysics Vol. 43. No. 3, and has reprints (see attachments)

Reference

Schmoker, J.W., 1978, Accuracy of Borehole Gravity Data: Geophysics, V. 43, No. 3, p. 538-542.

11844 - Geochemistry - Source bed study

6/26 Chuck Threlkeld reports that the carbonate ΔC^{13} fractions of samples from cores in Tazewell Co. Va., Mason and Upshur Counties, West Virginia have been analyzed.

The Rock-E-Val™ pyrolysis unit has been set up by Ted Daws, and 20 samples from cores in Martin Co. Ky. and Wise Co. Va. have been analyzed to produce thermograms of maximum pyrolysis temperatures as well as to establish oxygen and hydrogen indicies for these sets of samples.

6/22 George Claypool attended the Program meeting and reported on the progress of project 11844. As requested by de Witt, George revised his budget request for FY 1979 and adjusted task scheduling to permit more supportive analysis for Jim Schmoker's needs in the cross plot work.

11845 - Structural Studies

6/6 Colton attended the Lineament Analysis work shop at Morgantown and presented a paper on his analysis of joints in the northwestern and western part of the Appalachian basin. He pointed out that joint patterns were different for different lithologies at the same locality, and because of this surface lineations, which commonly inherit their orientation from the hardest near surface beds, may not be indicative of joint patterns developed in the black shales at depth.

Colton continued collecting joint data in Kentucky and in part of the Rome Trough areas in western West Virginia during the first half of the month.

Perry spent about 3 weeks in the field collecting joint and fault orientation data along the Allegheny Front and the Broadtop synclinorium in Maryland and adjacent West Virginia. He completed an area in northeastern Virginia begun by Colton and Neil Wilson last summer.

Harris continued compiling and synthesizing data on thin-skinned fracture zones in the Appalachian Plateau of northern West Virginia, western Manyland and south-central Pennsylvania. de Witt assisted Harris for several days for Allegany and Garrett Counties, Md. and Blair, Bedford, and Somerset Counties, Pa. areas where de Witt had done field work.

Harris completed review and partial recasting of Tennessee's Division of Geology report on seismic sections in the Valley and Ridge of east Tennessee. Robert Milici and Tony Statler are authors for the Tennessee Survey.

6/66 Harris attended the Program meeting in Denver and reported on the status of work in project 11845. He reworked his budget for FY 1979 at the request of de Witt.

11847 - Trace Elements

6/22 Joel Levanthal attended the Devonian black shale Program meeting and reported on the status of work for project 11847. At de Witt's request Leventhal adjusted his budget requests for FY 1979. Leventhal will work more closely with Jim Schmoker to supply Jim with additional basic data on uranium, thorium, and potassium concentrations for use in Jim's cross plots.

Leventhal has completed a preliminary data base for uranium in the Center Hill and Tioga metabentonites. He is now analyzing a suite of 20 recently collected samples of bentonites from cores and from outcrops to evaluate the effects of weathering on the radioactivity of the Devonian bentonites.

Joel Leventhal has published USGS open-file report 78-504 entitled "Trace elements, carbon, and sulfur in Devonian black shale cores from Perry County Kentucky, Jackson and Lincoln Counties West Virginia, and Cattaraugus County New York. Three copies of the report were sent to Arlen Hunt by de Witt on 6/26. The report gives basic data and in tabular and graphic form. Some preliminary geochemical interpretation of the data are presented.

11898 - Data System

Ted Dyman attended the Program meeting in Denver and reported on the progress of project 11898. At de Witt's request Dyman has reworked his budget requests for FY 1979 to fit into the smaller budget set by MERC.

Dyman reports large blocks of data have been submitted by Jan Downey MERC, the Pennsylvania Geological Survey, the New York Geological Survey, Juniata College, and the Kentucky Geological Group. Unfortunately Ed Wilson is not following established encoding procedure and is attempting to flood the system with low priority well data. As yet the Ohio Survey has not begun to encode their stratigraphic data.

PI and Dyman are continuing to remove inconsistencies in the encoding system and to check the formats for troublesome areas.

11900 - Clay Mineralogy

6/22 Hosterman attended the Devonian black shale Program review in Denver and reported on the progress of work in project 11900. At de Witt's request Hosterman revised his budget requirements for FY 1979 to fit into the austerity budget set by MERC

Hosterman has begun analyzing the clay fraction extracted from drill cuttings in the selected suite of cuttings that he collected from the Pennsylvania Geological Survey's well sample collection.

Problem Areas:

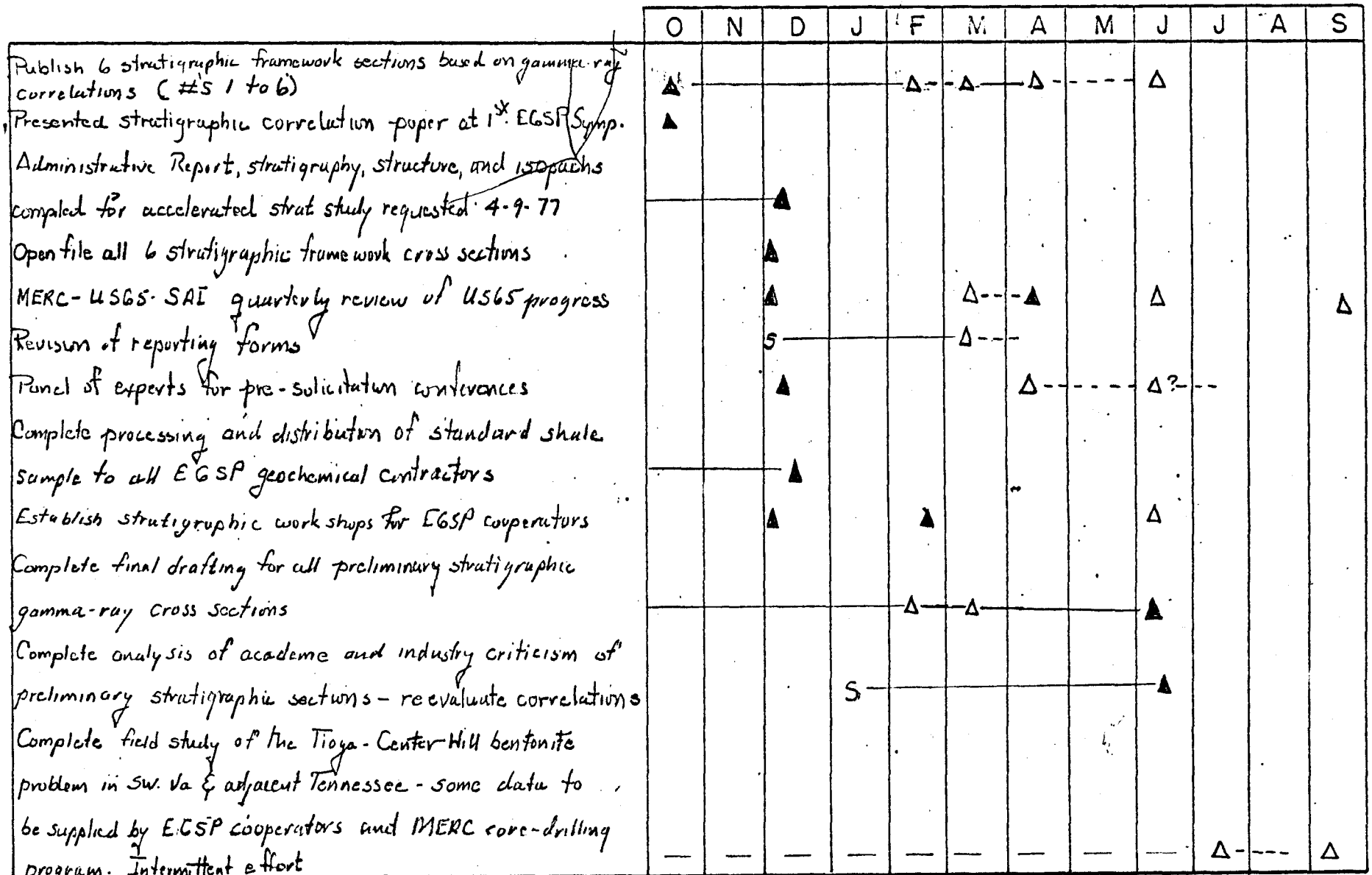
1) Ed Wilson of Kentucky is attempting to add a great number of driller's logs to the EGSP files by having original Kentucky Survey data sheets entered into the PI WHCS and then shifted to the EGSP file. This process is costly and many of the driller's logs are data of low priority value to the EGSP study. Samples sent to de Witt by Dyman contained little data applicable to the study of the black shales, and in one example, the entire Ohio shale sequence had been identified as Cleveland whereas most of the interval present was actually the older Huron Shale Member. Thus the data was wrongly interpreted in Kentucky and if encoded would be an incorrect entry which could only be corrected at a later date by additional expendature of money, time, and effort. Ed should restrict his efforts to the 3,000-4,000 key wells of high quality that he and Zaffar will use for the isopach and structural control in their part of the EGSP work.

2) Threlkeld reports that as yet the canned core samples from MERC #1 well have not been received in Denver. If samples and logs of the DOE-MERC cored wells are not made available soon after the wells are drilled, we cannot keep in schedule with our analysis of the samples and interpretations of the derived data.

USGS - Devonian Shale

Project - 9410-11791 - Stratigraphy (including Program Management) Page 1.

FY 78



USGS – Devonian Shale

Project – 9410-11791 Page 2.

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Complete half-year USGS budget review						Δ---	▲					
Preparation of FY 1979 budget & personnel assignment for USGS Devonian black shale program									S			Δ
Continue study of relation of lithologic sample logs and gamma-ray logs for more complete correlation of stratigraphic units in the gas-shale sequence of the Appalachian basin												
Samples to be supplied in part by MERC core-drill program								Δ				
Prepare stratigraphic reports for 2d EGSP Symposium								S				Δ
Submit preliminary data for evaluation by USGS Resource Appraisal Group, Denver. 2 regional isopachs				▲								
Series of meetings in Denver, Colo. with project chiefs and Branch chief to evaluate request for answers to specific questions by Arlen Hunt memo of 1/12/78				▲								
Kepferle and KGS personnel completed examination, re-measuring and sample collecting in the Big Stone Gap, Va. area, Samples to Harris, Hosterman, and Levanthal.			▲									
Supply geologic data on New York outcrops to West Virginia Geological Survey								▲				

USGS – Devonian Shale

Project – 9410-11791 Page 3

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Collect and locate about 600 sets of gamma-ray/density logs @ 1/per county in the Appalachian basin for J. Schmoker's cross-plot										S		Δ
Complete plans for gathering basic data for pilot resource appraisal											Δ	
Complete budget FY '79 reappraisal									S	Δ		

USGS – Devonian Shale

Project – 9410-11828 Borehole gravimeter

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Presented paper at 1st. EGSP symposium on relation of gamma-ray intensity to density.	▲											
Openfile basic data for borehole gravity stations in Col Gas Trans. Corp. wells 4982, 5016, & 6871 Jackson & Kanawha Cos. W. Va. USGS OF-77-82	▲											
Complete data analysis in OF-77-82	—	—	—	▲								
Complete electronic system for sensor on new slim-hole meter	—	—	—	—	▲							
Test and modify complete slim-hole borehole gravity meter system			S	—	—	—	—	Δ- - -	- - -	- - -	Δ?	
Log Devonian shale section in two to six wells in the Appalachian basin as EGSP core wells become available.						S -	—	—	—	—	—	Δ
Complete installation of safety device on truck-mounted boom winch	—	—	Δ- -	- ▲								
Complete gravity and density analysis of Dow Chemical Co data in the Michigan basin. Work Requested by J. Humphrys Dow Chemical Co Midland Mich. For DOE Study						▲						
Continue log analysis for expanded study of density/gamma-ray relationship as function of physical parameters indicative of depositionary environment and natural gas potential of the Devonian black shales. Samples to be supplied in part by MERC core drill program.	—	—	—	—	—	▲	—	—	—	—	—	Δ

USGS – Devonian Shale

Project – 9410-11828 Page 2

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Evaluate bore hole gravity project to determine if reorientation of effort is needed and revise tasks accordingly												Δ
Prepare report for MERC-EGSP 2d Symposium								S	—	—	—	Δ
Complete preliminary data encoding for EGSP data system				S	▲							
Prepare & submit to Arlon Hunt the task descriptions for extensive cross-plot work in the Appalachian basin						▲						
Complete evaluation of importance of pyrite in gamma-ray density cross plots. Report in preparation								▲				

USGS – Devonian Shale

Project – 9410-11844 Geochemistry – Source bed study Page 1

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Present paper at 1st EGSP symposium Claypool & Threlkeld	▲											
Complete remodeling sample preparation Lab. & recalibrate gas chromatograph –	——	▲										
Complete analysis of Tennessee samples from cores supplied by Robt Milici, T.G.S. to	——	——	——	▲								
Complete remodeling of Gasoline-range chromatograph & interface with Lab. minicomputer		S	——	▲								
Complete analysis of samples from Indiana Core #1113, Tazewell Co	——	——	——	——	▲							
Attend USGS quarterly review and associated geochemistry workshop						Δ	▲					
Complete preliminary data encoding for EGSP data system				S	——	▲						
Continue routine gas-chromatographic analysis of hydrocarbons in samples of Devonian black shales. Samples to be obtained from MERC core drill program	——	——	——	——	——	Δ	——	——	Δ	——	——	Δ
Prepare report for MERC-EGSP 2d Symposium												Δ
Supply available Lab. data on gas/unit volume of shale to U.S.G.S. Resource Appraisal Group						Δ	—— Δ					Δ

USGS – Devonian Shale

Project – 9410-11844 Page 2

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Complete collection & analysis of vitrinite samples from outcrops of Devonian shales in New York									S			Δ
Complete examination of 86 samples from cores from the Mason Co. W.Va well and samples of an Upshur Co. W.Va well supplied by Eric Smith, Columbia Gas Corp.						Δ						
						Δ	Δ		▲			

USGS - Devonian Shale

Project - 9410-11845 - Structural Studies Page 1

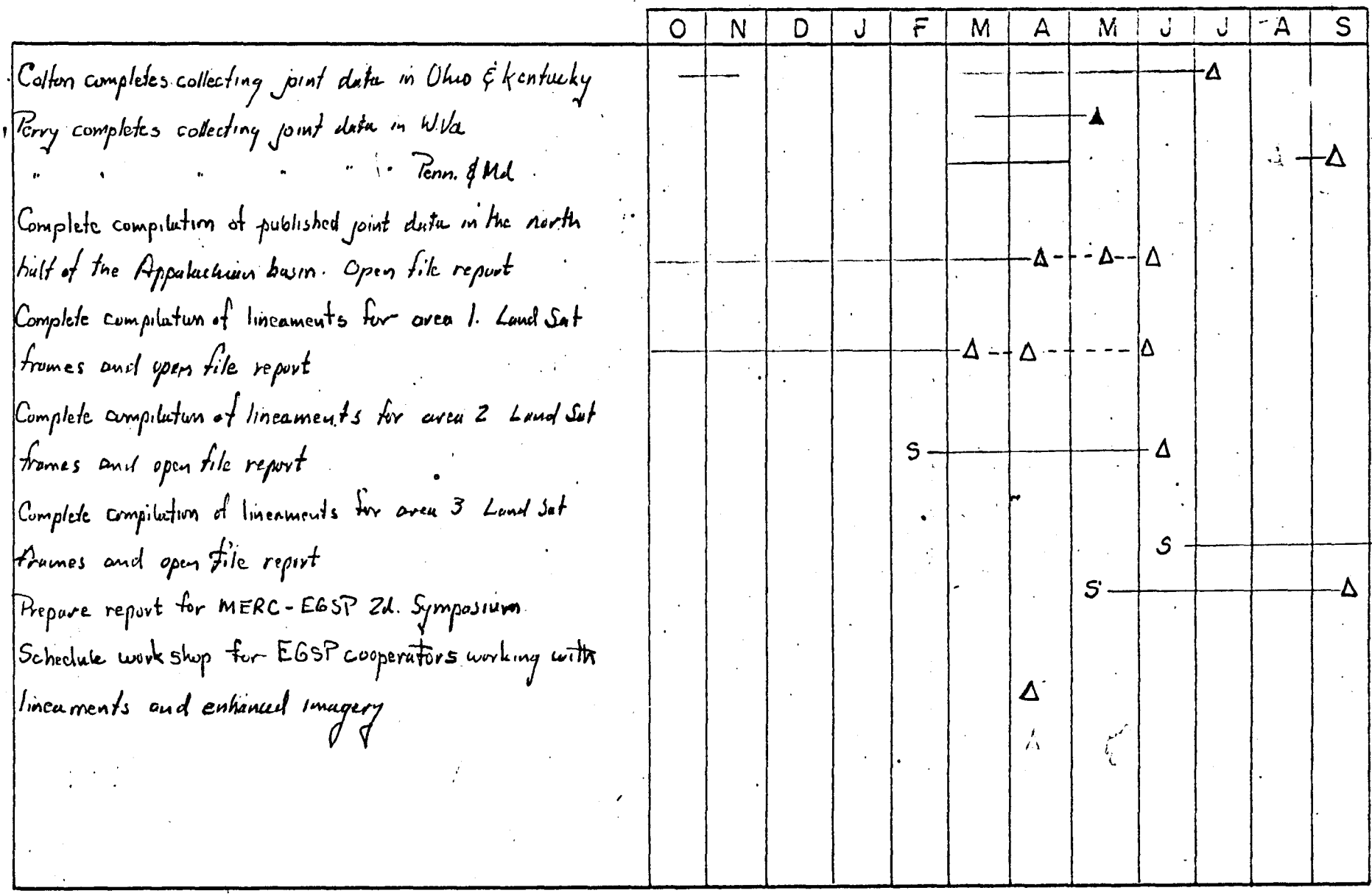
FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Meeting USGS, MERC, W.Va. U., SAI, & TRW - Select structurally important areas for drill sites for the Extraction Technology Demonstration Program - data compiled Oct. & Nov.	——	▲										
Open file report on conspicuous lineaments in parts of Land Sat. areas 1, 2, & 5		▲										
Report progress of USGS structural project @ Quarterly Review			▲									
Complete report on stratigraphic control of gas in the Devonian black shale. Transmitted to Oil & Gas Journal, published	——		▲		Δ- - -	-Δ?	▲					
Identify areas in the thin-skinned part of the Allegheny Plateau and the Valley and Ridge that are suitable for inclusion in the E.T.D.P.			S ——				Δ					
Panel Expert - pre solicitation conference ETDP			▲				Δ- - - -		Δ?			
Compile regional data - isopachs, structure, geophysics to delineat, define and analyze the development of the Rome trough. Prepare preliminary report 9/78	——	——	——	——	——	——	——	——	——	——	——	Δ
Analysis and interpretation of seismic cross section with Tenn Geol Surv. when data are available from GSI				S ——			▲					

USGS - Devonian Shale

Project - 9410-11845 Structural Studies Page 2

FY 78



USGS – Devonian Shale

Project – 9410-11846 Conodont Maturation

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Complete identification of conodonts and determine their												
Conodont Alteration Index for Thermal Maturation study Samples to be supplied by MERC or EGSP contractors												
Complete CAI determinations for Onondaga Ls. in EGSP cores from wells CGTC #20338 & 20403				▲								
Complete identification of conodonts and age determinations for samples of the "Tioga" metabentonite in east Tennessee and SW Virginia		▲										
Published report I-917-E, maps assessing hydrocarbon potential and thermal maturity (CAI isograds and overburden isopachs) for the Appalachian basin.					Δ-	- - Δ	- -	Δ- -	-Δ-	- -	Δ	
Identify conodonts and make age determination on samples of black shale from Big Stone Gap area, S.W. Va samples collected by R.C. Kepferle					▲							
Complete report on cephalopod anaptychi in cores of black shale from CGTC well #20403 Lincoln Co. W. Va. Request by Joe Schweitering, W. Va. USGS study by Mackenzie Gordon Jr.				▲								

USGS – Devonian Shale

Project – 9410-11846 Concodont Maturation Page 2

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Prepare report for EGSP 2d. Symposium								S				Δ
Completed preliminary data encoding for EGSP data system				S	▲							
Complete identification of conodonts from 10 samples submitted by Kepferle for outcrops of Chattanooga formation in SW. Va.									▲			

USGS – Devonian Shale

Project – 9410-11877 – Trace Elemental Analysis Page 1

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Present paper at 1st EGSP Symposium	▲											
Attend data encoding workshop	▲											
Complete analysis of EGSP Devonian standard shale sample			S—	—	—	▲						
Complete trace element analysis 67 samples – group 1 – Perry Co. ky, Jackson & Lincoln Cos, W Va.						▲						
Complete trace element analysis 60 samples – group 2 – Wise Co. Va., Martin Co. ky, Carroll & Washington Cos, Ohio, Overton Co. Tenn, Monroe Co. ky.												
Complete determination of trace elements to pyrite and organics											Δ	
Attend geochemical work shop (MERC)						Δ	▲					
Complete sulfur isotopes analysis groups 1 & 2, evaluate data						▲	"	/				Δ
Complete carbon isotopes analysis group 1, evaluate data												Δ
Collect core samples from Dow Chemical Co core – Midland Michigan							Δ	Δ				
Complete pyrolysis – gas chromatograph groups 1 & 2, evaluate data							Δ					Δ
Determine uranium and thorium content of core and outcrop samples, samples to be supplied by MERC, USGS, & other EGSP contractors – Continuing effort as material becomes available						Δ			Δ			

USGS – Devonian Shale

Project – 9410-11847

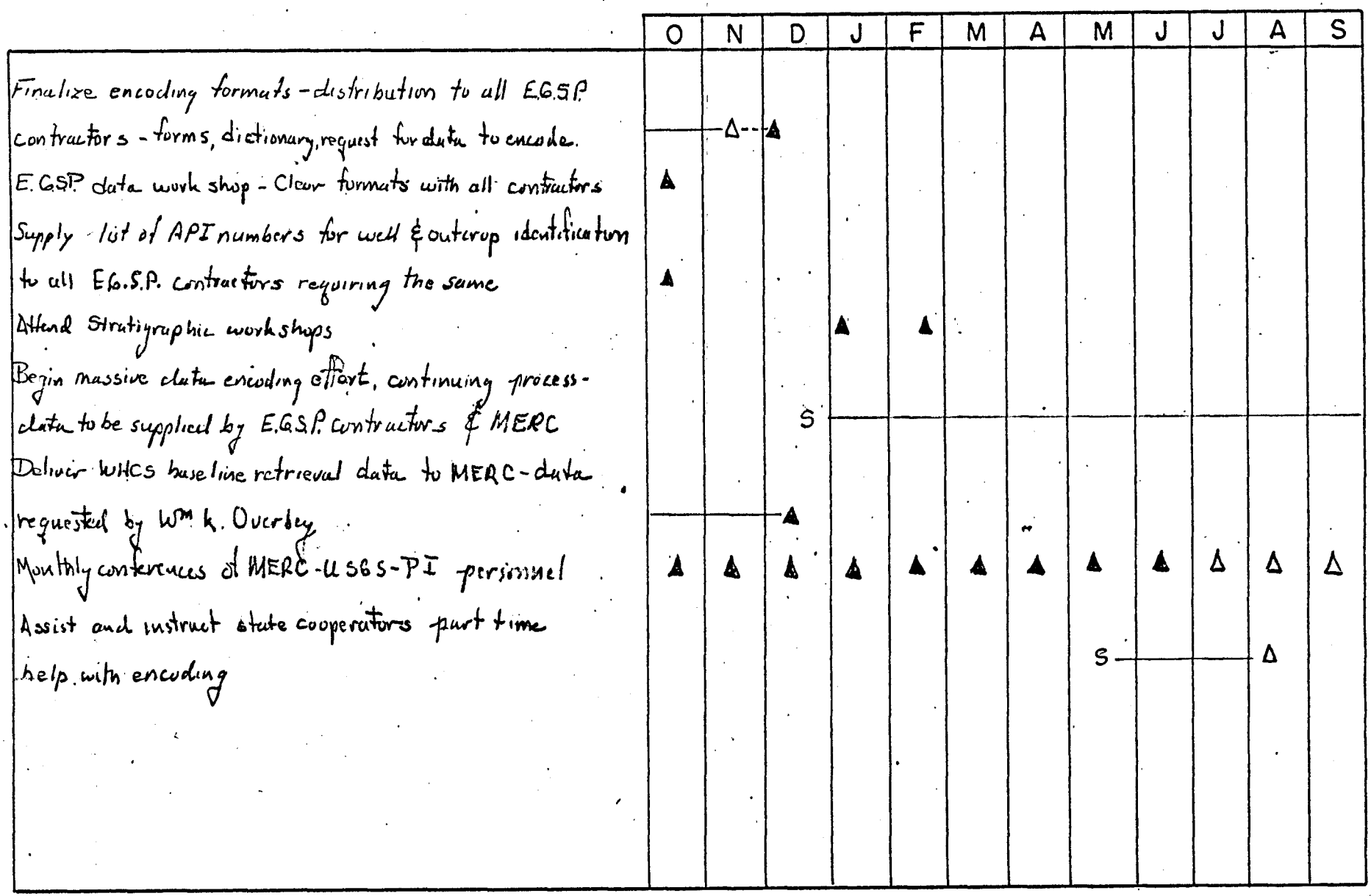
FY '78

	O	N	D	J	F	M	A	M	J	J	A	S
Complete uranium analysis on available samples of Tioga bentonite and Center Hill bentonite				▲								
Prepare report for MERC 2d E.G.S.P. Symposium												
Complete preliminary cluster encoding. (two shipments of data)			S	▲	▲							
Complete evaluation of importance of pyrite in the gamma-ray density log plots								▲				
Open file report 78-506 on Trace Elements, Carbon, and Sulfur in Devonian black shale cores from Perry Co. Ky., Jackson and Lincoln Cos. W. Va. and Cattaraugus Co. Ny.									▲			

USGS – Devonian Shale

Project – 9410-11898 – Data System

FY 78



USGS – Devonian Shale

Project – 9410-11900 Clay Mineralogy Page 1

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
All laboratory equipment functional - completed analysis of techniques for preparation of black shale for x-ray study	▲		▲									
Collected core samples in kentucky. W Va and Ohio		▲		▲								
Complete analysis of clays from residues of samples used by A. Harris in making CAI determinations for thermal maturation study of the Appalachian basin	S			▲								
Complete diffraction analyses of 110 whole samples from Tenn, W. Va, ky, Va				▲								
Completed diffraction analyses of 60-clay fraction samples from the south half of the Appalachian basin (Tenn. W Va, Va & ky). Data evaluation		S			▲							
Complete diffraction analysis of clay minerals in EGSP standard shale sample						▲						
Complete x-ray emission analysis of 140+ samples in southern part of the Appalachian basin, Data evaluation						S					△	
Complete preliminary data encoding			S		▲							
Prepare report for 2d EGSP Symposium								S				△

USGS – Devonian Shale

Project – 9410-11900

FY 78

	O	N	D	J	F	M	A	M	J	J	A	S
Assist MERC to organize a clay-mineralogy workshop						Δ–	–Δ?					
Completed analysis and evaluation of 77 samples for CGTC well # 20338, data to Ted Dyman				▲								
Collect samples from Mason Co. W. Va. & Sullivan Co, Pa.												
Cores at Morgantown W. Va & Pittsburgh, Pa.							▲					
Complete collection of well cuttings in Pennsylvania and Ohio from Geological Survey files. 400+ samples now being processed for analysis								▲				