

LEVEL BOOK

#101596

CME-75
DRILL
Log #1



BEN MEADOWS COMPANY

www.benmeadows.com • 1-800-241-6401

18266

When

the
Outdoors

is Your

Office™

4-02/8-05

Table of Contents

Page 1 W-18266

Page 15 W-18247

Page 24 W-18431

Page 35 W-unknown

Page 60 W-18622

Page 69 W-18631

Florida Geological Survey
903 West Tennessee Street
Gunter Building
Tallahassee, Florida 32304-7716
Mail Station 720

E. Harrington

528-2847

Name	ID #	Nextel Phone
Walt Schmidt	15054	528-2843
Tom Scott	15053	528-2842
Harley Means	15048	528-2837
Ron Hoenstine	15051	528-2840
Jim Ladner	15049	528-2838
Jon Arthur	15050	528-2839
Cara Gowan	15047	528-2836
Wanda Bissonnette	15055	528-2844
Susan Trombley	15052	528-2841
Ryan Means	15063	528-2852
Tina Roberts	15065	528-2854
Ted Kiper	15064	528-2853
Wade Stringer	15066	528-2855
Ken Campbell	15060	528-2849
Craig Berninger	15056	528-2845
Lee Booth	15061	528-2850
Frank Rush	15059	528-2848
Rick Green	15062	528-2851

FGS 1	15057	528-2846
FGS 2	15058	528-2847
Ed Gambrell	15075	(850) 393-6312
Jay 2	15076	(850) 393-6309

Bob Caughey 160*17033*3 (239) 229-4291

Paul Attwood 160*17033*4 (239) 229-4293

NWFWMD codes ad 2139
new 9132

FL Caverns secure area combo 9111

1 bag bentonite grout ~ 8' HSA HOLE
~ 70' HQ HOLE
~ 31' 4" CASING OD

* $\frac{1}{4}$ to $\frac{1}{2}$ qt. 'Penetrol' per 100 gal.

* 1 to 2 lbs per 100 gal. (Soda Ash)
(2.7 lbs per qt., so 2 qts.)



FLORIDA PARK SERVICE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

contact for CME storage
in secure compound

BILL MAPHIS
PARK MANAGER
FLORIDA CAVERNS STATE PARK

3345 CAVERNS ROAD
MARIANNA, FL 32446

TELEPHONE:
(850) 482-1228
FAX: (850) 482-9114

528-2846

[illegible]

ORLANDO (888) 327-2844

LARGO (800) 752-9416

ENVIRONMENTAL MFG- (800X850) 624-0005

CHRISTENSEN BOYLES (800) 453-8418

(800) 826-9063 FAX

CME (800) 325-8827

CLARENCE MORGAN BWSF (850) 957-6140

CAROLE MADDUX SFWMD (561) 686-8800

SWFWMD (800) 226-1066

JODY LEE STRWMD (904) 329-4812

USGS - MIAMI (305) 526-2895

~~DAVE ADAMS DEP - III - 8550~~

GARY MADDOX (AMBIENT) 921-9425

MIKE DICKSON (SITE INV) 921-9950

524-2053 cell

KEN CAMPBELL

545-8125 cell

668-4437 home

RICK GREEN

562-3780 home

443-9222 cell

ERIC HARRINGTON

668-5663 home

559-0902 cell

DAVE PAUL

563-4540

ED MARKS

576-3460

LEE BOOTH

510-6715 truck

CRAIG BERNINGER

510-6715 truck

WILL EVANS

656-6330 home

443-0414 cell

933-1906 field

FRANK FGS WAREHOUSE 487-2609

Microtel in Marianna (850)-526-5005
(888) 771-7171

LEE BOOTH (229) 872-8129

George Fisher NWFWD (850) 539-5999

Will (850)
443-0414 CL

Mr. Middlebrook's Supply

(850) 547-3658

Home

(850) 547-2330

W 18266

MIDDLEBROOK QUARRY #1

S 83RD T 3N R 16W

LAT 30° 40' 51.3"

LONG 85° 51' 17.4"

ELEV ~130

TD 183

Co. Washington

QUAD Hinsans Crossroads

— 4/1/02 DP & LB to Banbury —
w/ CME for 'shakedown'
meet w/ Mr. Middlebrook @
store, leave Rig overnight
in compound.

— 4/2/02 DP & LB w/ CME to —
Middlebrooks Quarry, KC
joins us later Sunday.
7:30am - 8pm

0-3.5' poor recovery - fill them
w. clayey sand.

35-8' poor recovery. or clayey sand
sandy zones washed out

8-13' or. clayey sand & sandy clay
~80% recovery - slow mayno,
feed hard.

13-18' or. clayey sand grading to orange
cream & maroon clays.

18-23' v. lt. olive gn/gy sandy clay
~3' recovered, prob. @ bottom.

23-28' ~35' recovered - lt. gn; or. sdy clay

28-33' poor recovery. clay AS ABOVE

33-38' clay lt. gn, gray br, or.
some sandy zones ~2' rec.

38-43' lt. gray/bl. gray sandy clay
last 4" darker, w/organic lenses
& peat fragments, bottom is gray/black

43-48' clay & sand v. poor rec.

48'-53' tan; lt. yellow br blocky clay
then clayey sand, last 1 ft
v. fine sand.

53'-58' wht, tan; yellow v. fine sand

58'-63' NO RECOVERY - plugged off bit
; burned/melted it - splr would
not retrieve - pulled string - repl.
bit w/ Devil's Nightmare.

63'-68' v. fine unconsol. sd

68'-73' AS ABOVE ~50% rec.

6:30pm to farm.

4/3/02 DP: LB

Run 75' 4" casing in
Trip drill rod in, ret. to
TLH.

@
Start
of day

75' 4" casing

70' NA

7.5' barrel

~4' stickup

top of rock
max depth 83'

4

4/10/02 DA & FR leave warehouse
@ 7:45am

- Water level flush w/ top of casing
~2' ALS

73'-78' lt. or. fine sand, some mica
minor clay. very tough feed @
end of run ~50% recovery

78'-83' put rock shoe on b/c ext. shoe
wouldn't feed. NO RECOVERY
Difficult feeding, lost circulation
pressure 150 psi +

83' - bust put ext. shoe back on, pushed
~6" feed stopped. pull out sampler
LIMESTONE! Go back in w/ rock
shoe; NO FEED. - sampler STUCK.
• Trip out drill rod.
• Attempted to remove sampler from
core barrel in pipe holder, dropped
sampler into hole! pull out core barrel,
fished out sampler & broken off reamer
and bit.

list to TAKE: Soda ash
10' 4" Casing
brake fluid

What is DIAMETER OF
FIRE EXTINGUISHERS IN
CME's H₂O Truck.

5

- pack up and leave site ~ 7:45pm
- bring back damaged pieces/parts.
- Arrive in TLH ~ 10:10pm

— 4/16/02 KC, DP —

- meet @ warehouse @ 7:30am
- pick up permit @ NFWMD
- leave TLH ~ 11am
- to Middlebrooks, run in 15' 4" casing, cored 5'

to motel 9pm

— 4/17/02 KC, DP —

7:30am start

- drove to Wausau; auger trailer not ready, so back to Middlebrooks.
- repaired leaky elbow fitting on moyno
- cored to 118'
- casing blown hole - BANG more

leave Middlebrooks; meet Frank w/
True-spin H&A's in Chipley -
proceed to Ambient site.

ran out of diesel fuel in dnally.
D'oh! drove up road to get
more.

to make 8pm.

HOSE LIST FOR CME ; H2O TRUCK

HAVE ON CME → 1" mud mixer hose
dedicate → 3" mud suction hose
for diaphragm pump
dedicate → 1.5" mayno suction
2" desander discharge

WANT 2" pressure to desander
2" suction for pump to run
desander. (artificial
(if using diaphragm only
need 1 of above)

30-50' 2" transfer hose, H₂O to tub

top H₂O - 50'
long; shat 2"

to desand - 30' desander discharge
20' 10' - 15' desander supply

⇒ 2" x 50', 30', & 20'

7

5/22/02 JP ; DP

- meet @ warehouse @ 8am
- arrive Hinsa's Roads - 11am
- fetch water - to Middlebrook's Pit.
- pull NA, remove bit + reamer - egg bit.
- dig out 4" casing top + bring up to
working height - run in 20' casing.
- re-assemble core barrel w/ new bit + reamer,
trip in and carefully drill to bottom.
- leave site ~ 6pm to fetch H₂O
- Drop trailer @ site 6:45pm

to motel Tivoli Inn @ 7:15pm

11.25

5/23/02 JP + DP

leave motel @ 7:45am

Waste half day fetching fuel -
couldn't start deck engine.
conferred w/ Lee Booth - no
crossovers.

NEED CROSSOVER
BETWEEN FUEL
TANKS ON
CME

8

Tear into fuel delivery system -
go bang plugs, wires, cap + abr
carb cleaner.

take keys in rig - break in
and retrieve keys + tools.

end day @ 7pm

X buy 13/16" deep
spark plug socket.

arrive motel - 7:30pm

11.25

5/24 JP + DP

11.5

leave motel @ 8am arrive whse
7:30p

buy 13/16 spark plug socket
tune up rig -

118' - 123'

123' - 128'

128' - 133'

133' - 138'

138' - 143'

143' - 145.5' ran out of water halfway they h
 run. drilled like hard LS.
 encoring for day.

arrive warehouse @ 7:30pm

5/29

JP : DP

meet @ warehouse @ 7am
 to Middlebrook + fetch H₂O

~143.5' - 148' hard to drill, took lots
 of H₂O rubble fossiliferous
 H. as. LS to hard recrystallized
 L)

148' - ~~150.5'~~ 150.5' — 2½' run - improved recovery.
rubby fossiliferous lt. or. ls.
w/ hard recrystallized zones

150.5' - 153' hard yellow-brown ls to calcilutite
100% recovery

153' - 158' two runs, one ~4', then ~1'
calcilutite matrix white ls to
hard rx ls; lost sample after
wards; drilled easier right @ end
of run.

158' - 163' 2 2.5' runs. yellowish brown
vf - microx dolostone

163' - 165.5' good recovery! hard dolostone
moldic; lt. brownish

165.5' - 168' ~35% recovery - 5th gear not
good! stay with 4th.

AS ABOVE, ~~then~~

- water run

- pack up + leave site @ 7pm
to motel 7:45pm

168' - 173' bp as above, then fossiliferous
rubby wackestone

173' - 178' AS ABOVE, then dolosilt
lost sample @ bottom of run.

178' - 183' shell hash bed, then dolosilt
to end of run.

11
5/30/02 DP, JP to Middlebrook's

pack up and load drill rod +
quick get to bring back to
warehouse.

- leave site @ 4:08pm
- arrive warehouse ~ 7:30pm

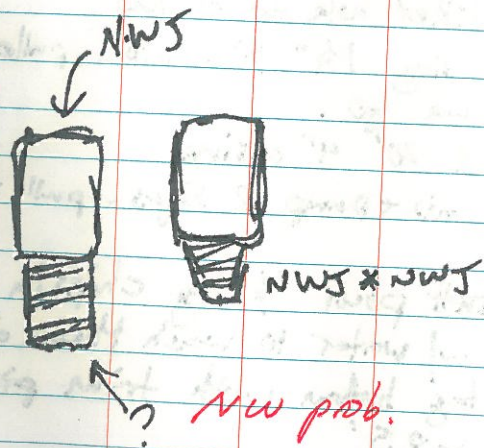
6/3/02 DP, JP, EM

meet @ warehouse @ 7am
to Middlebrook's Supply
buy PVC ends + glue
to site & fetch h2o.

- mix 3 bags + pump down hole
filled hole to ~ 100'
using 1 1/2" trim pipe, pulled as
we go.

- pull 20' 4" casing
mix + pump 2 bags - pull trim

- ~~put~~ pour 1/2 bag chips in hole
w/ water to wash them down.
tag bottom with trim pipe,
~ 85'



12

• pump 2 more bags grout, lost some
drum pipe in hole. oops.

pulled all but 30' casing

Pack up and leave - 5:30pm -
bad weather rolling in.

to warehouse 7:30pm

6/7/02 JP + DP

David	warehouse	8am
John	"	8:30am

to Hinson's Xroads, folschwer.
⇒ "hole to 83', above H₂O table.

mix + pump 1 bag grout
pull rest of casing

dropped 2 subs down hole

F-150's
547-4612
in Brinkley

13
mix & pump 4 more bags - ~ 5' hole
left. fill with chips, load up
and leave site @ 3:45 pm.

Drop of key w/ Middlebrooks,
get on road @ ~ 5pm

arrive warehouse & unpack - 7:30pm

TO DO ON RIG:

- ~~DOT tape / reflectors~~ ~~need 3 feet~~
- ~~Remount shims~~
- ~~Order; run cables~~ ~~60' $\frac{3}{8}$ "~~
~~66' $\frac{1}{2}$ "~~
- ~~use existing wire line~~
- ~~control labels~~
- ~~automatic feed valve~~
- ~~reassemble + bleed brake + clutch MC's~~
~~for mechanical hoist~~
- ~~install; plumb diaphragm pump~~ ~~new hoses~~
- ~~install Kelly hose to Mayno~~
- ~~replace Kelly hose on mast to swivel~~
- ~~move fuel pump switch to console~~
- ~~fuel cross over hose between tanks~~
- ~~mount new ignition switch - get 2.~~
- ~~hp hole for chain guard~~
- ~~lighter guard on compressor~~
- ~~tach for deck engine.~~
- ~~adjust overload clutch.~~
- ~~have mast; jack cylinders checked out?~~
- ~~TIGHTEN U-BRACKETS~~
- ~~New Battery~~
- ~~flow meter for H₂O~~

LOWE'S

14

- ~~Denatured alcohol~~
- ~~tie-down straps for H₂O tank~~
~~~ 1500 + lbs.~~
- ~~(eye bolts)  $\frac{1}{2}$ " x long~~
- ~~3/16 bolts, nuts, lock washers (1 doz)~~
- ~~$\frac{3}{16}$  ~~5/16~~ bolts, nuts for vices (8)~~
- ~~pop rivet gun + rivets~~
- ~~grease nipples~~
- ~~starting fluid~~
- ~~11/4" VISE (without shop vice)~~
- ~~5/16" carriage bolts x  $\frac{3}{4}$ "~~
- ~~trailer light bulbs~~
- ~~windshield wash~~
- ~~break fluid~~
- ~~lock file~~
- ~~starting fluid~~



Mr. Brooks

(850) 573-0635 mine

(850) 209-3587 cell

(850) 526-2809 home

Walmart list:

- bug spray
- hose cutoff
- prc glue + primer
- garbage bags
- big black marker

- have Eric bring hole plug / trimmer

W# 18358 18427

15

BROOKS - Hical pit

S32DAA TSN R10W

LAT 30° 47' 44.7"

LONG 85° 15' 34.4"

ELEV 194'

ID 203'

CO. Jackson

QUAD Cotandale East

4/14/03 D. PAUL L. BOOTH B. FAIN  
meet @ warehouse @ 7:30am  
meet Mr Brooks @ pit ~ 10:30am  
→ showed us site.

0-2' red-brown sandy clay  
push sample

2'-4' no sample; pushed it out of  
the way

4'-6' red/or/br sandy clay  
push sample

6'-8' used rock shov, only representative  
sample



8'-13' orange clayey sand  
~150 psi

13'-18' orange clayey sand  
~4' recovery

18'-23' orange sand, clay (end of 10')  
~3' recovery

23'-28' orange/red sandy clayey sand  
~3' recovery

28'-33' orange/red clayey sand

can't get back to bottom, run  
in 35' casing (33' + 2' stickup)

33'-38' orange/red clayey sand  
~4' recovery

\* add penetrol

38'-43' firm mottled red + orange  
clayey sand 100% rec.!



end 10' on "3"

43'-48' as above, near 100% recovery  
purple mottled zones

48'-53' as above purple/red-brown  
sandy clay / clayey sand

- pack up for the day @ 6:45pm  
arrive @ Microtel @ 7:30pm

4-15-03 DP/LB/BF & EH @ Dawn

- start 8am
- walmart for supplies  
to site ~8:45am

- wash to bottom of hole, grease  
sliders / kelly / drive bars etc.  
desand + condition mud

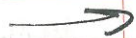
53'-58' red/orange + white/gray mottled  
sandy clay, then Δ to olive  
gray clay. excellent recovery

• begin traveling to bottom of hole  
for next run, kelly hose elbow  
(45° 300psi) snapped pin off of  
swivel - reengineer it and off



end 10' on 3"

60' casing  
2' stickup



18

58'-63' we go - begin drilling, no  
feed - pull splr, change to  
rock shoe - slow feed,  
125-200 psi, set feed psi + core.  
100% recovery  
olive - tan, to gray ~~str~~ LIMY

BYRAM?

63'-68' olive gray silty clay to lt. gray  
silty clay hard dry - drilled @  
~150 H<sub>2</sub>O psi 1500 rot. ~100 + feed  
100% recovery  
68'-73' olive gray to tan dolosilt/mud  
very sticky. LS mud

• trip NQ out to run casing to  
60' (25 more)

• trip NQ in & clean hole  
mix up mud after pumping  
off old native clay - ridden mud

73'-74' (2) 2.5' runs  
good LS Marianna

78'-83' whole 5' run 100% rec.  
as above



83'-84'

starts off ~1' of top. rich  
granular calcilitic matrix LS  
to calcilitic

88'-93'

granular lprich LS to  
calcilitic

93'-98'

granular lprich LS and soft  
calcilitic

98'-103'

as above.

103'-108'

packstone to soft calcilitic  
interbedded

108'-113'

as above, still Marianna

113'-118'

~60% recovery  
formation beginning to take H<sub>2</sub>O  
very hard extl LS, then softer  
calcilitic granular LS

118'-123'

full sampler - 100% recovery  
soft granular calcilitic - 1 very  
hard zone @ bottom.18622  
Hatch Creek Rd18622 18431  
N. Ft. Rock  
MATHIS #118478  
Andrews



tomorrow

- Check CME oil, coolant
  - check fuel on rig
  - mix up good mud
- 
- main hoist drive seals leak
  - feed cylinder top seals leaky
  - auger rack cylinder seal/fitting
  - replace upper seal on right & drive
  - most cylinders leaky (light)
  - right jack check valve esp.

20.

stop work for today, pack up  
and leave site @ ~ 8:05pm  
arrive motel @ 8:20pm

---

4-16-03 DP+LB; BF had  
personal emergency  
RG/WE/EH met @ site  
leave motel @ 7:30am

- oil full
- coolant full
- half tank fuel

static H<sub>2</sub>O 106' 3" BLS

~ 1' slough in hole

- make first run 2.5' to catch  
slough; not compact inner barrel

123'-128' - two runs so I wouldn't over-  
bulge splr. 100% secondary  
packstone - grainstone (almost)  
poorly consolidated SS

128'-133' as above

133'-136' packstone w/ calcilutite cement



break 4 lunch →

~ 75 H<sub>2</sub>O psi system  
between 1000 & 1500 psi  
feather feedrate to match  
~ 100 psi pulldown

21.

138'-143' as above

143'-148' as above, with hard consolidated  
interval ~ half way through run.  
148'-153' packstone drilled real well slow &  
steady

153'-158' packstone, chalky as above

158'-163' as above, last 3" very stubborn -  
abort, will catch it on next  
run.

163'-168' (2) 2.5' runs 1st ~~run~~ 4' is  
hard rxl LS & last 1' is  
unconsolidated packstone

168'-173' ERIC HARRINGTON DID IT.  
could not retrieve splr, tried rot/flush  
etc. tripped out to ID; solve  
problem - splr was not latched  
so I shortened splr by 1 turn.

173'-178' ~ 85% recovery from hash packstone  
crs sand-size grains

178'-183' mixed up mud, drilled in  
very difficult, hydraulics not  
near 100% recovery.



- pack up & secure site ~ 6:45 pm
- arrive @ motel @ 7:15 pm

4-17-03 LB + DP, KC met @ site

check out motel @ 8 am

- clean hole to bottom, then go in to sample

193'-198' drilled slow + smooth  
 fram - hash packstone  
 sort of calcarenite, unconsol.

188'-193' K.C. drilled  
 fram - hash packstone

193'-198' K.C.  
 as above

198'-203' K.C. as above

ID

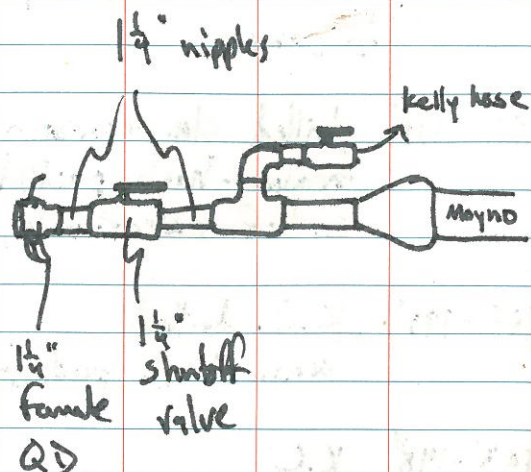
grant thuyh trim pipe  
 2 bags for 140' rd hole  
 1.5 for 8 1/4" casing hole  
 used open bag hole plug

18622  
 HATHAT CK. Rd

18622 18431  
 N. Ft. Rock  
 18434  
 HATHAT #1

18418  
 Andrews





1" x 1 1/4"  
bushing + nipple 1"

23.

pack up: leave site ~ 5:45pm  
drive to FL Caverns St. Park  
arrive WTS @ 7:30pm  
.....

contact Bill Naphis @  
FL Caverns re. Rig storage  
see card taped to front of truck.

### FOR NEXT TRIP OUT:

- ✓ 1 1/4" 300psi valve to close 3"/6" nipple  
to 1 1/4" female quick-connect
- ✓ 1 1/4" grant/mud pressure hose
- ✓ build 1" x 1 1/4" double-male adapter  
to run red mud hose off 1 1/4"  
female QD.
- 300 psi!
- ✓ 2" nipple to make 2" valve to female QD
- ✓ garden hose
- 4" casing hoist bail
- \* TAKE DESANDER STAND



N. FL Dolomite Pit contact:

Fred Webb owner

(850) 769-2481 office

(850) 762-4315 pit

Managers Donnie & Ronnie

W# 18362 18431

24.

N. FLORIDA DOLOMITE PIT

T 3N R 9W S 19 DAD

LAT ~~30° 11' 44.6"~~ 30° 38' 31.6"

LONG ~~85° 15' 35.0"~~ 85° 10' 9.6"

ELEV 65'

TD 220'

CO. JACKSON

QUAD OAKDALE

4-29-03

D. PAUL, L. BROTH, A. WOOD  
meet @ WHS @ 7:30am

meet Donnie (brown rat)

@ 9:15, choose site

to FL caverns to fetch CME

choose site, set up, build  
adapters/plumbing etc.  
break for lunch.

drop book in H<sub>2</sub>O

0-2.5' clayey/organic rich sand to  
fine clayey sand



2.5-5.0 orange br. clayey sand / sandy clay

5.0 - 10.0 ~ 35% recovery last - 2.5'  
fed freely 1/4 tan to ar. br.  
clayey sand.

10' - 15' loose sludgy clayey sand;  
feed STOPPED 3" from  
end of run; TOP OF DOLOSTONE.

run in  
15' - 20' sandy dolostone packstone  
excellent recovery

- run in 18' + 2' casing / stickup
- pack up + leave by ~ 5:30pm  
(gate closes @ 5pm central)
- at motel @ 6pm

4-30-03

D. PAUL / L. BOOTH / A. WOOD  
leave motel @ 7:30am

- Water level @ 4.5' BLS



• work on pump that Alie dumped  
off trailer.....

• trip back in w/ NA, wash to bottom,  
then begin coring.

20'-25' NS -

25'-30' NS -

Change shoe; try ext. shoe.

30'-32.5' / 32.5' - 35'

• drilled as 2 runs to attempt  
to catch sample.

• ext shoe failed

• tried rock shoe w/ basket f/ext.  
shoe 30'-32.5'

• drilled w/o basket 32.5' - 35'  
excellent recovery.

35' - 40' ~60% recovery

tan brown, rubbly dolostone

lost 3" fell freely, lost  
circulation

40' - 45'

good fossil-moldic brown dolostone  
to rubbly dolosilt.



- 45'-50' tan/brown dolostone to blue marl (clean break 1/2 way through core)
- 50'-55' blue marl to ~52' then brown dolosilt
- 55'-60' ~60% recovery in brown dolosilt
- 60'-65' shell mddic dolostone, rubble @ end of run 80% recovery probably lost sample @ end.
- 65'-70' good indurated dolostone to a rubble/soft dolsilt, unconsol.
- 70'-75' shell mddic dolostone to soft unconsol. dolsilt (stone; last 4" HAED rexd dolostone.
- 75'-80' pump stalled @ end of run, plugged off, sys psi to 2000. 50psi showing on H<sub>2</sub>O psi gauge. retrieved sample, very tight.
- sample started in good hard rexd dolostone, then brown friable dolostone, then rexd dolostone. last 1' or so very soft expanding gray clay - this is what plugged bit off. & stalled pump.

★

18622  
HATCHER CK. Rd18434  
MATHIS #118418  
ANDREWS



80'-85' Hard rexd dolostone  
 85'-90' as above, then friable dolosilt  
 90'-95' ~ 25% recovery  
 gummy dolosilt, more consol. @  
 bottom.

95'-100' Hard rexd dolostone 1B w/  
 softer partly consol dolosilt/day,  
 than Hard rexd dolostone.  
 CAVITY @ ~ 99.75'

3:00 pm Jim C. arrives

4:00 pm L. Booth; A. Wood depart

100'-105' HARD REXLD LS Dolomitic?  
 riddled with cavities difficult  
 drilling ~ 15% recovery

105'-107.5' after 2.5' string fed freely.  
 stopped to recover sampler  
 HARD REXLD LS/DOLOSTONE

107.5'-110' more cavities 11. br.  
 dolosilt, then HARD REXLD  
 dolostone



110'-115' DOLOMITE SWISS CHEESE!  
HARD REULD WITH DOLWLT  
CAVITY FILL.

115'-120' AS ABOVE - LUCKY TO GET  
ANYTHING. 1 cavity was  
at least 2' tall.

- stop coring; pack up  
lightning detector rings 20-40
- leave site ~5:40pm.
- arrive motel @ ~6pm

---

- Walmart to get pump air filter  
5/1/03 D. DANE, J. CICHON

- leave motel @ 7:20am, to Walmart
- arrive @ s.k @ 8:00am
- fetch H<sub>2</sub>O, replace filter on pump.
- check water level  
~ 10' BLS

- WASH to bottom of hole; little bit  
of rubble @ bottom

120'-125' hard reuld swiss-cheese LS/Dol-  
1~2.5' void, multiple small  
voids.



125'-130' Swiss cheese massively rexd  
DOL/LS last 3' would not  
feed. stop + retrieve sample.  
Shoe was plugged with rexd  
DOL/LS as above, also limey  
cuttings ???

went back in, cleaned up; down  
hole, then sampled last bit of  
eck. sampler came back w/  
extra "carings"

130'-135' unable to get new 10' rod in  
hole; take it off; commence  
to clean hole; retrieve inner  
barrel and save carings  
• go fetch H<sub>2</sub>O / call KC.  
• finally get going using 3' + 2'  
new stem instead of 5'.

Hard rexd DOL/LS

135'-140' Hard rexd DOL/LS best recovery  
all day!

140'-145' same Hard rexd debris @ top  
of sample, then friable clayey  
dolosilt, then back to hard  
rexd rock w/ cavities.  
fetch H<sub>2</sub>O

18622  
HATCHER CK. RD

18434  
MATHIS #1

18478  
ANDREWS



145'-150' clayey zones w/ glauconite /B  
w/ hard rock dol/LS layers, then  
glauconitic LS @ bottom!!

150'-155' Sand size Dol or QTZ?  
uncanol., then grey clay. ←  
(cavite fill?) w/ glauconite

- sat in truck b/c "Severe Thunderstorm" 4:30 - 5;
- when skyscan calmed down, we retrieved sample, tightened up site; left. VERY BLACK Sky to south + skyscan canceled off again.
- leave site @ ~5:30pm
- arrive motel ~5:45pm

---

5-2-03 D. PAUL / S. CICHAN

check out; leave motel ~7:30am

Water level @ ~5.5' BLS

155'-160' Drilled very soft, then through cavity, then firmer @ bottom of run. only caught firmer rock @ bottom



\* Leave core for Rick

31.

150-160' (contd) rock has 'salt and pepper' appearance, black and green (glauconite?) flecks in LS

160'-165' could not get splr latched  
cleaned hole, back in w/splr.  
bit plugged!  
cleaned hole, mixed EZ mud  
to help stabilize hole.

Success! we have good hard  
LS w/ green chert? glauconite  
~50% recovery, because we still  
have cavities in upper portion of  
run. Ocala!

165-170' GOOD Ocala! (Happy Dance)  
found Asteroocyclina @ top of  
run. unconsol. pectestone  
pebbles, forams, OH JOY!

170'-175' NS! ~100 psi H<sub>2</sub>O, good  
steady feed! may be dropped  
out of sampler? ~~try 2.5 min.~~  
run in w/ core catcher to catch  
something - got sand size ooze.  
cuttings?



\* left rig with

7 bags Quick Grant  
3 bags Hole Plug.

32.

175'-180' 1 Rock. Go back w/ ext.  
shoe to try to pick up  
anything from hole - got  
or-brann muck; 1 piece  
Ocala LS.

180'-185' top 1.5' of sample is or-br.  
muck, then 2.5' good Ocala.  
is muck cuttings? cavity fill?

\* used a different shoe; Ken  
said if others are "rot/crimped"  
core won't feed into inner barrel.  
maybe this helped!

185'-190' 100% recovery  
good Ocala fossiliferous foramin  
wash packstone

190'-195' AS ABOVE, muckier towards  
bottom.

195'-200' ~100% recovery  
fossiliferous packstone unconsol.

200'-205' AS ABOVE, unconsol/consol.

205'-210' AS ABOVE, mixture unconsol/consol.

210'-215' horrible recovery; washed away  
all clayey zones left "potter chip"  
indurated LS.

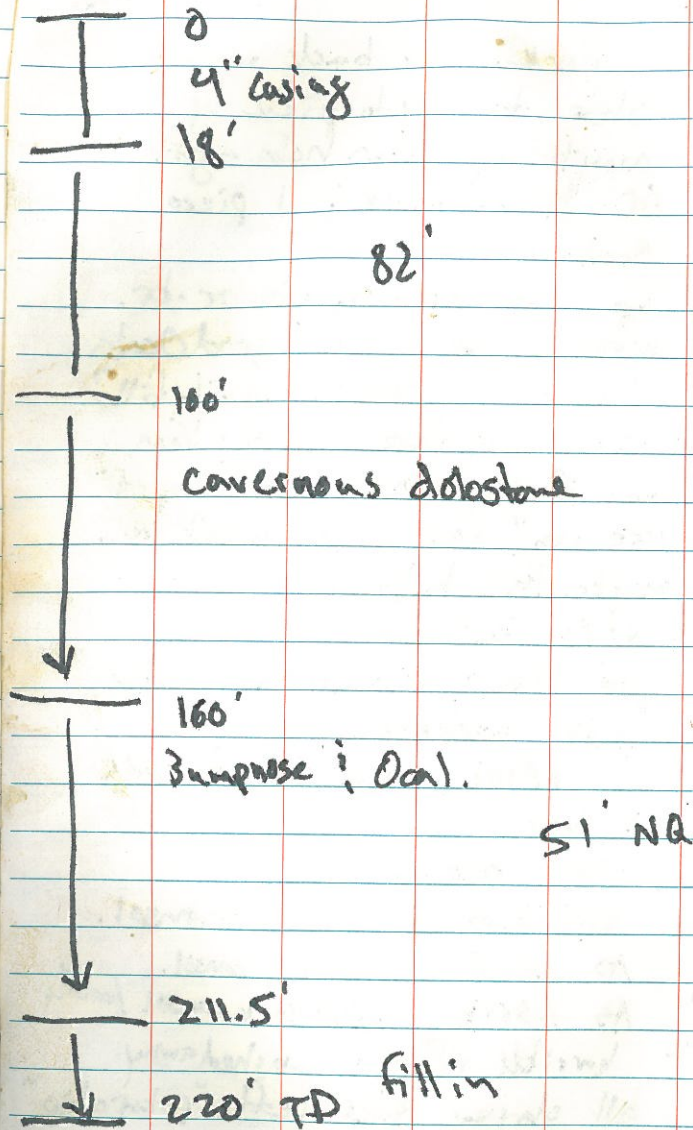
215'-220' 80% recovery, pushed less, higher  
H2O pri "potter chip" packstone.

18622  
HATCHER CK. RD

18934  
MATHIS #1

18418  
ANDREWS





33.

Secure site, leave core  
for Rick, leave @ 5:55pm  
• unload core @ survey, drop Jim C.  
@ his car @ 7:15pm

• to warehouse, fuel up F 550,  
unload truck, leave warehouse  
@ 8pm

5-14-03

A. BAKER, D. PAUL meet @ warehouse  
@ 7am  
to site by 8:20am

• build air hose; air up trailer  
tires, fetch H<sub>2</sub>O.

• water level @ 7.5' BLS  
• Hole to 211.5'

• mix one bag; pump; pull  
70' trim pipe; snagged on  
rock and broke it; removed  
110' total. ops.

• drop 1/2 bag chips into hole.

18622  
HATCHER CK. RD

18434  
MATHIS #1

18478  
ANDREWS



used 4 Hole Plug  
5 QGrout

34.

- measure hole - open to 158'
- drop  $\frac{1}{2}$  bag more chips
- hole open to 156'
- drop 1 bag chips
- hole open to 81'4"  
bridged!
- mix 1 bag grout, PLUGGED mayno  
+ suction hose, spent  $1\frac{1}{2}$  hrs  
cleaning out pump + jelling out suction  
hose
- broke valve tower - need  $1\frac{1}{4}$ " scoop  
nipple.
- mixed 3 more bags to fill hole  
into casing; pull casing. grout  
to ~10'
- fill last 10' w/ hole plug.
- pack up + hose to b + rig.
- leave site @ 5:50 pm
- leave rig @ FL Caverns
- arrive w/H 8:30 pm



W# 18434

35.

MATHIS #1

T 3N R 10W S 19 REC

LAT 30° 38.465' 27.9"

LONG 95° 16.753' 45.2"

ELEV 151'

ID 303'

CO. JACKSON

QUAD KYNESVILLE

6-2-03

• D. PAUL, L. BOOTH ~~warehouse~~  
warehouse @ 7am, pick up  
Lee @ P&S

• to FL Caverns to pick up rig  
then to Mathis site; fetch H<sub>2</sub>O.

• rebuild H<sub>2</sub>O tower on CME

• sit in truck til 5:30pm Thunderstorm

0-2.5' dark or. brown organic rich  
clayey sand

2.5-7.5' orange crs. clayey sand  
gravel



- losing mud out bottom of tub neck  
seal - run in 10' 4" casing  
to get returns
- wash back to bottom w/ NQ

pack up & leave site  
to motel @ 7:40pm

6-3-02 leave motel - 6am

- wash to bottom hole

7.5-12.5 no penetration with ext. shoe  
switch to rock shoe

- sit in truck for thunderstorm  
until ~8:30am  
gray/or/red sandy clay

12.5-17.5' ~50% rearm lost softer spl  
@ end of run.  
red or. sandy clay

17.5-20' 2 2.5' runs ~100% rearm

or/red sandy clay to pale  
20-22.5' } yellow/green crs sand + clay



end 10' NA  
on X2.5'

37

22.5'-24.5' crs greenish / orange  
clayey sand

2 2.5' runs ~ 100% recovery

27.5'-~~32.5'~~ 2 2.5' runs or / gray sandy clay  
32.5' only got 4" on second run;  
the last ~2' was crs  
sand w/ or. clay matrix

32.5'-37.5' fed too easy, 3" recovered.

red / gray / or. clayey crs. sand  
37.5'-42.5' 2 2.5' runs

switched back to EXT SHOE

crs. red / gray / or. clayey sand

42.5'-45' as above

SKYSCAN 3-8m

45'-47.5' red / gray / or. clayey crs sand

47.5'-52.5' AS ABOVE inc. gravel

52.5'-57.5' red / gray / yellow / br. crs.

clayey sand, then sandy clay

57.5'-62.5' ~~to 100% recovery~~ ~80% recovery

pushed hard entire 5',

don't know where spl was lost

red / or. crs clayey sand,

then fine gray sandy clay /  
silty clay

18622  
Hatcher Ck. Rd

18478  
St. Andrew



62.5'-67.5' fine - med gray/or sandy  
clay / clayey sand  
~40% recovery.

67.5'-72.5' fine - med gray clayey sand  
excellent recovery

72.5'-77.5' ~~recovery~~ recovery ~100%  
red/gray fine clayey sand

to yellow/or fine clayey sand  
77.5'-82.5' caught ~8" of fine clayey  
sand, then nothing pressure  
clean sand that the rock shoe  
couldn't catch.

• SWITCH OVER TO EXT STAGE.

82.5'-87.5' only caught sample in shoe -  
gummy buff clay with LS  
rubble.

STOP CORING 4:20pm

RUN CASING IN 30', fetch #20

PACK UP - LEAVE SITE ~6pm

to motel ~ 6:25pm

6-4-02 DP/LB

leave motel @ 6:30am



90' 4" casing  
88' casing in hole  
2' stickup

39.

run in 40' more casing for a  
total of 90', less 2' stickup

Trip in NO

87.5' - 92.5' may have washed sample  
while turning in 4" casing;  
only ~ 10" sample - red/gray  
AMBF Clay.

92.5' - 97.5' drilled as 2 2.5' runs 40% rec.  
tan/red clay to gray/br. clay,  
then "salt and pepper" clay or  
micrite? dendrites

97.5' - 102.5' NS - drilled like clay

102.5' - 107.5' gray plastic clay - very hard  
to sample. ~ 20% recovery.

107.5' - 112.5' gray/br clay for ~ 1.5', then  
head fell freely. clean white  
sand @ bottom of spl, washed  
away.

112.5' - 117.5' ~~hard fract~~ soft gray & br.  
clay.

117.5' - 122.5' caught clay @ beginning, then  
head free - fell when I disengaged  
chuck.

18622  
Hinter Ck. Rd

18478  
St. Andrews



TOP OF ROCK @ 124.5'

40.

122.5'-127.5' fed freely until ~ 124.5'  
then feed STOPPED. PULSED SPL,  
then finished run.

- cavity fill sludge, then very lite  
creme-brown dolosilt.

127.5'-132.5' creme dolosilt to HARD ROCK  
Dolosstone

132.5'-137.5' Dolostone to yellow or packstone  
lugs etc. then hard red moldic  
LS.

137.5'-142.5' fossil moldic hard rexbld LS  
lots of coral

pack up & leave site - 7:45pm  
to motel 5:20pm

6-5-03 DP. L13 check out: leave  
motel 6:30am

Water level at 79.1' BLS

142.5'-147.5' 40% recovery. wackestone/pack  
white micrite supported

147.5'-152.5' hard pack/wackestone to  
soft wackestone brams inail  
spines

18622  
HATCHER CK. RD

18478  
ST. ANDREW



~~bring~~ - mud dr. (in new shed)  
40' 4" casing only 35'  
50' NQ  
Trim pipe (have 100')  
grout (have 5 bgs)  
hole plug (have 2 bgs)  
small blocks  
box materials (have 11)  
EZ MUD

294- 5417

HAVE 90' 4" casing in hole;

41.

152.5' - 157.5' 100% ream. start off in  
white / v. pale or. packstone / grainstone  
w/ nummulites / small bryozoans  
then softer micritic packstone / wack-  
stone

157.5' - 162.5' start in good hard fossiliferous  
packstone - bryozoa / coral / numms /  
small bryozoans, then softer pack / wack-  
stone

~~162.5'~~

- cannot get drill string back to bottom  
of hole; hole is not stable - need  
casing to sta. top of dolostone.
- trip out NQ, load core into truck  
Pack up rig.

Secure site; depart ~ 1pm  
to warehouse ~ 2:30pm

69

Ran 5' 4" casing - High Forge  
Ran 105' 3" casing - hole open

18622  
HATCHER CR. RD

18476  
ST. ANDREW



42.

6-10-03

KC runs rig  
LB / CK helpers

ran in casing to 130', cased to 208'

18622  
HITLER CK. Rd

18418  
ST. ANDREW



- Dave to annex @ 7 am  
load trailer & drive  
to Mathis site.

6-11-03.

DP/LB/CK

43.

208'-213' brown hard reld dolostone  
moldic fossiliferous

213'-218' Δ from above to wackestone  
white fossiliferous unconsol. LS  
then back into moldic br. dolostone

218'-223' br. moldic dolostone to olive gray  
sulfur smelling H<sub>2</sub>O<sub>2</sub> + friable  
dolostone.

223'-228' olive gray/br. moldic dolostone  
w/ GLAUCONITE, then Δ to  
white /yellow/gr. wackestone LS  
@ last ~1' of run

228'-233' lt. yell/gr. fossiliferous wackestone  
to olive gr. dolostone ~1' cavity  
@ 231'-232' (glauconitic)

233'-238' glauconitic olive gray massive dolostone  
then 2" green clay friable, then  
muddy dolostone brecciated, then  
glauconitic fossiliferous yell/gr. wacke-  
stone

238'-243' glauconitic fossiliferous yell/gr. wacke-  
stone to olive gray glauconitic  
moldic dolostone.

243'-248' muddy moldic olive/gr. dolostone  
to "salt n pepper" fossiliferous  
wackestone.

18622  
Hinter CK. Rd

18478  
St. Andrews



248'-253' Salt & pepper buff fossiliferous  
wackestone to very (glauconitic  
or heavier) rich.

253'-258' v. glauconitic packstone/wackestone  
Bimpressive? then harder glauconitic  
pack/wackestone, burrowed, then  
softer muddier wackestone.

258'-263' Hard pale or. packstone, LOADED  
w/ quarter sized Leps & molluscs.

263'-268' lt. or w/ pink tinges fossiliferous  
(Leps & molluscs) packstone

268'-273' as above, then white to lt.  
yel/gr. packstone, amussini;   
fram hash.

273'-278' lt. or. fram + fossil hash packstone

278'-283' as above. ASTEROCYCLINA ~ 280'

283'-288' pelletal. calcarenite / grainstone  
Leps & nms

288'-293' lt. or. calcarenite as above

end coring for day; pack up;  
leave site ~ 6:30pm  
arrive motel @ 7pm



6-12-03 LB/DP/CK  
leave motel ~ 6:30am

293'-298' ~60% recovery  
lt. or. pelletal / foram  
packstone / grainstone  
washed muddier zones?

298'-303' 100% recovery  
lt. or. pelletal / skeletal hash  
packstone / grainstone

TD

95' 4" 40' 3" casing  
135' 3" 1068' NA  
303' TD

- 1 bag graft
- ~~2~~ bags 3"
- 3 bags 4"

- trip mt NQ; load trailer w/  
NWJ, other w/ NQ
- go to motel - see Δ clothes,  
then find PVC for sale.
- back to site DP/CK w/ PVC  
Lunch.
- mix; pump 2 bags graft, pull  
140' Trim.

- made ready to mix more graft,  
main hydraulic return hose  
for air comp. block blew.
- tear hose off, pack up &  
leave site ~ 6pm



## SHOPPING LIST

- paper towels
- teflon paste
- grease for gun
- plastic tates for organizing toolbox
- \* QD 2" ball to 1 1/4 reducer  
for grouting w/ bladder pump.

- \* reweld <sup>valve</sup> tower
- \* replace 1 1/2" nipple on mayno suction
- \* steam clean rig.

4/6.

- To Marianna Auto Parts  
to purchase repl. Hyd. hose  
\$151

- arrive motel 7:15pm

6-13-03 FRIDAY the 13<sup>th</sup>

DP LCK check out of motel @ 6:15am

- repl. hyd. hose
- clean up spilled fluid
- Mix & pump 2 bags grout, trip out  
trim pipe, trip out 3" casing.
- 11:20am sit in truck for severe  
thunderstorm.
- call office ~ 12:30, ask Karen to  
look up weather - it's only going  
to get worse;
- pack up when lightning meter  
calms down, head home.  
arrive warehouse ~ 2:30pm



W-18478

ST Andrews Track Cone  
Jackson Co

SEC 17 T 2N R 11W  
SW, SE, NW

LAT  $30^{\circ}34.446$

LONG  $85^{\circ}21.737$

Elev 17'

Elev 210'

TD 250'

Quad Alford SE

26.16  
44.22

48

DLB-FR-ED

6-24 Set up static @ 2:00 PM

0-7 sand

7-12 sand

12-17 sand

17-22 sand very soft @ 20'

22-24 sand

24-27 - Blue sandy clay

27-51 Sand

51-52 sandy clay

6-25

52 set 3" casing

DLB-FR-ED

6-26

wh. 15' BLC

DLB-FR-ED

Advance casing to 111 FT @ 12"  
Packed up rig.

7-7-03

KC, Clark Kenji - 9:30 AM start  
load truck/trailer - fax contract  
to Todd - Craig to deliver  
logs etc to MARK Hooker

to drill site - 4 long pulls  
w winch to get truck and  
empty trailer into site

run drill rod in - 107'

drill in to 117 ~ 3' blue

18622  
HITCHER Ck. Rd

18478  
ST. Andrews  
TRACT



~~break~~  
gatorade  
water  
5/16" chain  
5/16" quick links

116.25  
3.5  
112.75

49

clay sd.

thunderstorm / heavy rain  
held us up ~ 2 hrs  
end day 6:45 pm

7-8-03 7am start  
walmart then to site

mix mud, clean out hole

depth 116.25 - 3.5 = 112.75  
112.75 - 115.75 blue clay <sup>sd</sup> then  
hard zone - last 6" - broke  
thru with ext. shoe then refusal  
this is at btm - plugged shoe  
115.75 - back in with rock shoe

- no penetration
- pull drill rods - ck bit/  
reaming shell - no problems  
ck rock spl - ck  
back in try again - need  
diamond bit - brie  
gets to site w. derrick  
- send her back to get  
diamond bit.

clint, Kenji make water mix  
fit diamond bit + reaming shell,  
adj inner bbl.



115.75 - 117.25 - poor recovery  
 chert jammed core bit -

hard + soft zones

117.25 - 119.75 - dk gy ls

119.75 - 122.25' No recovery -

1 chip of chert from above - washed

END DAY 700 PM

7-9-03 7:15 start. fuel  
 for rig, ice, then to site

Rig mileage 40487, deck 1708 hrs

122.25 - 124.75 - ~1.25' marred  
 gray ls - hard, rubble + blue  
 green clay

124.75 - 127.25' gn chyd + gray ls

127.25 - 128.75 - same + dk gy bit. ls

128.75 - 132.25 - gn + gray clay + hard  
 brittle limestone

132.25' - 137.25' gn + gy rubble ls,  
 ds,

137.25 - 142.25' ol. gn chyd

142.5 - 147.5' lt ol. gn + gy chyd w  
 some limestone

fully drilled down



drive chain master link  
1 1/4" npt plug  
5/16" quick links

147.5 - 162.5' slower drilling now  
sticky zones (clay) also  
started taking mud

mix tub of dry mud / penetrant /  
gubstrol IV

thunder storms move in -  
till ~ 5:30

start next run - master  
link on moyno drive chain  
came loose - could not  
find the clip. NO SPARE

- start cleanup / lockup

deck engine hours 1713

ER to marianne at top  
find MASTER link. - NO GO

End day 7:15 pm

KC to bill + Geni - weld link

7-10-03 7:30 start - re instl  
moyno drive chain, adjust,  
pull NG - bit plugged - cleanout  
~ go back on



152.25 - 157.25' slow drilling - 52  
sticky clay at top blue gn clay/  
clay sd.

157.25 - 162.25 - same - darker grey  
at 6 AM

162.25 - 167.25' blue gn clay sd

167.25 - 172.25 - same

172.25 - 177.25 hard blue clay/sd

177.25 -

RAD. "boiling over - slings  
tube from top seal - grey -  
rotten egg smell - water  
cont? - chg green tube in  
RAD

177.25 - 182.25' tight hard blue  
green clay upper 3' grad  
to grey + br crumbly but hard ls

182.25' - 187.0 ~ 4' recovered  
br, gn + gy ls, hard - back to  
clay at base -

187 - 189.75' bl. gy ls + blue clay  
2.5' left to drill Kelly down

189.75 - 192.25' grey ls + br brittle  
dolomite

END CORING FOR DAY

REG HOME 1721



33  
pulled 40' NQ, pm, look up  
head time  
arrive 1st 8:45 pm

9/14 Arrived Drill site 12:30 PM  
W.L. 82'  
Tupper

192-197 - Started run dolomite  
change to soft h. westone muddy  
197-200 Hard dolomite w/ muddy zones  
200-202 Very soft cored like very  
wet mud.

202-204 very soft

204-206 Hard

206-207 soft - mud like - left site 6:00 pm

9/15 Left motel 7:00 am - Walmart for  
Water & Lee - Arrive site 8:00 am  
Bit played - ~~tripped~~ **clown**  
**Bit** - Small hole in rock  
on face of Bit

207-212 Hard dolomite change to brown  
gray muddy clay

212-217 soft - felt like crumbly  
loose ~~not the same~~

217-222, Semi hard brown limestone



lost 4<sup>1/2</sup> hrs 12<sup>30</sup> - thunderstorm  
rain. Left drill site 4:30 in  
T storm. no rain coming. Arrived  
motel 5:00 PM.

7-16 Arrived site 6:30 AM 2B-BP

222-227 Soft Brn. limestone

227-232 soft to very soft limestone  
core barrel plugged w/ rock chips

232-237 (232-235) soft muddy poor  
recovery 235-237 white to brown  
limestone.

237-241 soft limestone

241-242 harder brown limestone

242-247 Brown limestone changing to  
gray Brown

247-250 Brown limestone - 6:30 AM

Rig torqued up at 250' - started  
pulling core rod. Pulled back  
with head to 230' - couldn't  
pull or rotate. Tried to air lift.  
No good. Will run 4" casing over  
3" down to 111'.

7-17 Tried various things nothing works  
advanced 3' to 120' - 6:30 PM

7-18 6:00 AM tried to wash - plug top of  
core rod & 5" casing off started

34

to advance 4' casing to 30'  
Drove back to Tall 7:30 PM

7-19 left Tall 6:30 AM

Drilled in 10' - off casing ~~222-227~~  
~~227-232~~

7-20 Drilled in 3" casing to 129'  
added 5' - 4" casing total 115'  
Arrived Tall.

7-23 Tom KC picked Q. GEL, 2-HEAD,  
G-TROL

8 AM EH, CK @ WH LOAD

F550; GOT FUEL Dept TUM

9:15 AM 10:30 AM BOUGHT RAIN GEAR

@ Wal-MART / MARIANNA

TRAV. TO SITE

trip out 3" csg. replace csg shoe  
tripped back in - resistance at  
~ 115' drilled back in to 129

drilled 129-160'

mudded up hole, pulled 20'  
csg off btm

Rig hours 1756

End day 8:00 PM



454 4201

Andy Western  
Karen

DANE -

2278.

3" x 1 1/4" bashing  
~~grease~~  
Liquid Basket

55  
7-24-03 7:30 START KC, EH, CK  
mix mud, wash back to btm - NO  
resistance

drill new csq to ~176  
start to mix mud - may no  
fight back up - attempt to dress up -  
will not to dress up - call  
Craig - get new moyno on the  
way.

lunch - flower pots in vicinity  
wait in truck - again at 2:30

pull moyno pump  
to marionna pump pads  
End day 6:30 p.

7-25-03 KC, EH, CK 7:30  
start - walmart - get more  
+ ice

to site - prep for new  
moyno

BRIE arrives w/ pump + parts  
instl - BRIE runs for lunch  
mix mud - cont drill in  
new csq fr. ~ 175' 176'

lose most pet's fluid by  
181'

mix mud - wash in  
several in pump section



189.5 56  
drill to ~~189.5~~ - for taking lots of  
fluid

Attempt run NQ - NO go  
up or down

mix/pull heavy mud pull 26'  
of NW csq - hang in mast  
Rig hours 1762

RETN TLH 7:30 pm

Things to bring...

SODA ASH

COVER FOR NQ ROD CANS  
CHARGE 18 Volt set

7-29-03 KC, EH, CK 8AM  
start, load up/walmart/fuel  
to St Andrews Tract ARR 11:00A  
Need metric wrenches / sockets

mix mud, make water runs -  
hole clean, pump - establish  
circulation - check fluid level  
sit in till most of afternoon  
drill 189.5 - ~ 192 - NW csq  
tighten up - file rotation



57  
hard to pull - pulled new CS9  
end day - 8:30 pm

---

7-30-03 7 am start, Walmart  
to site

pick up NQ w/ hoist, break  
joint w/ winch on trk,  
pull 120' NQ (~~of 220' + 100' + 100'~~)  
top joint box is crushed  
∴ recovered 110' usable NQ

RAN TAPE ON HOLE - CAN  
FEEL WEIGHT TAMP AGAINST  
BIT AT 217' BELOW ROD  
CLAMP (15 ~ 214' GCS)

Tremmie & bag - quick growth 250 -  
108

thunderstorm all afternoon  
~ 1:30 on finally give up at  
600 pm - retired 6:30 pm

---



7-31-03

6:30 start

58

fd top of grout at 124

pump 2 bags quick grout

pull 4" casing

grout at 78'

pump 2 addl bags quick grout  
and 1 bag EZY SEAL to  
surface

total 9 bags 20 p solids  
bentonite grout

- Packed Green Trailer w/ hoses  
after 2 hr of waiting for  
a storm to pass
- KC & ED leave for Talla.
- CK & EH leave due to migraine  
for EH.

8-1-03

7:30 start

- CK & EH checkout of hotel

WASHED / PACKED UP SITE

RIG WOULDN'T START

1:15 Dept. for TLH

30min Lunch

HEAVY RAIN  
3:45 pm Arr @ WH.

18622  
HINTER CK. RD



SUBS

~~core barrel / inner barrel~~ 3 P  
~~200' NA (70' off (nig)) 6" NWJ x NWJ sub~~  
~~trash pump hoses~~ 6" NWJ x NA  
~~4" / 3" csq. / Ang?~~ 8, 6, 4" NWJ x NWJ  
~~Hot guard~~ (sg) { NWJ x 3" N  
~~6 gloves~~ { NWJ x 4" N  
~~Shaples / staples~~  
~~blocks~~  
~~Sgt bucket (4)~~  
~~boxes - tops, bot, trays, liners (25 each)~~  
~~paper bowls~~  
~~handcleaner / soap~~  
~~sunscreen~~  
~~bug spray / Permethane~~  
~~SS spatula / bottle brush~~  
~~bolt cutters~~  
~~3" screen halves for sampling~~  
~~teret~~ resistant  
~~pipe wrenches 36" 2x24" 2x18"~~  
~~chain wrenches~~  
~~4 lb sledge " pin hammer~~  
~~NWJ hoist plug~~  
~~NA hoist plug~~  
~~3" csq bail~~  
~~4" (sg) bail~~  
~~cheater bar~~  
~~wood chits~~  
~~vise grips~~  
~~wireless bot set~~  
~~grease gun / grease~~  
~~tape measure~~  
~~200' tape down hole~~  
~~w/ bolt for weight~~

Gas can for trash pump

59

~~nut~~

~~Hole Plug~~

~~grout~~ 8

~~EZ Mud~~

~~Punchot~~

~~Quickbot CV~~

~~Soda Ash~~

~~Hoses: 1/2" mayno suction~~

~~1" red mud mixing hose~~

~~FIRE HOSE + WRENCH~~

~~Sawhorses~~

~~COOLER!~~

~~tremmie pipe~~

~~shovels~~

~~mud tub screens / desander~~

~~Split spoon for pushing first sample / sub~~

→ 8" true spin augers ✓

• couplings / bolts ✓

• hoisting bail ✓

• drive assy. ✓



29° 47' 41.9"  
82° 15' 17.2"

W# W 18622

60

HATCHET CREEK ROAD

S 13CAAD T08S R20E

LAT 29° 47' 42.6"

LONG 82° 15' 17.6"

ELEV 166' Topo

TD 253'

CO. ALACHUA CO.

QUAD MONTEOCHA

13 boxes

6/13/05

Brie & Dave meet @ whs 7:20am

- depart whs @ 10:30am

- arr. drill site ~ 2:30pm

Thunderstorms. Get rig on feet; raise mast.

Thunderstorms. Scout H<sub>2</sub>O; alternate roads  
depart site 6:30pm, more Thunderstorms!  
arr motel 7:30pm

→ 2181 rights.

6/14/05 Brie/Dave depart motel 5:30am

arr. site 6:20am

Set up to push SS

0-2.5' dark gray organic rich soil @ surface  
to br gray sand, then clayey sand  
2.5'-5' tan to red/white clayey sand

18622  
HATCHET CK. RD



- vice grips  
 bar bag on  
 Need misc. card H.I.  
 • ~~tyvec sample bags~~  
 • ~~extended shoes~~  
 • ~~flat pry bar~~  
 • ~~duct tape~~  
 • ~~6" nws<sup>2</sup> sub~~  
 • ~~3" casing~~

L core barrel = 8'

6/14 rig hrs 2187  
 depart site 4:30 pm  
 arr hotel 5:45 pm

\* sample extruder assay  
 for Christiansen splr.

61

5' - 7.5' refusal pushing SS; top of hole sloughing into hole; switch to coring; run in HSA as surface casing. tan lightly clayey sand.

7.5' - 9' tan to red; white clayey sand

9' - 14' NS

14' - 15.5' plugged bit, pulled out 6" coarse sand & gravel, then pushed Split Spear for tan/light gray clayey sand

6/15/05 Brie; Dave start 5:45 am arr. 6:45  
 15.5' - 19' NS washed sand, pumped represent sample. Gray water

19' - 22.5' advance augers, pump sample. SAA  
 22.5' - 25' advance augers, pump sample SAA  
 25' - 27.5' "

2:19 secure & depart site arr TLH 6:07 pm  
 rig hrs 2188

6/16/05 Brie; Dave start 8 am, load core barrel & 3" csg scout new road into site; unload truck. Severe Thunderstorm 3:45 pm! Scout roads, depart site arr hotel 7 pm

rig hrs 2188

6/17/05 Brie; Dave start 5:50 am arr site 7 am  
 H<sub>2</sub>O level ~ 1' BLS  
 bottom of hole 24'  
 augers to 26.5'

Little Orange Ct  
 18631



\* 1 1/4" inner bbl space, shoulder-shoulder

core barrel = 7'

- knuckle heads
- plastic sawhorses/pallet
- rubber cone 3" ID 4" OD
- to rest 3" cgs in HSA

Don't forget Gas cans for  
CME!

Rig Hours 2195

62

- advance augers to ~ 1.5' stickup  $\Rightarrow$  29' BLS
- mix EZ mud, beginning.
- hole open to 26.4'

$\rightarrow$  cored out plug in HSA to 27.5'  
25'-27.5' red/or clayey sand to 3" then  
green-blue clay.

27.5'-32.5' refusal last 6" only ~ 8" recovered  
SO NS from ~ 28.3'-32' burst!  
32'-32.5' sandy br. gy limestone

32.5'-37.5' ~ 1' rec. fossiliferous sandy br. limestone  
37.5'-42.5' softer gray LS; clay, then br  
vuggy/fossiliferous sandy LS/dolomite?

42.5'-47.5' ~ 50% rec. gray/br. sandy phos-  
sandy LS.

47.5'-52.5' phosphate gravel + sandy gray clay

52.5'-57.5' phos. gravel + sandy gray clay

57.5'-59.5' SAA

59.5'-62.5' SAA, better indurated darker gray.

62.5'-65' SAA

Advance 3" casing to 55'

secure site; depart 5:10pm

arr TCH 8:30pm

LITTLE ORANGE CK  
18631



Gorman TLT  
Gorman Grille (352) 377-2311  
Stolen EZMUD!  
FL-352

Sgnl \$117.70

~~S. on 4th to 39th Ave, turn left~~

S. on 24 past airport past 39th  
turn right on 27th (Sammy's BBQ)  
into industrial park, go to 4way,  
turn right, take next right

dig hrs: 2199  
leave site 6:20pm  
arr motel 7:30pm

6/22 6:04 depart motel  
7:08 arr site  
7.2 H<sub>2</sub>O

6/21/05 Jake + Dave hrs 7:15am 63  
depart TLT ~7:45am  
arr site ~11:45am

EZMUD STOLEN!

Static H<sub>2</sub>O @ 4.7' BLS  
- advance 3" csg to 65' w/ 18" stickup 43.5  
- wash NQ hole to 65' open to 68.1?  
65'-73' washed first 2' advancing 3" csg, then  
phos. sandy olivegray clay  
73'-78' phos. sandy olivegray clay, in b hard-  
rock phosphate, ; friable dry clay?  
~50% rec.  
78'-83' poor rec. hard dry lt. olgray friable clay  
to gray phos sandy clay  
83'-88' ~50% rec. dk gray & phos. sandy  
clay to v. lt. gray friable dry clay  
88'-93' starts in v. lt. gray hard dry clay, then  
phos sandy sticky gray clay.  
end day @ 7:30pm

6/22/05 Jake + Dave start 6:04am  
AZU level = 7.2' BLS  
hole open to: ~86' wash hole.  
93'-98' poor rec. sticky lt. gray clay to  
base g. sand / phos sand, drilled hard.  
98'-103' gray phos + gtz sand to phos. sandy  
lt. gray clay



6/23

leave 8:37pm  
hotel 10:00pm  
rig hrs 2212

64

103' - 108' qtz; phos. sandy sand, slight clayey, to dry lt. gray phos. clay

108' - 113' poorer. hard, dry, friable lt. gray clay / silt.

- meet Brie in Live Oak to get 60' more casing.

- advance casing to ~ 112.5' (114' bhl)

- depart site 8:24pm

- arr motel 9:30pm

rig hrs 2203

misestimated by 5' really 119' bhl !!

6/23/05 JAKE; DAVE leave motel 6:10am  
arr. site 5:22

static H<sub>2</sub>O level: -0- 3" csg is plugged?

hole open to ~ 116.5'

- trip in NQ, wash hok.

113' - 118' NS. misestimated amount of casing, washed casing down 5' to far.

118' - 123' br. gray clayey sand w/ phos. to blue green. clay

123' - 128' blue green clay to lt. gray / olive gray clay and phos.

128' - 133' NS

133' - 138' gray to green clay

138' - 143' NS  
143' - 148' olive gray to hard dry green clay  
148' - 153' olive gray green clay

LITTLE ORANGE CK  
18631



- quicktrol
- rubber cone fun packer
- 50' NA
- 3" CSG
- ✓ Mayno hydr. motor serviced
- suction hose cracked, lanky
- sample extender
- Penetrol
- ext shoe longear, other bit?
- longer allen wrench

Tape it!

→ Comfort Inn: (352) 264-1771  
Ext. Stay: (352) 375-0073

anf # 162278  
162279

65

6/24/05 JAKE & DAVE  
check out motel 8am

- Finish adv. casing to 151'. (152.5' total)
- begin coring after trip in NA + washing to bottom @ 153'. hole open to 151.6'

153' - 158' blue-green dry clay, then v. pale green clay - plugged inner bbl w/ b/g clay + washed rest of run.

158' - 163' ~~blue-green clay~~ v. lt. olive gray siltstone

163' - 168' AS ABOVE, into blue-green clay. returns had sand

168' - 173' blue-green sandy clay, 2 intervals siltstone; last 2' clayey sand. sand in returns.

stop coring for day, pull off Mayno hydr. motor. clean up + secure site.

depart 5:15pm

arr. T2H 8:50pm, depart WTH 9pm

rig hrs: 2216

7/5/05 DTP: Sarah Rawden

meet WTH 8:00am

depart 9:00am

arr site 12 pm

static H<sub>2</sub>O level 45' BLS w/ 152' CSG

Little Orange Ct  
18631



buy a  
fucking  
ALLEN  
WRENCH

Got one!  
Game on!

7/5

- 173'-178' carbonaceous sandstone; siltstone of gray  
178'-183' olive gray phosphatic sand.  
183'-188' ol. gray phos. gds. sand to sandy phos.  
carbonate to ol. gr. phos. sandy clay  
188'-193' ol. gray sandy clay to dk. gray clay  
to sandy LS, then cavity 192'-193'  
193'-198' phos. chunks / rubble LS, into LS  
for ~ 2', then cavity, ~ 1' then  
clay + LS rubble, then cavity w/  
resistance right at 198'.  
198'- refusal, plugged bit w/ chunk of limestone.

leave site ~ 5pm

rig hrs 2220

Arr motel 6pm for Sarah, DTP fill H<sub>2</sub>O fuel 7pm

7/6/05 DTP ISR start 7:20pm arr. 8:28

198'-203' rubblely LS; phos. chunks, caved?  
sandy ol. gray clay gap then brown  
friable dolostone, bryozoans / molluscs

203'-208' broken rubblely dolostone lt. br.

208'-213' 1cp rich br. dolostone

213'-218' 1cp / mollusc rich br. dolostone

218'-223' AS ABOVE w/ whole 3/4" oligopygus

223'-228' AS ABOVE

228'-233' AS ABOVE w/ whole oligopygus

LITTLE ORANGE CT  
18631



7/6

rights 2225

search done 5:45

Dave done 6:10

7/7

trip to Int. dealer...

7:30am - 7pm

7/8

start 7:30am

rights 2228

depart site 5:30pm

arr LHS 9pm

238' -

67

Little Orange ck  
18631



Ext. Stay 352-375-0073

conf. # 66390~  
66391

7/19 rig hrs: 2231

7/20 rig hrs 2233/ 42631 mi

7/19/05 BC/DTP

68

met @ whs 8am

arr site 12 noon

→ begin to grant 1 bag, pull 3" cgs.

grant #2 bag, to ~ 110'

grant #3 bag plug everything, spend

afternoon jetting hoses/tremors &

unplugging may no.

secure site; depart 7pm

arr hotel 8pm

7/20/05 BC/DTP

start day 7:15am

5 bags grant, (2 bad mixes)

2.5 bags "hole plug, 6" native  
material on top. clean up;

abandoned site, move equipment  
to new site.

end day @ 8:45pm

7/21/05 BC/DTP start 7:15am

@ new drill site setup site

Little Orange Ct  
18631



W#

18631

69

LITTLE ORANGE CREEK

S 24

CD

T 10S

R 22E

LAT

29° 36' 18.4"

LONG

82° 3' 43.0"

ELEV

105' (TOPO)

TD

CO.

ALABAMA

QUAD

HAWTHORNE

H<sub>2</sub>O table ~25'

0-5' push spl. brown organic rich loamy sand.

5'-7.5' unconsol. brown loamy sand.

7.5'-12.5' unconsol. brown clayey sand.

12.5'-17.5' lt. gray clayey sand

17.5'-22.5' gray clayey sand

22.5'-27.5' washed same spl, lt. gray clayey sand.

27.5'-32.5' lt. gray clayey sand

32.5'-37.5' poor rec. sloppy unconsol. sand, maybe cobbles except for contents of shoe

37.5'

37.5'-42.5' v. lt. gray clayey sand

→ pull NA; Adv. 3" CGG TO 43.5'

secure site

end day: 9pm

LITTLE ORANGE CREEK  
18631



NEED:

- ✓ Small Blocks
- ✓ Large Blocks
- ✓ 6" NA sub for top of core bbl
- ✓ → Small mixing tub from KC
- ✓ Permanone

reworked TH

3" CSG to 86' (87.5') →

ADV. CSG.  
to 55' less  
shrinkage.

7/22 BC: DTP

70

start day 7:30am

42.5' - 47.5' poor rec. after ADV. CSG.

unconsol. grey slightly clayey sand.

\* 47.5' - 52.5' lt. grey med. crs. slightly clayey sand

52.5' - 57.5' AS ABOVE...

57.5' - 62.5' ~ 20% rec. very soft mostly lost  
@ last 4' run. spl is lt. grey  
clayey sand.

62.5' - 67.5' clayey sand to clay, then  
clayey sand w/ waxy white/cream  
phos. gravel ol. grey

~~67.5' - 72.5' 11.01. grey clayey sand~~

67.5' - 72.5' 11.01. grey clayey sand

72.5' - 77.5' poor rec, spl not latched in?

77.5' - 82.5' tiny representative spl. from  
shoe. grey clayey sand

82.5' - 87.5' NS. ADV. CSG. To 86' (or. returns)

87.5' - 92.5' lt. grey & some orange slightly  
clayey sand.

Secure hole & drill site  
arr TLH @



13

7/26 BC: DTP left for Giville 71  
meet @ whse 8am, load up; depart  
hole open to 85', wash NQ back to bottom.  
92.5' - 97.5' soft slightly clayey or/gray  
sand

97.5' - 102.5' gray-orange slightly clayey  
sand

102.5' - 107.5' had trouble getting new 10' stick  
drill rod in, washed back to bottom +  
added 10' stick NQ, misbore spl for  
slough; dropped it all. representative  
sample taken - gray; or. clayey sand

107.5' - 112.5' gray; orange mottled clayey sand

112.5' - 117.5' 2' of slough then ~ 8" v. lt. gray  
clayey sand.

117.5' - 122.5' v. lt. gray clayey sand.

122.5' -

BREAK SWIVEL!!

- fix swivel.....

- trip out NQ to prepare for 3" ss run.

rig hrs 2247.

end day @ 9pm



10

7/27 BC: DTP

72

start day 7am

- run 3" csg to ~~117.5'~~ 117.5' w/ stickup
- tip in NE
- prepare to wash back to 122.5', SNAP SWIVEL AGAIN!

- must will @ Live Oak to get swivel parts, wrong stuff.
  - order correct swivel f/ Atlantic Drilling
- end day 5pm.

10

7/28 BC: DTP

fix swivel (delivered @ ~10:15am)

begin coring.

- 122.5' - 127.5' ~~to~~ gray & orange clayey sand
  - 127.5' - 132.5' 40% rec. or gray clayey sand
  - 132.5' - 137.5' dry br/bm + orange sandy clay @ top of run, washed, lost 4' sample  $\Rightarrow$  unconsol. sand.
  - 137.5' - 142.5' starts in blue/green clay then gray & orange clayey sand.
  - 142.5' - 147.5' gray & orange clayey sand
- $\rightarrow$  ADV. csg, transmission sticks!

fig hrs 2252

end day: 7:30pm



147.5' 3" csq



7/29 BC/DTP

73

start day 7am

remove bp end of drill transmission, find neutral + line up arms w/ gears, reattach water hoses + set up to adv. 3" csq to 147' (use 6" sub instead of 1" nut)

147.5' - 152' gray clayey sand.

152' - 157' fine clayey gray sand.

Thruclorsbruns - pack + secure site  
end day 6:20pm

8-9-05 KC, Will Evans 9:30 hit  
road ~ 12:30 at site

mix mud / bit plugged - put  
rods into csq - obs. cleared

- NQ sand loc to ~~cs~~ 3" csq

- pulled up csq. -

pushed csq back

- T.S. since ~ 1:30

- to GAINVILLE - ck in retel.

end day 6:30 pm



8-10-05 KC, WE. 6:30 AM 74

start

mix quicksl / top quicksl 18  
157-162' clysd or + bn mottled  
btm 1' of slgy sdy clay  
162-167' ~ 3.5' mottled

clysd mud. sand - v btm bn  
hard brittle dolomite (?)

167-172 go back in w rock stone  
6-8" bn ls + clay than vlt gy  
granular ls (packstone) - prob  
top oolite

172-177' CRM, lt org ls. granular  
Vandy calcarenite

177-182' same - some rubblely  
~~rock~~ rex/ mat at top

182-187' - ~ 50% rec - soft  
zone or cavity in the middle

187-192

End day 5:30 pm

Ris hour 2266

8-11-05 KC, WE 6:30 start

side trip to examine next drill  
site. At current site 8:30



WATER RUN  
mud mud

FOR GME

70311 guide bushings 50304  
pull down pressure control  
drive bar square Kelly bar  
whet gears - Mayno

drive sprocket 71434

drive sprocket 71427

Rotary box brg # 40621

187-192' ls on shore 75  
192-197 clayey sand layers at top  
(?) slump or cavity fill  
than ls on shore

197-201.25 - ls granular some  
fossil molds - run terminated  
became core jammed in bbl.

201.25-202 same

202-207 same

207-212 cm granular ls, fossil  
moldic last 1.5'

212-217' cm + tan ls, fossil  
moldic

217-222 ? cavity ? or v soft  
pushed last 2.5' - white  
calcareous

222-227' unconsolidated  
calcareous (calcareous)

227' TD

pull 100' NQ

pu 10' more

Rig hrs 2267

END day 6:30 pm



## Swivel

- 1) 1 1/4" coupler
- 1) 1 1/4" x 4" long npl
- 1) 2 1/4" EL
- 1) 3/8-1/2" welded eyebolt

## load Quik clamps 2" ball valve

### VALVE TOWER 300psi

- 1) 1/4 x 2" bush
- 1) 2" X
- 1) 2" x 3" long npl
- 2) 2" cls npl
- 1) 2" x 1" bush
- 1) 2" T
- 1) 2" x 1 1/4" bush
- 2 1 1/4" T
- 2 1 1/4" cls npl
- 1 1 1/4" str. EL

8-12-05 KC, WE 6:30 start 76  
ck out from motel.

pull remainder of nq  
pull ~~2~~ NW CSG  
- run tremmie for grout  
pump 6 bags grout  
to surface

pull square kelly bar + lower  
back rotary box by

order

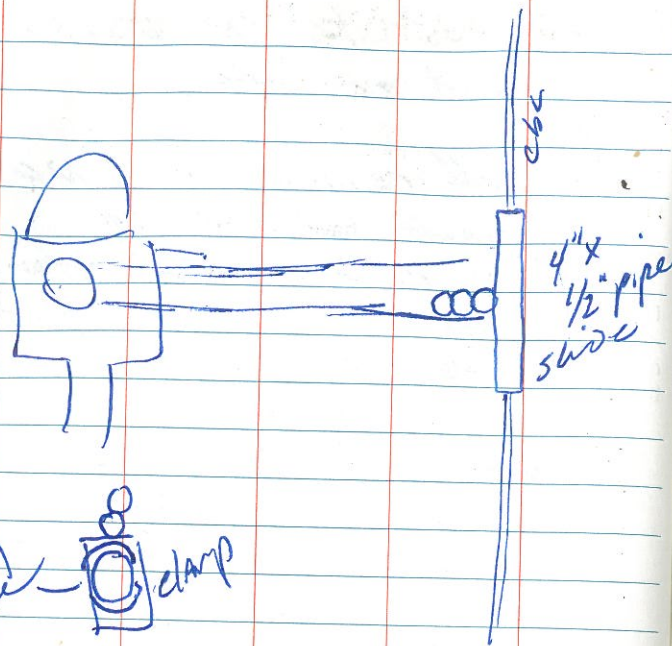
1 rot. box bng  
4 slide bushings  
1 feed pressure valve  
to be here now  
square kelly is bent

load up / backup return to  
end day 8:30 pm

8-16-05 Sarah / Dave / Ken 7:30 - 8:30  
repair CME

8-17-05 Sarah + Dave 7am - 7:45pm  
clean up + abandon site, move to new  
site.





# CURVE TABLES

## HOW TO USE CURVE TABLES

Table I. contains Tangents and External to a 1° curve. Tan. and Ext. to any other radius may be found nearly enough, by dividing the Tan. or Ext. opposite the given Central Angle by the given degree of curve.

To find Deg. of Curve, having the Central Angle and Tangent: Divide Tan. opposite the given Central Angle by the given Tangent.

To find Deg. of Curve, having the Central Angle and External: Divide Ext. opposite the given Central Angle by the given External.

To find Nat. Tan. and Nat. Ex. Sec. for any angle by Table I.: Tan. or Ext. of twice the given angle divided by the radius of a 1° curve will be the Nat. Tan. or Nat. Ex. Sec.

### EXAMPLE

Wanted a Curve with an Ext. of about 12 ft. Angle of Intersection or I. P. = 23° 20' to the R. at Station 542 + 72.

Ext. in Tab. I opposite 23° 20' = 120.87  
 $120.87 \div 12 = 10.07$ . Say a 10° Curve.

Tan. in Tab. I opp. 23° 20' = 118.31  
 $118.31 \div 10 = 11.831$ .

Correction for A. 23° 20' for a 10° Cur. = 0.16  
 $11.831 + 0.16 = 11.991 = \text{corrected Tangent.}$

(If corrected Ext. is required find in same way)  
 Ang. 23° 20' = 23.33°  $\div 10 = 2.3333 = \text{L. C.}$

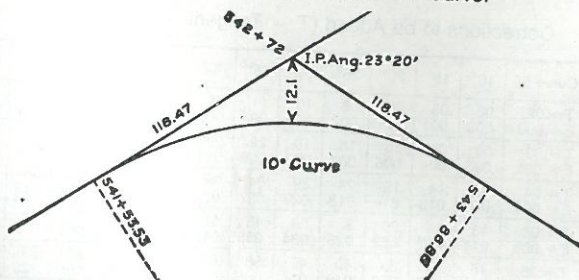
|                         |       |              |             |
|-------------------------|-------|--------------|-------------|
| 2° 19½' = def. for sta. | 542   | I. P. = sta. | 542 + 72    |
| 4° 49½' = " " "         | + 50  | Tan. =       | 1 .18.47    |
| 7° 19½' = " " "         | 543   | B. C. = sta. | 541 + 53.53 |
| 9° 49½' = " " "         | + 50  | L. C. =      | 2 .33.33    |
| 11° 40' = " " "         | 543 + | E. C. = Sta. | 543 + 86.86 |
|                         | 86.86 |              |             |

$100 - 53.53 = 46.47 \times 3' (\text{def. for 1 ft. of } 10^\circ \text{ Cur.}) = 139.41' =$

2° 19½' = def. for sta. 542.

Def. for 50 ft. = 2° 30' for a 10° Curve.

Def. for 36.86 ft. = 1° 50½' for a 10° Curve.





CM15 Front Axel

N54-3200R1110

NK 34?0781

DATE 10-4-84

Carting #

3200R1188

Ford Housing

Rockwell International

Model

FD 8's 75CHX10

E4HS 3062-DA

Serial # KK8453120

Ratio 683

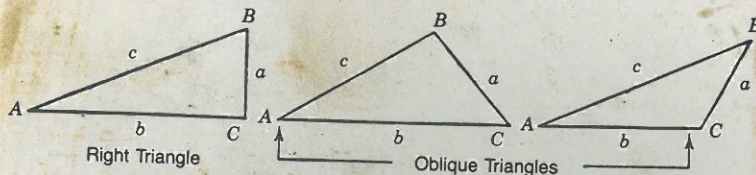
DATE 17-4-84-01

A9 3121-E-967

Serial- KN00165N899

173-84

# TRIGONOMETRIC FORMULAE



## Solution of Right Triangles

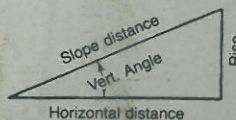
For Angle A.  $\sin = \frac{a}{c}$ ,  $\cos = \frac{b}{c}$ ,  $\tan = \frac{a}{b}$ ,  $\cot = \frac{b}{a}$ ,  $\sec = \frac{c}{b}$ ,  $\csc = \frac{c}{a}$

|                  |                     |                                                                                          |
|------------------|---------------------|------------------------------------------------------------------------------------------|
| Given<br>A, B, c | Required<br>A, B, c | $\tan A = \frac{a}{b} = \cot B$ , $c = \sqrt{a^2 + b^2} = a \sqrt{1 + \frac{b^2}{a^2}}$  |
| a, c             | A, B, b             | $\sin A = \frac{a}{c} = \cos B$ , $b = \sqrt{(c+a)(c-a)} = c \sqrt{1 - \frac{a^2}{c^2}}$ |
| A, a             | B, b, c             | $B = 90^\circ - A$ , $b = a \cot A$ , $c = \frac{a}{\sin A}$                             |
| A, b             | B, a, c             | $B = 90^\circ - A$ , $a = b \tan A$ , $c = \frac{b}{\cos A}$                             |
| A, c             | B, a, b             | $B = 90^\circ - A$ , $a = c \sin A$ , $b = c \cos A$                                     |

## Solution of Oblique Triangles

|                  |                     |                                                                                           |
|------------------|---------------------|-------------------------------------------------------------------------------------------|
| Given<br>A, B, a | Required<br>b, c, C | $b = \frac{a \sin B}{\sin A}$ , $C = 180^\circ - (A+B)$ , $c = \frac{a \sin C}{\sin A}$   |
| A, a, b          | B, c, C             | $\sin B = \frac{b \sin A}{a}$ , $C = 180^\circ - (A+B)$ , $c = \frac{a \sin C}{\sin A}$   |
| a, b, C          | A, B, c             | $A+B = 180^\circ - C$ , $\tan \frac{1}{2}(A-B) = \frac{(a-b) \tan \frac{1}{2}(A+B)}{a+b}$ |
| a, b, c          | A, B, C             | $c = \frac{a \sin C}{\sin A}$                                                             |
| a, b, c          | A, B, C             | $s = \frac{a+b+c}{2}$ , $\sin \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}$                |
| a, b, c          | Area                | $\sin \frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}}$ , $C = 180^\circ - (A+B)$              |
| A, b, c          | Area                | $s = \frac{a+b+c}{2}$ , $\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$                           |
| A, B, C, a       | Area                | $\text{area} = \frac{bc \sin A}{2}$                                                       |
|                  | Area                | $\text{area} = \frac{a^2 \sin B \sin C}{2 \sin A}$                                        |

## REDUCTION TO HORIZONTAL



Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle =  $5^\circ 10'$ . From Table, Page IX.  $\cos 5^\circ 10' = .9959$ . Horizontal distance =  $319.4 \times .9959 = 318.09$  ft.  
Horizontal distance also = Slope distance minus slope distance times  $(1 - \cos \text{ of vertical angle})$ . With the same figures as in the preceding example, the following result is obtained.  $\cos 5^\circ 10' = .9959$ .  $1 - .9959 = .0041$ .  $319.4 \times .0041 = 1.31$ .  $319.4 - 1.31 = 318.09$  ft.

When the rise is known, the horizontal distance is approximately: - the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance =  $302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$  ft.



