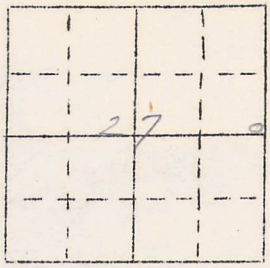
N-0130

IOWA GEOLOGICAL SURVEY
In Cooperation with U. S. Geological Survey

RECORD OF WELL



Location:

Town: Williams (N E / S W); County Hamilton

SE¼ NE sec. 27 T. 89 N., R. 23 E. W. Twp.

Well name and number Williams City Well.

Owner _____ Address _____

Tenant _____ Address _____

_____

Contractor J. Becker Address Ft Dodge

Drillers _____

Drilling dates 1932

Well data:
Elevations: Drilling curb 1205 feet; Land surface _____ feet

_____

_____

Determined by Gulf

Topographic position Upland

Total depth: Reported 1760 feet, Measured 1760' feet

_____

Drilling method 8" to 300'. 6¼" to 750' 5" to 1000'; 4½" at

Hole and casing data 15 at 80' 24" at about 160'
(Give amount, size, kind, and depth of all casing; type and

position of seals and packers; cementing; how finished--perforated pipe, screen,

gravel pack, open hole, etc.)

_____

_____

_____

Original depth to water _____ ft. above/below _____ Date _____

Original elevation of water level _____ ft.; Source of data _____

_____

Sources of water: Principal New Richmond; Others Quarter

_____

Production data: Date _____

Static depth to water 50' Measuring point _____

Pumping level 52 at 125 g.p.m.

1937 ET S.W.L. 240 100 g.p.m.

Specific capacity _____ g.p.m. per ft. drawdown; Temperature 42° °F.

Pump data; Type pump Turbine Column Dia. _____ Length 253

Cylinder or bowls: Dia. _____ Length _____ Suction pipe 20

Power Electricity Airline _____

Estimated rate of production: _____ g.p.m. for _____ hrs. a day

Use of water City Supply

WATER ANALYSES (in parts per million)

Date sampled	Dec. 22, 1936			
Sampled by	H.G. Hershey			
Total solids	410.0			
Insoluble matter	10.4			
Alkalinity (Meo)	405.0			
Alkalinity (Phn)	0.0			
pH	7.0			
$Fe_2O_3 + Mn_2O_3 + Al_2O_3$	2.8			
Alkali as sodium	31.7			
Calcium	69.4			
Magnesium	39.5			
Iron (unfiltered)	0.1			
Manganese	0.0			
Nitrate	0.27			
Fluoride	1.0			
Chloride	6.0			
Sulfate	1.2			
Bicarbonate	494.1			
Hardness (ppm)	336.0			
Hardness (gpg)	19.8			

Remarks _____

Laboratory data: Sample storage location _____

Sample range _____ No. spls. _____ No. dupls. & cond. _____

Spls. prepared by _____ Washed range _____ by _____

Driller's log and cond. _____

Insoluble residues: Prepared by _____ Studied by _____ Strip log _____

Microscopic study _____ strip log _____

Gen. log _____ Correl. by _____

Notes on Williams City Well, Hamilton Co.
Survey No. W-0130

This is a fair set of samples taken at 10 foot intervals mostly, with a few ranging up to 20 feet and a few 5 feet, with the exception of the glacial material, which has two gaps.

Pennsylvanian System.- The bed rock at Williams is mapped as Des Moines. In this well from 140 to 170 feet the samples consist of dark gray to black shale soft, laminated, with a large amount of glacial sand which is apparently cave.

In comparing this log with adjacent logs, namely Ft. Dodge City No. 1, Webster City No. 1, Hampton City No. 2, and Ralston Purina No. 3, several facts may be noted. Williams shows a thicker section than any of the others. In comparison with the wells west of it, the section from the top of the Juniper Hill to the base of Maynes Creek is added. It is perhaps significant that the interval between the top of St. Peter and top of Cedar Valley is the same in both Ft. Dodge No. 1 and Williams City. In the Webster City well, which lies almost directly between these two wells, the interval between St. Peter and Cedar Valley increases over 100 feet. The Galena is lowered proportionately so that essentially all of this thickening occurs in beds above the very thin Maquoketa. These beds are composed of limestone and dolomite with a very large percentage of evaporites. Thus, Webster City, even with a very thin Maquoketa, still shows a very much thickened section due to the presence of beds containing evaporites in either lower Devonian or Silurian.

The Williams well shows more section than those to the east (Hampton and Iowa Falls) because a greater thickness of Mississippian above the curbs of those wells is present here. In general, the Williams City Well very closely parallels these two wells for their entire depth.

The shaly interval between the top of the Shell Rock and base of Maynes Creek is remarkably consistent with Iowa Falls No. 3 and Hampton No. 2, although less shaly.

The Maquoketa is topped by excellent Neda in Williams City Well, which consists of varicolored shale and hematite concretions. This Neda occurs upon a relatively thick Maquoketa section. There are two cherts as in Iowa Falls and Hampton, but the upper one is much less pronounced. The lower chert coincides with that which was called Ft. Atkinson in Mason City wells.

Galena top is placed at 1250 where there are good cinnamon specks embedded in typical Galena - type lithology.

Decorah top is uncertain because of the lack of any good green shale to indicate Ion.

The Platteville shows a green shale very prominently at the top (Spechts Ferry) and has apparently good Glenwood green shale at the base.

The St. Peter appears about normal, and is underlain by typical Willow River composed of sandy dolomite with traces of oolitic chert. The New Richmond is finer grained than usual with minor amounts of dolomite, some of which is oolitic with sand grain centers. It also shows traces of small chert oolites.

Williams City well 1
Hamilton Co.

Iowa City, Iowa
Dec. 1, 1932.

Dean G.F. Kay
L.A. Building,
Iowa City, Iowa

Wells-Water

Dear Dean Kay:

I have studied the samples of the "Williams Well" to determine the stratigraphic horizon from which the lowest sample was taken. In doing this I made a detailed study of the samples below the Glenwood shale (1500 feet) from which I have prepared the enclosed log. Samples above the Glenwood shale were studied only to the extent necessary to determine the shale horizon.

The detailed section shows the following thicknesses of the different formations and members:

Glenwood..... 20 feet
Saint Peter.....50 feet
Prairie du Chien....188 feet to the bottom of the well
Shakopee.....118 feet
New Richmond..... 40 feet
Oneota..... 30 feet to bottom of well.

In the report on the Deep Wells of Iowa published in 1928 Lees states from Norton as follows: "Had the drilling continued 150 feet deeper, the Saint Peter sandstone probably would have been struck, and 400 to 600 feet deeper the creviced limestones and sandstones would have been tapped". Lees → He further states regarding the Webster City well; "Small flows at 600 and 1100 feet were cased out. The Saint Peter sandstone is reported dry. The supply was obtained from the New Richmond sandstone and the Oneota dolomite, the main flow being struck in the former at 1620 feet.

"The well had flowed until the depth of 1620 feet was reached when the water fell to the present static level of six to seven feet below the curb. The pumping capacity is rated at 2,500,000 gallons a day, and under protracted capacity pumping the head is drawn to, but not below, 32 feet below the curb."

The Deepest well at Fort Dodge receives an increased supply of water from the Jordon while the other deep well receives most of its water from the Saint Peter, Shakopee, and New Richmond.

The deep well at Ackley penetrated the Jordon sandstone but according to the report given in Volume 21, Iowa Geological Survey, page 848, the well did not prove satisfactory. The following statement is made: "Two wells are owned by the city of Ackley (population 1,244), one 2,032

feet deep, the other 119 feet deep. The deep well, which was put down some time prior to 1894, was abandoned because it did not yield sufficient water. The curb of this well is 1,110 feet above sea level; the head is reported to have been 82 feet below the curb, or 1,028 feet above sea level; another report gives the head as 25 feet below the curb."

The driller of the Williams well reports that the water is 215 feet from the top with 240 feet of pump. He pumps it for 8 hours at 73 gallons per minute.

At this rate the well would supply 105,120 gallons per day if pumped 24 hours. I wonder if this supply would not be enough? If it is not, I can see no objection to drilling deeper into the Oneota which appears to be a fairly good aquifer in some places. If normal here the base of the Oneota should be about 160 feet below the base of the well now. Likewise it would be necessary to anticipate drilling deeper than 160 feet yet, before tapping the Jordon. However if the Jordon comes in dry the well could be saved by sealing it out.

I will complete these samples after I have had time to finish those from the Clarinda well.

Sincerely yours,

Paul Miller

Log of the Williams Well between depths of 1510 and 1760 feet.

Ordovician:

Glenwood shale (20 feet thick; top 289 feet below sea level)-
Shale, bright blue-green, fissile, abundant pyrite, slight effervescence.....1500-1515

Saint Peter sandstone (50 feet thick; top 309 feet below sea level)-
Sandstone, White quartz sand with less than 1 per cent of iron oxide grains, quartz grains well rounded, and average diameter between $\frac{1}{4}$ and $\frac{1}{2}$ millimeters in diameter.....1520-1570

Prairie du Chien-

Shakopee dolomite (118 feet thick; top 366 feet below sea level)
Dolomite,(calcareous) gray to drab, granular and in cuttings contains no fragments of rock, effervesces freely, contains grains of quartz and iron oxide in the dolomite.....1572-1595
Dolomite,effervesces slowly, samples contain small chips of light gray to drab dolomite which is firmly coherent. contains many rounded quartz grains...1600-1610
Dolomite, light gray and more compact than that of the bed immediately above.....1620
Dolomite, coarsly granular, gray-buff, contains chips of rock in the cuttings.....1630,1640
Dolomite,light gray, fine grains, no chips from the cuttings, effercesces slowly.....1650,1660
Dolomite, light buff, coarsly granular and crystalline, cuttings contains some chips, effervesce slowly..1670,1680
Dolomite, gray-buff colored, some chips of hard compact rock, effervesces slowly.....1690

New Richmond sandstone(40 feet thick; 474 feet below sea level)
Sandstone, white to light buff due to some iron oxide grains; most of the grains are well rounded quartz although some show their original angularity. The slight effervescence appears to be from dolomite carried down from above..... 1700-1730

Oneota dolomite (30 feet to the bottom of the well; 514 feet below sea level)
Dolomite, light buff, the buff color due to a small percentage of iron oxide ~~grains in the almost~~ on some of the coloriest grains of dolomite; effervesces slowly; no chips of the rock in the fine sandy cuttings.....1740-1760

Hamilton Co.

Williams, Iowa,

Dec. 22, 1936.

Dear Dr. Foster:-

Enclosed are two data sheets for samples collected at Williams. You will notice that there is a great deal lacking and what information was obtained is questionable. It represents, however, every source that I could run down in Williams. It is doubtful whether or not analyses will be worthwhile, but I thought it best to send the samples.

The two wells are about 30 feet apart and the town wants to know if water from the horizon tapped by the shallower well is being pumped by the deep well.

Water from both wells has a strong sulphur smell and the two temperatures seem to indicate that both wells draw water from the same horizon.

No more express leaves here today so I will send the samples from Iowa Falls when I pass through there on the way to Eldora.

Very truly yours,

A.G. Hershey.

Helen
OK to copy last -
Send to [illegible]

Sheet No. 1 Name of Well. Williams City Well Survey No. W-0130

Location ..... Date Drilled ..... Analyst. Carriker 9-2-42.

00

10

Clay - dark gr to black, v silty calc, soft, with occassional granules of igneous material embedded.

16.

Clay - v. silty & gravelly, lt. bf. gr. with sand up to gravel size included consisting of ls, dark & lt. igs. & qtz.

20.

30

40

50

One Sample 20-90'

60

70

80

Sple ditto 16-20 with traces of med. gr. rounded, fairly hard, shale granules embedded also. (Carriker)

90

90.

00

Sheet No. 2 Name of Well. Williams City Well Survey No. W.C. 130

Location ..... Date Drilled ..... Analyst. Garrison 9-2-42

/00

One sample 90-110.

Clay, v. silty, calc, lt. grayish brn. soft, unconsolidated, micaceous few rounded brn-gr. fn-grain dense, polished dolomite granules

10 — 10.

Clay etc as above with 1% qtz & lt. rounded granules emb.

20

125.

Clay, silty calc, v. lt. gr. stained brn by iron in part, soft, contaminated with much sand, maj. gr. 1-½ mm. with abundant grains up to 4 mm. Some a to C, tnly frosted qtz grains, but mostly A qtz & lgs.

30

140. — Penn?

Clay, dk. gr. to black, stained brn in part, v. silty calc. brn. & more calc. 30% sand & gravel, mostly lgs & qtz plus some lo. s/r ly rounded & polished.

/50

155.

60

Clay, black, v. silty calc, soft, contaminated with 20% secondary limestone or calcareous matter embedded, lt. gr. v. fn-grain, v. soft.

Gravel - rd-s qtz & lgs granules, 10%.

170. — 70 — Mississippian

Cht. lt. bf, conch w/ transl. fr.

Gilmore City

(subcolitic)

Lm. v. lt. bf, fn. grained, with numerous fossil fragments, sandy, clastic appearing. Tr. med lav. brn fissile soft non-calc. shale

Tr. qtz. sand & gravel s/r ly rounded & polished, cave.

190 — 80

(definitely phenoclastic, needs)

Sple dith 170-180 w/ th to blk non-calc lam, soft shaly brn shale.

Sand, med. C to R in part, well frosted. — trace - does not seem to be glacial cave. also some angular qtz

190 — 90

Sple dith 190-200: grayish in part, transl. to fn grained in small part.

200. — 200

Sheet No. 3 Name of Well. Williams City Well Survey No. W-130

Location ..... Date Drilled ..... Analyst .....

200

Hampton

Iowa Falls

One Sple 200-220

10

Dol. lt tawny brn, mottled slightly med gray, fn-med grain, xlline, sacch., porous in part - translucent

Ls, as above - tr. - cave.

220

20

One Sample - 220-240'

30

Dol. as above - slightly grayish in part grading into trace, lt gr. v.fn-grain dense limestone.

240

40

250

Dol. as above, v. finly divided - nels.

260

60

Eagle City

Ls. v. lt bf. v. fn-grain, oolitic in about 15% - slt ly fossiliferous

Dol. as above - tr. - cave - not plotted.

Ls. v. lt. gr. speckled by pyrite - v. fn-grained, etc. - 10%

270

70

Strong tr. clear, coarsely. xlline, loose calcite.

Ls. v lt bf etc as above - no oils.

Tr. lt gr. pyritic ls as above.

Tr. brn dol. fn. grained sucrose.

280

80

Maynes Creek

Dol. lt. brn fn-med. grain, sach, soft, finly divided - 85%

Ls. v. lt bf etc as above - 15%

290

90

Dol. lt.-med. graysh-brn., fn-grain, xln, dense, calcareous.

300

3 00

Sheet No. 4 Name of Well. Williams City Well Survey No. Wo130

Location ..... Date Drilled..... Analyst. Carrier 9-2-42

300

00

Cht. pale bf gray, granular, dull, vfn grained, soft, dolomitic, subconch. in pt & slightly botryoidal in part. 15%

Dol. lt yell-brn, slightly graysh, mott. med. gr. in part, fn-grained xln, subsacch. - 85%.

10

15

Cht. pale bf. gran - weathered appearing - tr.

Dol. lt yell brn etc as above grading into mostly lt. drb fn-grain, xln., subsac slightly porous - few crse. clear dol. xls. emb.

20

Dol. v. lt. bf-drb. v fn-grained gran xln dense - 30%

Calcite xln - large, clear, loose - strong trace.

30

cht. med. gr. weath. on outside to lt. gr. conch. opaque subvit. dense except for weath. ext. which is gran soft & porous. 5%

Dol. lt med brnsh gr. to brn. fn-grain, gran, dense, 95%.

40

(slightly bf)

Cht lt. to med. gr. banded in part conch dull dense. - weathered ext as on cht. from 330-40. slightly dolom. 20%

Dol. lt med to med. gr. brownish in pt. etc as from 330-40.

350

50

Cht. as above slightly mottled - 20%

Dol. lt. med brnsh gr. to gr. v. fn. grain, gran. slightly porous - 80%

60

Cht. as above - <10%

Dol. med brnsh gr. v fn-grained granular, slightly porous, marlaceous in part. with clear crse xlline masses of calcite emb. in v. minor amount.

70

75

Cht. lt bf. subvit. conch, dense, sub transl. - tr.

80

Dol. lt. med to med brnsh gr. fox ln gran slightly calc mostly dense.

90

(to med)

Dol. lt. med brn slightly mottled graysh to medium gray, v. fn to fn grain, xln, slightly porous (subtransl) calcareous in pt. with few large masses clear coarse calcite xls. emb.

400

400

Sheet No. 5 Name of Well. Williams City Well Survey No. W.O.130.

Location ..... Date Drilled ..... Analyst. Carrier 9-2-42

400 Sheffield.

400 Sh. lt gr. v. dolm. x soft, faintly lam.

410

Sh. as in 400-410

420

(silty silty & micaceous)
Sh. as above grading into less than 10% dol. ditto color.
v. fn. grained, soft.

430

Spls ditto 420-30

440 (or brn)
Dol. lt. med. drb gr. mott dark gr. in small part fn-grained,
gran, argillaceous, soft. Sh. blue-gr. slty silty, dol. etc. as ab. - 10%
445 Secondary SO_4 x's on outside of dol grains wh't - strong tr.

Cht. lt bf speck blk. sub vit conch dense - tr - cave?
450 Dol. as above heavily Fe stained dark maroon. - SO_4 x's as in 440-45
Sd. med. t, well frsted tr - cave?
- Poor Spls.

460

Cht. lt bf heavily spkd black. soft scrappy weathed, etc - tr.
Dol. lt med. grysh-brn, mott heavily dark gr. fn-gr. gran. porous

470 7° Lime Creek?

Dol. lt. med. brn etc as above - tr.
Ls. v lt to lt. d-b. faintly brnsh tinted, sublith cg. to v. fn grained,
dense

480.

Ls. as above - slly gray. sh.
(med)
Sd. loose, C well frsted & angular qtz - tr each - cave.

490.

Ls as above - with tr. tinted reddish-brn - some creamy
subtranslucent.

500 5

500

Sheet No. 6 Name of Well. Williams City Well Survey No. W.0130.

Location ..... Date Drilled. 1932 Analyst. Carrier 9-2-42

500 — 500

Ls. palebf v. fngr, soft, ~20%

(Slty grayish)

Ls. v. lt creamy drab v. fn grain, subtransl dense, hard ~80%

10 — 510

Spls d. ittos 500-510 - grysh part is slightly porous & weathered appearing & slightly pyritic.

20 — 520

One ostracode? frag

Ls. as above badly heavily mottled lt gr. pyrite emb. fr

30 — 530

Dol. lt med. to med. drb slty greenish, fn. to med. grain, pyritic, argillaceous - 15%.

(grained)

Dol. lt yellow-drb, v. fn. to little med dense subtransl. med hard v. calc. - 85%.

40 — 540

Dol. v. lt drab - slty yell & graysh - fn. to mostly med. grain. xln, dense hard subtransl. Fr. clear loose coarse dol. xls.

50 — 550

Spls ditto 540-550.

60 — 560

Dol. lt med. yell - brn, fn-med. grain, xln, dense, with abundant free, white, med. xln dol. masses.

70 — 570

Juniper Hill

Dol. brn as above - 10%

Sh, med. gr. soft dolom, silty, faintly bam grading into ~30% dol. med. gr. v. fn grade, dense, silty bam, soft

80 — 580

Sh as above but greenish in part grading into dol 60% in 570-580'

90 — 590

Spls ditto 580-590'

600

Sheet No. 7 Name of Well. Williams City Well Survey No. W.O.B.A.

Location ..... Date Drilled. 1932 Analyst. Carrier 9/26

600 — 600

Dol. med drb-sh gr fn-grain, dense v arg & silty grading into Sh. as in 590-600 ± 10%.

10 — 610

Dol. med. gr etc as in 600-10 - 30% grading into Sh. med. gr dolom, faintly laminated, soft, flaky.

20 — 620

One Sample 620-640

30 — 635

Dol. lt. med drab-sh gr mott dark med. gr. in small part, with white elongate small sulphate xls on outside of grains - secondary - slightly silty, E arg.

40 — 640

Shell Rock.

Ls. v. lt. to lt. drab-sh gr silty stained yellow in part, sublithographic with tr coarsely xlline fos frags emb -
Sh. med. gr mottled in pt. dolom, soft, slty lam <10%.

50 — 650

Dol. lt med drb. to gr. coarse-grained grain - arg, looks like transl. pure dol. xls. cement by arg. matrix. 40%
Ls. as in 640-650 - 45%
Sh. " " 640-650 - 15%

60 — 660

Dol. as in 650-660 - tr. (lithog to)
Ls. lt. drb. & gr. slty stained yellow in part fn-grained phenoclastic slty dolom.
Sh. as above - tr. - cave?

70 — 670

Cedar Valley ?

One Sample 670-90'

80 — 690

Dol. lt brn to gray, fn-grained, x ln, dense, granular, slty arg in small part
Sh. as above - tr. - cave.

90 — 690

Dol. lt. creamy gray, med. grain, x ln, dense, hard. - calc in small part.

700 — 700

Sh. lt-med. gr. dolm, faint lam, v. soft. - tr.

Sheet No. 8 Name of Well. Williams City Well Survey No. W.a.130

Location Hamilton Co. Date Drilled 1937 Analyst Garner 9-2-42

700

Dol. as in 690-700 - v. lt. creamy gr etc - subsacch in small part

710

Spl. as to 700-710 but lt. creamy drk. sl. ltly. gray, sh.

720

Dol. lt. bf-brn fn-grain. gran, dense sl. ltly silty v. arg

Dol. as in 710-720 - strong fr.

Calcite xls - clear. v. crse rhombs, loose - tr.

730

Dol. lt. bf fsh-brn etc as above but calc. - 40%

Dol. lt. bf fsh-brn. med-grain x ln. dense - calc - 40% grading into

Ls. lt bf fsh-brn fn-grain dense - 20%

740

Sh. lt. grn-gr as above - lpc - cave.

Dol. lt. yell-bf. med-grain, x ln, dense to 10% sacch. porous.

Small amount stained bright reddish orange

750

Dol. lt. bf-brn. med to crse-grain x ln. dense to sl. ltly porous,

tr. frags favosite corals? sl. ltly. phenoclastic

760

Tr. loose calcite - clear crse x ln.

Dol. lt. bf. brn (to minor amt. gr) fn-grain, to little medium

770

Loose calcite as above - tr.

Dol. as in 760-70 med-grain, scrappy, calc. dense ± 20% → Ls (below)

Ls. v. lt. to lt bf-brn, v. fn. to fn-grain. dense, dolm - ± 80%

780

Dol. lt. to med. bf. v gr-brn, fn. to med. grain, x ln, mostly dense, tr. porous - 60%

Dol. dk. med. gray sh-brn fn-grain (x ln) gran, dense - 40%

790

Sh. lt. med. grn gr. dolm, sl. ltly lam. v. soft - strong fr. prob. cave

Dol. lt. med. bf-brn fn-grain, x ln. dense granular - trem b calcite x ls. 40%

Ls. lt brn sh bf sublithographic dense soft - 60%

800

Sheet No. 9 Name of Well. Williams City Well Survey No. W-130

Location ..... Date Drilled. 1932 Analyst. Carriel

800 900 Dol. as above - to lt gr. v. fn. grained. dense - 90%

Ls. lt. bf-gr. v. fn. grain, scrappy, soft - 10%

10 910 -

Dol. lt. brn, bf-gr. fn-grain, gran, dense - slty, silty

Heterogeneous lithologies.

20 920 Sh. as above - cave.

Dol. lt brn to gr-brn (to lt-med) - fn-grained, fr. med. transl. calcinpt. slty silty - 85%

Ls. lt bf gr v. fn. grained with fn dol. rhombs. emb. - 15%

30 930. Much gr sh. as above - cave.

Dol. lt. med buff-ish-brn, fn-grain dense gran, slty silty

Ls. lt bf, sublith dense - fn

Sh. med. gr. slty dolomitic, waxy, med. hard - 10% - cave?

40 940. Dol. lt. bf to lt-med. brown, fn-grained, gran, xln, dense - 50%

Sh. lt med gray, dolomitic, soft, faintly lam. - flaky - 30%

Sh. med. grn etc as in 830-40 - prob cave - 5%.

8 50 950 Dol. as in 840-850 with minor amount lt. bf. v. fn-grained.

Sh. med. green, slty dolom, waxy, soft, structureless - 75%

60 960 -

Dol as in 850-860 mostly lt. bf with small percentage grading into lt-med brn, fn-grained. (slty, mottled dk gr)

70 970. Tr clear coarsely xline loose calcite -

Dol. as in 850-60 with sample consisting mostly of lt-med brn dol v tess of the lt bf

Sh. as in 840-850' - 10%

80 980. (slty mott dk gr)

Dol. lt-med brn, fn-grain, xln, gran, dense ~~to~~ subtransl in part with few areas coarse white calcite x-ls. embedded.

90 990. Tr. authigenic qtz.

Dol. lt. bf-brn. to bf. v. fn to fn-grained plus little medium, dense, calcareous - 80%

Ls. lt. buff-gr & dk. sublithographic dense - 20%

Heterogeneous sple.

9 00 900 Sh. green & gray - tt. - cave.

Sheet No. 10 Name of Well. Williams City Well Survey No. W.0130

Location ..... Date Drilled. 1932 Analyst. Garner 9-4-42

900 —
Dol. lt gray sh-bt. fn-grained, gran, xln, dense - v. calc; sltly arg. fairly unif. text & color.

Ls. as in 890-900' - tr.

910 — 10
Dol. lt. med. brn fn.-grain, gran, dense sltly dry with

Calcite x/ls, loose, clear, coarse - tr.

920 — 20
Dol. lt. brnsh bf. (to brn) fn-grained, gran, x/line, dense - sltly arg? -
Tr. loose clear calcite. Tr. xln masses of pyrite.
Shale - lt gr-gray, dolom, micaceous, sltly, heavily laminated, sltly silty. - 20% cave?

930 — 30
(sltly mott med brn-gr)
Dol. lt gr-bf fn-grained, xln gran. dense sltly arg.

Sh. as in 910-930 - tr. - cave?

940 — 40
Dol lt. crmy bf. to brn-bf. fg-grain gran, porous, as in 930-940 with strong tr. emb. med. well frosted sd. -
(bf)
Cht lt gr mott dk gr, dull to v. lt, conch, op. to transl-(smoky) - 5%.
Sand, free, med. C, well frosted - 10%

950 — Sh. lt. grnsh gr. dolm, flaky, faintly laminated, v. soft. - 10% - cave?
Neda.

Sh. lt. med. brick red, to sltly maroon with tr. blue-grn. dull, structureless, v. calc. with
Hematite oods, round, flattened, polished - 10%

960 — 60

Sh. med. maroon & bluish green mott (waxy in pt.) sltly dolom, soft structureless

970 — 70
Mag.

Sh. lt gray-grn sltly mott maroon. dull, soft, sltly flaky - dolom

Lg. rd. granules & pebs. of dk. brn dol. - cave?

980 — 80
Tr. hem. oods & concretions cave?
Dol. lt. drb, v. fn. grain, dense, gran, arg.; calc - 40% grading into ls.
Ls. lt. drb., fn grain, arg, dol. - 20% grading into -
985 —
Sh. lt. gr-drb to grn. v. calc in pt. soft, sltly flaky 40%.
Dol. lt crmy drab, med.-grain, sacch, transl. porous.

990 — 90
Is this spl honest.?? - peculiar Maquoketa
Cht. pale drb sltly banded gr. vit, conch, subtransl. - tr.
Dol. ditto 985-990.

1000 — 1000

Sheet No. 11 Name of Well. Williams City Well Survey No. W-0130

Location ..... Date Drilled ..... Analyst Carnes 9-4-42

1000 1000 Dol. lt. crm y drb. slt ly grayish in part. med. grain, xln, sacch, transl. slt ly silty.

10 1010 Dol. as above - tr. (slt hydolm)

Sh. lt. gr. slt ly greenish, dull. soft structureless. slt ly-silty.

20 1020

Sh. as in 1010-20 - grading into about 10% lt brnsh, transl med. grain dol, arg.

30 1030 cht lt. gr. chalcedonic, weathered white opaque dull on surfaces, porous, hard - 10% plus tr. med. gr dull conch, opaque.

1035 Dol. lt drk brn fine - medium grained xln sacch transl - 90%

cht as in 1030-35 - tr.

Dol lt. med brnsh drk, fn-med. grained xln, sacch, transl - 85%

Ls. v. lt. bf. fn-grain, dense, slt ly pheoclastic 15%

40 1040

Sp le ditto 1035-40 plus tr. med gr-grn slt ly dolm faintly lam, slt ly silty sh.

1050 1050

cht. tr. as above, but mostly lt bf mott v fn ly drb, waxy to dull, hackly, with fn, blk foss emb - as crooked lines, not spines? - slt ly porous, 15%

Dol as in 1040-50 -

Fragment of oboloid brachiopod ? in chert. -

60 1060 Dol. lt. med. drb. v. fn. grained, mostly dense, tr porous, granular hard. slt ly arg. slt ly foss - brach shell.

(Carn.)

Sh. lt med. grn & minor amount brown. slt ly dolm, non laminated, soft, silty. - 30%

70 1070

Dol as above - calc. prob not arg.

80 1080 Ls. lt. gr. v fn - grain dense gray, arg, soft. ±30% grading into Sh. lt. gr-grn, dolm. slt ly silty, dull laminated - ±70%

90 1090

Ls. as above ± 15% 2

Sh. lt gr-grn tuffaceous arkosic lam. soft. ±85%.

1100 1100

Sheet No. 12 Name of Well. Williams City Well Survey No. W.0139

Location ..... Date Drilled..... Analyst. Cannier 9-4-42

1100

Sh. lt med gr dolom, no structure left

1110

Ls. v. lt. bf mott f blk. fn-grain, v. soft, looks secondary - 10%
Ls. lt. drb & bf. v. fn-grain. phenocl. in part - dense - cave? - 10%
Sh. med gr slt ly greenish, dull, silty, calc, roughly laminated soft.

1120

Ls. lt. drb to bf. fn. grain fos. phenocl - 20%.
Dol. med brn, fn-grain, gran, dense, hard 20%
Sh. as in 1110-20 - less calc. 60%

1130

Dol. (lt med) brnsh drb, crse grain, xln, sacch, transl. - slt ly silty in small part. -
Calcite xls coarse wht loose - tr
Tr. med, (q) frosted, loose sd.

1140

Dol. med. brnsh gr. med. grain gran dense argill. (slt ly phenoclastic) with tr. crse xln, white calcite masses embedded. ± 70% grading into
Sh. med gr. slt ly grnish bf. dolom. dull, soft, slt ly laminated, ± 30%

1150

Dol. (slt ly) v. lt. drb mott. med. brn-gr crse grained, phenoclastic, with many calc. closely xln fossil frags. emb. porous.

1160

Cht. pale gray, slt ly porous waxy, conch to gran, opaque - tr

Dol. as above - v. calcareous.

1170

Cht pale gr. mott. lt. drb. speckled by black fos. frags, waxy, to dull, hackly, dense, with tr. grading into dol. - 30%
(weathered appearing) 70% lt bf gran slt ly dolm. dense soft cht.
Dol. lt. drb med grain, sacch xln - 40%

1180

Sh. med gr slt ly dolom, dull laminated, soft, slt ly silty - 10%
Cht. as above - conch fresh cht has small blk spines emb which give hollow circular x sections when fractured. May be same type as Mason City. Mag. cht. spks. but I doubt it. - 30%
Dol. lt to lt. med. bf + drb. med grained xln - 30%

1190

Cht. as in 1180-90 - 80%
Dol. " " 1180-90, but lighter - 20%

1200

Sh. as in 1170-80 - <10% - cave?

Sheet No. 13 Name of Well. Williams City Well Survey No. W-0130

Location ..... Date Drilled ..... Analyst. Carver 9-4-42

1200 00 — 1200

Cht. as in 1190-1200 – 70%
Dol. " " 1190-1200 – 15%
Ls. lt. gr. v fn-grained x Ingran compact hard – 15%
Sh. as in 1190-1200 – <10% – prob cave.

10 — 1210

Cht. as in 1200-10 but mostly fresh – 85%
Dol. lt bf med grained cherty in small part – 15%
Sh. as in 1200-10 – <10% – cave?

20 — 1220

Chert. lt. drb, slitly speckled black, subvit, conch, opaque – 20%
Ls. lt. grsh drb v fn grained, dense hard – 80%

30 — 30

Dol lt. brnsh drb. med-grain, x fn, gran, subsucch – 60%
Cht as in 1220-30 tr
Ls. lt. bf fsh gr. v fn. grained, dense gran, soft – tr emb. blue chalced.
Sh. lt. med grnsh gr dol. silty structureless – tr – cave.

40 — 40

Cht. lt. blue-gr chalcedonic, transl in pt – mostly opaque – str. tr.
Ls. as in 1230-40 – slitly darker & mott. dk. gr. in small part – slitly phenoclastic
Sh. as in 1230-40 – tr cave.

50 — 50

Galena 5 1250

Ls – lt bf to dk fn (to med) grained, phenoclastic with abund lt dk. red-brn CIN spks emb. soft.
Tr crinoid & brach.

60 — 60

Ls as above but v lt bf v fn. grained to dk dol rhombs emb. not abundantly – fewer CIN spks.
Sh. med. gr. dol. silty faintly lamin – 15% – prob. cave.

70 — 70

Cht as in 1230-40 – tr. cave
Ls as in 1260-70 – tr. CIN spks & dol. rhombs

80 — 80

Sh. as above – cave.
Spl edit to 1270 – Pu with 10% sh. cave & strong tr. chert cave.

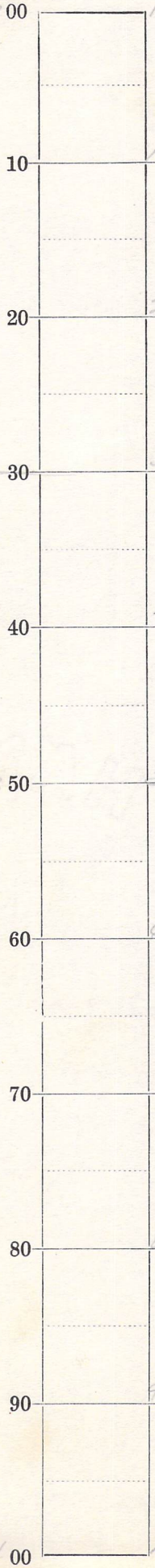
90 — 90

Dol. v. lt brn. fn-grained dense – 10%
Ls as in 1280-90
Cht. as in 1180-1190 – tr. cave.
Sh. as in 1280-90 10% – cave

00 — 1300

Sheet No. 14 Name of Well. Williams City Well Survey No. W-9130

Location ..... Date Drilled ..... Analyst. Garner 9-4-62



1300 Cht as in 1290-1300-fr cave.

Sple ditto 1290-1300'

10

Dol. lt. dr-b. med, xln, dense 30%

Ls v lt bf v fn-grain dense gran soft-70%

20

30

Sple ditto 1310-20 with the ls very flaky, v soft

30 — Prosser.

Cht. lt bf speckled dk gr + blk. subvit, hackly to dull gran, opaque dense - blk spks in pt look like spine frags as from 1180-1190 - 20%

Ls lt brn sh dr-b mott dk gr, med xln, phenoclastic - 80%

40

Cht. as above - 20%

Ls. lt bf stly brn sh v fn to mostly med-grained phenoclastic in small part. 70%

50 —

Cht. lt. bf. v few blk spks, subvit, conch, dense stly mottled by dr-b, transl, spicule-like markings - v. fn. - 30%

Ls. lt. bf. v fn grained dense gran, stly flaky - 80%
fr. brn shale partings

60

Cht. as in 1350-60 - 15%

Ls. " " 1350-60 - 85%

70 —

Sh. med. gr. dol, lusterless, fam. soft - 15% - cave?

Cht. as in 1360-70 - fr. (t. med)

Ls. lt. bf to dr-b heavily matt. dark gr, fn-grained, irregular, phenoclastic few dol rhombs emb. 85+%

80 —

Sh. med. gr. etc as above - 5%

Sh. med to all-grn, dol, nontissile med hard - 10%

Ls. lt. gr-dr-b. with abund't fn blk. spks. fn-grain. x/n fn. dr-b dol. rhombs embedded - few arse x/n fos frags emb.

90

Ls. lt bf to dr-b gr. matt heavily dk gr v fn-grained to fn.-med-grain, phenoclastic, irregular - heterogeneous, fn dol. rhombs

1400 Tr med gr-b

Sheet No. 15 Name of Well. Williams City Well Survey No. W. D130

Location ..... Date Drilled ..... Analyst. Cannier 9-4-42

14 00 — 1400

Spl ditto 1390-1400 - trace crinoid stems

10 — 1410

Ls. lt med drb mott med brn (dk) gray, fn-grained, phenoclastic, emb. cristems - rare. scrappy, heter. sple.

20 — 1420 — Sh. med. brn sh gr as above to med green-gr. v. calc, sltly lam. soft. 10%

Cht. lt to lt med bf-brn, subvit, conch, dense mostly opaque - 30% (sltly spked red brn.

Ls. lt. bf. v. fn-grained dense, soft, gran- to v sltly phenoclastic 70%

30 — 30.

Cht. as in 1420-30 sltly mott wht - 10%

Ls. as in 1420-30 - mott moderately dk. gr. v sltly phenocl. 90%

40 — 40

Cht. v. lt bf to gr conch to gran weathered opaque - tr.

Ls. as in 1430-40 - heavily mott dk gr black bry. mostly also crinoids, brachs

50 — 50. — Sh. as in almost all spls above - 85% - cave

Cht as above with tr. gr rose - tr. 45%

Decorah — Ls. med drb transl. to dk. gr. or blk. v fn-grained fossil. phenocl. 30%

Ls. lt. bf. v. fn grain - sltly fossil - 25%

Tr. blk shiny PO_4 nodules.

60 — 60. — Sh. med. gr. sltly dolom etc as above - 15% cave

Cht. pale gr conch. gr. tr cave

Ls, lt. bf. to lt. med. bf-brn. fn-grained, dense granular, soft, few emb fossils also tr. blk fos. ls. as in 1430-60 - 85%

70 — 70. — Sh. as above plus 15% med. gr blk. mott, dolm. soft practically structureless - fossiliferous

Ls. lt bf to lt-med drb, bf, heavily mott dk. gr. fn-grained to v coarse phenoclastic. bry & brach esp.

Tr. PO_4 nodules.

80 — 80. — Sh. gr as above - tr.

Platteville — Sh., lt. med green, sltly dolom., waxy, nonlaminated, soft, sltly pyritic -

Spechts Fy — 85 — Ls. lt. bf to gr. mott. dk. gr. v fn. grained, dense to phenoc 20%

Sh. lt med grn semi waxy, nondol, laminated, Flaky, shoe peg structure. 80%

90 — 90. — Ls. lt. med brn. fn-grain, dense gran - few brach. -

Sd fn well frosted C - tr loose

Sh. lt-med. gr n. noncalc as above - tr.

15 00 — 1500.

Sheet No. 16 Name of Well Williams City Well Survey No. W.C.130

Location ..... Date Drilled ..... Analyst Carrier 9-42

1500

Ls as in 1490-1500-30%

Sdst free, med 25% fn 5%, a to C, strongly frosted by pits & short grooves-

10 1510 Sh. lt med gr slty grnsh (dk) dull, soft, structureless 40%

Sd as in 1500-10 - mostly medium <10%

1515 Sh med to dk gr v sl. grn noncalc waxy lam. flaky

St. Peter Sdst free, med. 60% fn 40% v. fn-fr. a to C, v. well frosted by fn. pits & short irregular shallow grooves

20 1520. Sh. lt green flaky soft 15%-cave

Sdst. free, med. 50% fn 45% v fn. 5% etc as in 1515-20.

Much cave shale

30 1530.

Sdst. med. 45% fn 50% v. fn. 5% etc as in 1520-30'

Much sh. cave.

40 40

Spl. ditto 1530-40

15 50 50.

Sdst free med 55% fn 45% a to c well frosted etc a.a.

60 60

Sdst free, med 45% fn 50% v fn 5% a well frosted with minor amount 2nd polish.

70 70.— (formed)

Willow River Dol. lt bf v. fn. grained, dense with emb fn. sd. 40%

72 Sdst. loose, mostly fn. a to C etc as above 60%

Cht. vlt bf-gr conch, opaque with many loose cht fools. - 15%

Dol. lt. yell-drb, fn. grain. grau with tr. fn sd. emb. - 40%

Sdst free, mostly med. about 10% fn. frsted v. heavily with

80 80. few reconst. xl. faces.

Cht. as in 1572-80 - strong tr. fools free - 5%

Dol. v. lt. bf to lt tan fn to little fn-med dense with abund't med. sd. emb. - 60%

Sdst. loose. mostly med., 10% fn., A to a. well frosted in pt

90 with many large reconst. xl. faces. developed very rough surfaces.

95. Tr. grn-gr sh-cave.

Spl. ditto 1580-95. much emb med sd.

16 00 1600

Sheet No. 17 Name of Well. Williams City Well Survey No. Wi. 0130

Location ..... Date Drilled..... Analyst. Carrier 9-4-42

1600 1600-

Dol. as in 1595-1600 slitly more grayish, only tr. sd emb. -15%

Sd. st free to a little fn. - well frosted by tr. bits & grooved - 85%

Grnsh. save. - 10%

10 1610.

cht. lt. gr. conch vit to dull gran porous - tr.

Dol. v. lt. bf. fn-grain, dense, gran. x ln. - 80%

Sd. free - as in 1600-10 - 10%

20 1620.

Spl. ditto 1610-20 with dol. slitly grayish & tr. emb. fn sd.

Much iron casing scale & grnsh. cave

30 1630.

cht. ools. lt bf. free - tr. & tr. cht as in 1610-20.

Dol. as in 1620-30 - no sd emb.

Sd st free fine-grained & frosted - tr.

40 1640

cht. as above - opaque ools cement by chalcedonic cht - tr.

Dol. as in 1630-40 but fn-med grained sub sacc.

Sd. free, fn. etc as in 1630-40 - tr.

1650 1650.

cht as in 1610-20 not oolithic - tr.

Dol. pale drb. med to crse-grained x ln, sub sacch. -

Sd. free fn A. not frst. - tr.

60 1660.

Spl. ditto 1650-60 but with 10% free fn A to a, slitly frosted sd.

70 1670.

cht ools small irregular concentric - tr. & op. dull conch

Dol. lt. bf slitly yellowish to brown. fn. to mostly crse grained sub sacch. to v. sacch. crustified, porous,

Sd. free, med to crse-grained, a. to r., strongly frosted & some reconstl faces - 15%

80 1680.

Cht. as in 1670-1680 - tr.

Dol. as in 1670-80 - 80%

Sd " " 1670-80 - 20%

90 1690-

New Richmond

Cht. aa - tr.

Dol. " tr.

Sd st loose, med 5%, fn 50% u fn 45% A, v little frst.

1700

Sheet No. 18 Name of Well. Williams City Well Survey No. W.O.130

Location ..... Date Drilled ..... Analyst. Garner 9-4-42

1700
1700 Dol. as above - tr.
Sdst. free, med 20%, fn 70% v. fn. 10% med is A to a with recoast x l. faces & little frosting - fn & v. fn are R unfrosted
05
Cht. ools lt drb rd. opague - strength
Dol. v lt. drb fn-grain. in ools insmall pt with sd grn. centers - 20%
10 Sd. med 10%, fn. 50%, v fn 10% A to tr R well frosted in pt with tr recoast x l. faces
10
Cht. as above - tr.
Dol. as in 1705-10, no ools - 15% tr. emb sd.
Sd as in 1705-10, med. 10%, fn. 60% v fn 15%
20
20
Ss. free wht med tr fn 70% v fn 30% A to a w little frosting
30
30
Dol. lt. bf fn-grained v. fn ly divided - 20%
Sdst. free f/med. fn. 50% v. fn 30% - etc as in 1720-30
Much iron bit stain.
40
40
Spl ditto 1730-40
43
Spl ditto 1730-40. with 10% dol. lt bf etc.
50
50
Dol. lt. bf drb arse-grained sacch - 10%
Sd free, med tr fn 50% v fn. 40% mostly A freshly broken pieces with few poorly frosted grains.
60
1760
TD 1760
70
80
90
00

IOWA GEOLOGICAL SURVEY
Generalized Log Based on Detailed
Description of Drill Cuttings

Name of Well Williams City Well Survey No. W-0130

Location sec. 27 T. 89 N., R. 23 W., Hamilton County

Drilled by

Total Depth 1760 ft. Curb Elevation 1205 ft. Static Level ft.

Pumping Test Hours Min; Gal. per min. Drawdown ft. in min.

Casing Data 8" to 300'; 6¼" to 750'; 5" to 1000'; 40' of 4½" at 1500';
80' of 4" at about 1600'

Description of Formations

No.	Rock Unit	Thick.	From (feet)	To
	PLEISTOCENE SYSTEM			
1.	Clay, dark gray to black, slightly calcareous, soft, few granules of igneous material embedded	16	0	16
2.	Clay, very silty, light buffish gray, with sand and gravel (limestone, igneous material, quartz, and gray shale) embedded. One sample 20 to 90 feet	74	16	90
3.	Clay, light grayish brown, calcareous, very silty, few dolomite, limestone, igneous, and quartz grains embedded. Two samples	35	90	125
4.	Clay, very light gray, slightly calcareous, soft, with much sand up to 4 mm. diameter (major grade 1-½ mm.), angular to trace curvilinear, finely frosted in part	15	125	140
	PENNSYLVANIAN SYSTEM Des Moines series (undifferentiated)			
5.	Shale, dark gray to black, trace brown, very slightly calcareous. Sand and gravel 30%, composed of igneous rocks, quartz and little limestone (caved drift)	15	140	155
6.	Shale, black, very slightly calcareous, soft, with 20% secondary calcareous matter embedded, light gray, very fine-grained, very soft. Gravel 10%, composed of rounded quartz and igneous granules (caved drift)	15	155	170

Notes:

Survey No. W-0130

No.	Rock Unit	Description	Thick	From	To
		MISSISSIPPIAN SYSTEM			
		Osage Group			
		Gilmore City formation			
7.		Limestone, very light buff, fine-grained, very fossiliferous, clastic. Shale trace, medium lavender brown to black, laminated, soft. Sandstone trace, medium-grained, curvilinear to round, free. Chert trace, light buff, vitreous, conchoidal, translucent	30	170	200
		Kinderhook Group			
		Hampton formation			
		Iowa Falls member			
8.		Dolomite, light tawny brown slightly mottled gray, fine medium-grained, crystalline, saccharoidal, porous in part, translucent	60	200	260
		Eagle City member			
9.		Limestone, very light buff, very fine-grained, slightly fossiliferous, in part oolitic from 260 to 270 feet	20	260	280
		Maynes Creek member			
10.		Dolomite, light brown, fine medium-grained, saccharoidal, soft, finely divided. Limestone 15%, as in 260 to 280 feet	10	280	290
11.		Dolomite, light medium grayish brown, fine-grained, crystalline, dense, calcareous	10	290	300
12.		Dolomite, light yellowish brown slightly grayish grading downward into light drab, fine-grained, crystalline, subsaccharoidal. Chert 15%, grading downward to trace, pale buff, very fine-grained, granular, dull, dolomitic	30	300	330
13.		Dolomite, light medium brownish gray, fine-grained, granular, dense. Chert 5% to 20%, light to medium gray, banded in part, conchoidal, dull, dense, somewhat weathered	30	330	360
14.		Dolomite, medium brownish gray, very fine- to fine-grained, granular, slightly porous, calcareous, with traces of clear, coarsely crystalline masses of calcite embedded. Chert trace to 5%, as in 330 to 360 feet	30	360	390
15.		Dolomite, medium brown mottled grayish to gray, very fine- to fine-grained, crystalline, slightly porous, with traces of crystalline calcite embedded as in 360 to 390 feet	10	390	400

Survey No. W-0130

No.	Rock Unit	Description	Thick	From	To
	DEVONIAN (?) SYSTEM				
	Sheffield formation				
16.		Shale, light gray, very dolomitic, soft, faintly laminated, grading into very small amount of dolomite, light gray, fine-grained, soft	40	400	440
17.		Dolomite, light medium drabish gray mottled dark gray, fine-grained grading downward to sublithographic, granular, argillaceous, with strong trace of white secondary gypsum crystals from 440 to 460 feet. Chert trace, light buff heavily speckled black, subvitreous, dense, conchoidal	30	440	470
	Lime Creek formation undifferentiated				
18.		Limestone, very light to light drab slightly tinted brown, sublithographic to very fine-grained, dense	30	470	500
19.		Limestone 80%, very light creamy drab, very fine-grained, subtranslucent, mostly dense, hard; limestone 20%, pale buff, very fine-grained, soft, slightly pyritic and fossiliferous	30	500	530
20.		Dolomite, very light to light yellowish and grayish drab, fine- to medium-grained, dense, hard, subtranslucent; dolomite 15%, 530 to 540 feet, greenish drab, argillaceous	30	530	560
21.		Dolomite, light medium yellowish brown, fine medium-grained, crystalline, dense with abundant free masses of dolomite crystals	10	560	570
	Juniper Hill formation				
22.		Shale, medium gray, dolomitic, silty, soft, faintly laminated, grading into 30% dolomite, medium gray, very fine-grained, dense, slightly argillaceous, soft	30	570	600
23.		Dolomite, medium drabish gray, fine-grained, dense, argillaceous and silty, grading into 70% shale from 610 to 620 feet, medium gray, dolomitic faintly laminated, flaky, soft	40	600	640
	Shell Rock formation				
24.		Limestone, very light to light drabish gray slightly yellowish, sublithographic to fine-grained with trace coarsely crystalline fossil fragments embedded. Dolomite 40%, from 650 to 660 feet, light medium drab, coarse-grained, argillaceous	30	640	670

Survey No. W-0130

No.	Rock Unit	Description	Thick	From	To
		Cedar Valley - Wapsipinicon formation (Undifferentiated)			
25.		Dolomite, light brown to gray, fine-grained, crystalline, dense, granular, slightly argillaceous. One sample	20	670	690
26.		Dolomite, light creamy gray, medium-grained, crystalline, dense, hard, slightly calcareous	30	690	720
27.		Dolomite, light buffish brown, fine- to medium-grained, crystalline, dense, calcareous. Limestone 20% from 730 to 740 feet, light buffish brown, fine-grained, dense. Trace loose calcite crystals	20	720	740
28.		Dolomite, light buffish brown, fine- to coarse-grained, crystalline, slightly saccharoidal and porous	30	740	770
29.		Dolomite, as from 740 to 770 feet, grading into 80% limestone, very light to light buffish brown, very fine- to fine-grained, dense, dolomitic	10	770	780
30.		Dolomite 60%, light to medium buff and grayish brown, fine- to medium-grained, crystalline, slightly porous; dolomite 40%, dark medium grayish brown, fine-grained, crystalline, granular, dense	10	780	790
31.		Dolomite 40% to 90%, light medium buffish brown, fine-grained, crystalline, dense, granular, with trace embedded calcite crystals. Limestone, light brownish buff, sublithographic, dense, soft	20	790	810
32.		Dolomite, light to light medium buff, brown, and gray, fine-grained, dense, granular, slightly silty. Limestone trace to 15%, light buff, very fine-grained, dolomitic	30	810	840
33.		Dolomite 50%, light buff to light medium brown, fine-grained, granular, crystalline, dense. Calcite crystals trace, embedded. Shale 50%, from 840 to 850 feet, light medium gray, dolomitic, faintly laminated, soft, flaky	50	840	890
34.		Dolomite, light buffish brown to buff, very fine- to fine-grained, dense, calcareous. Limestone 20%, light buffish gray and drab, sublithographic, dense	10	890	900
35.		Dolomite, light grayish buff, to light medium brownish buff, fine-grained, granular, crystalline, dense, calcareous, argillaceous, with traces crystalline calcite and pyrite	40	900	940
36.		Dolomite, light creamy brownish buff, fine-grained, granular, porous, argillaceous, with embedded medium-grained, curvilinear, well frosted sand grains. Chert 5%, light gray, mottled dark, dull to vitreous, opaque to translucent	10	940	950

Survey No. W-0130

No.	Rock Unit	Description	Thick	From	To
	ORDOVICIAN SYSTEM				
		Neda formation			
37.		Shale, medium brick-red and maroon slightly mottled bluish green, very calcareous, dull, structureless, with 10% hematite oolites from 950 to 960 feet, flattened, rounded, polished	20	950	970
		Maquoketa formation			
38.		Shale, light grayish green slightly mottled maroon, dolomitic, soft, slightly flaky	10	970	980
39.		Dolomite 40%, light drab, very fine-grained, dense, granular, argillaceous, calcareous, grading into 20% limestone, light drab, fine-grained, argillaceous, dolomitic, grading into 40% shale, light grayish drab to green, very calcareous, soft, slightly flaky	5	980	985
40.		Dolomite, light creamy drab, medium-grained, saccharoidal, translucent, porous, slightly silty in part	25	985	1010
41.		Shale, light gray slightly greenish, slightly dolomitic, soft, structureless, slightly silty	20	1010	1030
42.		Dolomite, light medium brownish drab, medium-grained, crystalline, saccharoidal, translucent. Limestone 15% from 1035 to 1050 feet, very light buff, very fine-grained dense, with few coarsely crystalline fossil fragments embedded. Chert trace to 15%, light gray, chalcedonic, weathered light buff, with black fossil specks	30	1030	1060
43.		Dolomite, light medium drab, very fine-grained, slightly porous, granular, slightly fossiliferous and calcareous. Shale 30% from 1060 to 1070 feet, light medium green to trace brown, slightly dolomitic, nonlaminated, soft, silty	20	1060	1080
44.		Shale, light grayish green to medium gray, calcareous, laminated, soft, slightly silty in part, grading into 15% to 30% limestone, light gray, very fine-grained, dense, granular, argillaceous, soft	20	1080	1100
45.		Shale, light medium gray, dolomitic, structureless	10	1100	1110
46.		Shale, medium gray slightly greenish, calcareous, roughly laminated, soft, silty. Limestone 20%, light drab and buff mottled by black fossils, very fine-grained, dense. Dolomite 20% from 1120 to 1130 feet, medium brown, fine-grained, granular, dense	20	1110	1130
47.		Dolomite, medium brownish drab, coarse-grained, crystalline, saccharoidal, translucent, slightly silty, with loose, coarsely crystalline calcite. Trace sand, free, subangular, medium-grained, frosted	10	1130	1140

Survey No. W-0130

No.	Rock Unit	Description	Thick	From	To
48.		Dolomite, medium brownish gray, medium grained, granular, dense, argillaceous, with loose, coarsely crystalline calcite masses embedded. Shale 30%, medium gray, dolomitic, soft, slightly laminated	10	1140	1150
49.		Dolomite, very light drab slightly mottled medium brown and gray, coarse-grained, with abundant coarsely crystalline calcareous fossil fragments embedded	20	1150	1170
50.		Chert, pale gray mottled light drab speckled by black fossil spines, waxy to dull, hackly, dense, slightly weathered, dolomitic; chert 20% light buff, granular, dense, soft, slightly dolomitic. Dolomite 15% to 40%, light buff and drab, medium-grained, crystalline	50	1170	1220
51.		Limestone, light grayish buff and drab, very fine-grained, dense, granular, with traces embedded blue chalcedony. Chert 20%, from 1220 to 1230 feet, light drab speckled black, subvitreous, conchoidal, opaque	30	1220	1250
	Galena formation				
52.		Limestone, very light buff, very fine-grained with coarsely crystalline fossil fragments and dark reddish brown specks embedded. Dolomite 10% from 1290 to 1310 feet, very light brown, fine-grained, dense	60	1250	1310
53.		Limestone, very light buff, very fine-grained, dense, granular, soft. Dolomite 30%, light drab, medium-grained, dense	20	1310	1330
	Prosser formation				
54.		Limestone, light brownish buff and drab, medium-grained, slightly fossiliferous. Chert 20%, light buff speckled dark gray and black spine (?) fragments, subvitreous hackly to dull granular	20	1330	1350
55.		Limestone, light buff, very fine-grained, dense, granular, soft, with trace brown shale partings. Chert 15% to 20%, light buff, slightly mottled by drab, translucent, spicule-like markings, subvitreous, dense, conchoidal	20	1350	1370
56.		Limestone, light buff to drab heavily mottled dark gray, fine-grained, with coarsely crystalline fossil fragments and few dolomite rhombs embedded. Chert trace as in 1350 to 1370 feet	10	1370	1380
57.		Limestone, light buff, gray, and drab, mottled heavily dark gray, very fine- to fine medium-grained, with fine brown dolomite rhombs and coarsely crystalline crinoid fragments embedded	30	1380	1410

Survey No. W-0130

No.	Rock Unit	Description	Thick	From	To
58.		Limestone, light medium drab mottled medium brown and gray, fine-grained with embedded coarsely crystalline fossil fragments	10	1410	1420
59.		Limestone, light buff, very fine-grained, dense, soft, granular, slightly fossiliferous. Chert 30% grading downward to trace, light buffish brown, speckled reddish brown, subvitreous dense, conchoidal	20	1420	1440
60.		Limestone, as in 1420 to 1440 feet, heavily mottled dark gray by bryozoa, crinoid, and brachiopod fragments. Chert trace, very light buff to gray, dense, conchoidal to granular weathered	10	1440	1450
	Decorah (?) formation				
61.		Limestone 75%, medium drab to dark gray, fine-grained, fossiliferous; limestone 25%, light buff, very fine-grained, slightly fossiliferous. Trace phosphate nodules. Shale 15%, medium gray, slightly dolomitic, structureless	10	1450	1460
62.		Limestone, light to medium buffish brown, heavily mottled dark gray from 1470 to 1480 feet, fine-grained with abundant very coarsely crystalline fossil fragments embedded. Shale 15% as in 1450 to 1460 feet. Trace phosphate nodules	20	1460	1480
	Platteville formation Spechts Ferry member				
63.		Shale, light medium green, slightly dolomitic, waxy, nonlaminated, soft, slightly pyritic. Limestone 20% from 1485 to 1490 feet, light buff to gray mottled dark gray, very fine-grained, dense, slightly fossiliferous	10	1480	1490
	Platteville (undifferentiated)				
64.		Limestone, light medium brown, fine-grained, dense, granular, brachiopod fragments. Sandstone trace, free, fine-grained, curvilinear, well frosted. Shale trace, as in 1480 to 1490 feet	10	1490	1500
65.		Shale 40%, light medium gray slightly greenish, calcareous, dull, soft, structureless. Limestone 30% as in 1490 to 1500 feet. Sandstone 30%, mostly medium-grained, subangular to curvilinear, strongly frosted, free	10	1500	1510
	Glenwood member				
66.		Shale, medium to dark grayish green, noncalcareous, waxy, laminated, flaky. Sandstone 10% as in 1500 to 1510 feet	5	1510	1515
	St. Peter formation				

Survey No. W-0130

No.	Rock Unit	Description	Thick	From	To
67.		Sandstone, free, fine- to medium-grained, subangular to curvilinear, very finely frosted	55	1515	1570
	Prairie du Chien group Willow River formation				
68.		Dolomite very light buff to light tan and drab, fine-grained, granular, dense with fine- to medium-grained sand embedded. Sandstone 35%, free, mostly medium-grained, angular to subangular, with many small secondary crystal faces. Chert 5% to 15%, very light buffish gray, conchoidal, opaque, with many free chert oolites	30	1570	1600
69.		Sandstone, free, medium- to little fine-grained subangular to curvilinear, well frosted. Dolomite 15%, as from 1570 to 1600 feet, with only trace sand embedded	10	1600	1610
70.		Dolomite, very light buff, fine-grained, dense, granular, crystalline, slightly sandy. Sandstone 10% as from 1600 to 1610 feet. Chert trace, light gray, vitreous conchoidal, to dull granular, oolitic in part	40	1610	1650
71.		Dolomite, pale drab to light buff, mostly coarse-grained, crystalline, subsaccharoidal. Sandstone, trace of fine-grained from 1550 to 1560 feet grading downward into 20% medium- to coarse-grained from 1580 to 1590 feet. Chert trace as in 1610 to 1650 feet	40	1650	1690
	Root Valley (New Richmond) formation				
72.		Sandstone, free, mostly fine-grained, angular to subangular with secondary crystal faces ($\frac{1}{2}$ to $\frac{1}{4}$ mm. 6%, $\frac{1}{4}$-1/8 mm. 70%, 1/8 to 1/16 mm. 24%). Dolomite 15%, as in 1650 to 1690 feet, trace oolitic from 1705 to 1710 feet. Chert trace, mostly loose oolites	30	1690	1720
73.		Sandstone, free, white, mostly fine-grained, angular to subangular, very little frosting ($\frac{1}{2}$ to $\frac{1}{4}$ mm. trace, $\frac{1}{4}$ to 1/8 mm. 70%, 1/8 to 1/16 mm. 30%)	10	1720	1730
74.		Sandstone, free, mostly fine-grained, angular to subangular, little frosting; ($\frac{1}{2}$-to $\frac{1}{4}$ mm. trace, $\frac{1}{4}$ to 1/8 mm. 65%, 1/8 to 1/16 mm. 35%). Dolomite 20%, light buff, fine-grained	20	1730	1750
75.		Sandstone, free, mostly fine-grained, angular, very little frosting ($\frac{1}{2}$ to $\frac{1}{4}$ mm. trace, $\frac{1}{4}$ to 1/8 mm. 55%, 1/8 to 1/16 mm. 45%). Dolomite 10%, light buffish drab, coarse- grained, saccharoidal	10	1750	1760
Total Depth					1760

Curb. 1205

Sheet No. ..... Name of Well City Well Survey No. W-0130

Location Williams Date Drilled 1932 Analyst Rowsey

00

10 Drift, blk, well sorted, chiefly clay; about ±10% gravel, up to 10mm; some snd, non calcareous.

16 Drift, gry, chiefly s/t, well sorted, calcareous, Gravel 10-20%; some snd.

20 No Sample

30 No Sample

40 No Sample

50 No Sample

60 No Sample

70 No Sample

80 Drift, gry, well sorted, chiefly s/t. + sh; calcareous, with frag. of l.s, some snd, about 10-15% gravel.

90 No Sample

100

Sheet No. 2 Name of Well City Well Survey No. W-0130

Location Williams Date Drilled 1932 Analyst Rowsey

100

Drift, gry to buff, Calcareous; Chiefly slt; Gravel ±10%;

10

Drift, gry to buff, calcareous; chiefly slt; some gravel.

20

No Sample

30

Drift, yellow-brn, non-calcareous, chiefly slt and snd, some Gravel, ±10%;

40

Drift, dk gry to blk, 50% Gravel + coarse snd, slightly calcareous; some Ls fragments.

45

50

No Sample

" "

60

Drift; dk gry to nearly blk, slightly calcareous slt predominating, 10-15% coarse snd + fine Grav. some Ls. frag.

Drift. (170')

70

Miss. ~~(295)~~ (295)

Ls. 80-90%, lt. cream; about 15% is oolitic; x/s of moderate size; Snd + gravel included in sample, probably from drift.

465
170
295'

80

Ls. 80-90%; lt. cream, hard, x/s of moderate size; drift content 10-20% of sample.

90

Ls; ~~85~~-95%; lt gry to cream; hard, non porous, x/s of mod. size; drift Content 5-15%.

200

Sheet No. 3 Name of Well City Well Survey No. W-130

Location Williams Date Drilled 1932 Analyst Rowsey

200

LS; 95-99%; dk. gry to buff; coarsly x'lized, non porous; Pyrite <1%

10

20

LS; ±100%; dk. gry to buff, dolomitic; Coarse x'line; somewhat porous; x's of very uniform size.

30

40

Dolo; ±100%; lgt cream to gry; very finely x'lized; ground almost to a powder by the drill.

50

60

LS ±100% lightly dolomitic; light cream to buff; x's of mod size; non por. Pyrite <1%

70

L.S. 95-99%; lgt. cream to gry, rather hard, non porous, x's of mod size; Pyrite <1%, in minute x's; Qtz, 1 to 2%; clear, fresh x's;

80

LS 95-99%; dk buff to gry, finely X'lized; non porous; Gypsum 1-1%; Pyrite, <1%; in minute x's;

90

LS; 95-99%; gry, to cream, x's of mod. size; non porous; insoluble residue probably 5%; Pyrite <1%; in minute x's;

300

Sheet No. 4 Name of Well City Well Survey No. Wa130

Location Williams Date Drilled 1932 Analyst Rauser

300

LS, ±100%; dk gry to buff, hard, x/s of mod. size, non porous; Gypsum ∠10%; Pyrite, a trace

10

15

20

LS, ±100%; dk gry to buff; finely x/lized; non porous, rather hard; Gypsum ∠1%; Pyrite, a trace.

30

LS, ±100%; med gry in color; finely x/lized; non porous; hard; — Chr, 10-20%; gry to wh.

40

LS, 50-60%; gry; finely x/lized; rather hard; non porous; — Chr; 40-50%; gry to nearly white; dense;

chry

50

LS, 70-80%; drk gry; impure, in appearance dolomitic, insoluble residue probably high 10-20%; Chr; 20-30%; similar to that in 340-350

60

Dol; 85-95%; drk gry; hard; contains some Ls; Chr; 10-20%; gry, dense; detrital Qtz, 1-10%;

dol. + chr. no

70

Dolo; 95-99%; drk gry; Ls content rather high; finely x/lized; Chert, 1-5%; gry, mottled; dense.

80

90

Dolo. ±100%; drk. gry, very hard; finely x/lized; non porous; in large pieces; not ground up badly by drill. 2-3

A

00

Sheet No. 5 Name of Well City well Survey No. W-0130

Location Williams Date Drilled 1932 Analyst Rowsey

00 Sh, ±100%; grn to grnish grn; soft; laminated; slightly calcareous; Pyrite <1%;

10 Sh, ±100%; lt. grn to grnish grn; soft, all original structure lost in drilling; very slightly calcareous;

20 Sh, ±100%; lt grn-green; soft; very sticky when wet, slightly calcareous; original structure lost in drilling. Pyrite <1%.

30 Sh, 85-95%; light grn-grn; soft, slightly calcareous; snd, 1-10%; qtz, C, ½-¼; Slt. content 1-10%;

Sheffield beds (Dev.?)

40 Slt; 50-60%; grn; calcareous; thinly laminated; Dolo 40-50%, grn; cementing sh & in sep. aggregates; Dolo; 50-60%; grn; shly, rather hard, xls of mod. size; Slt; 40-50%; incorporated in dolo; grn; (sample very small)

dol.

170'-465' 60 Dolo; 45-55%; similar to that in A45-A60; xls of mod. size

Base of Kind 465' Slt, 45-55%; incon. in dolo. sample is about ½ of slt. & dolo.

Top Dev.

70 LS, 80-90%; lt. grn. to cream; hard, xls of mod. size; Slt, 10-20%; as in A60-A70; from above; contact Probably about A72-B3;

80 LS, 90-95%; lt. grn. to cream; rather hard; finely xlized; slt + sh content 1-10%; snd, in ½-¼, r to C, 1 or 2%. Pyrite <1%

90 LS, 95-99%; lt grn to cream, hard, finely xlized; non porous; insol. residue 1-10%; Pyrite <1%.

600

Sheet No. 6 Name of Well City Well Survey No. W-0130'

Location Williams Date Drilled 1932 Analyst Rowsey

500

LS, ±100%; very pure, wh. to cream; minutely x'lized; hard; so pure as to be translucent on thin edges; Pyrite ±1%

10

LS, ±100%; very pure, hard, cream; similar to that in 500-510'; Pyrite, a trace a few shell fragments.

20

LS, ±100%; lgt gry. to cream, rather hard; x'ls of med size; slightly more gry than 510-520'; Pyrite, ±1%; in minute x'ls;

30

LS ±100%; gry. to cream; rather hard; x'ls of med size; non porous; Sh, 1 or 2%; grn; probably from above:

40

LS, ±100%; gry to cream; rather hard; fine x'line; a few frag. of fossils. Pyrite <1%

50

LS, ±100%; gry to Cream; very similar to that in 540-550'; Pyrite <1%

60

LS, ±100%; gry to buff; rather hard; x'ls. of med. size; non porous; Pyrite <1%;

70

S/s - 73' S/s; 70-75%; dk gry; soft; calcareous;

LS; as in 560-570'; 25-30%; Contact Probably about 572-73'; SS, ±1%; ¼-⅛, R

80

Sh; 80-90%; lgt gry; soft, calcareous some dark gry bands; Sol. content high; Ls; 10-20%; may be in cal. bands; some probably from above; Pyrite 1 or 2%; SS; 1 or 2%; as in 570-580

90

Sh, 80-90%; lgt. gry, soft, calcareous; similar to 580-90'; Ls, 10-20%; as in 580-594'; Pyrite 1 or 2%; SS; 1 or 2%; C; ½-¼ average.

600

Sheet No. 7 Name of Well City well Survey No. W-0130

Location Williams Date Drilled 1932 Analyst Rowser

600 — LS, 60-70%; dk gry, soft, impure; finely xlized; Sh, 30-40%; gry; distributed thru. Ls. Pyrite <1%; Snd, 1-2%; 1/2-1/4 Gr

10 — Sh, ±100%; lgt gry, soft, sticky when wet; slightly calcareous; thinly laminated; Pyrite <1%

Miss. (450')

20 — LS, 95-99% drk. gry to buff; somewhat impure in places, dolomitic; xls mod size; zones of larger xls, with increased porosity; Sh, about 5%; is pure; as in 610-620; Snd, 1-3%; 1/2-1/4 Gr, Qtz grains; Pyrite <1%

Dev. (200')

30

40 — LS, 80-90%; about 80% is lgt cream, hard, finely xlized; 20% is similar to 620-640; Pyrite <1%; Sh, as in 620-640, 10-20%.

50 — LS, 70-80%; lgt gry, impure, rather soft, xls of mod size; Sh, content 20-30%; gry, mixed into LS; evidently some bands of pure sh; Pyrite <1%

60 — LS, 70-80%; lgt gry; interbedded with thin beds or lenses of blu-gry sh. Ls is hard; xls of mod. size; Sh, 20-30%; blu-gry, in solid sh. pieces, & incor. in LS. Pyrite <1%

LS: sh, 10-20%

70

LS; 80-90%; lgt. gry to cream, impure, rather soft, finely xlized; Sh, 10-20%; incorporated in LS, not in lenses or beds; Pyrite <1%

80

90 — LS: 95-98%; lgt. gry to cream; hard, non-porous; xls of moderate size; Sh, 3-5%;

LS.

700

Sheet No. 8 Name of Well City Well Survey No. W0130

Location Williams Date Drilled 1932 Analyst Rousey

700 LS; ±100%; lgt gry to cream, pure, hard, finely x'lized; non porous; Qtz, 1 or 2%; in clear, fresh x's:

10 LS; ±95-99% lgt gry, rather soft; somewhat Porous, finely x'lized; insol. residue 1-10%. Pyrite, a trace:

20 LS, 60-70%, lgt gry to buff, soft, shy; very finely x'lized; Sh content high; 30-40%;

30 LS, 75-85%; lgt gry to buff, soft, shy; x's of mod size; Sh; blu-gry, 15-25%; in thin beds & lenses, and also in the LS: Pyrite <1%

40 L.S, 95-98%; gry to buff, hard, finely x'lized; non porous; a small amt of iron staining: Pyrite <1%; Sh. Content, 3-5%, probably from above.

50 LS: ±100%; buff to cream; pure, finely x'lized; non porous; hard; Calcite, in clear x' frag, 1-5%;

60 LS, 80-90%; buff, rather soft; finely x'lized; ground fine by drill; Detrital Qtz, 10-20%; Pyrite <1%.

70 LS, 75-85%; lgt gry, impure; soft; shy; very finely x'lized; Sh. & s lt. content 15-25%; chiefly s/t. (Some dolo. in sample)

80 Dolo; 80-90%; drk buff to brown; hard; x's of mod size; LS, 10-15%; similar to 770-780'; grn Sh, 5-10%; in rather small fragments; Qtz, 1 or 2%, in clear, fresh x's;

90 LS, 70-80%; lgt. gry; soft, shy; finely x'line; Sh content 20-30%; Pyrite ±1%

800

Sheet No. ..... Name of Well City well ..... Survey No. W0151

Location Williams ..... Date Drilled 1932 Analyst Rowser

800 LS, 75-85%; gry; impure, shy; soft, finely x line; Detrital Qtz. 15-25%
Pyrite ± 1%.

10 LS; 50-60%; grv to buff; iron stained in part; soft; Sh, 40-50%, blu-grv, slightly calcareous; thinly laminated; Contact between LS + Sh prob. about 816; Pyrite < 1%

Devonian 814 / Silurian

20 Sh, 45-55%; blu-grv, calcareous; thinly laminated;
LS, 45-55%; buff, impure; rather soft; finely x'lized; Pyrite 1 or 2%

30 LS, 50-60%; buff, impure, soft; similar to that in 820-830;
Sh, 40-50%; blu-grv, thinly lam; slightly calcareous; Pyrite ± 1%.

40 LS, 45-55%; similar to that in 830-840
Sh, 45-55%; blu-grv as in 830-840.
snd, 1 or 2%; C, 1-½; Gypsum a trace, Pyrite < 1%

50 LS, 45-55%; grv, very impure, soft; minutely x'lized; Sh, 45-55%; blu-grv; and included in matrix of LS; where pure is thinly Laminated.

60 LS, 65-75%; dk. grv, soft, impure, shy; finely x'lized; shale content high, 25-35%; snd, 1-½, r to C; 1 or 2%
pyrite < 1%;

70 LS, 50-60%; containing bands of Sh, as well as incorporating 15-25% shale; grv in color, soft; Gypsum 1%; Pyrite < 1%
Sh, 40-50%; where pure is blu-grv; Laminated.

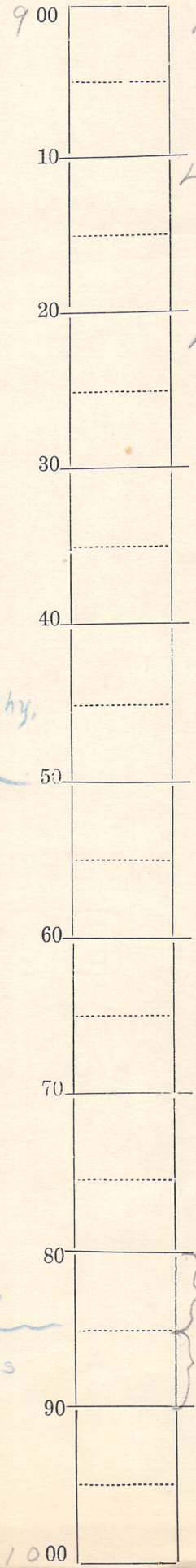
80 LS, 80-90%; grv, impure, soft, finely x'lized; sh. content 10-20%; no Loose frags. of pure shale.
Gypsum < 1%

90 LS, 70-80%; Very similar to 880-890, but sh. content 20-30%; Pyrite, a trace.

900

Sheet No. 10 Name of Well City Well Survey No. W0130

Location Williams Date Drilled 1932 Analyst Rowsey



LS, 70±80%; shy; grn to buff; impure, rather soft; finely x'lized; shale content high, 20-30%, but ±5% of this is in pieces of shale;

LS, 70-80%; very similar to 900-910; Sh. content 20-30%, few sh. frag ments,

LS, 50-60%; similar to that in 800-810;
Sh, 40-50%, blu-grn; soft, thinly laminated; pyrite <1%

LS 45-55%, similar to that in 800-810;
Sh, 45-55%, hard, blu-grn, very slightly calcareous, thinly laminated,

LS, 45-55%, grn to buff, soft, shy; impure; finely x'line;
Sh, 40-50%, blu-grn, thinly laminated; some included in the LS; pyrite <1%

LS; shy.

Sh, ±100%, brown to red; thinly laminated; contains ±10% of brown, elongate nodules measuring up to 1mm, index 1.56±, isotropic; may be related to hisingerite.

Sh

Sh, ±100%, red and blue interbedded, thinly laminated; slightly calcareous

Sh, ±100%, grn-blu; soft, slightly calcareous; sticky when wet

Sh, 70-80%; similar to 970-980;
LS, 20-30%; grn-buff soft, impure

Sh.

LS; ±100%, cream to buff; rather hard; x'ls of mod. size; brown nodules, as in 950-960, ±10%, (From above) Casing seale.

LS

LS, ±100%, cream, pure; minutely x'lized; softer than 965-990;
Chert <1%.

Sheet No. ..... Name of Well City Well ..... Survey No. Wa130

Location Williams ..... Date Drilled 1932 ..... Analyst Rowser

1000

LS, 80-90%; gry to cream; rather soft, shy; finely xlized; some dolo; Sh, 10-20%; included in matrix of shale,

10

LS, 50-60%; gry, shaly; soft; very finely xlized; Sh, 40-50; incorporated in LS;

LS

20

Sh, 80-90%; calcareous; gry, rather hard, Probably 20-30% soluble in dilute acid. LS, 10-20%; similar to that in 1010-1020;

Sh.

30

LS, ±100%; gry to buff, minutely xlized; rather hard; insol. residue 5-10%; Pyrite <1%

LS

LS ±100%; gry to buff; rather soft; finely xlized; Pyrite ±1%

40

LS, ±100%; gry to buff; hard; xls of mod. size; somewhat dolomitic; insol. residue 1-10%; Pyrite ±1%

50

LS; 95-98%; buff to gry; very finely xlining fairly hard; Sh. gry, 2-5%; wh to gry; Pyrite <1%

60

LS; 80-90%; gry, soft; very finely xlized; Sh; 10-20%; gry, soft, calcareous; Pyrite <1%

70

LS; 60-70%; gry to lt buff, soft, shy, finely xlized; Sh, 30-40%; gry, similar to that in 1060-1070,

Base Sikes. 1076'

Sil. (1080')

80

Mag. (90')

Sh; 50-60, gry, very calcareous, soft, thinly laminated; Calcareous content 40-50%

90

Sh, 60-70%; Similar to that in 1080-1090; Calcareous content 30-40%; Pyrite <1%

1100

Sheet No. 12 Name of Well City Well Survey No. Wa 130

Location Williams Date Drilled 1932 Analyst Rawson

11 00

Sh, 70-80; grn; rather hard; very calcareous; Calcareous content 20-30%;

Sh; 60-70%; grn to blu; very calcareous; fissil; Ls, 30-40%; grn, mixed with the Sh; Pyrite <1%

Sh; 60-70%; similar to 1110-20; calcareous content 30-40%; includes fragments of shy Ls. in Sh.

Ls; 80-90%; dk. buff to brn; rather hard; xls of mod size;
Sh; 10-20%, similar to 1120-1130

Ls; 60-70; grn to buff; impure, shy; xls of moderate size;
Sh, 30-40%; blu-grn; calcareous; thinly laminated. Pyrite <1%

Top Pawnee 1150'

Ls; 95-98%, Cream to wh; pure; finely xlized; non porous; hard;
Sh, 2-5%; blu-grn, as in 1140-50;
Pyrite <1%

Ls, ±100%; similar to that in 1150-1160; Some iron stain; chert ± 1%; Pyrite <1%

Mar. (90')

Ls, 50-60%; grn; impure; finely xlized; rather soft.
Chert 30-40%; wh; dense;
Sh; 30-40%; grn-blu; calcareous; thinly laminated.

Gal. (200')

Ls, 50-60%; similar to that in 1170-1180;
Chrt 40-50%; grn, to wh.; dense;
Sh, 1-5%; Pyrite <1%;

Ls; 50-60%; Like that in 1170-1180;
chrt, 40-50%; grn; dense,

12 00

Sheet No. 13 Name of Well City Well Survey No. W0131

Location Williams Date Drilled 1932 Analyst Rausser

1200 00 LS; 60-70%; gry to buff; rather hard finely xlized; some clear dolo xls; Chert, 30-40%; wh. to gry; dense; Sh; 1-10%; blu-gry; slightly calcareous;

10 LS 40-50%; gry, shy; soft; impure Chr; 35-45%; like that in 1200-1210 Sh; blu; 10-20%; sep. beds + as a part of Ls beds; Pyrite <1%

20 LS, 70-80%; gry; rather soft, shy; insol. residue high; finely xlized; Chr; 20-30%; gry; dense; Sh; 1-10%; gry; soft;

30 LS; 60-70%; gry, very soft; shy; finely xlized; Sh, 30-40%; mixed in Ls, in bands of gry; calcareous; thinly laminated;

40 LS; 60-70; gry; soft, similar to that in 1230-1240; Sh, 20-30%, as in 1230-1240

50 LS, ±90-95% soft; pure; very finely xlized; lt. gry in color; Sh. content 1-10%; Pyrite <1%

60 LS; 90-95; like that in 1250-1260; Sh, 1-10%; blu; thinly laminated, probably from above; Pyrite <1%

70 LS; ±100%; pure; wh to cream; hard; finely xlized; Pyrite, a trace

80 LS, ±80-90%; as in 1270-1280; Sh, 10-20%, (from farther up) brown nodules, 100%; Probably have fallen from above. (950-960)

90 LS; 95-98%; similar in 1270-1280 Chert 1-3%; Sh 1-10% (from above) brown nodules, Prob. from 950-960

1300

Sheet No. 1A Name of Well City Well Survey No. W0130

Location Williams Date Drilled 1932 Analyst Rawson

13 00

LS; ±100%; cream to buff; very finely x'lized; Chr, ±1%: Pyrite <1%

10

shy

LS, 80-90%; lt grey; rather soft; shy; finely x'lized; Sh. content, 10-20%.

20

LS; 85-95%; like that in 1310-1320'; Sh. content 10-20%;

30

chr.

LS; 70-80%; lt grey to cream; hard; x's of med. size; Chr. 20-30%; wh to gry; dense; Pyrite <1%

40

LS; 70-80%; like that in 1330-1340'; Chr. 20-30%; wh, dense; Pyrite ±1%

chr.

50

LS, 70-80%; wh to gry; soft; shy; very finely x'lized; Chr, 1-10%; gry; dense; Shale content of LS; 20-30%.

60

LS; 95-98%; cream to wh; hard, pure; finely x'lized; Sh, 1-5%; gry; from above; Chr, 100-%; gry; dense;

70

LS; 80-90%; dk. gry to buff; very finely x'lized; Sh; 10-20%; blu-gry; probably from higher up in the hole;

80

LS; 80-90%; dk. gry. to lt. gry; impure; x's of med. size; insol. residue 10-20% (detrital qtz); a trace of blu shale from higher up in hole.

90

LS, 90-98%; gry to cream; about 20% dk gry; finely x'lized; hard; Detrital qtz 1-8%; Pyrite ±1%;

14 00

Sheet No. 15 Name of Well City Well Survey No. W013D

Location Williams Date Drilled 1932 Analyst Rowser

1400

LS, 80-90; drk gry to cream; impure; rather soft; xls of mod. size;

Sh, 10-20%; blu-gry; thin lam; calcareous; Pyrite ±1%; Chr ±1%

10

LS, 70-80%; gry; impure; soft; Shy; Shale 20-30%; incor. in LS; & in Sh. fragments; blu-gry; Thin. lam. Pyrite <1%.

20

LS, 60-70%; cream; hrd; sub-litho. in part; Chr 20-30%; wh to cream; Pyrite <1%.

Cal. / Platt.

30

LS, 90-95%; cream to drk gry; finely xline; hard; — Chr, 1-5%; detrital Qtz; 1-10%.

40

LS ±100%; cream to gry; xls of mod size; rather hard; Pyrite <1%; frag. of fossils numerous.

50

Platt. (5')

LS; 70-80%; drk gry. to lgt. gry; impure; Detrital Qtz 15-25%; Pyrite 1-2%; in masses of minute xls; Chr, 1-10%; gry to nearly blk. Sh, 5-10%; blu-gry; cal;

60

LS; 70-80%; gry; impure; soft. Sh 20-30%; blu calcar; thinly laminated; Pyrite 1-3%; in minute xls; making LS appear blk in some instances.

70

LS, 70-80%; gry; impure; rather soft; Pyrite 5-10%; in minute xls; giving blk. color to LS; Sh; 10-15%; blu-gry; calcareous;

1479

80

Sh; 95-99%; green; soft, calcar; LS as in #70-80, 1-5%; Pyrite <1%

85

Sh; 70-80%; green; calcareous; thinly laminated; LS 20-30%, in Lenses; Pyrite <1%

Glwd. (27')

90

LS; 80-90%; drk brn to buff; impure; Shy; Sh, 20-30%; like that in 1485-1490; also is in LS. Pyrite <1%

1500

Sheet No. 16 Name of Well City Well Survey No. W0130

Location Williams Date Drilled 1932 Analyst Rowser

1500

10

20

30

St. P. (83')

40

50

60

70

72

80

Shak. (100')

90

94

1600

LS, 40-50%; gry; soft; impure, shy;
Sh, 10-20%; blu, soft, calcareous;
Pyrite 2-5%; in minute x/s + aggregates
Sand, 30-40%; ¼-⅛, C to r; well frosted.
SS; 65-75%; wh; prin. ½-¼ (50-60%) sec. max ¼-⅛; some grains up to ½mm; C-70-80%; also a & B; Sh; 25-35%; green; thin lam; Pyrite 2 or 3%; some snd grains cemented by pyrite.
SS; 65-75%; like 15'10-15'20;
Sh, 25-35%, as in 15'0-15'20 (probably from higher up) Pyrite 1 or 2%
SS, 75-85%; similar to 15'10-15'20;
Sh, 15-25% (as in 15'0-15'10) represents caving. Pyrite ± 1%
SS; 75-85%; like that 15'10-15'20;
Sh, 15-25% (represents caving)
Pyrite ± 1% includes some snd in some of the x/s.
SS; 80-90%; like that in 15'10-15'20;
Sh, 10-20% (cavings)
Pyrite 1 or 2%;
SS; 80-90%; gry; ¼-⅛ predom; a to C;
sec max ½-¼; well frosted;
LS; 10-20%; gry; minutely x/lized;
rather hard; Sh, 1-5% (cavings)
SS; 70-80%; similar to that in 15'60-72';
Calcareous cement; Chert, 10-20%;
wh, oölitic; dense; Sh; 1-10%; blu; LS, 1-10%
minute frags (prob. part of cementing material)
SS; 50-60%; like that in 15'60-72'; calcar
eous cement
Dolo; 30-40%; butt, impure, inclusions
of snd; Sh; 1-5%; Chert, wh,
oölitic, 1-10%; Pyrite ± 1%;
Dolo; 60-70%; butt; x/s of mod. size;
SS, 30-40%; as in 15'80-95'; some snd. 2nd. enlarged;
Pyrite ± 1%

Sheet No. 17 Name of Well City well Survey No. W0130

Location Williams Date Drilled 1932 Analyst Rowser

1600 Dolo; 80-90%; buff; rather hard; finely x'lized; Chert, 10x2%; Blk, banded. Snd 10-20%, Probably from above, since none was found in dolo; Sh, 1-5%;

10 Dolo; 80-90%; like that in 1600-1610; Snd; 10-20%; may be from above, since not included in frag. of dolo; Pyrite ±1% Shale 1-5% (from above)

20 Dolo; 85-95%, some calcite; buff, hard; x'ls of med size; Snd; 5-10% ½-¼; C; (Prob. from above;); Sh, 1-5%; Casing rust ± 3%. Chert, 1-5% wh, dense

30 Dolo; 80-90%; as in 1620-1630; Snd, 5-10%; ½-⅛, a to C; not much frost; Chr; 1-10%; wh, some oolitic; Pyrite ±1%

40 Dolo; 95-99%; buff, very finely x'lized; contains some calcite; Snd, as in 1630-1640, 1-10%;

Shak. (100')

50 Dolo; 90-98%, similar to 1640-1650; Snd, 1-5%; similar to that in 1630-1640; Chert ±1%; Pyrite <1%

60 Dolo; 90-98%; buff to cream; very finely x'lized; Snd; 1-10%; as in 1630-1640; Chert ±1%, Pyrite <1%

70 Dolo 60-70%; buff to cream; finely x'lized; Snd. 30-40%; ½-¼, C; Sec. enlarg. well shown.

80 Dolo; 70-80%; similar to that in 1620-1680 Snd, 20-30%; like that in 1620-1680.

90 SS; 80-90%; wh; ¼-⅛, 60-70%; A to a; sec max. ½-¼; Dolo; 10-20%; as in 1620-1680; snd shows 2ndary enlarg. Chr. oolites ±1%

N. Rich. (60')

00

Sheet No. 18 Name of Well City Well Survey No. W0130

Location Williams Date Drilled 1932 Analyst Rowsey

1700 SS; 95-99%; wh; ¼-⅛ Predom; a to C; sec. enlarg;
sec. max ½-¼; dolo 1-5% (From above)

05 SS; 60-70%; wh; similar to 1700-1705

dolo; 30-40%; wh to cream; finely x'lized.

10 SS; 70-80%; wh; similar to 1700-1705; sec.
enlargment common; Some oolites;
Dolo, 20-30%; wh to cream; finely
x'lized; minute frags.

20 SS; 70-80%; wh; ⅛-1/16 average; sec. max ¼-⅛;
A to a; not much frost.
Dolo; 20-30%; similar to that in 1710-1720.
Casing rust ~5%

30 SS, 45-50%; like 1720-1730;
Dolo, 45-55; very finely x'lized; yellow-buff
in color;

N. Rich.

40 SS; 70-80; ⅛-1/16; flat, angular frags;
iron stained; Dolo, 20-30%;
Similar to that 1730-1740;

50

60

70

80

90

1800