

APRIL - MAY

MARSON CORE #1 1991

DRILLER'S NOTEBOOK

W# 32200

WELL RECORD

Driller.....

Address.....

.....

Owner.....

Address.....

.....

RETURN TO
IOWA GEOLOGICAL SURVEY
IOWA CITY, IOWA

WHEN RECORD IS COMPLETED PUT IN ENVELOPE AND MAIL TO

THE DIRECTOR

IOWA GEOLOGICAL SURVEY

IOWA CITY, IOWA

sc. clasts of dk.gr.-blk. noncalc. clay shale to 0.6 ft (315-321); mudst. clast, silt-lam., noncalc., deformed/contorted (318.5); mudst. clast, m.-dk.gr., micac., silt-lam. (dips 45o), noncalc. (321-23.6); shaly breccia/mixtite with shale, siltst., limest. clasts (323.6-25.2); mudst. clast, m.-dk.gr., silt-lam. (dips 10-30o), noncalc.-sl. calc. (325.2-328.8); breccia, tr. chert clast (328.8-29.7); mudst./shale clast, m.-dk.gr., noncalc.-sl. calc., sl. pyritic in upper part, coaly material (331), sc. silt lam. in lower part (329.7-334.5). [interpretaton: breccia with large clasts dominantly of Cretaceous shale/mudstone; minor Paleozoic and Precambrian crystalline clasts].

UNIT 8 (334.5-347). Shaly breccia with large shale block at base; shaly breccia/mixtite (334.5-40.5), dk.gr. (darker than breccia matrix in overlying units), calc., with clasts of shale, silt-lam. mudst. (to 3-5 inches), sandst. (calcite veined with offsets), igneous/metam. clasts with quartz/hornblende/feldspar (336.5-40.5); clay shale block, dk.gr.-blk., noncalc., pt. lam., pt. pyritic and pyritic lam., sc. calcite-filled fractures and microfaults (340.5-347), dips 5-60o (341-46). [interpretation: breccia is of different character and composition than overlying units; includes higher percentage of probable Precambrian sedimentary and crystalline rock clasts; lower shale block closely resembles dark shales (aff. Nonesuch Sh.) of the Keweenaw "lower red clastic" interval].

UNIT 9 (347-361). Crystalline rock breccia in glassy tuff-like matrix, m.gr., harder than above, noncalc., with sand to grav.-sized igneous/metamorphic and glassy clasts, pt. porous; top 2 ft with dk.gr. matrix containing frac. igneous and tuff-like clasts, some blk. shale clasts; matrix sl. porous in pt., with calcite void fills/linings (349-55.2, 357-58) and pyrite void linings (351-55.2, 357-58); larger clasts include gneiss (351.6-51.9, 353.6-54.7), granite (355.5-56.1); glassy clasts with flow structure sc., dk.gr.-blk. irreg. banding (351-55.2, 56.7, 58, 61). [interpretation: Precambrian crystalline rock breccia intermixed with some Keweenaw shale at top; glassy clasts and tuff-like matrix indicate melt-rock].

UNIT 10 (361-406). Crystalline rock breccia in altered glassy tuff-like matrix, lt.-m.gr., noncalc., pt. highly altered with siliceous domains, matrix-dominated thru most, most clasts are small (<1 mm-1 cm), sc. larger ign./metam. clasts; sl. porous with sc. quartz-lined voids/fracs. noted (362.7, 66.2, 66.5, 69.8, 74, 78, 81, 83-85, 88.5-93,, 99.7, 401, 406.4), pyrite void/frac. lining noted (369.4, 69.8, 402-04.5 [in frac. gneiss clast]), calcite? pore linings (369.8, 81); fractured altered siliceous clast, sl. calc. (376.8-77.7); altered "granite" clast (381-83.7); altered clasts to 4 inches (393.5, 98); banded gneiss clasts (402-04.5). [interpretation: crystalline rock breccia in glassy matrix; melt-rock has been hydrothermally altered, glass is devitrified into siliceous domains].

UNIT 11 (406-431). Crystalline rock breccia, similar to above, clasts to 6 inches, but with differences in clast

composition, becomes sl. more matrix-dominated downw.; includes sc. glassy clasts with flow structure (408.2, 414); quartz and pyrite fracture lining (416.4); clasts dominated by altered granite/gneiss, includes sc. altered mafic/amphibolite clasts (406-411, 12.8, 17.8, 21), graphic granite clasts (411, 14.9, 15.1, 19.8, 22.5, 25.2-25.8); asbestosform mineral in void, probably altered mafic clast (423.1). [interpretation: as above].

UNIT 12 (431-484.5). Crystalline rock breccia in glassy matrix, similar to above, clasts are sand sized to 3-4 inches (rarely larger as noted below), dominantly altered granite/gneiss; pt. sl. porous with quartz-lined voids and frags. (41.7, 43.2, 48.5, 47.8, 66, 71, 71-72.4, 74.8, 75.8, 77, 80.7) calcite? fracture and void fill/lining (38.4, 40.1, 71-72.4, 80.7, 81-84); clasts dominated by altered granite/gneiss (larger clasts 68-69.6, 78.3-78.8, 79-79.6), includes sc. mafic/amphibolite clasts (436, 52.6, 57.7, sc. 61-71), graphic granite clasts (441.7, 64); asbestosform mineral in voids, altered mafic clasts (47.8, 53.5); altered glassy clasts with flow structure (436.9-37.4, 49.7, 62.5-62.8). [interpretation: as above].

UNIT 13 (484.5-530). Crystalline rock breccia in glassy matrix, as above but with notable increase in glassy clasts with flow structure, most clasts are small (< 1-3 inches); matrix is sl. porous, pin-pint porosity generally increases downw., gradational with Unit 14; Precambrian crystalline clasts include gneiss (502-03.7), granite (516.16.2), graphic granite (495-95.3), mafic rock and amphibolite sc. thru; calcite fracture or void fill (522); altered mafic clasts with void spaces (526.2, 26.7, 27.5); swirled altered glassy clasts with flow structures at 486-86.3, 90.1, 91, 91.4-91.7, 92.7, 93, 95.5, 96-96.2, 96.4, 96.8-97.2, 98, 98.6, 99, 99.8, 505.6, 506, 508.8, 509.2, 16.5, 16.9, 17.5; small swirled clasts (< 1"), pt. with white alteration rinds (518-530). [interpretation: as above, but with higher content of altered glassy clasts, some with complex accretionary structure].

UNIT 14 (530-595). Crystalline rock breccia in silty-sandy matrix, matrix pt. sl. calc., calcite void fill (550.3); porous zone, pin-point porosity thru, unit is a water-producing interval; most clasts are small (< 1-3"), altered to well preserved; noted clasts include gneiss (larger clasts at 538-38.5, 568.8-73, 593-93.5), amphibolite/gneiss clasts (531.2-31.5, 35.5-36, 40, smaller sc. thru), mafic clasts (536.4, 43.7), graphic granite (577.5); highly altered and porous banded clasts (555.6-55.9, 56-56.3); altered glassy clasts, pt. with swirled flow structures, light colored rims/rinds (sc. thru, 544.2, 51.9, 61-62.8, 67.5-68.5, 78-81). [interpretation: matrix and clast composition shows significant decrease in glassy clasts and matrix, increase in finely fragmented sand-sized rock].

UNIT 15 (595-636). Crystalline rock breccia, as above, but with downward decreasing porosity, denser downward, gradational with above unit; matrix silty-sandy, pt. calcitic (esp. 610-11); clasts mostly small, but larger clasts of gneiss

and amphibolite/mafic noted at 597.5-98.2, 601-01.5, 05.4-05.8, 07.5-07.8, 08.3-08.7, 13.8-14.3, 17.5-23 [v.large], 624.2-24.7, 25.6-28.7, 31.6-32.6; rare glassy-like clasts with swirled/flow structure at 606.4, 12.2, 33.8. [interpretation: sandy-matrix breccia].

UNIT 16 (636-703, T.D.). Crystalline rock breccia, as above, matrix pt. sl. calc. (more calc. 651-61; mostly noncalc. 675-703), sl. porous; most clasts < 0.5-2 inches, more clast-rich below 651; larger clasts of gneiss/amphibolite at 647.9-48.9, 653.1-54.7, 85.6-86.2, 87.1-88.1, 82.5-83, 97-98.1; mafic clasts noted 638.8-39.2, 63.4, 64.6, 93.8, 96.6-96.8; granitic clasts 71.7-72.3, 77.9-79; lt.gr. glassy clasts with swirled flow structure at 640.1, 42.5, 43.6, 69.5, 82 (swirled fabric in matrix), 93.6. [interpretation: as above].

SUMMARY: Units 1-8 are sedimentary-clast breccia, dominated by Cretaceous lithologies, but including Paleozoic clasts in part. The bottom of this interval (Unit 8) differs from that above in having a darker colored matrix, and in containing Precambrian sedimentary and crystalline clasts; this unit may be related to the underlying glassy-matrix breccias. Units 9-13 represent the glassy-matrix breccias, with clasts composed of Precambrian crystalline lithologies with glassy clasts/rinds. The matrix is tuff-like in part. This interval shows evidence of siliceous hydrothermal alteration, and void spaces are commonly lined with quartz crystals. The glassy-matrix breccias are gradational with the sandy-matrix breccias below (Units 14-16). The matrix in this interval, porous in part, contains an abundance of silt and sand-sized rock particles (commonly shocked), along with small to large clasts of Precambrian crystalline lithologies. Glassy clasts, commonly with flow structures and accretionary-like rinds, also occur within this interval, but are less common than in the glassy-matrix interval. The M-1 core contains evidence of probable air-born melt material, that formed complex glassy clasts, glass-coated rinds, and tuff-like matrix material. The interaction of this melt material was exclusively with Precambrian basement lithologies; no Phanerozoic sediments are contained within the complex breccias.

Block; m. dk. gr. shaly breccia/mixtite matrix noted (261-67.5, 265.5-266); limest. bloc. pt. fossilif., brown. In middle, sl. arg. in lower part (275.5-281); limest. block, lt. gr., dense, xfin (285-91). [interpretation: breccia with dominant clasts of Paleozoic limestone].

UNIT 6 (291-310.5; no core 291-293; 3 ft core loss 293-302; 2 ft core loss 302-311). Dominated by large shale blocks; soft clay shale, dk. gr., slickensided (293-302); clay shale, dk. gr. -blk, noncalc. slickensided (302-310.5); minor shaly breccia/mixtite (295, 302). [interpretation: large blocks of Cretaceous shales].

UNIT 7 (310.5-334.5). Shaly breccia/mixtite, m. gr., calc., with clasts of shale, siltst., sandst., limest., igneous rock; arg. siltst. clast, frag. and microfaulted (312.7-13.6); igneous or metamorphic clast, with quartz-hornblende (313);

SAMPLE TRACKING FORM

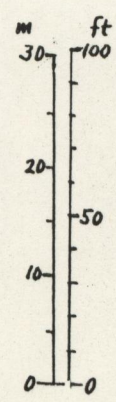
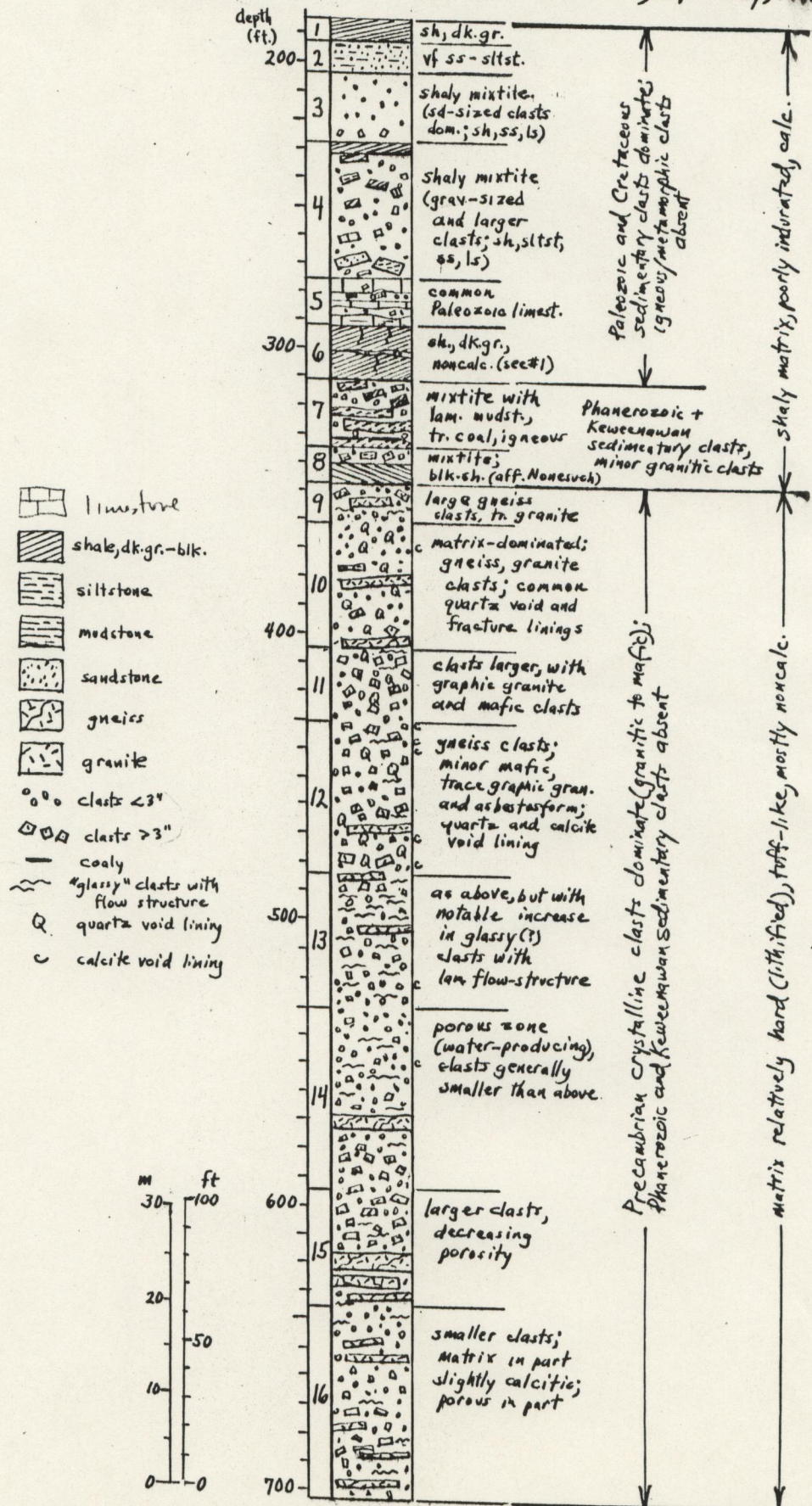
WNUMBER: 32200DATE RECEIVED / /OWNER: PIERSON, CLARA (M-1)PROJECT: MANSONOPERATOR: GSBLOCATION: POCAHONTAS COUNTY, IOWA

T90N R31W SECTION 18 ADAAD

LATITUDE: 423643LONGITUDE: 943226LL ACC: 1ELEVATION: 1237ELEV ACC: 3QUAD NAME: MANSON (I18)TOTAL DEPTH: 703BEDROCK DEPTH: 186AQUIFER:ABANDONED:TYPE SAMPLE(S): chip\coreSTRAT DATA:GEOPHYSICAL DATA:WELL TYPE: ExplorationPUMP TEST:WATER ANALYSIS:DRILLER: IGS/USGSDRILL DATE: / /DRILL METHOD: RotarySTRIPLOG BY/GEOLOGIST:STRIPLOG DATE/STUDY DATE: / /MIRCOFILMED:SAMPLE LOCATIONNUMBER SAMPLES: 32INTERVAL: (ft)NUM BOXES: 1SAMPLE TOP: 2 (ft)SAMPLE BOTTOM: 186 (ft)WASH TOP: (ft)WASH BOTTOM: (ft)GAPS: 0-2CHIP SAMPLE STORAGE: OD2-685CUT DATE: 05/09/91CORE STORAGE: T61L5-T65L1

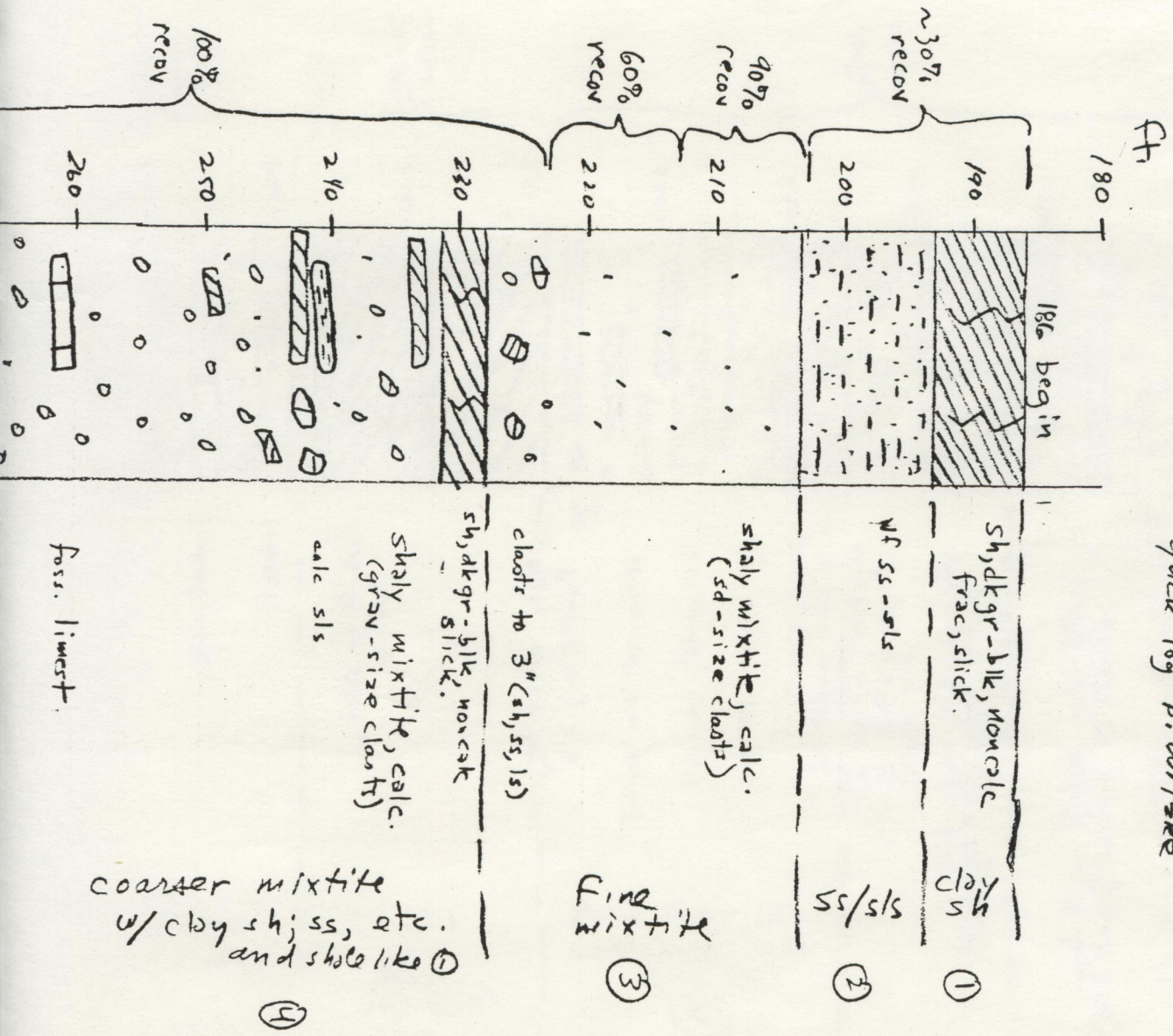
MANSON PROJECT, M-1 core
 Clara Pierson, SENESENE sec. 10, T90N, R31W
 Pocahontas Co., Iowa; elev. 1237'; Apr.-May, 1991

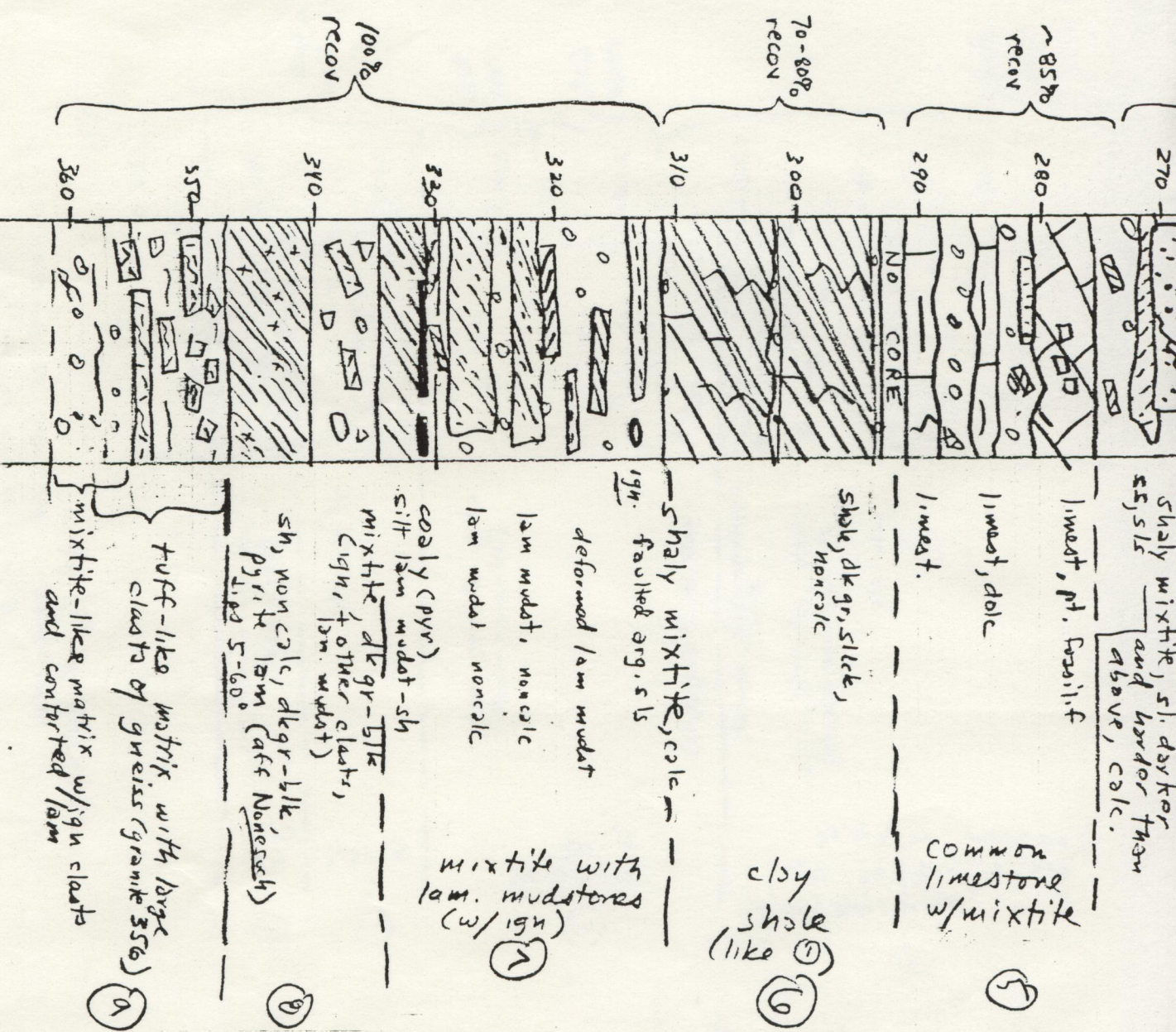
CRATER
 SUEVITE



W-32200

Pierston, M-1 core, Manson Project
 T90N, R31W sec 18, ADAAD
 Pocahontas Co., IA 24 Apr 1991
 quick log B. Witzke





W-32200

Manson n-1

Thin sections { 464.5 (Box 27) NX 9990
 { 670.5 (Box 47)

51 Total boxes

Core starts @ 186

TD = 703

T6145 - T6541

DRILLER'S NOTE

It is important that a driller's notebook, filled out as completely as possible, be sent to the Iowa Geological Survey at the completion of each hole. A number of drillers have found it convenient to string samples from a single well on a heavy wire and attach the log book to them. A hole has been punched in the log book for this purpose.

Sample sacks and log books will be furnished by the Geological Survey. A copy of the log book will be made and returned if desired by the driller.

SUGGESTIONS TO DRILLERS

1. Samples should be taken from each bed passed through, and never more than 5 feet apart, even in the same bed.
2. Samples should not be washed, except to remove excess drilling mud, as washed samples may give a wrong idea of the character of the bed.
3. Fill out the label on each sample bag with the name of the well and the depth interval which the sample represents.
4. Make frequent use of the "Description" column to explain the material being drilled.
5. Note depth and thickness of all water-bearing layers.
6. Note the quality of the water from each layer: as hard, soft, salty, alkaline, or sulphur bearing.
7. Note height to which water from each layer rises in well, and give flow or capacity in gallons per minute.
8. Fossils, such as oyster, clam, and other shells, are important and should be placed in bags with the material with which they are found and carefully labeled as to the depth from which they were obtained.
9. If you do not understand what is wanted, or desire information on any point, write to the Iowa Geological Survey, Iowa City, Iowa.
10. Samples may be boxed and sent to IOWA GEOLOGICAL SURVEY, IOWA CITY, IOWA, EXPRESS COLLECT.

The Iowa Geological Survey desires to assist and cooperate with owners and drillers in every way possible, and will be glad to answer questions and assist in the solution of problems at any time.

MANSON QUAR.

WELL RECORD

Well is located 5 3/4 miles S and 1 miles S from MANSON in POCAHONTAS COUNTY, IOWA.
(Nearest Town) (County)

in the NE 1/4 SE 1/4 Sec. 18 T. 90N R. 31

Owner G. S. B. Well No. M-1

Postoffice address _____

Contractor _____

Address _____

Driller D. L. EVANS

Well begun _____, 19____;
completed _____, 19____

Rig used—Cable, Rotary, Jet, or _____

Depth of well 203
(Feet)

Size of hole (note total amount of each size) _____

Main water supply at _____
(Feet below surface)

Final water head _____
(Feet above or below surface)

Is well pumped? _____

Yield _____
(Gallons per minute)

Water level when pumping _____

Position of well _____
(Upland, valley, side hill, etc.)

EVANS

T: 90 R- 31 SEC. 18 NE / NE/SE/NE

m-1

1233 ELEV

SAMPLE NO.	DEPTH		THICKNESS
	From	To	
4/8/91	0	2	5" HOLE
	2	6	
	6	10	
	10	16	
	16	18	
	18	38	
	38	39	
	39	50	
	50	54	
	54	56	
	56	60	
	60	80	
	80	89	
	89	92	
	92	94	
	94	132	111' 2000'
	132	145	

OVER

DESCRIPTION OF BEDS
KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.
TOP SOIL
YELLOW-GRAY VERY SANDY ^{TILL} GRAVELY
YELLOW-BR. TILL SANDY + GRAVELY
BR + YELLOW-BR. SILTY CLAY
BL-GRAY + OLIVE TILL
BL-GRAY TILL
SAND + GRAVEL F-COURSE
BL-GRAY TILL
F-COURSE SAND + GRAVEL, ^{BL-GRAY} DOUBT SOME TILL
SANDY + GRAVELY BL-GRAY TILL
DARK GRAY + GRAY SILTY CLAY
BL-GRAY TILL
YELLOW-BR. TILL
YELLOW-BR. SILTY CLAY
YELLOW-BR. TILL TO OLIVE
BL-GRAY TILL
GRAY CLAY FEW SAND GRAINS
OVER

M-1

SAMPLE NO.	DEPTH		THICKNESS
	From	To	
	145	147	
	147	160	
	160	165	
	165	175	
4/9/91.		REAMING HOLE	
	175	178	
	178	182	
	182	186	
	SET 5" P+E STEEL PIPE		
	RAN 6 SACKS CEMENT		
	PUMPED BEHIND PIPE (5")		
4/10/90	CLEANED OUT HOLE WITH		
	TOOK TO LOCATION & RAN		
4/15/90	186	188	CORR
	188	193	2' REC
	193	203	4' REC
	203	204	

OVER

DESCRIPTION OF BEDS	
KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.	
BL-GRAY TILL	SANDY
YELLOW-BR TILL	SANDY
DARK GRAY CLAY	FEW SAND GRAINS
DARK GRAY + GRAY SHALE	
TO 6 $\frac{3}{4}$ "	
DARK GRAY SHALE	
GRAY SILT + SANDY SHALE ?	
GRAY SHALE	
TO 186'	
THROUGH 1 $\frac{1}{2}$ " TIRCO +	
5" BET) LOADED CORING EQU.	
COLE BARRATT	
GRAY SHALE	
V. FINE SS	SILT SOME OX
FINE TO V. FINE SS	^{SILT} SOME OX
SS.	

OVER

m-1

SAMPLE NO.	DEPTH		THICKNESS
	From	To	
	204	213	9' REC.
	213	223	6' REC.
	223	233	10' REC.
4/16/91	233	243	10' REC.
	243	253	10' REC.
	253	258	5' REC.
	258	268	10' REC.
	268	276	6" OR 7' REC.
	276	280	3.5 REC.
	280	285	4.5 REC.
	285	291	6
4/17/91	Loaded	HW CASING + TOOL	
	TO 5"	SIT HW CASING FROM	
4/22/91	292	302	6' REC.
	302	311	7' REC.
	311	321	10' REC.
	321	331	10 REC.

OVER

DESCRIPTION OF BEDS		
KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.		
SOFT + BRACCA		
DARK SHALE WITH LAYERS OF S.S. + R.S.		
(BRACCA.) SHALE + SIT SANDSTONE		
" " + LIMESTONE		
" " "		
" " "		
(BRACCA.) SHALE + L.S., SANDSTONE		
" MORE L.S. + S.S.		
" " " " HARDER		
LIMESTONE BROKEN SOME SHALE		
L.S. + BRACCA SHALE		
L.S. SOME SHALE NEAR TOP		
TO LOCATION; BEAMED CORE HOLE		
292 - 182;		
MOSTLY GRAY SHALE SOME TAN L.S. LAYERS		
GRAY SHALE BROWN + CRUMBLY		
BRACCA SHALE SANDY		
" " "		

OVER

SAMPLE NO.	DEPTH		THICKNESS
	From	To	
	331	341	10'
	341	348	{ 10' }
	349	351	
4/23/91	351	361	10'
	361	371	10' ^x
	371	381	10' ^{xx}
	381	391	10'
4/24/91	391	401	10' ^{NEW BIT}
	401	411	10'
	411	421	10'
	421	431	10'
	431	441	10'
	441	451	10' ^x
4/29/91	451	461	10'
	461	471	10'
	471	481	10'
	481	491	10'

OVER

DESCRIPTION OF BEDS	
KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.	
DARK GRAY SHALE SOME CARBON.	
DARK GRAY + BRECCIA SHALE	
BRECCIA GRANITE + CARB	
BRECCIA GRANITE + CARB	
" " " "	
BRECCIA GRANITE + CARB <small>FOR PORTIONS AT BASE</small>	
"	
BRECCIA GRANITE + CARB	
" " " "	
BRECCIA GRANITE + CARB <small>ALL ONE PIECE</small>	
" " " "	
" " " "	
" HAIR CRISTALS " "	
" " " "	
" " " "	
" HAIR CRISTALS IN MASS	
" " " "	
BRECCIA GRANITE + CARB	
" " " "	
" " " "	
" " " "	

OVER

SAMPLE NO.	DEPTH		THICKNESS	DESCRIPTION OF BEDS	
	From	To		KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.	
	491	501	10'	BRECCA GRANITE CARB	mostly GRAY-GREEN
	501	511	10'	"	"
4/30/91	511	521	10'	BRECCA GRANITE + CARB.	"
	521	531	10'	"	"
	531	541	10'	"	"
	541	551	10'	"	"
	551	561	10'	"	"
	561	571	10'	"	Bottom 4' mostly WEATHERED GRANITE
	571	581	10'	BRECCA GRANITE + CARB	mostly GRAY-GREEN
	581	591	10'	"	"
	591	601	10'	"	"
	601	611	10'	"	"
	611	621	10' X	"	Bot. 4' pink + black granite (brown)
	621	631	10'	"	"
	631	641	10'	"	"
5/1/91	641	651	10'	BRECCA GRANITE + CARB	mostly GRAY-GREEN
	651	661	10'	"	"

OVER

OVER

SAMPLE NO.	DEPTH		THICKNESS
	From	To	
	661	671	10'
	671	681	10'
	681	691	10'
	691	703	12'

DESCRIPTION OF BEDS			
KIND OF ROCK, COLOR, HARD OR SOFT, WATER, ETC.			
			MOSTLY GRAY-GREEN BRECCIA GRANITE + CARB.
11	"	"	"
81	"	"	"
11	"	"	"

5/6/91 Run in Hole; Hole caving; stuck core barrel at 560'; unable to move up or down; backed off tubing; retrieved all but 70';

Pulling core tubing; tried to drive free; picked up welder

5/7/91 Picked up welding rods; core barrel; met with warehouse; unloaded; unloaded welder;

repaired 4" stabilizer + Ray A.; took truck to tubing + loaded plastic; sent core back with Ray

5/8/91 Run in Hole with 4" liner has caving; took truck to unload plastic; cut off 1200# bentonite med. +

2 1/2" rock bit; unable to clean slipped 50' down hole; hole warehouse to pick up bentonite + 5" 3' below ground; placed 200# cement; backed fill hole

MANSON PROJECT, M-1 CORE (NX), Pierson (W32200)

SE NE NE SE NE sec. 18, T90N, R31W, Pocahontas Co., IA; elev. 1237 ft
descriptive units (depths in feet); 100% core recovery unless noted.
preliminary log, Brian J. Witzke, Apr.-June, 1991.

UNIT 1 (186-193; 1.7 ft core recovery; cuttings 188-193). Shale,
dk.gr.-blk., sl. calc. highly frac., slickensides; cuttings
labeled 188-193 are sand, vf, quartzose, subangular to
subrounded (suggests that top of Unit 2 sandstone may range
higher than noted). [interpretation: probable block of
Cretaceous shale].

UNIT 2 (193-203.5; 3 ft core recovery 193-203). Sandst./siltst.,
vf, m.yel.gr., sl. arg., sl. calc., subangular to subrounded
grains. [interpretation: sandstone block; grain angularity
and composition consistent with Cretaceous assignment].

UNIT 3 (203.5-228; 9 ft recovery 203-213; 6 ft recovery 213-223).
Shaly breccia/mixtite, silty-sandy, lt.-dk.gr., calc., sc.
clasts of shale, chert, limest., sandst.; most clasts are
sand-to sm. pebble-size; clasts to 6 cm (223-228) include
noncalc. blk. sh. with slickensides. [interpretation:
matrix-dominated sedimentary breccia].

UNIT 4 (228-275.5; 2 ft core loss 273-285). Shaly
breccia/mixtite, silty-sandy, m.-dk.gr., calc., matrix with
gravel-sized clasts (to 3 inches) of shale (dominant clast,
dk.gr.-blk., with slickensides), limest., siltst., sandst.,
chert; large clasts of clay shale, dk.gr.-blk., highly
slickensided, minor shaly mixtite (228-231); dominantly
dk.gr. shale clasts as above, clasts <5 cm (231-33); siltst.
clast, with xlln calcite (240-41); shale, dk.gr.-blk.,
slickensided (242-43); calcite fracture fill in matrix
(252); clast of xlln limest., crinoid debris (260.5-61.5);
matrix becomes darker and harder downward (263-73); sandst.,
lt.gr., in lighter matrix, , vf-c, sl.calc.-noncalc., some
dark shaly stylo. surfaces (268-70.3); shale, lt.gr., with
dipping lam of siltst.-vf sandst. (270.3-71.6).
[interpretation: breccia clasts dominantly Cretaceous,
secondary Paleozoic].

UNIT 5 (275.5-291; 90% core recovery). Dominated by limest.
blocks; m.-dk.gr. shaly breccia/mixtite matrix noted
(281-83.5, 285.5-288); limest. block, pt. fossilif., brecc.
in middle, sl. arg. in lower part (275.5-281); limest.
block, lt.gr., dense, xlln (288-91). [interpretation:
breccia with dominant clasts of Paleozoic limestone].

UNIT 6 (291-310.9; no core 291-293; 3 ft core loss 293-302; 2 ft
core loss 302-311). Dominated by large shale blocks; soft
clay shale, dk.gr., slickensides (293-302); clay shale,
dk.gr.-blk, noncalc., slickensides (302-310.9); minor shaly
breccia/mixtite (293, 302). [interpretation: large block(s)
of Cretaceous shale].

UNIT 7 (310.9-334.5). Shaly breccia/mixtite, m.gr., calc., with
clasts of shale, siltst., sandst., limest., igneous rock;
arg. siltst. clast, frac. and microfaulted (312.7-13.6);
igneous or metamorphic clast, with quartz-hornblende (313);