STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES

Alaska Geologic Materials Center *Data Report No. 384*

No. 384

Boyer, D. 2011, Thin Section Photomicrographs and Descriptions for Mikkelsen Bay St #13-09-19, W Mikkelsen St #1, and Sag River St #1, Lisburne to Total Depth

CD available upon request (183 photos, 148 MB)

Received January, 2011

All data reports may be downloaded free of charge from the DGGS website.

Description of Mobil Mikkelsen Bay St. #13-09-19 (50029200550000) Thin Sections (from Alaska State Geological Materials Center):

Echooka Ss. Example Near Pre-Echooka Unconformity

11,736' Echooka Ss.: well-cemented, ang-subang qtz sand; f-mg with some cg qtzite (Bsmt.) clasts; clay lamins. with organics/tar and pyrite (opaques); well-compacted; tight.

Top of Wahoo/Pre-Echooka Unconformity

11,752-753' (2 chips): Chip 1: Spic-peloidal chert with occ. euhedral dolo rhombs; contact in T.S. with breccia/conglom.; **Chip 2:** Breccia/conglom near Pre-Echooka contact (stained); ls. matrix but overall mostly cg-vcg clastics of chert, qtzite. and chalcedony (banded); vf-fg qtz sand within ls. matrix, no porosity.

11,752-53'A (A6228A) a/a but not red stained; vcg-granule-sized clasts of qtz, qtzite and several chert types; one lg. argillite (Bsmt.) clast; tight.

11,752-53'B Spic chert w/ calcite-filled micro-fracs and some qtz silt.

11,753-54' Chert G-MLP with lg (chert-replaced) bry fronds (covers entire field of view under 5X lens).

11,754-55' Vcg Bry-echin-occ pelecy dolo lime MRP- 35% dolo, 5% chert, 1-2% qtz sand (silt-vfg); partial grain replacement; some chert in dolo (silicified); poor-fair porosity.

11,766-67' Bry-echin, rare pelecy lime G-MLP- cg-vcg,; chert within echin plate cores; lime mud (no dolo); thin mud coats on many lg. skel. grains; v. tight.

11,780-81' Foram-spic, vf-fg lime G- with bry-echin fines; occ. fg peloids; 10% ang-subang qtz silt-vfg sand; tight.

11,794-95' Bry-echin-foram-pelecy-spic (mixed) G, f-mg; 5% ang-subang qtz silt-vfg sand; v. well-cmtd, no porosity.

11,969-70' Dolo- vf xln w/ micro-vugs; open HL fracs w/ chert in lg. vug; good porosity.

11,991-92' Lime W w/ bry-echin-spic skel grains; 2-3% qtz silt; minor chert replacement within skel grains, esp. echins.; no porosity.

11,998-99' Extremely vf xln dolo- 10% qtz silt; some calcite-filled HL fracs; some micro-vugs, fair-good porosity.

12,385-86' Vf xln dolo M- sli. silty (qtz); FC's, calcite in micro-vugs but also open vugs; fair-good porosity.

Mobil Mikkelsen Bay St. #13-09-19 (cont.)

12,393-94' Mostly rounded (reworked) echin grains in dolo M matrix (MRP-W) w/ pelecy, rare bry; inter-laced w/ dolo lime mud (any algal?); tar along clay lamins.; no porosity.

Second Set of Unstained Thin Sections:

11,752-53'B Spic chert G-P with some qtz silt (~3%); HL calcite-filled fracs; nonpay.

11,753-54' Chert MRP-W w/ vcg bry-echin-pelecy skel grains (calcite); <1% qtz; some tar.

11,754-55' Dolo MRP-W- 50% dolo- f-m xln; 50% calcite skel grains (bry-echin-pelecy): all vcg, esp. bry fronds; some echin plates with chert replacement in cores (centers); poor to fair porosity.

11,766-67' MLP: bry-echin-pelecy, vcg; chert replaces echins. (3% chert overall); no dolo; tr qtz silt only; no porosity.

11,780-81' Lime G; vfg-fg, spic-forams- & bry-echin fines, some coated, occ. peloids; 2% qtz silt-vfg sand; tight.

11,794-95' Lime G: 3% qtz silt; HO/tar along styls.; tight.

11,969-70' Spic dolo W- some lg vugs are chert-filled; vf xln; 1% qtz; mostly open vugs, good porosity.

11,991-92' Lime W with cg & fg bry w/ minor echin & pelecy skel grains; 2% qtz silt; no dolo; no porosity.

11,998-99' Dolo W-M- extremely fine xln (at 5X magnif.); FO (HL); 2% qtz silt; common vugs, most open but some chert-filled; good porosity.

12,385-86' Dolo W-M- vf xln; spic; micro-FC; most vugs filled with chert-replaced spics or calcite spar, some filled w/ tar; fair to occ. good porosity.

12,393-94' Dolo MRP-W- mostly rounded, reworked echin. grains; occ. bry & pelecy grains; 60% dolo, 40% calcite (all skel grains); tar-stained clay lamins.; no porosity.

D. L. Boyer

Key for Abbreviations:

G	Grainstone
MLP	Mud-lean packstone
MRP	Mud-rich packstone
W	Wackestone
M	Mudstone
Ss.	Sandstone
Qtz	Quartz
Qtzite	Metamorphic quartzite (economic basement)
Gran	Granule (size of terrig clast)
Pyr	Pyrite
Dissem	Disseminated
Cht	Chert
Chal	Chalcedony
Bry	Bryozoan
Echin	Echinoderm
Pelecy	Pelecypod (bivalve)
Spic	Sponge spicules
Fines	Vfg, almost unrecognizable fragments of common skeletal grains
Donz	Donezella: a filament algae; look like microscopic "ladders"
Xln	Crystalline
Microxln	Microcrystalline
Xstal	Crystal
Styls	Stylolites
Anhy	Anhydrite
Nod	Nodule
Aliz. Red	Alizarin red stain for calcite
Lamin	Laminated or laminations
Terrig	Terrigenous
Spar	Calcite spar cement
Frac	Micro-fracture
FC	Calcite-filled fracture
FO	Open or partially open fracture
P & P	Porosity & permeability
Cmt	Cement
Pel	Peloid or peloidal
Dissol	Dissolution
Punky	V. porous and weakly cemented (can crumble core in your hands!)
T.S.	Thin section
Orig	Original

Description of ARCO Sag River St. No. 1 (50029200020000) Thin Sections (from Alaska State Geological Materials Center):

Wahoo Zone 1 (Core Depths: 9914 – 10,014' MD)

9918' Dolo bry-echin-, some pelecy MRP; 60% dolo w/ abt calcite spar; no visible porosity.

9926' Bry-echin-foram-spic lime G w/ occ. pelecy; some euhedral, lg dolo x-stals; ang-subang qtz silt-vfg sand; no porosity.

9927' Bry-echin-,occ. pelecy, v. well-cmtd lime G; tr chert in echin plates, no porosity.

9935' Coated gr. & ooid vf-fg lime G; grain cores of: bry-echin-pelecy & occ. peloids; several FC's; no porosity.

9950' Compacted peloid lime G w/ some vcg bry & echin frags. (~mdst in visual texture); minor chert/clay in fracs. tr qtz silt, rare lg ooids; no porosity.

9954' Oolite with coated grains, m-cg lime G; loosely compacted before early spar cmt; foram centers are common; no porosity.

9965' Coated grain lime G (with occ. true ooids) lime G; f-mg, no porosity.

9976' Coated grain & ooids lime G; f-mg with/ some cg**;** no lime mud but not well sorted; minor lg euhedral dolo rhombs, no porosity.

9985' Well-compacted, pelecy-foram-bry-echin-spics (vf-fg) lime G, poss. minor Donezella; also some coated grains with v. thin mud coats; no porosity.

9994' V. sandy lime G to calc qtz ss.; contains calcite spar, bry, echin, vf peloids; 40% qtz (poss. some clay too); no porosity.

10,005' Coated gr. lime G w/ some true ooids; (grain cores: bry-echin-foram-pelecy); 3-5% dolo along styls; no porosity.

10,013' Coated grain, f-mg lime G, common cg w/ occ. intraclast; 3-5% dolo & qtz silt along styls; FC's; common spar cmt, chert replacement is lacking; no porosity.

Description of ARCO Sag River St. No. 1 (50029200020000) Thin Sections (from Alaska State Geologial Materials Center):

Wahoo Zone 7 (Core Depths: 9222-9353' (131' MD)

9220-30' Oncolite (Osagia-encrusted grains with bryo-echin cores) lime grst; most rims are lime mud with some chert rims and minimal dolimite; common pyrite (finely disseminated), no porosity (2 photos).

9230-40' Silty (quartz), pyritic shale with dehydration cracks; badly plucked thin section (1 photo under crossed-nicols).

9240-50' Oncolite (Osagia) lime grst to MLP (mud-lean pkst) with chert/clay filling in early rim moldic porosity; most rims are lime mud; some bryo-echin are not algal encrusted; minor dolo, common pyrite, no porosity.

9255' (A6302 T.S.) Silty (quartz), compacted dolomite mdst with some coarser X-stals (dolomite overgrowths) and finely disseminated pyrite; no significant vug development; fairly tight.

9255' (TS2) Silty, compacted dolomite, a/a; HL fractures described in core (wellsite notes); stylolite with oil staining and quartz concentration; pyritic with some coarse crystalline dolo overgrowths, fairly tight.

9265' Dolo bryo-echin-pelecy (some coated with dolo rims) MRP (mud-rich pkst); 20-30% dolo.; some oncolites (partially dolomitized). Dolomitization is incomplete w/o obvious later moldic porosity enhancement; poor porosity.

9280' Dolomitized oncolite grst/pkst (see oncolite fabric "ghosts"); 5% calcite spar and spar in fracture; both fine and coarse-xlline dolo; well-compacted, appears to be very thin bed based on core descriptions.

9283' Dolo bryo-echin, (some mud coated grains) MLP; 10-20% dolo (fine & coarse), some dolo encrusted grains; calcite-filled micro-fracs, poor porosity.

9291' Sli. dolo oncolite & bryo-echin-pelecy lime MLP; 10-15% dolo; most encrusted rims are lime mud with limited early moldic porosity filled with mobile chert/clay; poor porosity; 2-3% internal local (sedimentary?) dip reported in ARCO core description.

9310' Oncolite with some mud-coated bryo-echin-pelecy; ~5% dolo; most rims are lime mud with some chert/clay filled early moldic porosity; finely dissem pyr; no porosity; very early (pre-compaction) calcite cmt.

9325' Peloid-spic-foram lime grst; tr chert; series of discontinuous calcite-filled micro-fracs (tension gashes (?)); no porosity.

9335' Dolo cg bry-echin-pelecy MRP; 40% dolo, fine & coarse xlline; no significant chert; no obvious porosity enhancement, poor porosity in T.S.; oil stained in core.

9350' Chert-replaced grst (original fabric probably oncolite-bryo-echin); contact with dolo lime grst near edge of T.S.. Photo taken under crossed-nicols to show texture.

Wahoo Zone 6:

9360' Spiculitic dolo wkst with peloid "ghosts"; common fine pyrite & qtz silt; interxlline porosity only, no vugs.

9365' Oncolite (Osagia?) grst; no dolo; all encrusted-grains; some chert filling in early moldic porosity in algal rims; lime mud dominates rims; no porosity.

9378' Peloid (with spar cmt) & compacted peloid grst with some coated grains; calcite-filled fracs, no porosity.

Description of ARCO W. Mikkelsen St. No. 1 (50029202780000) Thin Sections (from Alaska State Geological Materials Center):

Comments on Echooka Slides (overlies Wahoo section):

11,242' Echooka Ss.- tight, common organics w/contorted lamins.

11,252' Echooka Ss.- tight w/ cg-granule-size qtzite. grains.

11,254' Echooka Ss.- a/a, with granule-size qtzite. Clasts (w/ strain lamellae), argillite and spic chert clasts.

11,296' Echooka Ss.- w/ lg shell fragment (pelecy?) and organic lamins.

11,300' Echooka Ss.- silty (qtz) shale.

11,302' Echooka Ss.- tight w/ pyr and tar (opaque).

11,304' Echooka Ss.- a/a, w/ minor calcite spar cmt. and occ. echin. Grains near top of Wahoo (1st photo).

Top of Wahoo/Pre-Echooka Unconformity

11,305' Lime MRP (cg-vcg)- algal-encrusted grains (bry-echin-pelecy cored); chert/clay in rims; no dolo; chert replacement of echin. plate cores; minor qtzite grains (several fused grain clasts); stained.

11,305' Lime MRP- vcg bry, also echin & pelecy; no dolo; chert in echin plate; FC w/ tar in vugs (partially open); styls. w/ pyr & tar, no stain.

11,306' Lime MRP (cg-vcg)- bry w/ minor echin & pelecy; no dolo;; some chert/cly-filled rims; silty; stained.

11,306' Lime W w/ vcg bry frond; chert converted to qtz in bry zooecia; 2% qtz silt; some poss. silicified algal lamins; no stain..

11,307' Peloid lime G- vfg-fg w/ bry-echin-pelecy "fines"; minor chert; 5% qtz silt; no dolo; stained.

11,307' 95% Chert nodule w/ spicules; contact with peloidal G, a/a; no stain.

11,310' Peloidal MRP- spic w/ bry-echin-pelecy fines, occ. forams; no dolo; stained.

11,310' Broken chert nodule only; all chert except ~5% corroded dolo along former styls.; no stain.

ARCO W. Mikkelsen St. No. 1 (cont.):

11,312' Chert nodule (60%) & mixed peloidal G/MRP with peloidal intraclasts; lg FC; stained but did not hold (spotty).

11,313' Peloidal G w/ bry-echin fines-forams-spic (well-indurated); FC; no stain.

11,315' Peloidal-spic-foram G; no dolo.; minor chert along styls.; no porosity, spotty stain.

11,315' (T.S. 2) Peloidal-spic-foram, poss. Donezella w/ bry-echin-pelecy fines; lg FC; no porosity, unstained.

11,317' Peloidal MRP w/ some bry-echin-pelecy fines & spics-forams; HL fracs: partially open w/ tar; no porosity, no stain.

11,317' (T.S. 2) Dolo M-W- vf xln, fairly tight w/ few vugs; 5% qtz silt; chert-clay in small fracs.; poor stain.

11,317' (T.S. 3) Peloidal mixed G inc. spic-forams-bry-echin-pelecy fines (vf-fg); FC's; bad stain job.

11,344' Qtz-chalcedony w/ sharp facets (after anhydrite?) in vf xln dolo matrix (tight but oil-stained); 20% dolo, 80% qtz-chal. (A-14689); no stain.

11,350' Dolo W-M- 10% qtz silt; micro-vugs w/ good interxln porosity; lg FC; no stain.

11,352' Tight dolo M w/some peloids; ~15% qtz silt; interxln porosity w/ trace of micro-vugs only, stained.

11,356' Spic dolo W with radial chert-chalcedony (like Alapah anhy. pseudomorph examples) ; qtzite. clast; 15% qtz/chal.; some tar in spic vugs; silty; good porosity, no stain.

11,359' Spic vf xln dolo W w/ elongate vugs; common pyr; 1% qtz silt; good porosity; no stain.

11,362' V. spic vf xln dolo W; spics filled w/ chert/chalcedony; chert stained maroon (oil or dye?) ; HL FO; interxln porosity, vugs are mostly filled.

11,365' Dolo W- both open & spar-filled vugs; fine pyr; locally good porosity, no stain.

11,367' Dolo W- spic, a/a w/ chert/qtz in vugs & open vugs, some with tar; 7% qtz vfg sand-silt; good porosity; no stain.

ARCO W. Mikkelsen St. No. 1 (cont.):

11,370' Dolo W- vugs are open & calcite-filled; both FO & FC; poorly stained, good porosity locally.

11,372' Dolo W- with bry-echin-pelecy skel grains; <1% qtz silt, tight; no red stain.

11,373' Tight spic, argil dolo W- w/ chal & calcite-spar in vugs (replacement minerals); interesting chalcedony spicular xstals between 2 styls; no open vugs (poor porosity); 1% qtz silt, no stain (Alizarin red)).

11,377' Tight, vf xln argil dolo M; v lg chalcedony nodule w/ calcite spar core (similar to Alapah Zone C descrips.: possible anhydrite pseudomorph?); laminae containing pyr & organic matter bend around chal. nod.; 2% qtz silt; not stained.

11,380' Dolo M-occ. W- vf xln, argil w/ tar & pyr in lamins., a/a; 1-2% qtz silt; minor spic vugs filled w/ chert-qtz; poor porosity, no stain.

11,382' Dolo M-occ. W- vf xln, argil w/ open styls; ~2% qtz silt; oil-stained but tight; no Aliz. red stain.

11,384' Bry-echin-pelecy, cg G; common styls; also lg forams & mud/peloid intraclasts; FC's (contorted from later compaction); tr chert in echin plates; no red stain.

11,384' (T.S. 2) Bry-echin-pelecy G- ; well-compacted & cmtd (tight); styls w/ tar & pyr; vcg detrital vcg chert clast; no red stain.

11,385' Bry-echin G to MLP- cg; some chalcedony; 5% chert (within grains); some lg peloids, intraclasts & pelecys.; no dolo; 2% ang-subang qtz (f-mg); no porosity; no red stain.

11,385' (T.S. 2) Bry-echin G, a/a- mg-vcg, more in mg-cg; some peloids (lg & small); 5% ang qtz (detrital) & 5% chert; tight, red stained but did not take well.

11,386' Dolo M- argil, silty, vf xln; 5% qtz silt; chert replaced spics; FC's & FO's w/ tar infilling; tight; no red stain.

11,386' (T.S. 2) Peloid-spic-echin-bry MRP- some lime mud intraclasts; cse xln corroded dolo (40%); cg qtz clasts & fg qtz sand; chert-cly and lime mud; tight; spotty red stain.

11,389' Bry-echin-pelecy G- fg, mostly chertified (70%); 10% f-mg qtz silt; red stain is poor quality; no porosity.

11,391' Dolo W- v. spic; dolo xstals are extremely vf xln; spics replaced by chert (25%); 2-3% qtz silt; FC's; tight w/ red stain.

ARCO W. Mikkelsen St. No. 1 (cont.):

11,394' Dolo W-M- fine xln; spic, argil, peloidal; chert and spar fill vugs (none open); poor porosity; no red stain.

11,397' Dolo M- extremely fine xln; 1-2% qtz silt; terrig. clay lamins & micro-drapes; tr qtz silt; poor porosity but oil-stained; no red stain.

11,400' Dolo M- lg chalcedony cluster (radial extinction) with calcite spar in center (~30% chal nods, surrounded by styls.: poss. zone of anhy. collapse?); 5% qtz silt; HL FC's; poor porosity; no red stain..

11,401' Silty lime W-M- pyritic, 20% qtz vfg sand-silt; chert-replaced spics; some dolo xstals throughout; some skel grains; argil; tight; no red stain.

11,403' V. Spic (chert-replaced) Lime MRP- 2-3% qtz silt; one lg dolo rhomb appears to be replaced by chert; no porosity & no red stain.

11,403' (T.S. 2) V.Spic (chert replaced) MRP-W; 40% chert (all spic replaced; rest lime mud; no porosity; red stain for calcite.

11,405' Shale- v. pyr (some replaces spics); ~15% qtz silt to mg; nonpay; no red stain.

11,405' (T.S. 2) (A-14711) Shale- w/ 15% qtz silt; occ. lg dolo rhombs; pyritic & siliceous.

11,585' Dolo M- extremely vf xln, argil. with lg. FC's; 5% qtz silt-vfg sand; tight; no red stain.

11,588' Dolo M w/ wavy lamins.- fine xln & cse xln in voids parallel to lamins.; algal (?) or just soft sediment deformation; no porosity; no red stain.

11,590' Dolo M (laminated); 1% qtz; tight, no red stain on T.S.

11,591' Dolo M, a/a- ~1% qtz silt (oil stained); fairly tight, no red stain.

11,592' Dolo M, a/a- ~2% qtz silt (oil stain); fairly tight, no red stain.

11,595' Dolo M, a/a- some lg, spar-filled vugs; HL open frac; some microvugs; 1% qtz silt; sli. improved porosity; no red stain on T.S.

11,597' Collapse feature: mostly clastics with shale, tar, chert nods and terrig. clasts, pyrite (turbulent sample!); nonpay; no red stain.

11,599' Dolo W w/ darker lime mud clasts; 2% qtz silt; some chert-replaced spics; poor porosity, silicified dolo; no red stain.

ARCO W. Mikkelsen St. No. 1 (cont.):

11,602' Dolo M, a/a; vf xln with 2% qtz silt; finely dissem. pyr; poor porosity, no red stain.

11,605' Dolo M- freq. shaly lamins. filled w/ HO/tar; vf xln; 1% qtz silt; common lime mud (often rounded peloids) clasts; poor porosity; no red stain.

11,608' Dolo M- vf xln; 1-2% qtz silt; occ spics (chert-replaced); micro-fracs filled with chert; poor porosity; no red stain.

11,612' Dolo M- v. silty-sandy layer, occ. argillite grains; common bry fines (15-20% qtz silt-vfg sand); calcite-filled fracs (intersecting); poor porosity, no red stain.

11,615' Chert- 1-2% qtz silt in contact with silicified dolo MRP-W (spiculitic); no porosity, no red stain.

11,617' Spic Dolo W- silicified w/ chert replaced spics; ~20% chert (all spics) & 10% qtz silt to vfg sand; poor porosity, Aliz. red stain.

11,620' Dolo M to occ. spic dolo W- 10% qtz silt; poor porosity, no stain.

Note: All the dolo W/M samples in this series are well-compacted w/ rare vuggy porosity, usually limited interxln porosity.

11,625' Lime M - vf xln dolo) with soft sediment deformation preserved in cse. dolomite M matrix; ~3-5% qtz silt; poor porosity; no red stain.

11,627' Dolomite M- peloid (lg) ghosts of fg dol; both fg & cg dolo; ~10% qtz silt; fairly tight; no red stain.

11,631' Dolo MRP- silicified, chert in fracs; 3% qtz silt; ~30% chert encasing lg. dolo. X-stals; common spic & bry inc v. lg. fronds; poor porosity; no red stain.

11,681' Dolo M, occ. dolo W (Core 6: 50' MD gap between cores)- common oil/tar-stained clay wisps; silty (silt-fg-mg qtz); no vugs; 10-15% qtz; common chert-replaced spics; poor porosity; no red stain.

11,684' Dolo M- silty (20% qtz silt-vfg sand) w/ occ argil. grains; tarry shale wisps along lamins.; poor porosity; no red stain.

11,687' Dolo M- silty, a/a except f-lmg qtz; poor porosity; no red stain.

11,690' Dolo W- extremely fg dolo w/ spic vugs & good oil stain; ~10% ang. qtz silt w/ finely dissem pyr; good vuggy/moldic porosity; no red stain.

ARCO W. Mikkelsen St. No. 1 (cont.):

11,693' Dolo W- silicified w/ abt detrital qtz & detrital chert; also chert-replaced spics; 15% chert spics; 30% qtz sand (fg-mg); poor porosity; no red stain.

11,695' (no thin section in collection)

11,697' Dolo M- fine xln w/ argil wispy lamins. coated w/ HO/tar; 1% silt; occ vugs; some open HL fracs; poor porosity; no red stain.

11,699' Dolo W- fine xln w/ common vugs; 1-2% qtz; oil-stained; good vuggy/moldic porosity; no red stain.

11,701' Dolo W- fine xln; compacted but oil-stained w/ abt spic vugs/molds; good matrix P & P; spics are both open molds and chert-replaced; tr qtz silt-sand only; no red stain.

11,704' (Bad T.S. with many air bubbles.) Dolo M-W, a/a but with fewer vugs; tr qtz only; fair porosity, good where vuggy; no red stain.

11,707' Dolo M-W, a/a- common vugs in patches=better P & P; tr qtz only.

11,708' Dolo W- med. xln; abt vugs/molds from spics; occ. spar-filled (largest) vugs; tr qtz only; good P & P; no red (Alizarin) staining.

11,710' Dolo W- a/a, local patches of micro-vugs; decrease in P & P from 11,708' T.S.; no red stain.

11,715' Dolo M-W- a/a, w/ microvugs; some spic molds; tr qtz detrital grains (silt); common finely dissem pyr; fair to good porosity; no red stain.

11,716' Dolo M-W- occ vugs only (rare); FO (partly filled); tr qtz; no red stain.

11,719' Dolo M-W- vf xln w/ tarry styls w/ clay; spics in patches; dolo is silicified (cherty); all spics are chert-replaced; poor porosity; no red stain.

11,722' Dolo M-W- vf-f xln w/ some wispy clay lamins.; finely dissem. pyr; ~1% qtz; no open vugs, poor porosity; no red stain.

11,725' Dolo M-W- spic; highly burrowed; <1% qtz; tar stained clay wisps; silicified (chert); poor porosity; no red stain.

11,728' Dolo MRP- bry-echin-no obvious pelecys; 75% vf xln dolo; 25 % calcite; 1-2% qtz; **spotty red stain**; poor porosity.

11,728' Dolo MRP to W (patches of both)- a/a, in both sples echins are rounded & abraded from transport; poor porosity; no red stain.

ARCO W. Mikkelsen St. No. 1 (cont.):

11,729 (A-14749)' Dolo M- vf xln, argil, pyritic w/ shale wisps; silicified (chert in vugs); spicular pyr (abt); no open vugs; 2-3% qtz; poor porosity; no red stain.

11,729' Dolo M- a/a, duplicate T.S.; not stained (base of Core 6).

Another set of thin sections from ARCO W. Mikkel. No. 1 (no Alizarin red stain on any ot these):

11,307' Lime W- with cg-vcg bry-echin skel. grains along with bry-echin fines too; not well-sorted (poor); 2-3% qtz; tight.

11,317' Lime W- v. spic (all chert replaced); FC; series of chert-filled vugs aligned horiz: beach bubbles? EOD significant?; tight.

11,350' Vuggy dolo W-M- silty (3% qtz); great porosity; poss some grain plucking**.**

11,353' Vuggy dolo W-M- some spar in vugs; good porosity; 5-7% qtz silt; orig. fabric: peloidal w/ spics.; poss. some grain plucking.

11,357' Vuggy dolo W-M- burrowed-peloidal "ghosts"; 1% qtz; common vugs; good porosity.

11,360' Dolo W-M- increase in xstal size from above; mini-vugs only; common styls. w/ detrital qtz & pyr along contact; 2% qtz overall; some spar in vugs; fair to good porosity due to decrease in larger vugs.

11,364' Chert- orig. peloid-spic G-P (evidence of orig. fabric); ~1% qtz; nonpay, photo under X-Nicols.

11,367' Dolo W w/ abt vugs- minor calcite spar in some vugs; good expl. of dissol. of calcite in micro-fracs.; tr qtz; great porosity.

11,369' Dolo W-M w/ vugs- vf xln; some calcite spar-filled; a/a, 1% qtz silt; some plucking of grain, hard to assess % plucked in prep.; great porosity.

11,386' Calcite spar cmt.- probably from frac. or large vug/cavity; minor (late) chert-filled micro-vugs, no porosity; stained with Aliz. red.

11,393' Spic dolo W- FC; abt vugs/molds (often from spics); 1-2% qtz; one dissol. microfrac; vf xln.; great P & P.

11,394' Dolo spic W- a/a; ~2% qtz ; vf xln; great P & P.

ARCO W. Mikkelsen St. No. 1 (cont.):

11,399' Dolo W-M- some micro FO (from calcite dissol.); other FC followed by later chert in frac fill vugs; 3% qtz overall (concentrated in styls.); vuggy in some layers; some spic molds; vf xln.; finely dissem pyr; vuggy, good porosity.

11,594' Dolo M- vf xln; open micro-frac/vertical styl. FO; tr qtz silt; ; abt air bubbles in T.S. glue; fair porosity, no vugs.

11,610' Dolo M- no vugs; <1% qtz; oil-stained; just interxln (fair) porosity.

11,618' Dolo M-W m-c xln; silty; 3-5% qtz; some vugs, many spar-filled; peloid "ghosts", some burrows; spics replaced by chert; oil-stained; fair porosity (interxln).

11,622' (Poor thin section (T.S.) with v. thin spots); Dolo M-W- vf xln; 1 open frac; spic vugs/molds=both open and chert-filled; M & W lamins; oil-stained; good P & P.

11,628' Dolo M- m-c xln; ~5% qtz silt-vfg sand; no vugs; fair porosity, oil-stained.

11,685' No rock material on glass slide: all ground away during prep.

11,690' Dolo W- vf xln; spic open vugs/molds; 3-5% qtz silt/sand; good porosity.

11,692' Dolo W- spic, a/a; vf xln; 2-3% qtz (less qtz than 11,690' sple); vuggy, good porosity.

11,693' Dolo W- silty & spic; spics are chert-replaced; 3-5% qtz; mostly open vugs, some chert-filled, v. good porosity.

11,700' Dolo spic W- vf-f xln; spic vugs (some chert –replaced); most are open; great P & P.

11,704' Dolo W- med xln; spic; abt vugs (good porosity), some filled w/ chert (most are open).

11,706' Dolo W- spic, very vuggy ("punky" texture); med xln; tr qtz only; great P & P.

11,707' Dolo W- med-cse xln; v. vuggy (great P & P); tr qtz silt. Note: T.S. is uneven, too thin in middle and too thick on ends.

11,708' Dolo W- most f-m xln, occ cse xln; spic, very vuggy, great P & P; tr qtz only.

11,712' Dolo W- spic (distorted molds/vugs during compaction); abt vugs, great P & P; f-m xln, occ. cse. xln; tr qtz only.

ARCO W. Mikkelsen St. No. 1 (cont.):

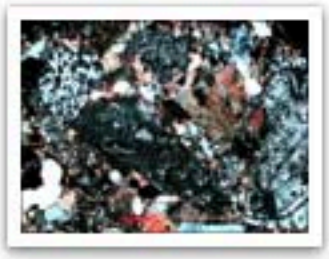
Key for Abbreviations:

G	Grainstone
MLP	Mud-lean packstone
MRP	Mud-rich packstone
W	Wackestone
M	Mudstone
Ss.	Sandstone
Qtz	Quartz
Qtzite	Metamorphic quartzite (economic basement)
Gran	Granule (size of terrig clast)
Pyr	Pyrite
Dissem	Disseminated
Cht	Chert
Chal	Chalcedony
Bry	Bryozoan
Echin	Echinoderm
Pelecy	Pelecypod (bivalve)
Spic	Sponge spicules
Fines	Vfg, almost unrecognizable fragments of common skeletal grains
Donz	Donezella: a filament algae; look like microscopic "ladders"
Xln	Crystalline
Microxln	Microcrystalline
Xstal	Crystal
Styls	Stylolites
Anhy	Anhydrite
Nod	Nodule
Aliz. Red	Alizarin red stain for calcite
Lamin	Laminated or laminations
Terrig	Terrigenous
Spar	Calcite spar cement
Frac	Micro-fracture
FC	Calcite-filled fracture
FO	Open or partially open fracture
P & P	Porosity & permeability
Cmt	Cement
Pel	Peloid or peloidal
Dissol	Dissolution
Punky	V. porous and weakly cemented (can crumble core in your hands!)
T.S.	Thin section
Orig	Original

1_Mobil MIKKEL-01
11,752-53...te 2.5X.jpg

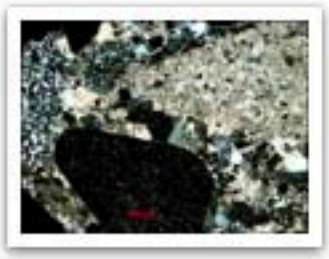
2_Mobil MIKKEL-01
11,752-53...ls) 2.5X.jpg

3_Mobil MIKKEL-01
11,752-53...ls) 2.5X.jpg

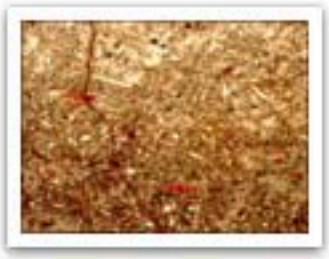


4_Mobil MIKKEL-01
11,752-53...ols) 5X.jpg

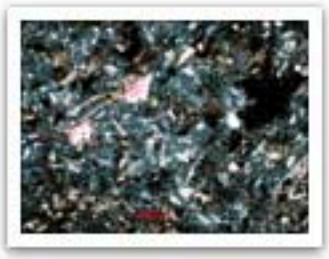
5_Mobil MIKKEL-01
11,752-53...ls) 2.5X.jpg



6_Mobil MIKKEL-01
11,752-53...ls) 2.5X.jpg



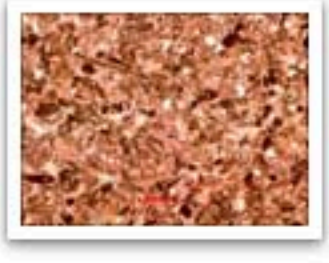
7_Mobil MIKKEL-01
11,752-53...hert 5X.jpg



8_Mobil MIKKEL-01
11,753-54...Nicols).jpg

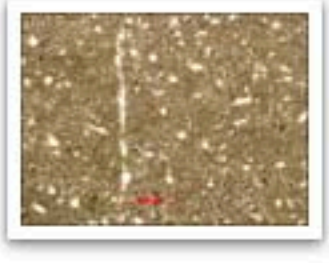
9_Mobil MIKKEL-01
11,754-55...ins) 5X.jpg

10_Mobil MIKKEL-01
11,766-67...LP 2.5X.jpg



11_Mobil MIKKEL-01
11,780-81...fg G 5X.jpg

12_Mobil MIKKEL-01
11,794-95...ic G 5X.jpg



13_Mobil MIKKEL-01
11,969-70...Frac 5X.jpg

14_Mobil MIKKEL-01
11,991-92...in 2.5X.jpg

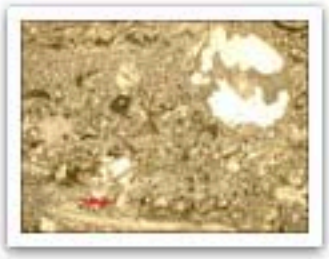
15_Mobil MIKKEL-01
11,998-99...-M 5X.jpg

16_Mobil MIKKEL-01
12,385-86...-W 5X.jpg

17_Mobil MIKKEL-01
12,393-94...RP 2.5X.jpg

18_Mobil MIKKEL-01
11,752-53...Nicols).jpg

19_Mobil MIKKEL-01
11,753-54...to W 5X.jpg

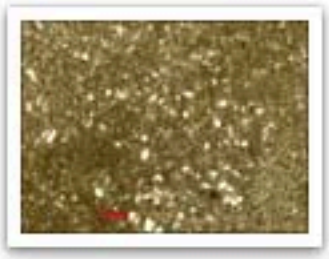


20_Mobil MIKKEL-01
11,754-55...l.) 2.5X.jpg

21_Mobil MIKKEL-01
11,766-67...LP 2.5X.jpg

22_Mobil MIKKEL-01
11,780-81...ic G 5X.jpg

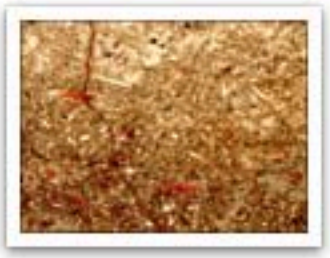
23_Mobil MIKKEL-01
11,794-95...ous 5X.jpg



24_Mobil MIKKEL-01
11,969-70...ggy) 5X.jpg

25_Mobil MIKKEL-01
11,991-92...ains 5X.jpg

6_Mobil MIKKEL-01
11,752-53...ls) 2.5X.jpg

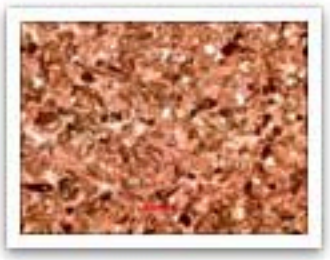


7_Mobil MIKKEL-01
11,752-53...hert 5X.jpg

8_Mobil MIKKEL-01
11,753-54...Nicols).jpg

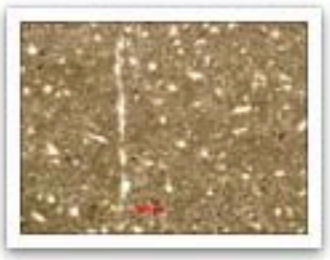
9_Mobil MIKKEL-01
11,754-55...ins) 5X.jpg

10_Mobil MIKKEL-01
11,766-67...LP 2.5X.jpg



11_Mobil MIKKEL-01
11,780-81...fg G 5X.jpg

12_Mobil MIKKEL-01
11,794-95...ic G 5X.jpg



13_Mobil MIKKEL-01
11,969-70...Frac 5X.jpg

14_Mobil MIKKEL-01
11,991-92...in 2.5X.jpg

15_Mobil MIKKEL-01
11,998-99...-M 5X.jpg

16_Mobil MIKKEL-01
12,385-86...-W 5X.jpg

17_Mobil MIKKEL-01
12,393-94...RP 2.5X.jpg

18_Mobil MIKKEL-01
11,752-53...Nicols).jpg

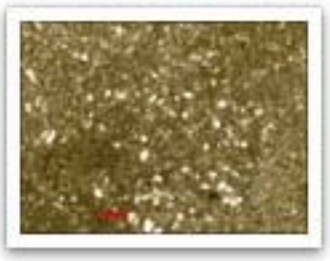
19_Mobil MIKKEL-01
11,753-54...to W 5X.jpg

20_Mobil MIKKEL-01
11,754-55...l.) 2.5X.jpg

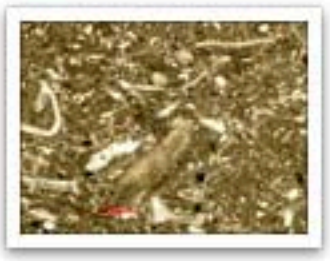
21_Mobil MIKKEL-01
11,766-67...LP 2.5X.jpg

22_Mobil MIKKEL-01
11,780-81...ic G 5X.jpg

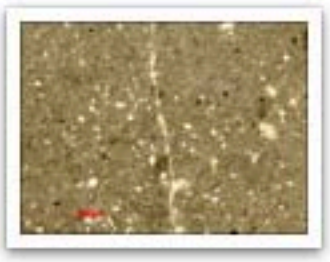
23_Mobil MIKKEL-01
11,794-95...ous 5X.jpg



24_Mobil MIKKEL-01
11,969-70...ggy) 5X.jpg

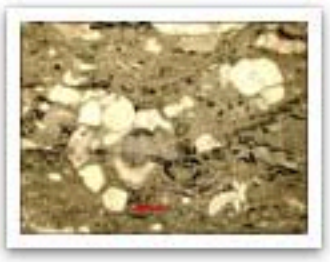


25_Mobil MIKKEL-01
11,991-92...ains 5X.jpg

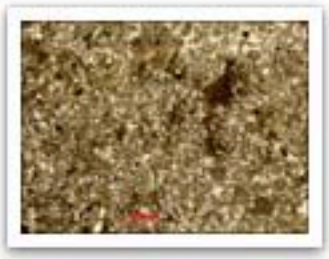


26_Mobil MIKKEL-01
11,998-99...FO 5X .jpg

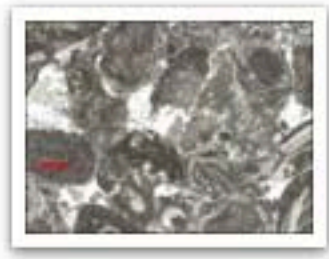
27_Mobil MIKKEL-01
12,385-86...-W 5X.jpg



28_Mobil MIKKEL-01
12,393-94...l.) 2.5X.jpg



1_SAGR-01 Z1 Core 21
9918' Bry-...) 5X.pg.jpg



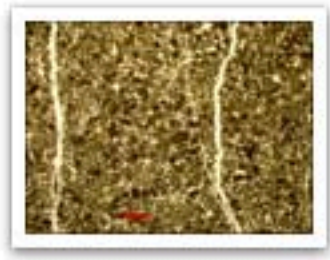
1_SAGR-01 Z7
9220-30'...Rims 5X.jpg

2_SAGR-01 Z1 Core 21
9926' Bry-...(fg) 5X.jpg

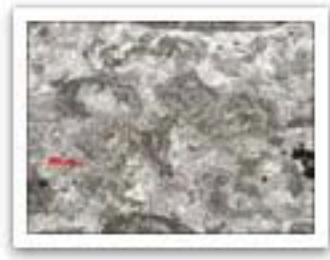
2_SAGR-01 Z7
9220-30'...icols)5X.jpg

3_SAGR-01 Z1 Core 21
9927' Bry-...(mg) 5X.jpg

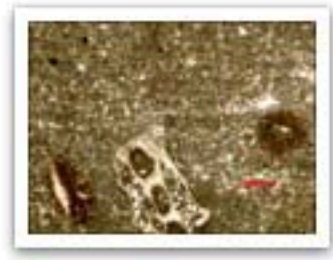
3_SAGR-01 Z7
9230-40'...icols) 5X.jpg



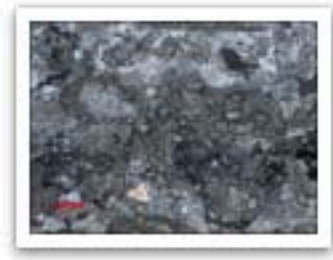
4_SAGR-01 Z1 Core 21
9935'Coat...fg) 2.5X.jpg



4_SAGR-01 Z7
9240-50'...Rims 5X.jpg



5_SAGR-01 Z1 Core 21
9950' Silty,...rags 5X.jpg

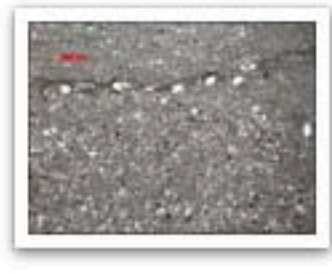


5_SAGR-01 Z7
9240-50'...icols) 5X.jpg

6_SAGR-01 Z1 Core 21
9954' Oolit...e G 5X.jpg

6_SAGR-01 Z7
9255' (A63...dst 5X.jpg

7_SAGR-01 Z1 Core 22
9965' Coat...e G 5X.jpg

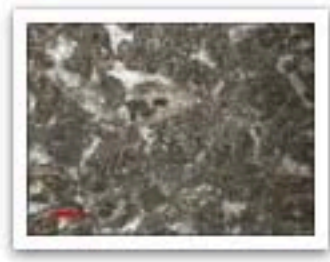


7_SAGR-01 Z7
9255' (TS2...Stylo 5X.jpg

8_SAGR-01 Z1 Core 22
9976' Coat...e G 5X.jpg

8_SAGR-01 Z7
9255' (TS2)...ols) 5X.jpg

9_SAGR-01 Z1 Core 22
9985' Well...e G 5X.jpg



9_SAGR-01 Z7 9265'
Dolo Bryo-...MRP 5X.jpg

10_SAGR-01 Z1 Core 22
9994' V. Sa...qtz) 5X.jpg

10_SAGR-01 Z7 9280'
Fine-Cse X...P-G 5X.jpg

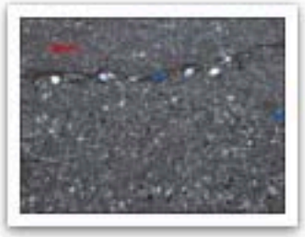
11_SAGR-01 Z1 Core 22
9994' V. Sa...Nicols).jpg

11_SAGR-01 Z7 9283'
Sli Dolo Bry...MLP 5X.jpg

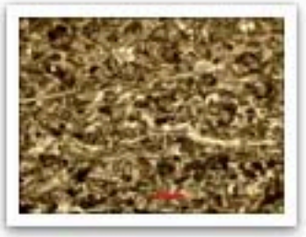
12_SAGR-01 Z1 Core 22
10,005' Co...olo) 5X.jpg

12_SAGR-01 Z7 9291'
Sli Dolo En...LP 2.5X.jpg

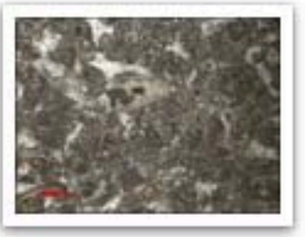
13_SAG-01 Z1 Core 22
10,013' Co...olo) 5X.jpg



8_SAGR-01 Z7
9255' (TS2)...ols) 5X.jpg



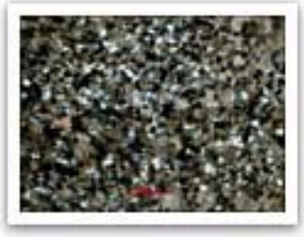
9_SAGR-01 Z1 Core 22
9985' Well...e G 5X.jpg



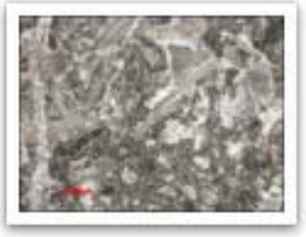
9_SAGR-01 Z7 9265'
Dolo Bryo-...MRP 5X.jpg

10_SAGR-01 Z1 Core 22
9994' V. Sa...qtz) 5X.jpg

10_SAGR-01 Z7 9280'
Fine-Cse X...P-G 5X.jpg



11_SAGR-01 Z1 Core 22
9994' V. Sa...Nicols).jpg

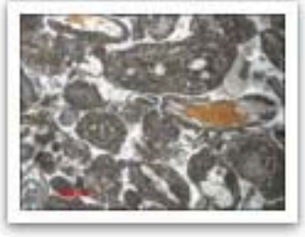


11_SAGR-01 Z7 9283'
Sli Dolo Bry...MLP 5X.jpg

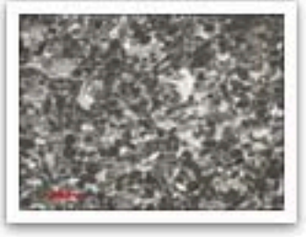
12_SAGR-01 Z1 Core 22
10,005' Co...olo) 5X.jpg

12_SAGR-01 Z7 9291'
Sli Dolo En...LP 2.5X.jpg

13_SAG-01 Z1 Core 22
10,013' Co...olo) 5X.jpg

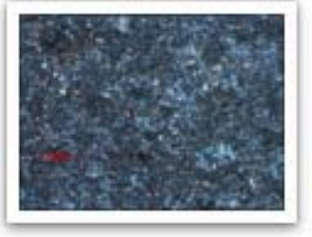


13_SAGR-01 Z7 9310'
Sli Dolo En...Grst 5X.jpg

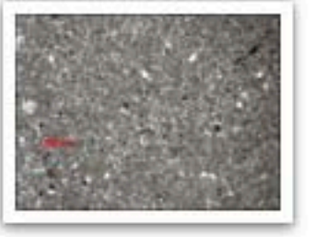


14_SAGR-01 Z7 9325'
Peloid-For...Grst 5X.jpg

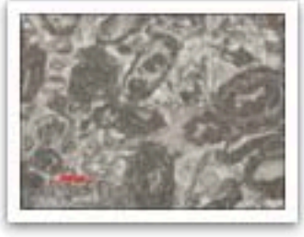
15_SAGR-01 Z7 9335'
40 % Dolo...MRP 5X.jpg



16_SAGR-01 Z7 9350'
Chert-Repl...ols) 5X.jpg



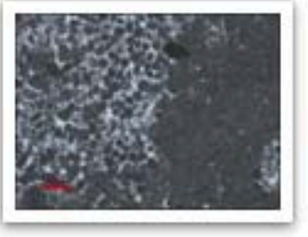
17_SAGR-01 Z6 9360'
Spic Dolo...hosts 5X.jpg



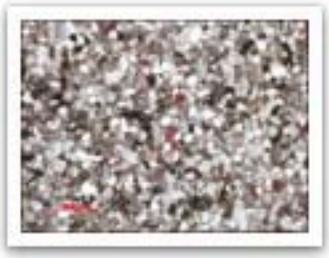
18_SAGR-01 Z6 9365'
Oncolite (O...Grst 5X.jpg

19_SAGR-01Z6 9365'
Oncolite (O...ols) 5X.jpg

20_SAGR-01 Z6 9378'
Peloid & C...rst 2.5X.jpg



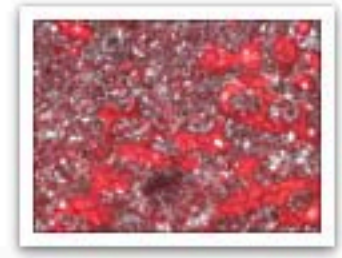
21_SAGR-01 Z6 9378'
Peloid, Coa...Grst 5X.jpg



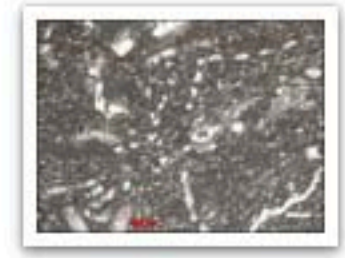
1_WMIKKEL-01 Core 2
11,304' Ec...ntact 5X.jpg

2_WMIKKEL-01 Core 2
11,305' Al...P 5Xjpg.jpg

3_WMIKKEL-01 Core 2
11,305' Br...in) 2.5X.jpg



4_WMIKKEL-01 Core 2
11,306' Sil...Grst. 5X.jpg



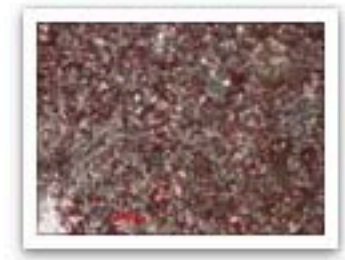
5_WMIKKEL-01 Core 2
11,306' Br...in) 2.5X.jpg

6_WMIKKEL-01 Core 2
11,307' Ch...Nicols) .jpg

7_WMIKKEL-01 Core 2
11,307' Mi...Grst. 5X.jpg

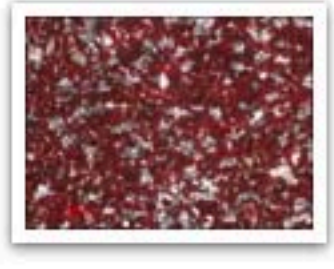
8_WMIKKEL-01 Core 3
11,310' Spi...tram ln.jpg

9_WMIKKEL-01 Core 3
11,310' Ch...tram ln.jpg



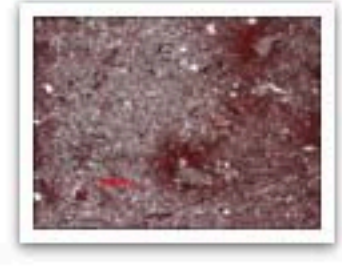
10_WMIKKEL-01 Core 3
11,312' Pel...tact 5X.jpg

11_WMIKKEL-01 Core 3
11,313' Spi...Nicols).jpg

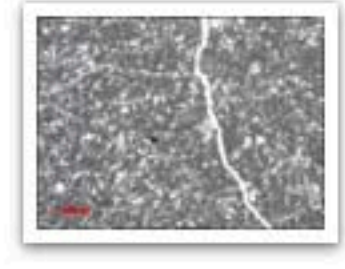


12_WMIKKEL-01 Core 3
11,315' Pel...d stain).jpg

13_WMIKKEL-01 Core 3
11,315' Pel...tram ln.jpg



14_WMIKKEL-01 Core 3
11,317' Do...xln 10X.jpg



15_WMIKKEL-01 Core 3
11,317' Li...no stain.jpg

16_WMIKKEL-01 Core 3
11,317' Pel...tained) .jpg

17_WMIKKEL-01 Core 4
11,344' Qt...plain lt.jpg

18_WMIKKEL-01 Core 4
11,344' An...Nicols) .jpg

19_WMIKKEL-01 Core 4
11,350' Do...pic.) 5X.jpg

20_WMIKKEL-01 Core 4
11,352' Silt.... M 5X.jpg

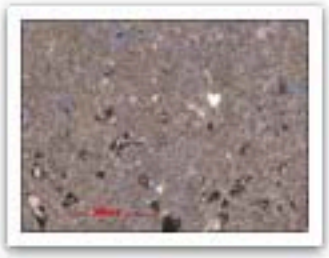
21_WMIKKEL-01 Core 4
11,356' Spi...Nicols).jpg

22_WMIKKEL-01 Core 4
11,356' Spi...Nicols).jpg

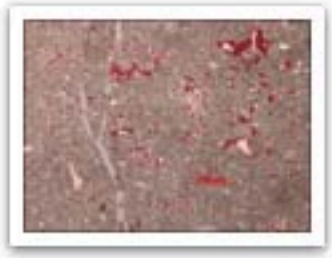
23_WMIKKEL-01 Core 4
11,359' Sp...lo W 5X.jpg

24_WMIKKEL-01 Core 4
11,362' Sp...ced) 5X.jpg

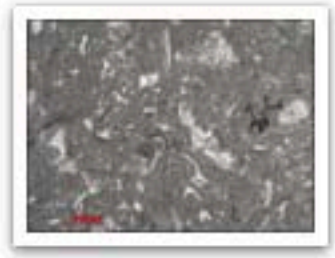
25_WMIKKEL-01 Core 4
11,365' Spl...ugs 5X.jpg



26_WMIKKEL-01 Core 4 11,367' Spi...gs 10X.jpg



27_WMIKKEL-01 Core 4 11,370' Sp...ugs 5X .jpg



28_WMIKKEL-01 Core 4 11,372 Dol...MRP 5X.jpg

29_WMIKKEL-01 Core 4 11,373' Do...Nicols).jpg

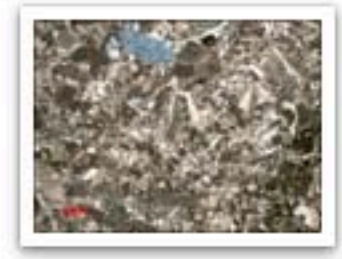
30_WMIKKEL-01 Core 4 11,373' Do...Nicols).jpg

31_WMIKKEL-01 Core 4 11,377' Do...Nicols).jpg

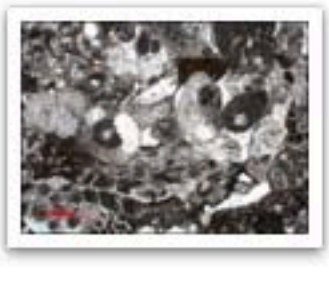
32_WMIKKEL-01 Core 4 11,380' Silt...M 5X .jpg

33_WMIKKEL-01 Core 4 11,382' Silt...o M 5X.jpg

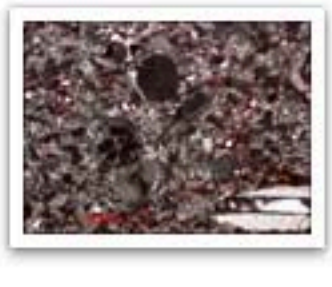
34_WMIKKEL-01 Core 4 11,384' Bry...) G 5X.jpg



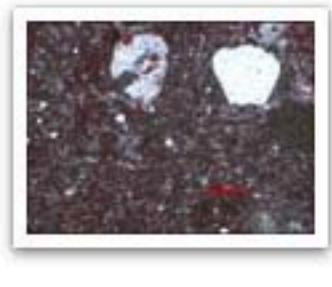
35_WMIKKEL-01 Core 4 11,384'(2)...-Nicols).jpg



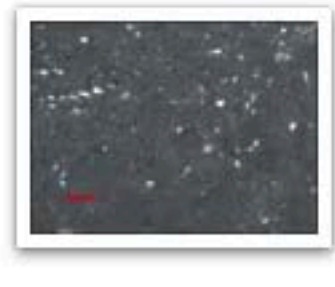
36-WMIKKEL-01 Core 4 11,385' Bry...id G 5X.jpg



37_WMIKKEL-01 Core 4 11,385' Bry...ed) 5X.jpg



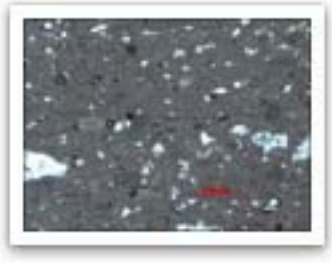
38_WMIKKEL-01 Core 4 11,386' Pel...ed) 5X.jpg



39_WMIKKEL-01 Core 4 11,386' Silt...o M 5X.jpg

40_WMIKKEL-01 Core 4 11,389' Br...tain) 5X.jpg

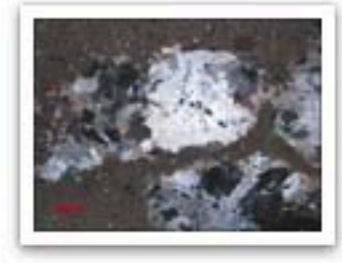
41_WMIKKEL-01 Core 4 11,391' VF...lo W 5X.jpg



42_WMIKKEL-01 Core 4 11,394' Fin...ugs 5X.jpg

43_WMIKKEL-01 Core 4 11,397' Bu...lo M 5X.jpg

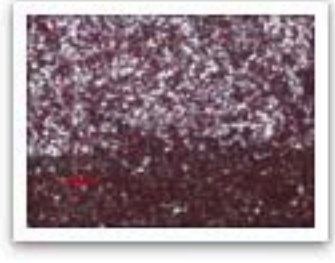
44_WMIKKEL-01 Core 4 11,400' Do...Nicols).jpg



45_WMIKKEL-01 Core 4 11,400' Do...Nicols).jpg

46_WMIKKEL-01 Core 4 11,401' Sil...W-M 5X.jpg

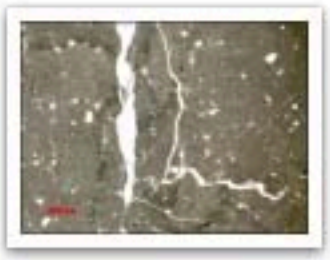
47_WMIKKEL-01 Core 4 11,403' Sp...MRP 5X.jpg



48_WMIKKEL-01 Core 4 11,403' V....P-W 5X.jpg

49_WMIKKEL-01 Core 4 11,405' Silt...light) .jpg

50_WMIKKEL-01 Core 4 11,405' Silt...Nicols).jpg



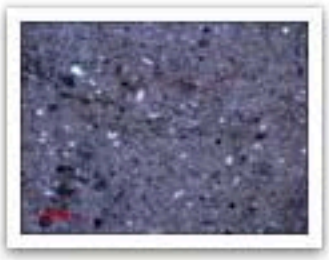
51_WMIKKEL-01 Core 5 11,585' Do...racs 5X.jpg

52_WMIKKEL-01 Core 5 11,588' Do...al) 2.5X.jpg

53_WMIKKEL-01 Core 5 11,590' Do...ins. 5X.jpg

54_WMIKKEL-01 Core 5 11,591' Do...ln) 10X.jpg

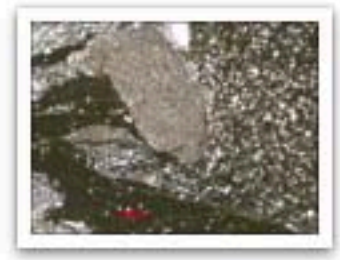
55_WMIKKEL-01 Core 5 11,592' Do...xln) 5X.jpg



56_WMIKKEL-01 Core 5 11,595' Do...oids 5X.jpg

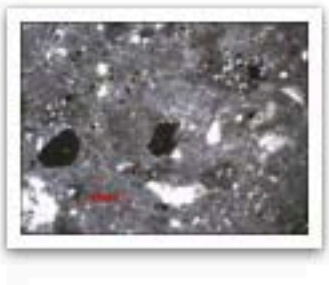
57_WMIKKEL-01 Core 5 11,597' Ch...Photo3).jpg

58_WMIKKEL-01 Core 5 11,597' Co...ls) 2.5X.jpg



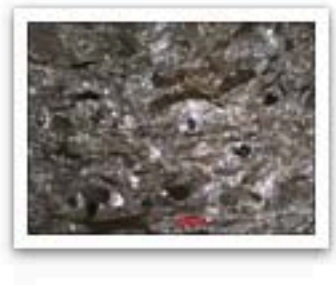
59_WMIKKEL-01 Core 5 11,597' Co...Photo4).jpg

60_WMIKKEL-01 Core 5 11,597' Co...Photo2).jpg

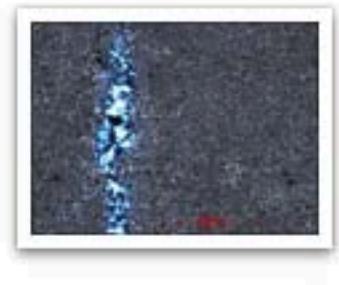


61_WMIKKEL-01 Core 5 11,599' Do...pics 5X.jpg

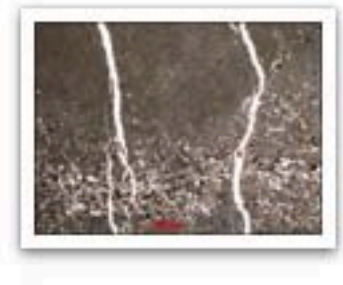
62_WMIKKEL-01 Core 5 11,602' Do...ln) 10X.jpg



63_WMIKKEL-01 Core 5 11,605' Do...ps 2.5X.jpg



64_WMIKKEL-1 Core 5 11,608' Do...Nicols).jpg



65_WMIKKEL-01 Core 5 11,612' Do...s. 2.5X.jpg

66_WMIKKEL-01 Core 5 11,615' Ch...Nicols).jpg

67_WMIKKEL-01 Core 5 11,617' Sp...lo W 5X.jpg

68_WMIKKEL-01 Core 5 11,620' Silt...ams 5X.jpg

69_WMIKKEL-01 Core 5 11,625' Silt...n 2.5X.jpg

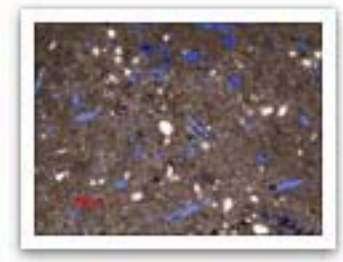
70_WMIKKEL-01 Core 5 11,627' Silt...o M 5X.jpg

71_WMIKKEL-01 Core 5 (base) 11,6...P-W 5X.jpg

72_WMIKKEL-01 Core 6 (top) 11,68...M 2.5X.jpg

73_WMIKKEL-01 Core 6 11,684' V..... M 2.5X.jpg

74_WMIKKEL-01 Core 6 11,687' V....ubbles).jpg



75_WMIKKEL-01 Core 6 11,690' Silt...6 W 5X.jpg

76_WMIKKEL-01 Core 6 11,693' V....-Nicols).jpg

77_WMIKKEL-01 Core 6 11,697' Do...ics) 5X.jpg

78_WMIKKEL-01 Core 6 11,699' Spi...gy) 5X.jpg

79_WMIKKEL-01 Core 6 11,701' Spi...y) 2.5X.jpg

80_WMIKKEL-01 Core 6 11,704' Do...ubbles).jpg

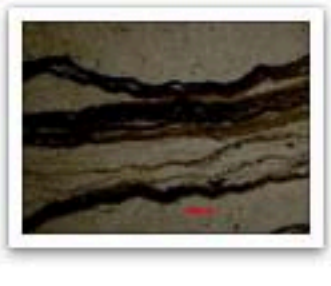
81_WMIKKEL-01 Core 6 11,707' Do...ugs) 5X.jpg

82_WMIKKEL-01 Core 6 11,708' Spi...gy) 5X.jpg

83_WMIKKEL-01 Core 6 11,710' Do...ugs) 5X.jpg

84_WMIKKEL-01 Core 6 11,715' Spi...ugs 5X.jpg

85_WMIKKEL-01 Core 6 11,716' Do...es 2.5X.jpg

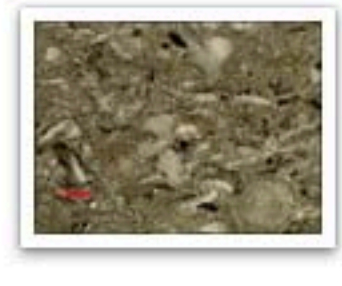


86_WMIKKEL-01 Core 6 11,719' Sp...ins. 5X.jpg

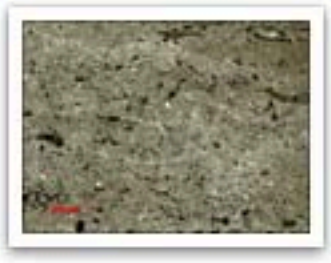
87_WMIKKEL-01 Core 6 11,722' Ex...ritic) 5X.jpg

88_WMIKKEL-01 Core 6 11,725' Do...ins. 5X.jpg

89_WMIKKEL-01 Core 6 11,728' Do...tained).jpg



90_WMIKKEL-01 Core 6 11,728' Do...ned) 5X.jpg

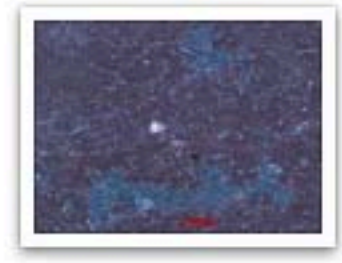


91_WMIKKEL-01 Core 6 11,729' Sp...lo W 5X.jpg

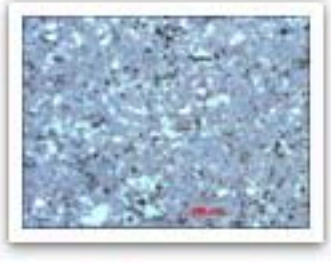
92_WMIKKEL-01 Core 6 11,729'(2)...W 2.5X.jpg

93_WMIKKEL-01 Core 2 (Set 2) 11,...ed) 2.5X.jpg

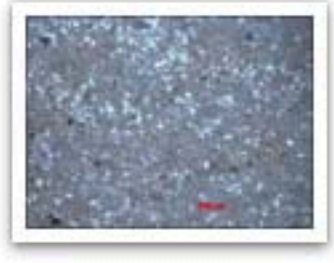
94_WMIKKEL-01 Core 3 (Set 2) 11,...e W 5X.jpg



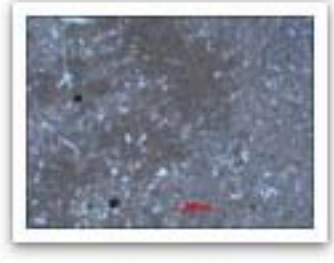
95_WMIKKEL-01 Core 3 (Set 2) 11,...-Nicols).jpg



96_WMIKKEL-01 Core 4 (Set 2) 11,...lo W 5X.jpg



97_WMIKKEL-01 Core 4 (Set 2) 11,...lo W 5X.jpg

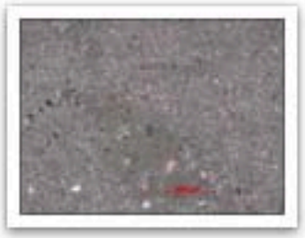


98_WMIKKEL-01 Core 4 (Set 2) 11,...f xln) 5X.jpg

99_WMIKKEL-01 Core 4 (Set 2) 11,...lites 5X.jpg

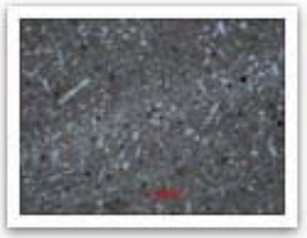
100_WMIKKEL-01 Core 4 (Set 2) 1...-Nicols).jpg

101_WMIKKEL-01 Core 4 (Set 2) 1...-M 2.5X.jpg



102_WMIKKEL-01 Core 4 (Set 2) 1...lled) 5X.jpg

103_WMIKKEL-01 Core 4 (Set 2) 1...taining).jpg



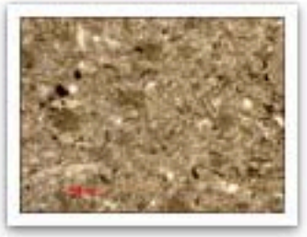
104_WMIKKEL-01 Core 4 (Set 2) 1...Frac 5X.jpg

105_WMIKKEL-01 Core 4 (Set 2) 1...Vugs 5X.jpg

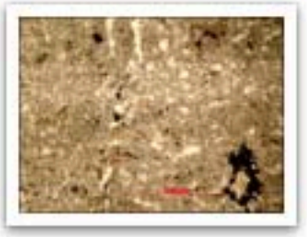
106_WMIKKEL-01 Core 4 (Set 2) 1...Sand 5X.jpg

107_WMIKKEL-01 Core 5 (Set 2) 1...-Nicols).jpg

108_WMIKKEL-01 Core 5 (Set 2) 1...rac 10X.jpg



109_WMIKKEL-01 Core 5 (Set 2) 1...xln) 5X.jpg



110_WMIKKEL-01 Core 5 (Set 2) 1...rac 10X.jpg

111_WMIKKEL-01 Core 5 (Set 2) 1...Vugs 5X.jpg

112_WMIKKEL-01 Core 6 (Set 2) 1...ggy) 5X.jpg

113_WMIKKEL-01 Core 6 (Set 2) 1...ggy) 5X.jpg

114_WMIKKEL-01 Core 6 (Set 2) 1...ggy) 5X.jpg

115_WMIKKEL-01 Core 6 (Set 2) 1...gy) 2.5X.jpg

116_WMIKKEL-01 Core 6 (Set 2) 1...5 5X.jpg

117_WMIKKEL-01 Core 6 (Set 2) 1...lo W 5X.jpg

118_WMIKKEL-01 Core 6 (Set 2) 1...too thin).jpg

119_WMIKKEL-01 Core 6 (Set 2) 1...oor T.S.).jpg

120_WMIKKEL-01 Core 6 (Set 2) 1...lo W 5X.jpg