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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LOOSE-LEAF FIELD NOTEBOOK

9-137

Please return to - K. M. Wadge,
Peabody Museum
New Haven, Conn.

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7048

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Collection number index.

Coll. No.	Locality	
A-4650	265	✓
4651	265	✓ (✓)
4652	267	✓
4653	270	✓
4654	270	✓
4655	270	✓
4656	270	✓
4657	272	
4658	274	
✓ 4659	20	✓ (✓)
4660	275	✓
4661	275	✓
4662	275	✓
4663	275	✓
4664	275	✓
✓ 4665	21	✓
✓ 4666	21	✓
4667	276	
4668	111	✓
4669	111	✓
4670	279	✓
4671	279	✓
4672	279	missing
4673	33	✓
4674	33	✓
4675	33	✓
4676	33	✓ part only!
4677	28	✓
4678	28	✓
4679	282	✓
4680	282	✓
✓ 4681	17	Upper Dnic (✓)
✓ 4682	17	Protocordia (Central Dnic) (✓)
4683	287	✓
4684	287	✓
4685	74	needs location data in this book.
4686	17	New cut, Gervilliz Concretion

2.0

1.8

1.15

1.25

1.19

7.20

7.20

8.50

36.71

7

30

recorded - map v
register

Locality 265. Bluffs S. of Moreau River in center W 1/2, SE 1/4, sec. 17, T. 14 N., R. 22 E., Lantry NW quad., Dewey Co., So. Dak.
Timber Lake overlies Irish Creek lithologies. Sections measured by Reistad + Scholle + J. Waage.

Following adapted from Reistad's notes

Section #1

Section begins at top of layer 8" gray cone-in-cone concs, with 3/4 to 1" jaspers associated, in "dark shale."

- 1) 5.8 Dark gray shale interbedded with lighter silty shale; jasperitic layers, 1" layers 4.4 and 5.8.
- 2) 9.4 Dark gray-orn shale with thin interbeds silty sh. increasing upward in thickness. Numerous jasperitic layers (lower 40'); 1" layers at 3.9, 7.2 and 9.2, silt layers in upper 2.2. At top layer sect flat concs 2th 16 diam. of reddish tan with tan outer layers.
- 3) 6.6 As in 2), several thin layers jasperitic, at top is layer sparse sect. gray sandy concs with cone-in-cone struct.
- 4) 4.8 As in 2), sect. concs* at 2.0, jasperite layer 4.4, sect. concs at top that have sandy gyms jackets etc. (flat (2") ovoid, (Ammonoid in foot may be from here not calc. sh.)
- 5) 7.2 As in 2), sect concs at 3.9, and layer flat ovoid concs at top that are silt-stn concs with gray c-in-c extensive jackets, 2.0 diam and about 4" high. Jasperite common, layers 2.3, 5.0 + 5.3, and sect J in upper 2.0.

* See J.R. notes for details of lithology.

2125

10

195

300

216

15

301

300

300

19

10

200

9

Check with JR silty clay = silty clay
 Note - except where interbedding noted or beds called "banded", questionable how much JR calls silty shale is actually a shale - bc in con. exp. to silty clay, where doubtful original is quoted. Doubt conc. zone "ironstone"

- ⑥ 5.2 As in ②, with concentration of concretions as follows -
 2.3 extensive thin layer dk gr. concs with light "bumpy" rind.
 3.3 sparsely scat. layer of similar concs.
 5.2 local, scat, small punky, sandy concs some with cores.
- ⑦ 8.0 Chiefly interbedded silt and silty-shale with extensive conc. zone at top. Concs in broad sand jackets that may constitute ^{0.8} layer, concs are "ironstone" [Question this]. Beds below have jarosite layers .2 to .5 thick at 2.6, 4.1 and 7.2.
- ⑧ 5.2 "Silty shale", layer concs 1.1 thick at top, concs. "ironstone" with convoluted gray ss jackets.
- ⑨ 11.4 ^{sandy} "Silty shale", dk mixed weathers tan gray some limonitic streaks. At top 9" limonitic zone with pocket loose fossils (A-4650)_{see}
- ⑩ 9.5 "Silty shale", with 1.0 conc. layer, "ironstone" with with gray ss jackets, at top.
- ⑪ 10.0 Clayey silt, lay small (3" thick, "ironstone" concs at top.
- ⑫ 4.8 "Silt", with zone large "ironstone" concs up to 2.0 dm with gray to tan ss jackets.
- ⑬ 6.9 Sand, fine grained, brown with, minor shaly beds, small scattered "ironstone" concs at 1.9 and 5.5. At top a layer "ironstone" concs with red-yell-brn.

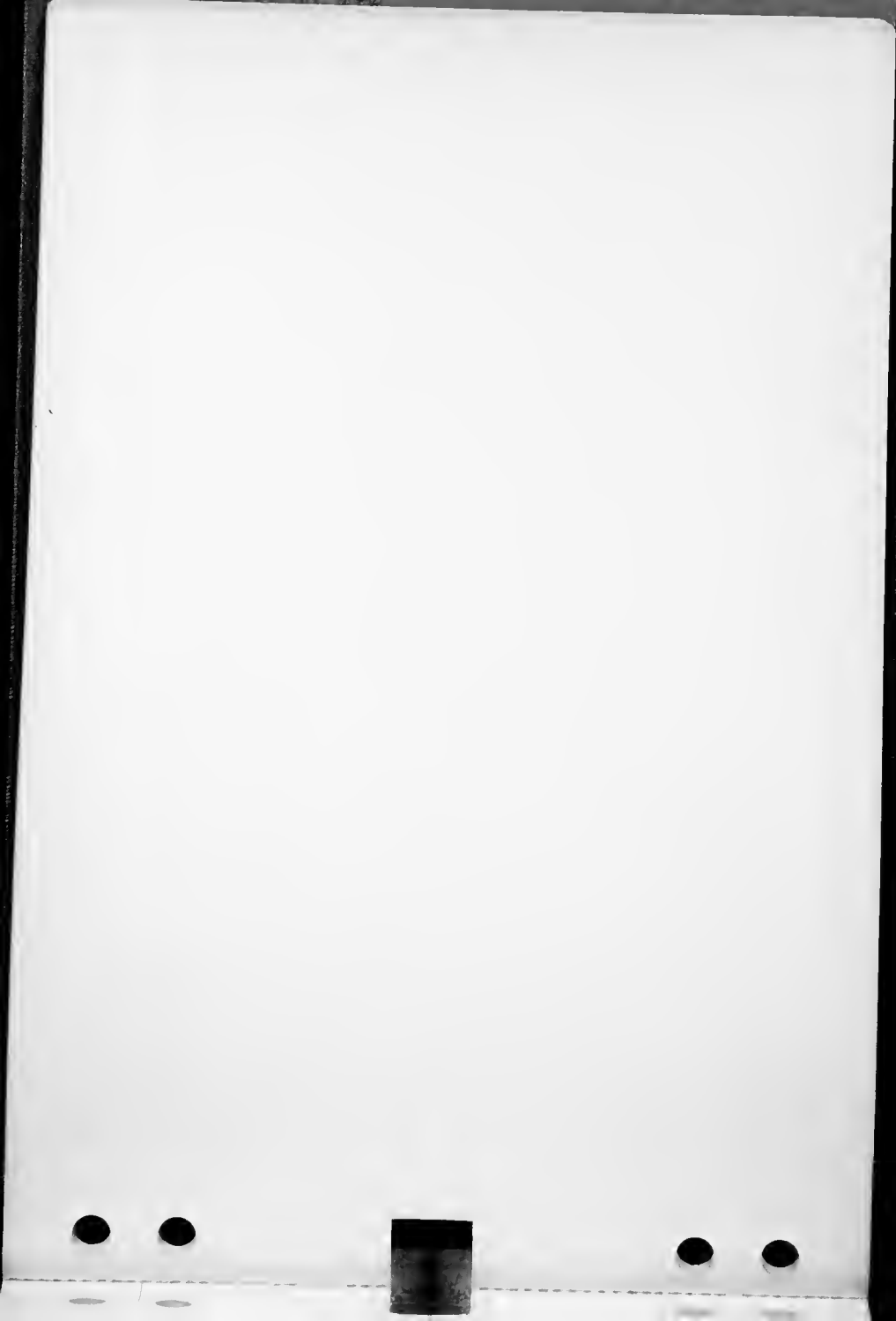


Section 2. How this fits with Sect 1 J.R. does
not show, says that

Base is top of "major conc zone above double layer
near bottom of T.L."

Large conc zone above double layer
near bottom of T.L. - 2.0' from base of T.L.

- ① 11.4 Clayey silt and sand, mottled with small concs.
layer at top
- ② 3.4 As in ① with small "ironstone" conc layer at top.
- ③ 5.7 As in ① with large concs. layer at top.
- ④ 1.2 Sandy silt, with thin (0.1") layer sandy
tan concs. at top.
- ⑤ 16.9 "Sandy". In top 5.0' large grey sandy "ironstone"
concs with grey ss jackets. *Fossiliferous*,
Sphaerodiscus, *Pteropteria*. [A-4651]



Locality 266. Exposures in gully N of dam and at base of butte south of Bickley Ranch in center W $\frac{1}{2}$, SW $\frac{1}{4}$, sec. 15, T18N R23E, Black Horse SE quad., Carson Co. So. Dak.

Tauconia-Ophiomorpha biofacies in gullies N of dam, grades into gray Ophiomorpha-bearing ss in lower part of butte which is capped by hard gray O-bearing 'Calgate'. Complete section of butte not exposed but patches show sandy sand. Total interval from gully base to butte top about 75'.
No section measured.

To south, on road heading E. from Fitzgerald School along S border sec's 22 and 23, T18, R23, float of Hell Creek concretions and chips fossil wood come in on rise in center sec's 22-27, at about Eli 2220. To crest across draw in road gutter. Shaly rather "banded" Calgate-like friable sand with + of OB ferrug. cones and purplish layers with abundant plant frags.

Sandy ss total absence of Bullhead fossils; but on road S from 266 to Firesteel a road cut on W side shows mixed Bullhead-Calgate lithology - which is actually interfingering or just loose Bullhead lens can't tell from outcrop scale. This cut located on S. side dip across draw, W side road, about 1 mile S of Fitzgerald school (which is in NE cor. sec. 28, T18N, R. 23 E.).



Locality 267. Southwest facing bluffs east of Firesteel Creek, 0.65 mi NNW of old Stone Church (Holy Spirit Ch.) in center SE $\frac{1}{4}$ sec. 4, T. 19 N., R. 23 E., Black Horse NE quard. So. Dak.

Following adapted from Reichard notes:

Section 1.

Begins within Irish Creek lithofacies - height to creek level not indicated.

- ① 7.7 Clayey silt and sand, dk grey - with sect. limy cones in lower 3.5 and at top.
[A-4652 from conc. zone at top]
- ② 12.0 "Sandy shale" (prob. clayey sand), conc. zone at 3.4, also 0.2 jarosite at top.
- ③ 33.0 Interbedded thin layers dk silty shale and tan fig. ss, latter increase upward portions of plant frags and micz., scattered Nucula. Capped by 1.0 conc layer dk gr. coars and gray convoluted ss jackets.
- ④ 6.5 Interbedded sand + shale with $\frac{3}{4}$ " layer limonite sand at top.

Section 2 (50 feet to N of Section 1)

Begins at jarosite layer 0.3 thick

9.6
5.6
2.5
7.1

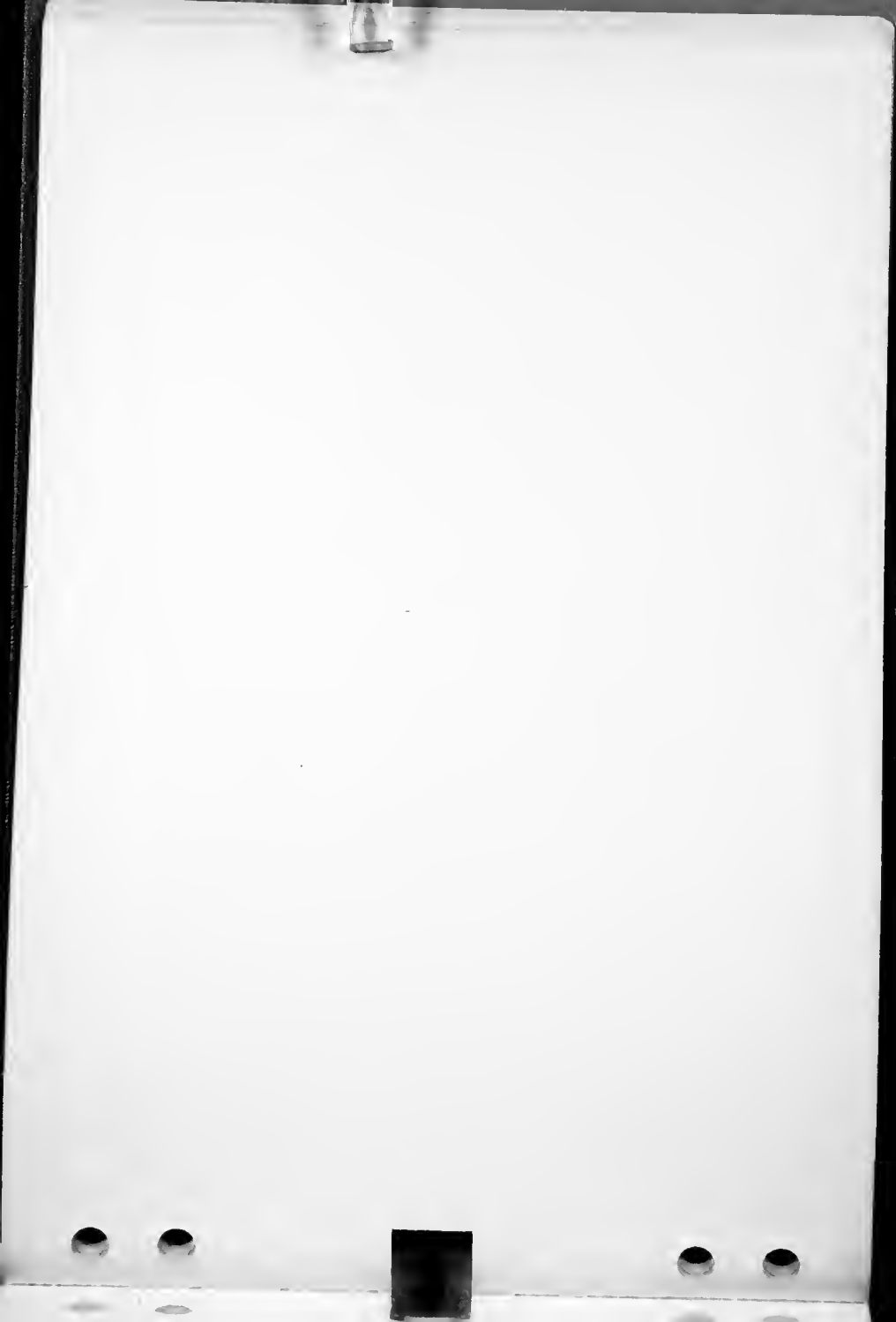
30.8

- ① 1.2 Silty shale with coner layer at top, dk centers, Fe weath.
- ② 15.6 Chiefly covered. "Shale and silt" up to concretion zone at base unit ① of Section 1.

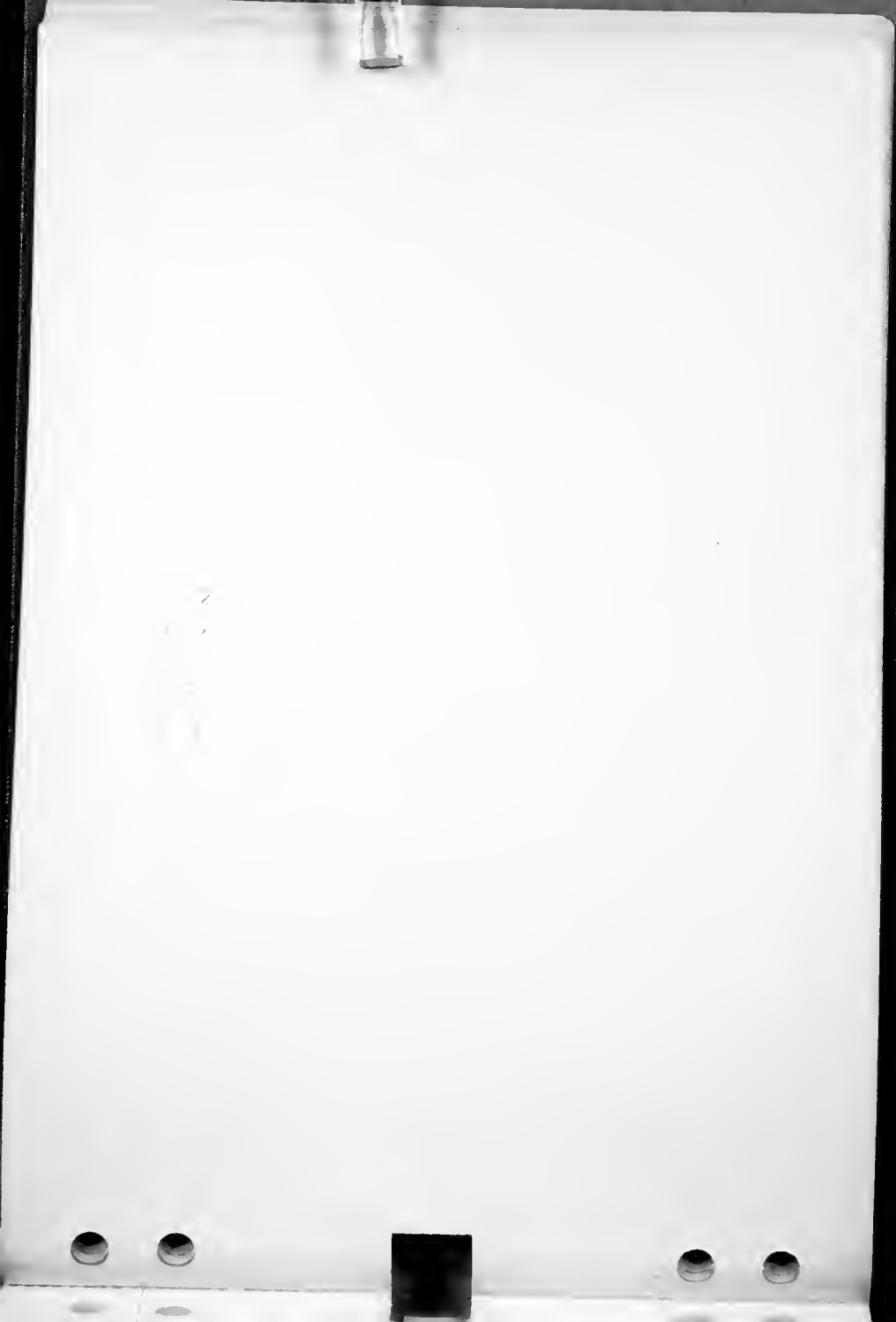
Section 3. (200 yds N of "the above sections")

Begins at top of concretion layer marking top of unit 3, Section 1.

- ① 24.9 Sandy silt and silty sand, mottled dk and light gray with fossil fragments.
- ② 5.9 Sand with interbeds shale, yellow with limonite impregnation [dk brn called "lignitic" could be limonitic stain + impreg.] Thin shaly limonitic (?) beds with concretions at 4.4 and at top, latter with gray sand jackets "ironstone" centers.
- ③ 23.7 Sand, mottled tan-gray and yellow-orange in lower 10.0, chiefly tan above. Massive. Layer thin concs at 9.6, limonite layer 15.2, and at top a zone of large "ironstone" concs up to 4.0 - rarely with ammonites.
- ④ 7.1 Sand, tan.
- ⑤ 20.0 - ? Sand, with limonite layers, Tenacled. and Ophiuroplia.



Remarks on sections at loc. 267



Loc. 268. Cut in the north bank Grand River
about one mile ESE of Highway 65 bridge
in E $\frac{1}{2}$, NW $\frac{1}{4}$, NE $\frac{1}{4}$, SW $\frac{1}{4}$, sec. 20, T. 20 N.,
R. 23 E, Black Horse NE quadrangle, Carson Co.,
So. Dak.

Following adapted from Reiskind notes.

Base of section on 0.5 jarositic layer overlying dk
thinly interbedded silt and shale (distance above
river not noted)

- ① 32.4 Interbedded & laminated silty clay and fine sand
scattered burrows; thin (0.1) jarosite layer at 17.5.
- ③ 19.9 "laminated with obvious burrows
"Clay and shale with sand-lined $\frac{1}{4}$ inch burrows"
Fossils loose in matrix (JR says "Mactra and
?Protocardia") At top is thin (0.1) conc. layer.
- ③ 13.1 * Sand and silt, mottled, overlain by more
dominant sand, bedded, zone which is
copper by Zn conc layer consisting of
gray sandy jackets with rusty to rb sandy cores
- ④ 27.8 Sand, tan to yellow, massive but with
faint appearance of bedding on
weathered surfaces. At top is conc
layer 1 to 3.0 in diam. ("ironstones")
- ⑤ 6.8 Sand, with faint layering (scale?), massive
- ⑥ 7.4 Sand, tan, faint layering, with interbeds
of dk gray fissile shale with ^{small} limonitic
concs in lower 1/2 and upper 1/3

* unit appears to bridge chng. from massive to well-bedded



⑦ 4.8 Sand, tan, massive, with abundant Ophiomorpha

⑧ 12.0-? Sand, tan-yellow, thin-bedded, x-bedded, limonite layers.

~~~~~  
Gravel cap







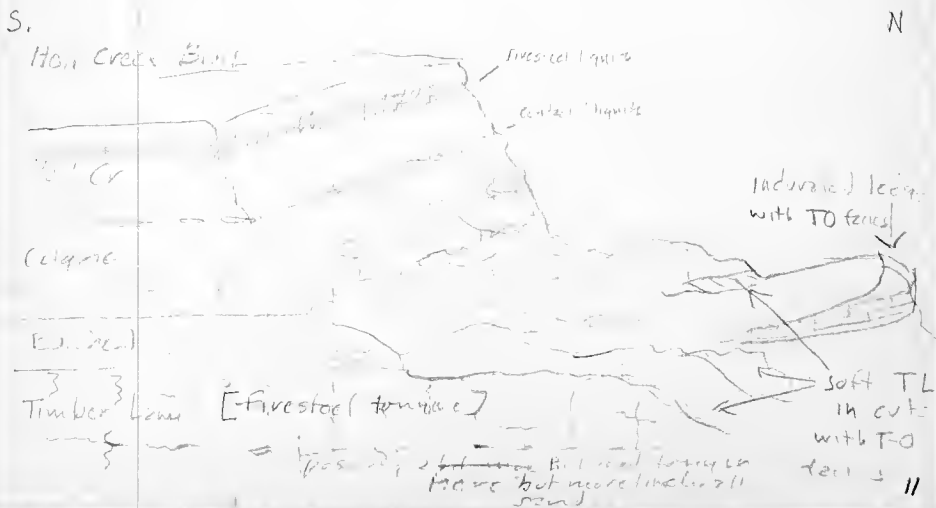


LOC. 269 Indurated ledge on S side Hump Creek valley  
 between 0.4 and 0.5 mi. 10° NW of the small bulge  
 of 'banded bed.' at locality 48; along E edge of W 1/2  
 NW 1/4, NE 1/4, Sec. 31, T21N, R. 23 E, Black Horse  
 NE quad, Carson Co., So. Dak.

Hard ledge of Colgate-like sand that is here  
 actually indurated top of Timber Lake.  
 Has *Tenuroditis* (scattered) - many *Ophiomorpha*.

South, down backslope, in ledge the  
 Timber Lake T-O bioherm is exposed in  
 several banks, and shell fragments of  
*T.* common on backslope itself. Although  
 direct tracing not possible, there can be  
 no doubt this ledge is indurated Timber Lake.

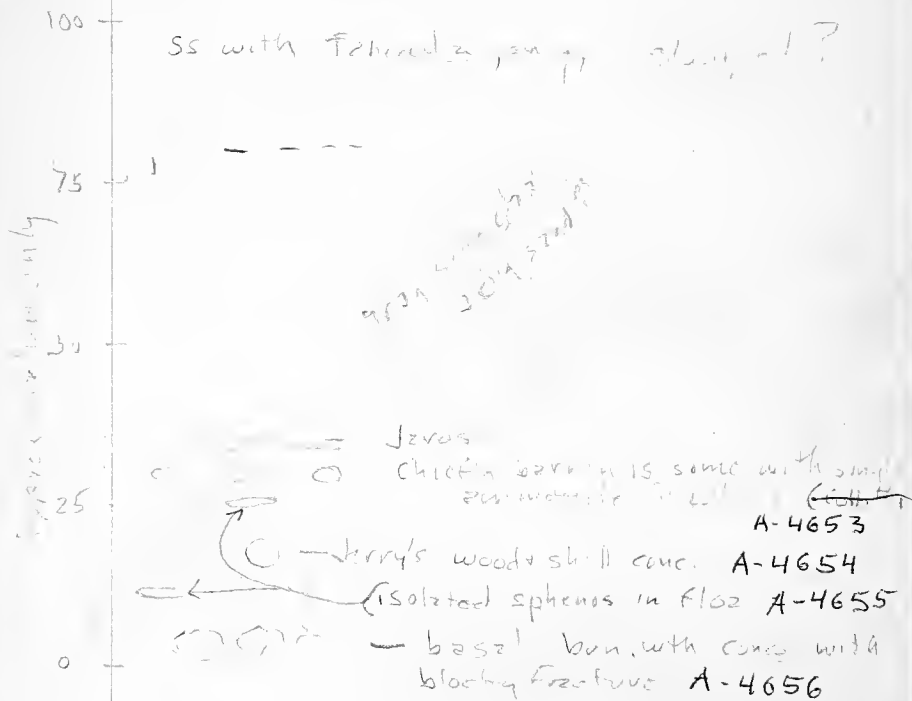
1. It carries semi bioherms
2. Occupies same strat position relative  
 to lateral TL exposures and overlying  
 Bullhead.
3. There is no TO bioherm in Colgate  
 beds present in adjacent outcrops to  
 N and S.



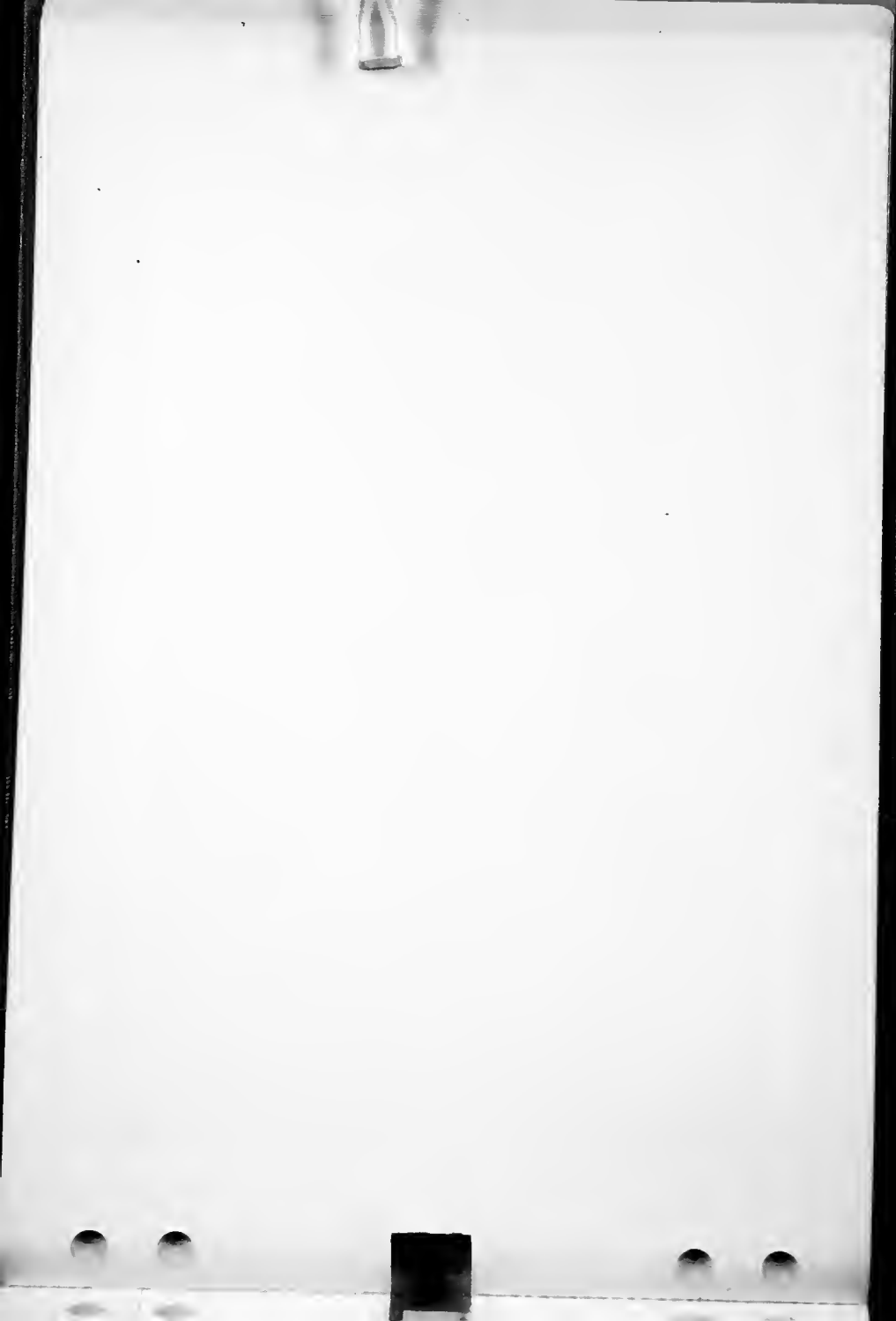


Loc. 270 Northwest-facing bluff south of Grand River in the SW corner, sec. 21, T. 20 N., R. 23 E., Black Horse NE quadrangle, Corson Co, So. Dak.

Exposure of Irish Creek lithated... capped by Timber Lake member. Could get a section but would take considerable digging. Guess at parts =



Note that the *P. linguiformis* fauna high in Irish Creek is lacking here, or else we didn't find it.



Exposures on

Loc. 271 - N-S bluffs west of old meander scar  
W side of Firesteel Creek in NW cor, SW  $\frac{1}{4}$   
NW  $\frac{1}{4}$ , sec. 28, and NE cor, SE  $\frac{1}{4}$ , NE  $\frac{1}{4}$ ,  
sec. 29, T19N., R. 23E, Black Horse SE  
quadrangle, Casson Co., So. Dak.

Following is adapted from Reiskind notes.

Section 1. South end of the exposure, -  
measuring up from top of a soft  
grayish tan sand that presumably marks  
top of Timber Lake.

- ① 25.3 "Banded beds:  $\frac{1}{4}$  to  $\frac{1}{2}$ " beds of shale, silt, +  
fine to med. grained sand; colors range from  
dk gray to tan + brown. Shale and  
silt predominant. (note presence of the  
dark gray silty shale + shale layers here)
- ② 3.9 Thinly interbedded dark gray silty shale  
with some rusty sand laminated, and tan  
sand with limonitic laminated, shale  
and sand layers 1 to 2 inches thick.
- ③ 4.6 Sand, tan, with limonitic sand beds,  
bedded, 3 to 8" thick; finer  $\frac{1}{2}$ " layering  
indicated on weathered surfaces.
- ④ 6.2 Sand, grayish-tan, appears massive; no  
evidence bedding may be thinly laminated.
- ⑤ 1.9 "Banded beds", up to 1" thick, dk gray to  
limonitic stained.
- ⑥ 3.0 - ? Gray-tan sand as in ④

Grass roots



Section 2. Just N. along bluff from section 1 the TL is better exposed,

Base is top of Ophiomorpha-rich, tan sand at least 4.0 thick.

- ① 5.0 Sand, massive, light tan-gray with thin indurated layer of Teneredia hash at top.
- ② 1.0 Conc-in-conc in X-bedded sand.
- ③ 0.7 Sand, reddish, partly indurated
- ④ 0.5 sand with conc-in-conc structure, locally concretions.
- ⑤ — "Banded beds"

Note — Section 1 apparently does not start at the lowest "banded bed" in section, but the base of section 1 is within about 5' of top of section 2.









Loc. 272, Low knob east of Firesteel  
creek and south of "Colgate" capped buttes in  
the NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ , sec. 33, T.19N, R. 23E,  
Blackhorse SE quad, Carson Co, So. Dak.

Southwest face has small exposure

At approx. 20 feet below top of knoll is  
contact of T.L. Memb. and Braded beds  
Rich T-O fauna just below it with  
Tenacredia, Mactuz, small Ostrea, Penope.  
A-4657

Note that this one of few Bullhead  
exposures seen thus far on E side of  
creek. Relation of this knob to  
butte 500 ft. due north can't be determined.  
No cone-in-cone seen here at TL-Bullhead contact.

Loc 273, Exposures in valley wall of  
tributary of Firesteel Creek in  
sec. 34, T. 19 N., R. 23 E, Black Horse SE  
quadrangle. Two best are SE $\frac{1}{4}$ , SE $\frac{1}{4}$ ,  
NW $\frac{1}{4}$  in SW-facing bank, and in  
center N $\frac{1}{2}$ , N $\frac{1}{2}$ , SW $\frac{1}{4}$ , in NE facing  
cut.

Here 50+ feet of Tenacredia-Ophiomorpha  
fauna in TL exposed without break  
and no top or bottom contact.

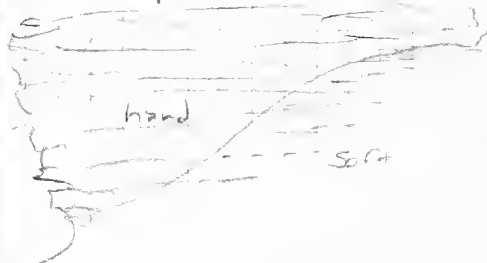
An obscure fault of unknown but  
probably small displacement seen at  
bank east side of west bend in minor  
gully in center N $\frac{1}{2}$ , NE $\frac{1}{4}$ , SW $\frac{1}{4}$ , SW $\frac{1}{4}$   
Downthrow is on the SW, trend about NWSE  
Contact of TL with about 3 or 4 ft Bullhead,  
and the cone-in-cone cores, on southwest  
against T-O faunas on NE. Note that



if this fault projected NW it could come between Loc. 272 and the "Colgate" buttes just to N and NW.

Loc 274 Area just east of Firesteel Cr and north of "short cut" to S.D. 65 from Firesteel via Bickley Ranch. Chiefly in SE cor. sec. 8 and small parts adjoining secs. 16 and 17, T. 18 N, R. 23 E. Black Horse SE quad, Cousson Co. So. Dak.

Butte on N. side of tributary in SE  $\frac{1}{4}$ , SE  $\frac{1}{4}$ , sec. 8, T. 18 N, R. 23 E. is capped by indurated T-O biofacies ss, some additional elements of fauna incl. Ostrea (small) etc. (Coll. A-4658). Cap grades down into buff sand on same biofacies. On SE end can see induration cutting across bedding thus



Downslope a few feet of "banded bed" shale picked up at several places on N side of tributary. Below it are exposures more T.O. biofacies incl. big conc. bryozoa, all the way to bottom.

460

Loc. 275. High, west-facing cut of Standing Cloud Cr.  
in SE 1/4, NW 1/4, SW 1/4, NW 1/4, sec. 8, T18 N, R. 23 E  
Black Horse SE. road, Corson Co, S. Dak.

Measuring up from creek bottom.

1) 10.3

Sand, fq., clayey, gray, some blebs  
of gray clay. In basal foot discontinuous  
layer of hard sandy gray conchs, and,  
for about 2 ft above, a few scat.  
flat conchs of same type and  
loose shells in matrix.

Basal Conchs A 4660 - P. linguiformis

Conc 1.0' above basal conchs. A 4661 <sup>Murchell</sup>

Loose fossils include Tenacledia, Fusus, 1/2 or  
3' above the basal layer.

A 4662 - parts of a second Murchell-  
Tellina concretion

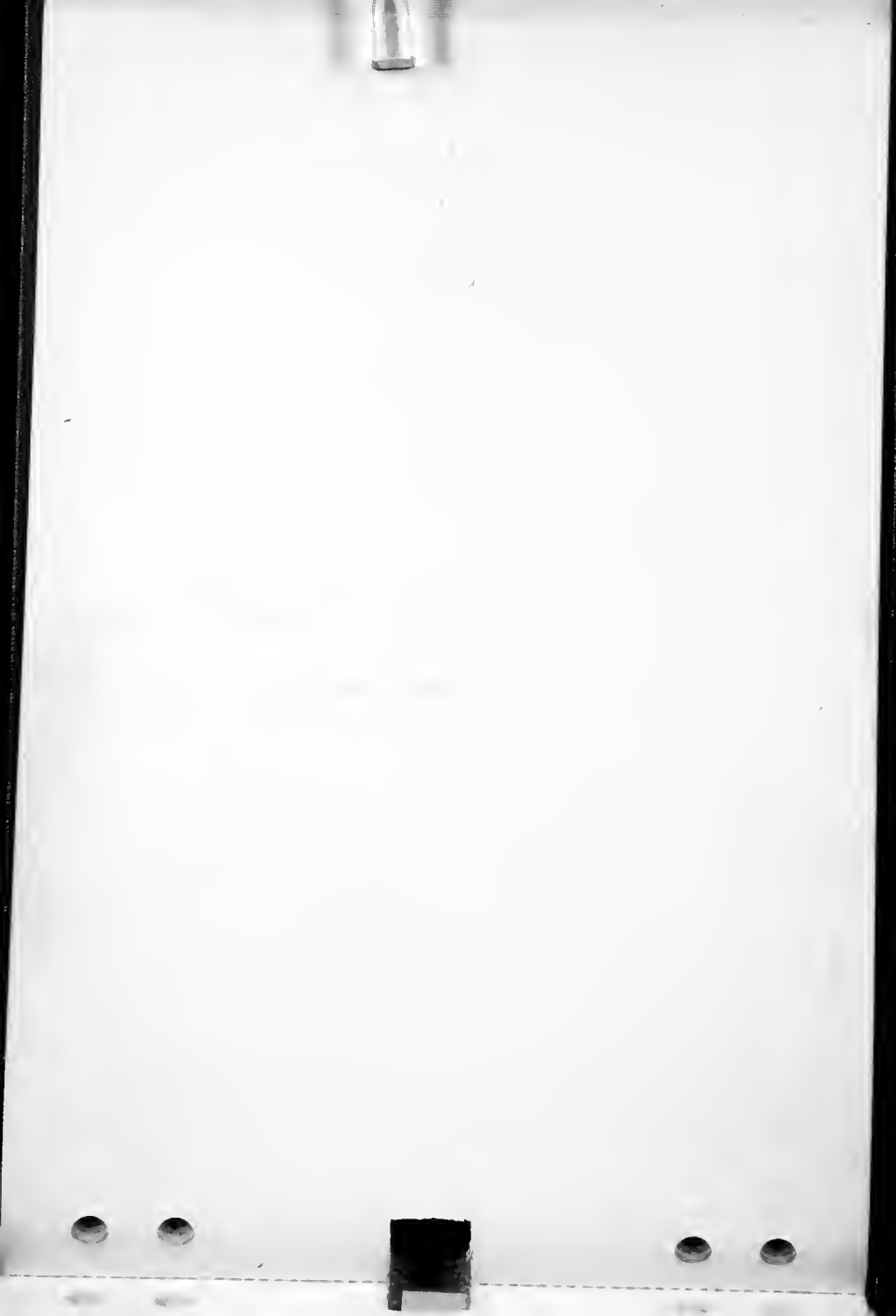
Concretions and matrix both have a  
great amount of wood - much of it  
black, locally boring clams in large  
chunks wood in conchs in lower level.

2) 13.0

Sand, fq, weathers light yellowish orange,  
few clay blebs, conchs, small in  
lower 2 to 3', chiefly P. linguiformis  
Weathers massive shows no bedding  
structure. (Single conch base A 4663)

3) 2.0

As above, some scattered Tenacledia  
valves appear. Massive, could add  
to interval #





4.) 18.5

N  
CITAN

As above, from 5 to 8 feet above base large rusty to red brn irregularly tabular concretions also with scatt. Tenuredia & few Ophiomorpha in but not abundant in lower 13 feet. In this lower part clusters of Orthis & some Tenuredia with both valves. A few scattered Panope in living position (Coll. A4664) in upper 5.5 ft massive bedding gives way to current tabular X low with much O. and current layers of T. shells.

5.) 15.5

Sandy, weathers light yellowish orange, is fine grained - similar to that in interval (4), but has abundance of Ophiomorpha in rusty part, and a very few scattered Tenuredia, many orange Fe chips and partings. Concentration of Tenuredia at top of unit 4 marks end of all but a few scattered valves, but no apparent change in lithology

6.) 1.0 ±

Shale, Dk gray to brownish green sandy with some layers greenish sand and scatt. cone-in-cone concretions. Prob. a keratinitic shale

7.) 1.1

Sand, massive greenish yellow to ochre-stained bed



- 8.) 2.7 Thinly interbedded sand & shale with plant frags on bedding planes. Shale is fissile dk gray, sand weathers yellowish green.
- 9.) 1.3 Sand as in 7, below.
- 10.) 7.0 Chert & shale, thinly interbedded or banded, minor sand.
- 11.) — Gravel to top of bluff.

- Resumed
- ① Fzone of basal gray clayey sand (=Irish Creek lithofacies) in unit 7 - could be 2 lateral equiv. of the Idonea biofacies of the Morzeau, or it may be the equiv. of Metro Telling of the thick west morzeau marine section.  
To get confirmation of latter would need to find lower fauna that could be related to Idonea. Worth a check N along Fiveston Cr.
- ② Note 3 phases TL sand.  
A Unit ② Massive marine  
B Units 3 & 4 Massive - Terebrida - Ostrea - Ophio.  
C Unit ⑤ Bedded " - Ophio.  
Note on top - some "colgate" in bottle Loc. 274!
- ③ Note Thicket interbedding of SS with browned beds - this could easily be "upper colgate" or transition laterally into it.



Loc. 111

Cut in T.L. lithology at junction of  
Rt 8 and road to Promise,

Have scattered puny concretionary sand  
masses with fossils. Appear to be,  
roughly, a lower horizon and an  
upper one about 2 to 3 feet above it.

Lower: — Protocardia - Tellina are  
A.4668 dominants, latter more a lower  
part of mass with few sect.  
linguistiformis & Mucio; Pecten  
in upper part with sand tellinae  
and small Drepanochelus. In  
our range, lowest internal  
cast clipped red schinoid.

A.4669 Upper: — Fossils scarce, Tellina,  
C. translucida, Mactra.



Miscellaneous Collections et al

- A-4659. Loc. 20, concretions in place Lower  
nicolleti AZ. - Reiskind Scholle Wazoo to
- A-4665. LOC 21, part of Lower nicolleti  
concretion in place
- A-4666. Loc. 21, most of Lower nicolleti  
concretion in place.
- A 4667 - See p. 23, oysters from Loc. 276.
- A 4668 - A4669 = Loc 111, see p. 21





loc. 276 - Iron Lightning bedlzads, oyster bed  
just beneath contact with Hell Cr.  
on west well of bedlzads <sup>about 150 yds</sup> ~~above~~ W of  
Loc. 224, ~~the~~ just s. center SW  $\frac{1}{4}$ , SW  $\frac{1}{4}$ ,  
Sec. 33, T. 14 N., R. 19 E., Redelm NE quad,  
Ziebach Co, So. Dak.

Unusually good preservation - oysters, many  
with both valves, and Anomia.  
Coll. A 4667.

~~Loc. 111 - Road cuts at turnoff on 8 to Promise Road~~

~~A 4668~~

~~A 4669~~

50.1

Loc. 277 Road cut on Ridgeview-Whitchorse rd - construction cut. Probably slumped down from nearby divide which has Cucullaea layer on top.

Two concretion layers

(2)



rusty weather outside to purple brown ls cones. loc.

(1)



Cucullaea with O-Passac. beneath - layer small punky cones like silt rind

8 feet ± to irreg layer lower cones which are punky + sandy, light gray when fresh, rarely with fossils incl. Lingulellus + Profoceras

$$\begin{array}{r} 5.9 \\ 5.2 \\ \hline 2) 11.1 \end{array}$$

$$\begin{array}{r} 54 \\ 3.9 \\ \hline 3) \end{array}$$

$$\begin{array}{r} 5.7 \\ 3.4 \\ \hline 4) \end{array}$$

$$5)$$

[161]

Locality 761. Bulldozer scrapes N+S of stock dam (about center SW $\frac{1}{4}$  SW $\frac{1}{4}$  Sec. 29, T13N, R. 27E, DeWey Co. (no USGS topog) Section from Ncut. French belongs to . See Ian's two sections of this locality

- ① 6.5 Clayey, silt and sand, with light brownish gray with some rusty stain grading up into sandy, clayey silt. massive to mottled. At top is layer cones, up to 1.5 LD, no fos., weath red to rusty brn, gray sandy jackets, blue ls interiors some calc in cracks.
- ② 11.1 Clayey silt + vfg sand mixed, is gray, weath light gray. At top layer chiefly ovoid rusty weath cones in zone of rusty stained matrix; cones rusty weath obs, dk purple blue ls with yellow calcite. [On opp (w) slope dk clayey silt + jvoss. + bleks near top]
- ③ 9.2 Chiefly clayey silt and sand as below capped by sandy gray weath silt layer that prob is jackets on layer rb weath blue gray ls covers yellow calcite, whole ledge 1.5 to 2' thick. Silt layer has conc - 14 - conc, considerable glaucanite. [on opp slope, 2nd conc layer 2.5 above base, as in top]
- ④ 9.3 Clayey silt and sand as below, brown to gray with to light gray.
- ⑤ 5.4 Gray to dk gray mottled clayey silt with heavy jarosite concret, in lower foot. This overlain by light gray calc. silt. concs with gypsum rhombs, weath pinkish gray. These silt to top of interval. Above

$$\begin{array}{r} 5.5 \\ 5.9 \\ 4. \\ \hline 15.4 \end{array}$$

lower 10 to 20 silt + fine sand lobes  
come in again so that at top it is  
dk grey clay + sandy silt mottled.

(6) 2.7

To Grass roots an calcite spotted  
gray silty sand + sandy silt., splashed  
Fe stain at top.

Just N of cut at E side of stock dam a  
lower layer concs visible. No layer  
in cut can be traced across to  
tie in, but one layer on slope  
holds approx same level as conc  
layer at top unit #1 and this is  
15.5 ft above lower layer at res.

Lower layer. blue ls some  
calcite in cracks. One Limopsis found





Loc. 73

Return visit with Mellow. River bank to NE shows part lower Irish Creek lithofacies and intervening bluffs include slumps, in which possible to go below bentonite (lowest of old sec. #12), tie into good jarosite zone then pick latter up in river face.

River cut Irish Cr. shows excellent, thin bedding also tabular masses of pyrite, but there are fossils loose in shale - found *Wocuz* + part of *Sphen.*

Also, old sec. #3 cut seems better cleaned than previously + basal banded beds do come in above the jarosite; they are bentonitic.

Scouting S. side Grand between Loc. 26 and Plum Cr.

① Spur about center  $N\frac{1}{2}$ , Sec 32, T. 20 N, R. 25 E  
On N side few scrappy bare spots show thin bedded lower T.L. Monks overlain by massive chiefly brown and which has 3 layers large or jacketed ledgy conc zones.

② Locality 279 - South facing bluff along small flat and eastward trending spur, west of Grand River on Petersons Ranch in  $N\frac{1}{2}$ , NE  $\frac{1}{4}$  Sec. 19, 2nd Sdg. SE  $\frac{1}{4}$ , Sec. 18, T. 20 N, R. 25 E, Miscel NE quarter, Carson County, So. Dak.

A section from Elk Butte into Timber Lake could probably be worked out here by carrying key beds slump to slump. On the spur the lower T.C.M. is almost completely



exposed, bare slopes from Elk Butte to  
Limpsis. Gessil. cones, patches from here to  
Poleward. Occurs AZ which caps knob.

LNAZ - Thick with much Juvosine,  
numerous jacketed cones but  
practically unass. Only a few  
micaceous in Boshan size cones  
and in uppermost part of zone  
a rare small *Drepanochitlys* cones  
(A 4672).

LGAZ - At least very faintly  
locally cone zone. Gouville  
unconformable and show cone's details.  
Size range includes some cones  
with big size. Locally Limpsis  
clusters with in same layer,  
same cone. - Not collected

POAZ - Richly Gessil. cones here.  
Occurs relative short distance  
above LGAZ.

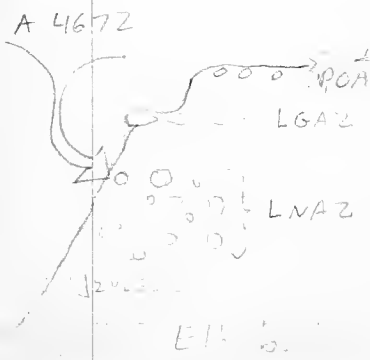
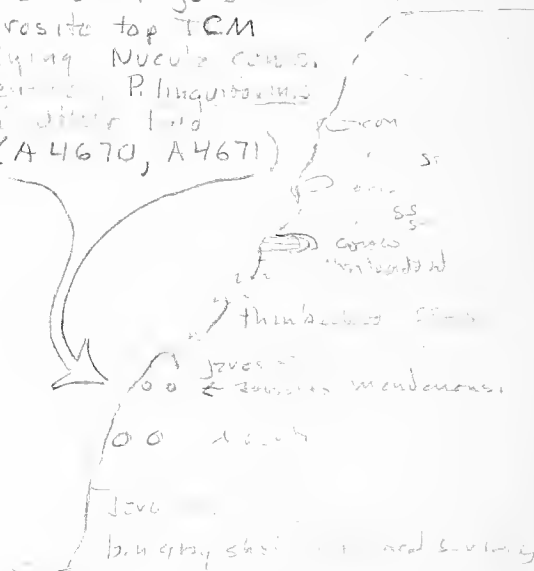
This is the jaw of spur - a part of  
it next block toward a few not investigated.  
Passing to spur of flat, outcrop of layers  
can't be carried. Exposure show  
shell + juvosine zone in lower part -  
i.e. loc. above the POAZ zone. Then  
above this short distance part stem.  
RB cone layer in which one micaceous  
tray seen, then above it same  
distance a juvosine located  
and above this is a few feet  
of thin-bedded SS & shale exposed.  
No reason to believe that TLM  
thin-bedded plane well represented

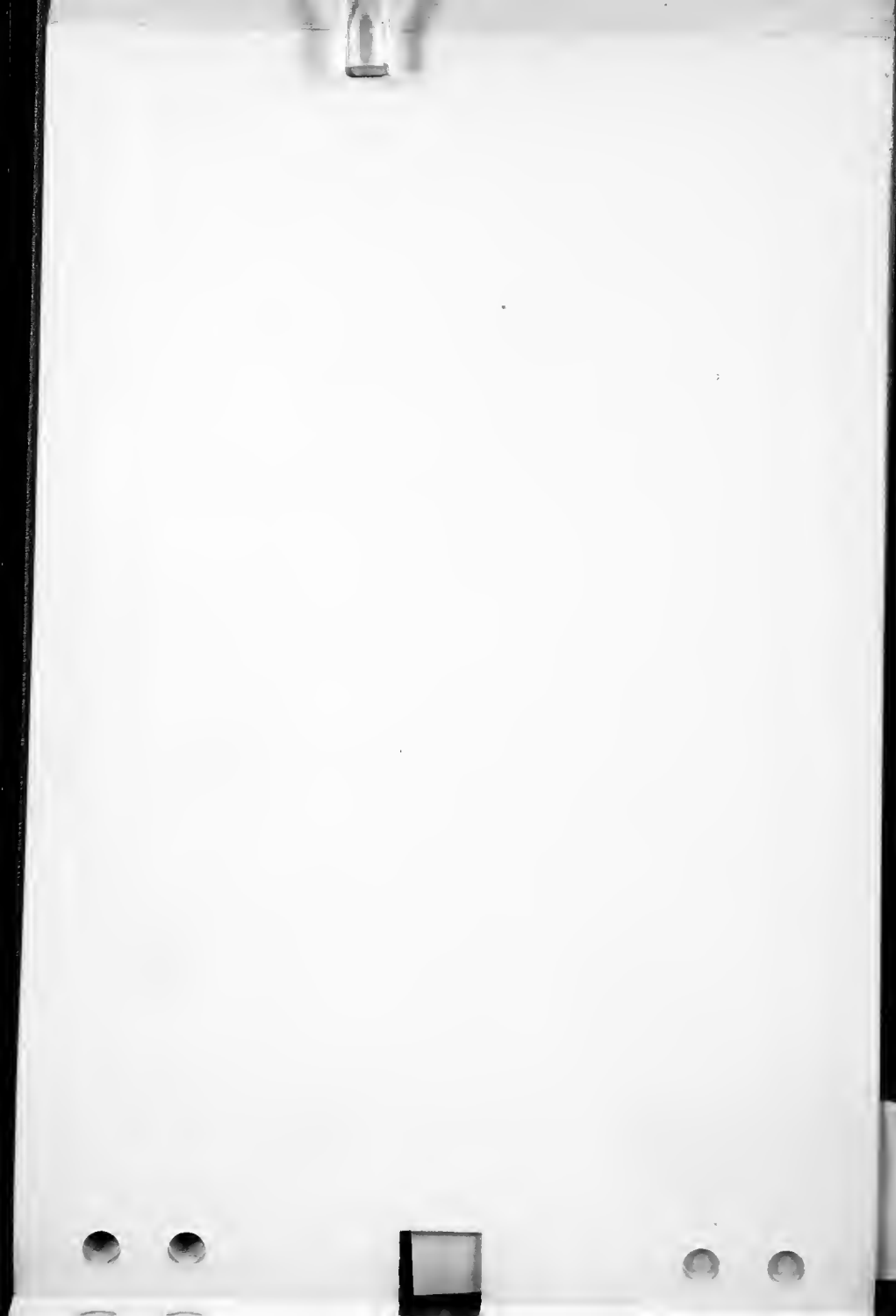


here. Possibly could piece section  
up the TL outcrop off sedge of  
flat but it is pretty poor.

No telling how thick thin bedded  
phase is - would guess not much over  
25 ft.

3 cores found at zone AM biofacies  
between jarosite top TCM  
and under lying Nucula conc.  
conc. was conc. P. linguiformis  
Portions of other two  
collected (A 4670, A 4671)

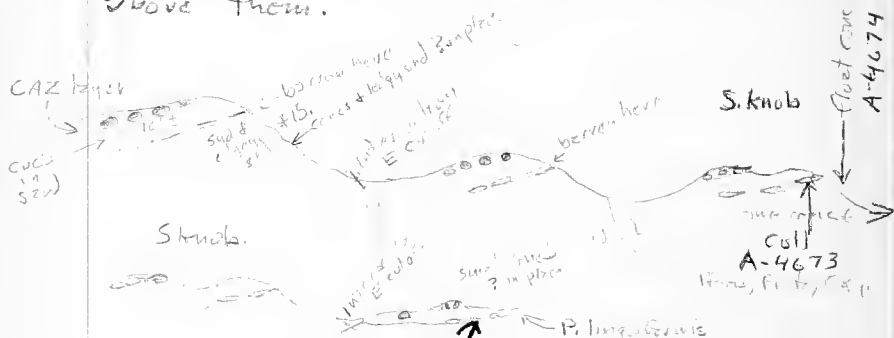




Locality 33 - Ch. 4 road bed + sides of dirt sec. view  
 due south at Eagle Butte 2.5-3+ miles, chiefly in  
 that part in S<sub>1/2</sub> sec

A succession of slumps of fossiliferous part of  
 Timber Lake. Unfortunately none of blocks  
 lend selves to a trustworthy section.  
 But the south knob + north knob (see  
 diagrams) have best actual exposures.

South of S. knob also in road, fossiliferous layer  
 in in E bed rd around small knob 70yds  
 S of into section. Knob itself has Big  
 Cucullaea cones on it, possibly in place  
 relative to cones in road cut and 10.5-12 ft  
 above them.



**A 4676 part of Pteris conc from place**

Only well defined part of section is  
 that with large amount of red with big cones with  
 Big Cuc. and ledge and 10'± below which  
 contains soft, shaly with hard blue to greenish blue  
 sandy cones. You found one in place with Pt. Proto-  
 Oxycene assoc + many small ammonites, this  
 is coll. A-4673

A4674 was in float well down slope and looks  
 like an "abyssinus" type assoc. with big Sphero  
 layer - tho no such layer established at  
 this locality. A4675-15 float from a  
 variety of places in sec

55  
36  
-9.0

.6



## Locality 28

Running section on conc levels + other key beds up road.

Base of conc. layer, brownish gray to purple is gray or gray with brittle brown ls. concs, no matrix or weathers, no jackets apparent. with lite rusty brown up to 1 foot down

- ① 9.0 weathered slope in road gutters. At top 1.5 - 2.0 zone tabular concs up to 2' long down, with rusty brown conc hard brittle barren ls lite gray<sup>15</sup> silty, not sandy, no ves, jackets.
- ② 0.6 wash covered
- ③ 5.1 shaly blue gray, silty clay with jarosite blebs and layers ~~at~~ and calcite xls in lower 4" becoming sandy at top. Fairly pure 1" jarosite at base. 2 other layers about 3.0 + 3.3
- ④ 6.0 wash covered, clayey silt sand and at base. At about 4.0 spot sample shows fine gr quartz somewhat shaly and a few scat, small ls concs. At top is conc layers. Brownish gray with some sandy ls concs barren, rusty with jackets
- ⑤ 5.6 To top widespread, rounded by ls concs occupies  $\pm$  upper 1.5. Just below it a few scat white matrix, patina ls concs in rusty patches, these small, finely sandy ls. Slope wash covered. Upper concs, weather lite

47

59

59

37

---

4

3

---

22.2

14  
12

4.8

5.0

4.9

4.0

4.3

---

23.0

gray to rusty, and grayish being similar to  
with. light to rusty. up to 4' in lower  
diam. tabular masses. Rare fossils - A-4677  
mollusks? small ammonoids - see list.  
conc layer holds up spur below the 2 knobs.

Carrying on conc layer top unit, (5) to W side  
spur just NW of 2 knobs. Measuring  
up over area slope to spur-capping layer  
of concs.

6 23.0 covered, at top is layer large  
(up to 3' l.d. tabular) rusty brown weather  
fossiliferous concs, (large cucullates  
and highly varied fauna, *Pectoceras*  
*25500*, *Prolo.* most common.)  
About to 3.0 beautiful layer scattered  
small concs many very foss.

Coll's from ~~these two layers~~ just  
below top unit 6 — A-4678, single conc.



Recco SoF SoDok8 between SoDok 63 + 65 - on "Colgate"  
problem.

Loc. 280 Colgate in road bed of county road about  
middle N line sec 1, T16N, R 23 E, Dewey Co.  
3 miles S and 1.5 miles W of Rt8-63 intersection

Cuts → ... Mzoz? ;  
well defined epherocypion here but not common  
other burrows, also interference ripple marks.  
Szuped.

Readings on joint sets - may have tilted or  
no surf. joints short & curved

A N50W, N53W  
N26W

B N-S N7°E

C N85W

Seems to be zui (long) lens cutting  
obliquely across road. Roughly N75W  
edges are well defined.

Major ripple set ridges strike N36W  
covered by tube fillings & surf.

Loc. 281 Road cut through base of butte NE of  
Lot 5 Farm, and associated buttes, just E creek  
along county rd in NW cor sec 15 and SW cor sec 10, T16N,  
R. 23 E. (Joint Readings on butte S of road)

South end butte North end of sec. 10

A. N. 72 W

N 54° E

B N. 08 E

N 80 W

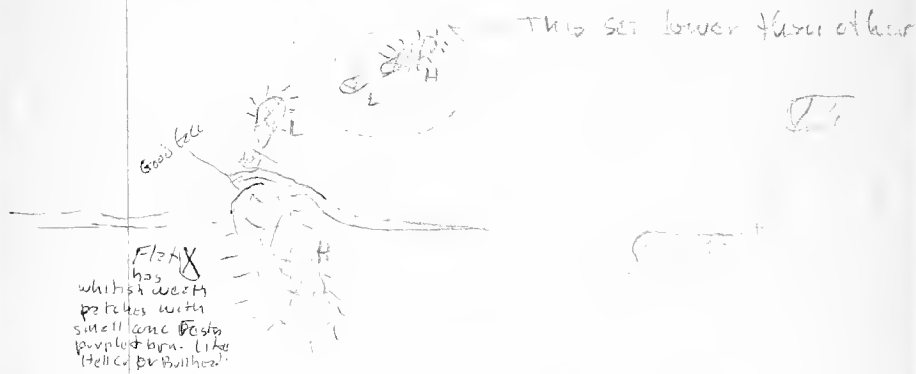
C N 78 E

N 54 W



Trincher Lane is. Silty. sand with hard  
 "buttercup" ledges. Locally along rd  
 transition from sand to ss can be  
 seen. Here distribution of hard caps  
 is at <sup>1st</sup> 2 levels in the sand, and in  
 diff. directions.

This set lower than other



(2)

20±

at least 4' thick loc., much Ophiomorpha  
 boring burrows, some are bedding, some  
 no trace, one pocket Pteris-Ostrea  
 assoc. (see sample)

(1)



Sand, gray with Jurassic fossils  
 laminae to impregn. sh. scattered  
 X-trace to mass, Ophiomorpha  
 locally.

at road level lower interval  
 layer begins to occur in.

Lower layer contains fewer Ophiomorpha,  
 less burrowing, but one patch Ostrea-Pteris  
 assoc. found. No Favosites seen (see sample)





Loc. 282 Cut on abandoned county road on N side Meadow Creek, along section line between sections 4 + 5, T 15 N, R 23 E, at top of rise just N of Creek.

Slightly clayey sand (which may be mixed with soil here) with concretions of calcite AZ, richly fossiliferous. No exposure big enough for a section. Fossils in large reddish weather cones and also in brown-colored cones of blue ls with peculiar irregular + crusty surface, which appears to come fast or 2 below red ones (compare Loc. 89.)

A 4679 - from single conc. A 4680 - from many concs

Loc 283 - A T.L. fauna; fragments weather out of highly clayey sand & sandy clay, below level of nearby butte by 2' to 4'. Suspect it is Belmont at Blk. lithologica. Frag. of Tancredia, Gastropoda, + Protocardia.

Small exposures along county road along line between sec. 36 T 16 N, R 22 E and sec 1, T 15 N, R 22 E, in vicinity of stock dam on Stradinger farm.

Loc 284 - stream cut just W of rd + N of Red earth creek tributary in SE cor. sec 21, T 16 N, R 22 E Dewey Co.

But here have sand in road cut. At 10-25' (some) of it to where section in rd cut gets down, sandy and 42s big hard platy concs. This is presumably "Belmont" but butte top along rd to S on same level. Altho cre is butte top higher. Along



rd to S both bottles have evidence of Bullhead  
in them.

Summary.

Loc. 281 is good + needs photo. Entire sand here could  
be calcite in strict sense (with some banded beds below?)  
but it 'looks' more like TC in its yellow weathering + OS  
stem + cone chip layers



Locality 225 - An area showing later in relation  
 of indurated ledges in upper & lower  
 Hills. Lies on Bickle Ranch E of Firesteel Cr.  
 in E $\frac{1}{2}$  SW $\frac{1}{4}$ ; W $\frac{1}{2}$  2nd NL $\frac{1}{4}$  SE $\frac{1}{4}$ ; SW $\frac{1}{4}$  NE $\frac{1}{4}$ ;  
 Sec. 17, T18N, R. 23E.

- ① Joint sets [N. 29 E  $\pm$ ]  
 [N. 75 W  $\pm$ ] in NW facing wooded  
 ledge. Ledge massive indurated ss up to 12'  
 in single faces + float blocks. Textured -  
 ophiomorphic with later prograde joint. A  
 flat body elongate NW-SE with local ind. on SW  
 underlain by T.L. ss. Is ind. T.L. thus NE
- ② Nearly vertical face fresh in - TL even 30' high  
 It has primary joint - true joint. Dis. in  
 O. transverse - much indurated. many  
 prof. joints - about 10 to 20' below  
 surface. No zone at the  
 linguiformis zone in. Textured  
 in ss above - in ind. ss. in local  
 20'
- ③ Joint wette. - Has Ophiomorphic cap, prob  
 overlies But. ind  
 N 15° E  $\pm$   
 N 70° W  $\pm$
- ④ Section of Bickel member E of fault. (Note  
 strike of sheared ss or "dike" along fault  
 is N 8° W - don't know what it means but  
 strike of phylites.)

36.2 22.0 bb-dk arsh + thin ss lb. + silt.  
 5.0 sandy zone, beds to 10' ss + lam. in 3' lb.  
 9.2 bb, dk arsh + silt + lb. minor ss upper part  
 ← local calc-microcr. zone.  
 T.L. ss, massive, ophiomorphic

4.2  
3.  
5.1

5.2  
1.7

of  
Locality 286 (NE 73 14 corner cut)

Start out at top + measuring down.

① 2.8

Thinly interbedded <sup>unit 1</sup> silty ss. with some x lam. ss. Rather highly porous, pronounced bands of sand. Laminar and some irregular less regular bands + patches or pods elsewhere. (About 2.0 above top is old river terrace deposit.)

② 14.4

Dark gray finely silty ss. with thin clay s. laminae, becomes more sandy in upper 2.0 with thin ss interbeds. Some small pebbles, scatt. in beds, mainly in upper part. Lower 5 feet the ss is + more thinly interbedded. About 2.5 from base unit 1 is porous, large (locally) tabular brown ls. rocks with silt jackets and small or coarse appear to be scatt. lat in zone from 2.5 to 5.0 below the top of this unit. And 1 lb. in this zone shows working

③ 6.9

Dark gray silty fine sh. to lb with gray silty ss up to 3/4 inch or so some very fine lam. + x lam. At top is zone passing to fine gravel zone to gray siltstone brown ls. comes.

4.1

2.1

—

5.1

1.1

4.8

2.3

—

7.0

1.5

17.5

6.9

14.4

2.8

.6

10.2



4. 17.0

Thinly interbedded shale and vlg siltstone above  
At top is layer hard sandstone cones, with  
green silty shale interbedded & somewhat with  
to brown. Low mass. loc. of pebbles  
in grey siltstone & some blue-grey.  
Laterally thinning sandstone bed within  
about 1.5, usually "pseudomorph" top layer  
Interval has mottled clay and small  
claystone siltstone throughout (see sample) See  
in some places. Few zirconiferous  
(v. rare. One partial splenic stage) quartz  
zone red brown with sandy ironstone  
interbedded & small. About 1/2" from base  
and in approx 12 ft from base.

5. 1.5

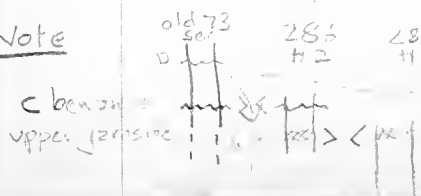
As above with persistent one layer in  
upper 0.5 to 1 - flat oval to tabular  
massive grey to ss & lam + c-l-c  
to fine. Cones + sediment has  
small nodules.

T. 42.6

Section 2 - Shaly red jointed ...

1.3+ bentonite  
6.5 Dk grey + mdy silty shale, with  
to grey clays, some fine siltstone, vlg  
Some low mass + thin lenses in  
upper 1.0 + and base 1.0.

Note



Key for picking  
sections 270-310  
Thunder Bolt crossing



Loc. 287, Rd cut, E side of Irish Creek Valley  
Rt E cutoff, south of Navarro Bridge in  
NW cor. NE  $\frac{1}{4}$ , SE  $\frac{1}{4}$  NE  $\frac{1}{4}$  sec 3 T14N, R 20E,  
Thunder Butte Quad., Ziebach Co., So. Dak.

Cut exposes most of CAZ in Irish Creek lithofacies  
near top is the D bentonite.

A-4683 - Two concretions with Protocardia  
masses from same horizon - about  
2.5± feet under the D bentonite  
and 10 feet apart along face.  
Note size consistency in each.

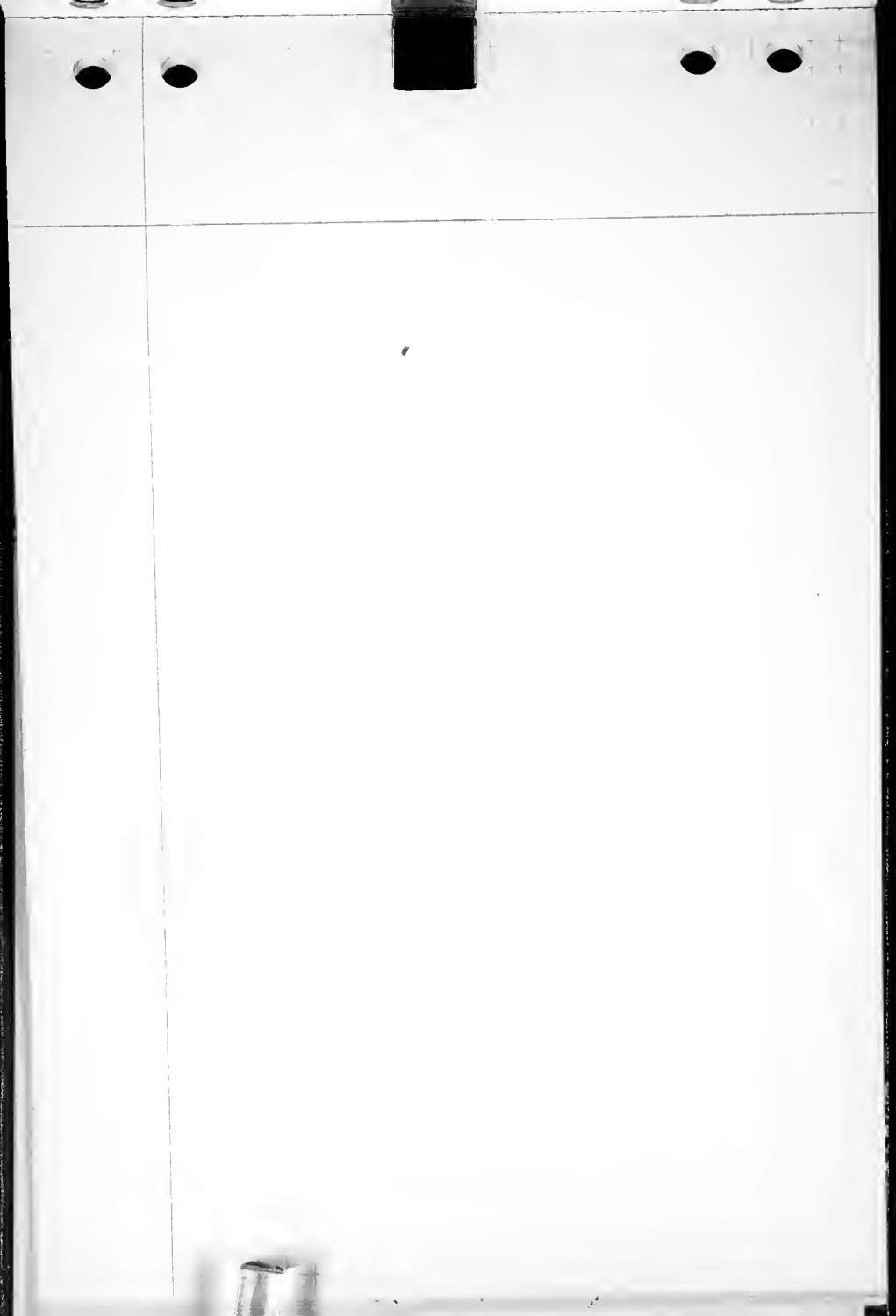
A-4684 - Fossils from several layers in CAZ.  
It looks as though there is a  
basal barren layer, a layer  
dominated by Circularia - the  
typical Irish Creek CAZ fauna,  
and other scattered concs.  
However relationships here  
are obscured because outcrop  
plucked of the more fossiliferous  
concs. - there may be no  
consistent order of distribution.  
On of few places easily accessible  
where relation of D bentonite  
can be shown.

★













# Shipping lists

Box #1 - ~~Loc. 265, A 4650~~ Loc. 20, single  
Lower nicolleti conc.

Box #2 ✓  
Loc 275, A 4660, 4661, 4662, 4663,  
4664;  
Loc. 267, A 4652 (2 bags)

Box #3 Loc. 21, - A 4665 conc + 2 bags (A 4666  
frag in one bag), part of A 4666  
concretion.

Box #4 Loc. 21 - Most of <sup>Lower</sup> D. nicolleti - A 4666,  
(See Box #3 for remainder).  
Miscell. from Loc. 74 - 3 bags  
Loc. 224 - 2 bags  
Dog bottle reef - 1 bag.

Box #5 ✓  
Loc. 265 - A-4650, A-4651, from  
section meas. by J.R. + crew.

Loc. 269 - Lith sample  
Loc. 270 - A 4655  
" A 4654 + One piece "edgite"  
" A 4653 and 2 chunks of  
" A 4656 the "type" Pduroxylen  
wazzei  
Loc. 272 A 4657  
Loc. 274 A 4658

Box #6 ✓  
Loc 54A - part of high LDmic conc - 1 chunk  
1 bag  
Loc. 265 - Float, lower sphero zone  
Loc. 276 - A 4667 - one bag  
Loc 111 - A 4668 - 2 bags, one tin box  
A 4669 - 1 bag



Box #6 (cont.) Some miscellaneous  
individually labelled

Box #7 Locality 279, A4670, A4671, A4672  
(Petersson's ranch - Trail City)  
✓ Loc. 280 - lith and Loc. 281 - lith  
Loc. 282, A4679, A4680  
Loc. 28, A4677, A4678

Box #8 Montez collection  
✓ 1 bag odd lots  
✓ Loc. 17, A4681 - Upper D. nic (part)

Box #9 Loc. 17, A4681 - Upper D. nic (part)  
Loc 17, A4682 - POAZ cones (1 bag)

Box #10 Loc 33, A-4673  
A-4674 A4675 A4676

Box #11 Loc. 17, A4682, A4681 (part)  
(The big fragment is in A4682)  
Loc 286, section Lot  
Some Tenebrionid fauna loc. on Firesteel Cr.

Box #12 Loc. 17, A4682  
Loc. 287 A4683  
Loc. 287 A4684





List With

S AM - Rollo's Coaster + US 192 construction

M RT 73 + Dupire 2022 N

T Lutz Farm picture, Redean M. 0200

W Eizen 270

T Buckles

F

S

S Peck

M Love



|               |                                        |       |
|---------------|----------------------------------------|-------|
| Saturday 15 - | Tickets (NH - D.C. round trip)         | 59.80 |
|               | Beqgqze                                | .75   |
|               | Bus.                                   | .25   |
|               | Tuzen (Oubrt - 30 <sup>th</sup> rtrip) | .88   |
|               | Czuds                                  | .44   |
|               | Mzq p p p p                            | .35   |
|               | Dinner                                 | 2.50  |
|               | Candy for Vin + Houshuds               | .74   |
|               | Taxi (Oubrt - Home)                    | 1.00  |

Sunday 16

|        |            |       |
|--------|------------|-------|
| Monday | Rm Sol Sam | 10.00 |
|        | Bus only   | .70   |
|        | Lunch      | 1.45  |
|        | Czb        | 1.00  |

|         |             |      |
|---------|-------------|------|
| Tuesday | Lunch       | 2.50 |
|         | Pipeclacans | .20  |
|         | Czb         | 1.50 |

Jule Wade  
Mrs Ross



72

Color  
traced

