Boyer, D. 2012, Thin Section Photomicrographs and Descriptions for the Ikpikpuk #1, Inigok #1, J.W. Dalton #1, and W.T. Foran wells

CD available upon request (107 photos, 75 MB)

Received February, 2012

All data reports may be downloaded free of charge from the [DGGS website](http://www.dggs.alaska.gov).
Description of Husky Ikkpikpuk No. 1 Thin Sections

11,380-390' (cuttings) Dolo., Sandy (qtz) Terrig. Mdst (at Echooka contact)- mixed clastics, possibly some lime mud mixed in; some blk (opaque) tar/pyr (Photo 1).

11,718' (Slide 1a, Dec. 1987) Bryo-Echin-Pelecy MLP to MRP- with vcg qtzite clast; cg-vcg grst; some lime mud-coated (Photo 2).

11,718' (Slide 1b-dup., Dec. 1987) as above, MLP to MRP- loosely compacted before abt spar cementation (bryo-echin-gastropod-some coated); lime mud between grains in small patches; longitudinal orientation of grains; some chert & qtz grains (Photo 3).

11,719' (IKP) Bry-Echin Lime G (cg-vcg)- occ. ooids (transported in)-pelecys-some coated grains, also forams & spiral gastropods; most mg-cg, some vcg; hairline, calcite-filled fracs (Photo 4).

11,723' (Slide #2, Dec. 1987) Foram-Spic (vfg-fg) G & Bryo-Echin Pelecy (cg-vcg) G-two facies along stylolitic contact with tar/pyr (opaques); tight, unstained; silt to vfg sand (qtz); minor chert in echn plates (Photo 5).

11,724' (IKP) Lime Bryo-Echin-Brach (vcg) MRP- w/ loose compaction; spar cmt is abt; unstained T.S.; some thin lime mud grain coats (Photo 6).

11,733' (Slide 3a, Dec. 1987)) Lime W to MRP- cg-vcg bry-echin w/ spar & chalcedony/authigenic qtz; common qtz silt-vfg sand; occ lg dolo x-stals (X-nicols-Photo 7).

11,733' (Slide 3b (dup.), Dec. 1987) Lime MRP-W- a/a, with fracture filled with calcite & chalcedony/qtz fill; bryo-echin w/ thin-shelled mollusks and spics; minor dolo (stained blue for Fe) (Photo 8).

12,746' (IKP) Ooid-Coated Gr. & Non-coated Lime G- inc. bryo-echin-forams, f-mg w/ minor qtz grains (silt-vfg sand); HL calcite-filled frac, no porosity (Photo 9).

12,749' (IKP) Lime G- vf-fg, coated with cores of: bryo-echin-forams-thin pelecys; occ ooids; styls. with tar/pyr (opaques) (Photo 10).

12,753' (IKP) Argill-Silicified Slst with Skel Lime Grains- silt-vfg, ang-subang qtz; vcg to granule sz bryo and echin elongate grains; well-laminated; silty mdst in part (Photo 11).

12,900-920' (cuttings) 2 Liths: Bryo-Echin-Ooid G & Silty, Argill Lime M- mix of carbonate and elastic facies; also inc. argil slst-vfg ss, peloidal lime G and lime M/W; some blue-stained Fe (dolo? cmt) or Fe-calcite? (see Photo 12).
13,780-800’ (cuttings) Bry-Echin G-MRP & Dolo M-W- many coated grains and minor ooids; some MRp (dolo mud); some chert and v. compact, vf xln dolo M-W; common qtz silt and dk brn oil staining (Photo 13).

14,420-440’ (cuttings) Bry-Echin MLP & Dolo W-MRP (silty)- (near base of Lisburne, prob. Alapah) approx. 20’ of dolo on logs; dolo has blue stain for Fe on logs; bry-echin dolo pkst contains chert w/ fine dolo x-stals and qtzite clast (Photo 14).

14,971.5’ (mislabeled as 12,971.5’) (IKP) Itkilyariak- Red, V. Argill Sltst to V. Silty Red Mdst.- minor calcite spar; some blk organic-tarry lamins; qtz is ang & silt-size; some fg spics (qtz-replaced); at least partly silicified (chert) (Photo 15).

14,975.5’ Itkil- Red Argill Ss to Sandy Terrig Mdst- w/organic dbris (blk); v. ang qtz & qtzite grains and clast; subro-rounded argil & chert clasts (Photo 16).

14,976.5’ (IKP) Itkil.- Dolo M- vf xln with possible collapse breccia; extremely fine xln (10X lens); abt qtz sand; tar-organics in styls between mud patches; cse xln calcite spar in vugs (lose red beds); “birdseye texture”?; (Photo 17).

14,977.5’ (IKP) Itkil.- Dolo. M & Ang Qtz Ss.- with possible collapse features; looks like dolo mud lumps, some with peloid or coated grains (rounded) relict texture; extremely fine xln dolomite; qtz/qtzite grains are mg-cg, ang-subang, some subro (w/ strain lamellae); also minor argil & chert grains; abt styls w/ dead oil/tar in dolo (Photo 18).

14,980’ Itkil.- (stained for calcite); loosely packed ang-suang qtz with minor argil and meta-chert before calcite cementation (high birefringence); some rounded bryo grains; some minor porosity (intergranular); fg-cg, poorly sorted (Photo 19).

14,983’ Itkil.- Red, Argill Qtz Ss. w/ Calcite & Clay Cmt.- most qtz is ang, also subang-subro; fg lamins and poorly sorted mg-vcg, ang patches) (Photo 20).

14,985.0’ Itkil.- Red Ss.- fg & cg interlamin; little to no clay; stained pink for calcite; most qtz is ang, fg-cg, most mg qtz and qtzite; also chert and argill grains; good intergranular porosity (Photo 21).

14,985.5’ Itkil.- Red Ss.- less laminated; some minor echin & rounded bryo carbonate grains;; in ss.- little to no clay; most ang qtz, some porosity (blue epoxy) in sandy lamins; some small, rounded bryo grains; qtz/qtzite w/ argil & chert grains with calc cmt (Photo 22).

15,421’ IKP-dup.) Katakuruk Bsmt.- brecciated dolo in chert or argillite matrix; X-nicols (Photo23).

15,421’ Katak. Bsmt.- sutured metamorphic contacts; looks like metamorphosed mud/clay (gouge?) between brecciated dolo and chert; X-nicols (Photo 25).

15,421’ Katak. Bsmt.- a/a, brecciated with meta-chert fragments in plain light (Photo 26).

15,464.5’ Katak. Bsmt.- meta-chert & vf xln dolo; chert and qtz in fractures (v tight, takes a polish!) plain light (Photo 27).

15,464.5’ IKP Katak. Bsmt- a/a, X-nicols (Photo 28).


15,465’ IKP Katak. Bsmt- a/a, fracs appear to be filled with xln qtz within vf xln dolo & chert; X-nicols (Photo 30).

15,466.6’ IKP Katak. Bsmt- Meta-Chert, Qtz-Qtzite & Dolo M- clay-like material could be frac/fault gouge or geopetal (soil on Katak. Dolo exposure surface? (Photo 31).

15,466.6’ IKP Katak. Bsmt.- a/a, core sample at T.D.; X-nicols (Photo 32).

D.L. Boyer 02/23/12
Description of Husky Inigok No. 1 Thin Sections

13,843’ Transition Zone: Silty Mdst to V. Argill. Ss.- vfg-fg with clay-mdst matrix; pyr and organic-rich stringers, qtz sand is mostly ang, (rge.: ang-subang); some pale grn argil grains (Photo 1)

13,846.7’ Transition Zone: V. Argill Ss.- brn, silty mdst to v argil ss, vfg-fg, interlam. with pyr and coaly stringers, cly matrix with few grain-to-grain contacts (Photo 2)

14,020-23’ (Slide 1) Transition Zone: Silty, Argill. & Lime Mdst.- with some lime skeletal grains inc. thin-shelled pelecys and crinoids (Photo 3).

14,020-23’ (Slide 2) Transition Zone: Limy Ss. with clay/lime mud matrix; silt to vfg qtz w/ bry & lg pelecy floating grains (vcg or larger); occ. dolo rhombs (not connected) (Photo 4).

14,020-23’ (Slide 3) Transition Zone: as above with 20-30% qtz silt to vfg; terrig. cly/lime mud with dk organic material; lg frags of brachs-bryos-pelecys; some chert-replaced crinoid ossicles (Photo 5).

14,021.5’ Transition Zone: Dark Argill. Siltstone- may have lime mud mixed in; carbonaceous stringers & pyr; 20% qtz silt; occ. skeletal grains & spics in argill. matrix (Photo 8).

14,021.5’ (dup.) Transition Zone: Dk Argill Sltst- as above with lg skeletal fragments such as pelecy in (Photo 7).

14,023-26’ (Slide 4) Transition Zone: Silty Terrig Mdst- with possible lime mud; 30-40% qtz (silt-vfg) in clay matrix with organic/pyr opaque stringers (Photo 9).

14,023-26’ (Slide 5) Transition Zone: Lg. distorted brach (?) filled with tar and dolo x-stals and possible pyr; rest silty mdst to argil sltst (Photo 6).

14,032-35’ (Slide 6) Transition Zone: Calc. Silty Terrig Mdst with skel grains inc. lg pelecys & brachs; qtz silt-vfg sand (40%); occ zoned dolo x-stals; some “thin-shelled” pelecys and partly pyritized (Photo 10).

14,037’ V. Silty Mdst to Argill Sl tst- silt to vfg qtz; pyr and carbonaceous stringers; dk brn-gry; some skel grains replaced by chert (Photo 12).

14,037’ (dup. slide) a/a, fairly homogenous except for pyr and carbonaceous stringers (Photo 11).
14,040-42’ (Slide 7) Mixed Skeletal Lime G- unstained, common pelecys-brachs-bryo-echin-spics-forams; pyr & dolo x-stals along stylolites; <1% qtz silt; some very thin coats (Photo 13).

14,040.4’ Mixed Skeletal Lime G- abt pelecy-brach-bry-echin-spines & spics-forams; some thin mud coatings; tr. qtz silt only; fg carbonate grains except for lg mollusks; calcite-filled fracs. (Photo 14).

14,040.4’ (dup. slide) Lime G- a/a, but strongly laminated; largest grains are pelecys-brachs-spines; common forams (Photo 15).

14,042’ Argill Sltst to Silty Mdst- dk brn gry with vcg bryo fronds & mollusk shells; calcite spar in bryo zooecia along lamins; some chert-replaced bry-crinoid grains; abt qtz silt-vfg sand (Photo 16).

14042’ (dup. slide) Argill Sltst to Silty Mdst- a/a, most qtz (40%) is silt sz. with clay matrix; lg bryo and pelecy grains along lamins; all are oriented grains lying longitudinally (Photo 17).

14,043-45’ (Slide 8) Argill Sltst- with 35-40% silt-vfg qtz; mostly bryo carbonate grains along lamins; v silty lime mud and/or clay matrix ((Photo 18).

14,043-45’ (Slide 9) Argill Sltst- a/a, bry-pelecy-brach grains along lamins; bryo fronds dominate; cly-lime mud matrix; 30% qtz silt-vfg sand; compacted lg mollusk shell w/ internal lime mud (Photo 19).

14,051-54’ (Slide 12) Lime W- with 2 calcite-filled fracs; brown-gry; <1% to 1% qtz silt; mostly spar-replaced sponge spics and thin-shelled mollusks (Photo 20).

14,051-54’ (Slide 13-dup.) Lime W-M- a/a, with qtz silt & sponge spics along lamins (more lamins. than Slide 12); 2 calcite-filled fracs (Photo 21).

14,052.7’ (Slide 14) Lamin. Lime W-M unstained w/ spics and sed structures (active currents during deposition); some possible fluid escape structures (Photo 22).

14,052.7’ (Slide 15-dup.) Lime M-W with lg brach & 2 fracs filled with calcite (one with tension gashes); spics and minor qtz silt; micro-ripples; some broken, thin-shelled mollusks (Photo 23).

14,052.7’ (Slide 15- 2nd photo) Lime M-W- tension gashes in fracture (Photo 24).

14,052.7’ (Slide 16-3rd Slide, same depth) Lime M-W- a/a, w/ lg brach; 1-2% qtz silt (Photo 25).
**Husky Inigok No. 1**

14,060-62’ (Slide 17) Mixed Skeletal Lime W- big increase in grains: spics-brachs-pelecys-forams; 3-5% qtz silt-vfg sand: stylolites with abt qtz silt & vfg sand, tar and pyr (opaques) (Photo 26).

14,510-40’ (cuttings) Bryo-Echin-Peloid Lime G- cg-vcg, well-cmtd bry-echin G with some oncolite (not dolomitized) and chert shards; also sltst intbds and a few W-M cuttings (Photo 27).

15,185-188’ (Slide 18) Argill, Silty VF Xln Dolo M-W- dolo rhombs are fused together; floating bryo fronds and echin plates; some qtz silt (5-10%); scattered, finely dissem. pyr and blk organic-rich wavy lamins, some are styls. (Photo 28).

15,191-193’ (Slide 19) a/a, Argill. Silty Dolo W-M with v. lg bryo fronds, echin plates, and thin pelecy shells; 5-10% qtz silt (Photo 29).

15,191-193’ (Slide 20) a/a, v. lg bryo frond in photo, also lg brach echin plates; 10-20% qtz silt (Photo 30).

15,210’ Lime G- v. lg bryo and peloid; looks like a dump of peloids into loosely packed bryos and echins; bryos appear “ripped up” and redeposited quickly; huge patches of spar cmtd lg bryos with irregular edges (no rounding nor smoothing) (Photo 31).

15,215’ (Slide 21) Bryo-Minor Echin lime MRP- ~20% dolo, also lg filaments (Donezella?) with lg patches of calcite spar and small peloid patches within bryos, esp. zooecia (Photo 32).

16,194.8’ Dolo Lime Bryo-Echin MRP- mg-cg, some vcg; lg dolo x-stals w/ overgrowths (zoned) and styls w/ heavy oil-tar along them (Photo 33).

16,370-390’ (cuttings) Cherty Dolo W- spiculitic, with dolo overgrowths (med xln); chert in vugs; some lime bry-echin G cuttings (prob. cave here); some chert is tarry (Photo 34).

16,370-390’ (cuttings) a/a, under X-nicols, chert fills vugs (Photo 35).

17,058.5’ (core) Silicified, Argill Sltst- v pyritic w/ qtz silt lamins; silty layers have silica cmt (Photo 36).

17,069.5’ (core) Bryo-Echin Lime MRP-W- no dolo, bryo dominated; lime mud has spic & thin-shelled pelecy; calcite-filled fracs, cg-vcg; styls. w/ organics & pyr (opaques) (Photo 37).

17,081’ (core) Silty, Lime M- qtz silt lamins, no dolo; 2 lg calcite-filled fracs that intersect and were filled prior to complete compaction (Photo 38)

D.L. Boyer 02/23/12
Description of Husky W.T. Foran No. 1 Thin Sections

8180-90’ (cuttings) Ivishak Ss. (locally Ledge Ss.) & Kavik Sh. (silty to sandy); some reddish, silty mdst (could be some red stain for calcite?) (Photo 1).

8190-8200’ (cuttings) Top Wahoo Silty Dolo M-W- sandy dolo, some blue stain for Fe; highly compacted with overgrowths; qtz-qtzite-cher and minor argil. grains, fg-mg sand (40% qtz); qtzite grains have strain lamellae (Photo 2).

8210-8220’ (cuttings) Silty Dolo W-M (vuggy) & Qtz-Chalcedony- dolo with blue stain for Fe; 40% qtz-qtzite sand inc. veg qtzite clasts; some chert-replaced spic material; could be Pre-Echooka alteration zone (Photo 3).

8210-8220’ (cuttings) Silty, Sandy Dolo- a/a, X-nicols (Photo 4).

8240-50’ (cuttings) Bry-Echin Lime G- silty lime grst (red stained) with vfg sand; some carbonate grains with thin coats; also sandy dolo (cave here) w/ f-mg qtz & sandy chert w/ fine dolo xstals; calc filled fracs (Photo 5).

8254’ (core) Intraclast-Bry-Echin VCG Lime G- several v. lg. pellets w/ silt-vfg qtz within and intraclasts (lime mud and peloids); chert-cored echin plates; bry-echin veg to granule-pebble size; one lg argill clast; msv spar cmt (Photo 6).

8258’ (core) V. Sandy Bry-Echin-Peloidal Lime G to Ss.- with patches of calcite spar; some coated grains and peloids (smashed); qtz-qtzite sand is mostly fg-mg, ang to subang; also clay & organics (dark); some argill and chert (Photo 7).

8258’ (core) a/a, X-nicols (Photo 8).

8260’ Ss. with Calcite & Clay Cement- v. ang grains; most is qtz, also argil & chert; some echin & bryo fragments; occ zoned dolo xstal; some possible dolo cmt. too; strain lamellae in qtzite grains; fg-cg (Photo 9). (Some intergranular porosity.)

8260’ Ss.- a/a, X-nicols (Photo 10).

8267’ Ss. with Calcite & Clay Cmt.- a/a, ang grains; common argil & meta-chert grains and brn, oil stained matrix; porosity in mg-cg laminae; argil clasts have silt-vfg qtz witin (Photo 11).

8267’ Ss.- as above, X-nicols (Photo 12).

8266’ Silty Dolo M- silty to vfg sandy (qtz); dolo is vf xln; 60%+ sand inc. vfg argil & meta-chert grains; lg. qtzite clast (Photo 13).

8266’ Dolo- a/a, X-nicols (Photo 14).
8273’ Silty, Foram-Spic-Peloid Lime G-MRP- vfg-fg, well-indurated; ~10% ss & 30-40% dolo.; lg calcite-filled frac (Photo 15).

8283’ Spic Chert G- with silty qtz both concentrated & dispersed; some patches of intergranular micro porosity (blue “haze”- dyed epoxy) (Photo 16).

8283’ Chert- a/a, X-nicols (Photo 17).

8290-8300’ (cuttings) Mixed Coated Gr-Foram G & Silty, Med Brn Sh- (red stain) fg, coated grain with spics; also sandy (qtz) dolo; somme ss (cave here) (Photo 18).

8300-8310’(cuttings) Mixed Liths.: Silty Coated Gr. G; Red-Blk (Fe) Silty Sh & Gry-Brn Sh- some dk gry silty sh (could be in place); redstained, silty coated gr. G; probable cave chert with vf xln dolo xstals; red-blk sh-sltst with tarry residue (Photo 19).

8310-8320’ (cuttings) Silty Lime G, as above & Sandy, Lt Gry Sh-Mdst- red stained ls with coated grains and lg bryo-echin-forams; dk red-blk sh-sltst with tar and organic debris (8312’ on WL logs); some round, argill cg; chert-chalcedony in ls (Photo 20).

8820’ (cuttings) Argillite Bsmt- dk gry to blk w/ micro-foliation; dk grains/minerals (jet blk) possible pyr; also vfg ss-sltst from lower Kekiktuk/Kayak; minor qtzite (one cutting) (Photo 21).

8830’ (cuttings) Argillite Bsmt- Lt to dk gry-blk, as above; lineations & foliations (biotite?); some qtzite cuttings; also vfg ss-sltst Kekiktuk/Kayak cave (Photo 22).

8840’ (cuttings) Argillite Bsmt- dk, granular w/ foliations/lamins & silt-sized qtz; v. Lt ss-sltst from Kekik./Kayak fms. (Photo 23).

8854’ (cuttings) Argillite Bsmt- brown to blk w/calcite-filled fracs; occ qtzite fragments; ss-sltst (Kekik./Kayak cave) (Photo 24).

8860’ (cuttings) Argillite Bsmt- dk, foliated argil w/ silt-sized qtz grains; also lg qtz/qtzite clasts with strain lamellae; lots of Kekik/Kayak cave: ss & sltst, some with coaly lamins (Photo 25).

8864’ (cuttings-T.D. sple) Argillite Bsmt- a/a; lots of Kekik./Kayak lt brn ss & sltst cave (Photo 26).
Description of Husky J.W. Dalton No. 1 Thin Sections

8319’ Lime G- coated grain (thin coats) over bry-echin-pelecy skeletal grains; abt clastics (mostly qtz), ang-subang, qtz and qtzite w/ granule-sz argillite flat clast; mg-cg, no dolo., abt spar, no stain, some partial rim moldic porosity (Photo 1).

8319’ Lime G- a/a with moldic porosity examples (Photo 2).

8331’ Lime G- coated gr.-bry-echin-foram-pelecy (vfg-fg); 20% qtz. (fg-mg); series of vugs filled with calcite spar, occ glauc grains, no porosity (Photo 3).

8520’ Limy Ss.- ~70% mg-cg, ang to subang qtz, argill. & meta-chert with some cly clasts; most coated gr., partial to occ. whole-rim molds & some whole molds (Photo 4).

8534’ Limy Ss.- 70%+ mg-cg qtz/qtzite-argill-meta-chert, a/a: coated gr. over bry-echin-pelecy; (vfg-fg); no porosity like 8520’ sple. (Photo 5).

8539.5’ Sandy, Argill. Red Siltstone- v. ang to subang qtz sand, poorly sorted; clay matrix, non-carbonate; dk organics or Fe weathering residue; some likely chert-replaced spics; v. proximal facies, no porosity (Photo 6).

8539.5’ Sandy, Argill. Red Siltstone- as above, with meta-chert & argill grains; X-nicols (Photo 7).

9359’ Argillite Bsmt- metamorphic foliation with chert/qtz-filled micro-fracs; strained, silt-sized to vfg qtz; tight (Photo 8-5X).

9359’ Argillite Bsmt- as above (Photo 9-10X).

9359’ Argillite Bsmt- as above (Photo 10-2.5X).

9359’ Argillite Bsmt- as above, with micro-thrust (Photo 11-2.5X).

D.L. Boyer 02/23/12
Key to Abbreviations (all wells):

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/Bryo  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
Argill  Argillite
Bsmt  Basement