

Division of Geological & Geophysical Surveys

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**SUMMARY OF MAY 25–JUNE 4, 2004, FIELD NOTES AND SAMPLES,
PUALE BAY AND WIDE BAY AREAS, ALASKA PENINSULA**

by
R.R. Reifenhohl, D.C. Shafer, T.J. Ryherd,
D.W. Brizzolara, and R.B. Blodgett

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Summary of May 25–June 4, 2004, field notes and samples, Puale Bay and Wide Bay areas, Alaska Peninsula

by Rocky R. Reifenhstahl, (rocky@dnr.state.ak.us), D.C. Shafer, T.J. Ryherd,
D.W. Brizzolara, and R.B. Blodgett

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Introduction

This non-interpretive report is based on 10 days of helicopter-supported fieldwork by Division of Geological & Geophysical Surveys (DGGS) and Division of Oil & Gas (DOG) geologists in the Puale Bay and Wide Bay areas (figure 1). Our primary goal for this 10-day field investigation is to better understand the source rock potential of the Mesozoic age (Jurassic and Triassic) stratigraphic section. The work is part of the Bristol Bay basin petroleum reservoir characterization, source rock potential, fossil fuel resources, and basin analysis program (2004–2007). Funding is by the U.S. Department of Energy through the Arctic Energy Technology Development Laboratory, University of Alaska Fairbanks, DGGS, and DOG. Fieldwork took place from May 24 to June 4, 2004, by geologists Rocky Reifenhstahl (DGGS, program head), Dave Shafer (DOG), Tim Ryherd (DOG), Don Brizzolara (DOG), Robert Blodgett (consulting macropaleontologist), and Mark Myers (DOG). Our base camp was Grizzly Skins Lodge near the Kejulik River and Becharof Lake.

Outcrop field stations and samples (figure 1; table 1) are from the Mesozoic section except for one station in the Tertiary (Miocene?) part of the stratigraphic section (figure 2). Mesozoic samples are from the Triassic Kamishak Formation, Early Jurassic Talkeetna Formation, Middle Jurassic Kialagvik Formation, Middle Jurassic Shelikof Formation, and Upper Jurassic Naknek Formation. The one Tertiary age outcrop is located on the southeast side of Upper Ugashik Lake and part of the Miocene age Bear Lake Formation (?). This Tertiary age outcrop lies just west of the approximate location of the Bruin Bay Fault.

The raw, unedited field notes (table 1) are significant in that they document oil-charged sandstone outcrops in the Chisik Member of the lower Naknek Formation on the east side of Deer Mountain, and south of Puale Bay on the ridge northeast of Teresa Creek (figure 1). Our goal with this report is to inform the energy industry and general public of new hydrocarbon exploration—pertinent information for the Mesozoic section in the study area.

Field notes (table 1) and organic geochemistry analyses yield new, modern information that bear on Mesozoic reservoir characteristics, stratigraphy, source rock total organic carbon (TOC; table 2), liquid hydrocarbon typing from a seep between Oil Creek and Ugashik Creek (figure 3), and distribution of stratigraphic units in the Puale Bay and Wide Bay areas. This information is relevant to hydrocarbon resources and exploration models in the state Division of Oil & Gas Bristol Bay area-wide lease sales for 2005 and beyond. Our work also bears on surface to subsurface stratigraphic correlations. This report is available on the DGGS Web site (<http://www.dggs.dnr.state.ak.us>). The Division of Oil & Gas Web site (<http://www.dog.dnr.state.ak.us>) has a variety of Bristol Bay and Alaska Peninsula information

including geology, well locations and details, cross section, area-wide lease sale maps and information, and public seismic data.

This ongoing Bristol Bay–Alaska Peninsula program is scheduled for additional fieldwork at the end of August 2004 in the Bear Lake area, northeast of Port Moller. During these 2 weeks we will address the reservoir potential, stratigraphic architecture, and structural framework of the Tertiary-age stratigraphic section. These Tertiary-age rocks, particularly the Miocene-age Bear Lake Formation, have stratigraphic reservoir potential in the Bristol Bay region.

AGE	ROCK UNIT	THICKNESS RANGE (m)	LITHOLOGY, FACIES, AND COMMENTS
QUATERNARY	Alluvial and glacial deposits		
TERTIARY	Pliocene Milky River Fm.	400 - 1000	Volcanic rocks and deposits Volcaniclastic, nonmarine and marine Ss., Cgl., Sfts., tuff, and volcanic flows.
	Miocene Bear Lake Formation	0 - 2300	Shallow marine to nonmarine Ss., Sfts., and Cgl. More quartzose and less volcaniclastic than other Tertiary units. Present only on northwest side of Alaska Peninsula.
	Oligocene Unga Fm.	0 - 300	Volcaniclastic Cgl. and Ss. Present only on Pacific side of Alaska Peninsula on and adjacent to Unga Island.
	Eocene Stepovak Fm. Meshik Volcs.	1700 - 2000	Volcanic flows, breccias, and tuffs. Grades southwestward to shallow and deep marine volcaniclastic Ss., Sfts., and Sh.
	Paleocene Tolstoi Formation	0 - 1500	Mostly nonmarine Ss., Cgl., Sh., and coal. Marine and nonmarine in Pavlof Bay area. Equivalent to West Foreland and Copper Lake Formations in Cook Inlet area.
	CRETACEOUS	Late Hoodoo and Kaguyak Fms.	0 - 900
Chignik Fm.		250 - 800	Alluvial Cgl. to deltaic lithic Ss., Sh., and coal.
Early Pedmar Fm.		0 - 82	Shallow marine Ss. and Sfts. Present only in small areas near Katmai Bay (between Puale and Hallo Bays).
Harendeen Fm.		0 - 270	Shallow marine calcareous Ss., sandy Ls. (abundant <i>Inoceramus</i> prisms), and Sh.
Staniukovich Fm.		0 - 250	Shallow marine fossiliferous (<i>Buchias</i>) Sh., Sfts., and Ss.
JURASSIC	Late Naknek Formation	1100 - 4000	Most extensively exposed unit on Alaska Peninsula. Fluvial arkosic Ss. and Cgl. grading upward and southeastward to shallow and some deep marine Sfts. and Sh. Common <i>Buchias</i> . Percentage of granitic clasts in Cgl. increases upward.
	Middle Shelikof Formation	800 - 1500	Deep marine to slope Sfts. and graywacke turbidites grading upward to shallow marine and minor nonmarine Ss.
	Kialagvik Formation	800 - 1200	Exposed only at Puale and Wide Bays. Deep marine to slope Sh. and Sfts., grades upward to shallow marine fossiliferous shoreface graywacke Ss. at Wide Bay.
	Early Talkeetna Formation	300 - 1700	Exposed only at Puale Bay. Shallow marine volcaniclastic Ss., tuff, and deeper marine Sh.
TRIASSIC	Late Kamishak Formation	800 - 1400	Exposed only at Puale Bay. Shallow marine biostromal Ls. at base, deeper marine interbedded chert, Ls., and organic-rich Sh. above. Basalt flows and breccias.
	Middle		
	Early		
MID-PERMIAN	Unnamed limestone	10+	Exposed only on small island at Puale Bay. Cherty Ls.

Figure 2. Stratigraphic column for Alaska Peninsula (modified from Detterman and others, in press). Ss., sandstone; Cgl., conglomerate; Sfts., silts; Sh., shale; Ls., limestone. See figure 1 for localities mentioned in comments.

Table 1. Summary of May 25-June 4, 2004 field notes and samples, Puale Bay and Wide Bay areas, Alaska Peninsula

Station	Latitude	Longitude	Quadrangle	Location	Formation	Age	Description	Thin section	Fission Track	Porosity & Permeability	Organic Geochemistry
04-RR-1	57.78810	155.55492	Karluk D-5	.5 mi W of Portage Creek	Shelikof Fm	Base of Upper Jurassic	ss, layered, parallel bedded, 10 cm to 3-4 m massive. 1A, 1B: dark-gray to very dark gray medium grained (.5-.25 mm) poorly sorted, lithic arenite to clay rich lithic ss, variable bedding-plane parallel and channels of debris deposits with ammonites, bivalves – disarticulated, rare belemnites, rare wood; offshore-channels into slope-no infauna. 1C: immature lithic ss w. biotite books volcanic quartz, hornblende. 1D: med-gray, light green med-gray, bedding 10-30 cm, fine ss, locally 1 m, lithic, locally with concretions and pock-marked outcrop. Cardioceras in conglomerate clasts. Shelikof Formation here deposited as event deposits, gravity flows, in deep marine basin.	04-RR-1A; 04-RR-1C	04-RR-1B	04-RR-1D	
04-RR-2	59.79255	155.60508	Karluk D-5	Head of Puale Bay, north side	Chisik Member, Naknek Formation		Fluvial, non-marine ss, pebble ss, conglomerate, cross beds, high-angle planar cross-bedded ss with conglomerate, pebbly clasts as stringers locally; clasts are volcanic and plutonic, medium- to felsic-granite grained with local radiolarian-bearing chert; ss is light gray to very light gray, immature, poorly sorted, subangular, lithic arenite. 2C: pebbly ss, light gray clasts to 10 cm. 2D: light gray, cross bedded.	04-RR-2A	04-RR-2B	04-RR-2C; 04-RR-2D	
04-RR-3	57.73318	156.39858		10 mi SSE of Puale Bay	Kialagvik	Middle Jurassic	Fine and very fine ss, calcareous very fine ss and siltstone, bedded, 1-4 cm, locally to 5-6 m. Faulting and minor folding locally important. 3A, 3B: med-gray face with less medium ss, subangular, poorly sorted calcareous cement; fine-medium ss local only to rare 4-5 cm thick soft, somewhat friable. Limey mudstone includes coalified wood, arthropods, ammonites.	04-RR-3A		04-RR-3B	
04-RR-4	57.73551	155.40000		400-500 m N of 04-RR-3 on beach	Kialagvik	Upper Jurassic	Very light gray to greenish lt gray, med-coarse grained. 4A, 4B: ss, angular volcanic clasts with feldspar and white tuffaceous grains; sample and GPS collected by Dave Shafer and Tim Ryherd 1/4 mi N along beach near fern-rich locality of Blodgett and Brizzolara.	04-RR-4B	04-RR-4A		
04-RR-5	57.61553	156.21453		Island Arm, Becharof Lake	Snug Harbor Member, Naknek Fm	Upper Jurassic (Kimmeridgian)	Siltstone with petrified wood to .5 m diameter, very dark gray to black, light brown, siltstone with very fine ss, limey matrix with limey concretions and layers to 70 cm thick; petrified wood with calcite on some fractures and white, translucent, radiating spokes in wood (gypsum?); wood blank on fresh and tan on weathered surfaces. Bioturbated, gastropods, chondrites, thalassinoides, Buchia.				

04-RR-6	57.6538 4	156.27242	Up unnamed creek .2 mi E of Pearl Dome oil drilling area; 10 mi E of upper Ugashik Lake and 6 mi S of SE end of Becharof Lake	(Chisik member with Northeast Creek ss Member?) Naknek Fm.	Upper Jurassic (Oxfordian to Kimmeridgian)	6A, 6B: very light gray locally cross bedded, medium and coarse ss with angular to very angular clasts of feldspar and biotite and local rounded clasts to 7 mm, volcanoclastic lithic ss, hard, dense, probably very poor porosity and permeability. 6C, 6D: second common lithology; ss and conglomerate polymict, mostly volcanic and plutonic with red chert and intraformational? very dark gray, local clasts to 20 cm; angular 1-2 cm; highly variable in outcrop; fluvial, outcrop in valley is hundreds of meters thick; ss 20-40%, locally 60%, cgl 70%; much better porosity and permeability; clasts are very light green volcanic and medium and dark gray and green-gray volcanic and chert?? and interformational ss??	04-RR-6A, 04-RR-6C	04-RR-6B; 04-RR-6D
04-RR-7	57.6667 7	156.37852	Ugashuk Creek, near confluence with Hot Springs Ck	Northeast Creek ss Member, Naknek Fm.	Jurassic	Very immature, nonmarine ss. 7A, 7B: orange-brown weathering coarse ss, pebbles. 7C: medium gray to bluish medium gray with angular igneous clasts. 7D: hard, dense, Blodgett says this is typical Northeast ss Member of the Naknek Formation. 30 m of deeply weathered section here.	04-RR-7A, 04-RR-7C	04-RR-7B, 04-RR-7D
04-RR-8	57.5767 5	156.74220	S. end of Upper Ugashik Lake	Miocene Bear Lake??, Eocene Tolstol Fm??	Tertiary	ss, conglomerate, coal, 20-30 m section. Coal .5 m thin, platy, weathered; ss medium and light gray with leaf imprints, crossbeds, conglomerate stringers, bedding is indistinct. 8A, 8B: brown to orange-brown, deeply weathered, sub-rounded, poorly sorted, lithic pebbly ss with volcanic c last and aphanitic conchoidal fractured chert. 8C, 8D: very fine ss, light gray to cream-light gray, soft, ripple-laminated (pervasive) lithic ss to lithic wacke (due to apparent rich clay content), bedding is defined internally by black organic content, which suggests organic influence at the time during deposition; then coal deposits with no clastics, these ss are part of larger stagnant bi-directional or variable current direction. 8E: leaf fossil, porosity and permeability similar to above. Above coal-bearing section, imbrication is south 5 degrees west.	04-RR-8A, 04-RR-8C	04-RR-8B, 04-RR-8D
04-RR-9	57.3935 0	156.37367	Wide Bay, NW side	Kialagvik	Lowermost Middle Jurassic	Fine ss and wood, carbonized wood, calcareous cement in local beds to 1 m, medium green, medium gray, soft, moderately rounded, moderately sorted lithic ss with 5% to 1% dropstones of 10-12 cm well rounded ss clasts of ? Fm ?; moderate water depth of approximately 50 ft with no inoceramids, abundant amounts of wood debris, 5 species of bivalves, ammonites to 17 cm diameter (R. Blodgett has species of all), exposure dips W and S 5-8 degrees, section is 20 m thick, organics to 1 m x 15 cm, logs local, broken up, concretions very common. Ammonites, pelecypods, coaly wood debris.	04-RR-9A	04-RR-9B
04-RR-10	57.3077 8	156.43194	Wide Bay, S side	Kialagvik	Middle Jurassic	ss, very dark gray with Inoceramids 6-7 cm by 3-4 cm.		

04-RR-11	57.3062 9	156.42686		Wide bay, S side, up slope 200'	Kialagvik	Middle Jurassic (Bajocian)	ss and siliceous siltstone up to 1200 m thick locally, here at least 500 m exposed. Exposures here appear too siliceous and coarse clastic to be considered source beds. 11A: siliceous siltstone with tuffaceous layers 1-3 cm, maroon to very dark gray, doesn't look like good organic content, not soft, not sooty or dirty. 11B: same rocks with less tuffaceous to none and very dark gray to locally black color. 11C: light green medium gray medium grained. 11D: .5-.25 mm, fairly hard, dense, doesn't appear to be a good reservoir candidate, feldspathic arenite-light green clasts=plag?	04-RR-11C	04-RR-11D	04-RR-11A, 04-RR-11B
04-RR-12	57.5356 1	156.75188		On high hill 1 mi SW of Ugashuk Lakes confluence, 1012/ elevation	Naknek Conglomerate ?		Expected Tertiary age conglomerate. Tertiary conglomerate of station 8 is 2 mi N along lake--what is nature of contact between this rock and Tertiary on lake? >75 m of cobble conglomerate, ss <5% of outcrop here; 30-40% volcanic clasts; 40-50% plutonic clasts. 12A: tan and dark gray. 12B: salt and pepper ss, tighter than Tertiary shaley clasts, cement fairly light, <15%. Attitude: N20E, 55NW. 75-100 m of discontinuous section; conglomerate clasts to 20 cm locally, averaging 3-5 cm; matrix is coarse with medium ss; conglomerate is clast-supported and cuts and fills in the local ss layers; ss is locally plane-parallel layered and cross-bedded; no fines or coaly matrix found; depositional environment is braided stream, very high energy flow with large clasts, well-rounded clasts of plutonic material.	04-TR-09		
04-RR-13	57.7929 5	155.58232	Karluk D-5	Puale Bay, N side	Shelikof Fm	Middle Jurassic	Very dark gray siliceous siltstone, very fine ss, thin bedded (7-20 cm); here siltstones are 60-70% of the section, ss beds loaded into siltstones. 13A, 13B, 13C: Black shaley, siliceous siltstone. Attitude: N50E, 21NW; ss: very fine medium to dark gray light brown weathering poorly sorted subangular sublitharenite; silts highly fractured.	04-RR-13A	04-RR-13B	04-RR-13C
04-RR-14	57.7017 8	155.76631		Oil Creek/ Becharof Creek	Shelikof Formation	Late-Middle Jurassic (Callovian)	Oil samples/asphalt samples, lots of pictures and videos of site, seep, asphalt, lighting off gas seep. Overview of asphalt alluvial fan.			
04-44-15	57.7004 0	155.75723		~10 mi S of Puale bay and 1 km E of seep	Shelikof (?) Fm.	Middle Jurassic	Typical Shelikof but with .5 m thick very dark gray to black saturated ss--oil stained, much softer than surrounding rocks. 15A, 15B, 15C: very dark ss, highly saturated, softer than other rocks here. 15D: saturated but lighter color and hard and dense in comparison. 15E, 15F, 15G: Attitude N40W, 37NE; highly saturated ss, medium gray not dark, gray saturated rocks as above, but more typical Shelikof ss: hard, dense, lithic subarenite, minor quartz, mostly lithic volcanic clasts with 5% feldspar weathered as pink specks=tuffaceous?, medium grained ss; bedding of 15 m section outcrop is 10-50 cm, laterally continuous beds, traces of wood debris, minor quartz crosscutting veins 1-3 mm, oil seeping from fractures into creek.	04-RR-15A, 04-RR-15F	04-RR-15B, 04-RR-15D, 04-RR-15G	04-RR-15C
04-RR-16	57.6212 0	155.86636		Exxon 'Spare Creek'? on Bear Creek	Shelikof?		ss, siliceous siltstone, disappointing as source candidate. 16A, 16B: very fine ss with calcite cement, weathered rocks at surface with punky white feldspar or volcanic clasts making up 15-20% of the rock. 16C: float, probably Shelikof, punky white felsic volcanic clasts to 1 mm, angular .5 mm	04-RR-16A, 04-RR-16C	04-RR-16B	

04-RR-17	57.7143 4	155.36869	Karluk Quad	Kekurnoi Point, Puale Bay, North Point	Limestone	Upper Triassic (Late Norian)	100 m of well exposed, consistent structure, locally Minotis 6-7 cm diameter, large example, average 4-5 cm; Heterostrotrium (spherical "goof-balls") with 1-1.5 mm pores on surface; thin bedded, very light gray packstone; bedding locally 2 cm to several cm thick; thin-bedded limestone is locally fetid on breaking surfaces. 17C: limestone clast in volcanic matrix. 17B: siliceous volcanic "chert" of Wang and others. 17A: thin, shaley, dark gray limy mudstone 2 cm to 25 cm thick, 5-10% of section; reef or iostromatic structure.	04-RR-17B, 04-RR-17C		04-DS-13, 04-RR-17A
04-RR-18	57.3903 0	156.43261		Wide Bay/ Short Creek	Shelikof/ Kialagvik contact	Middle Jurassic	Shelikof Fm: medium, gray, medium and fine-grained ss, beds 10's of cm, massive, cliff-forming, hard, dense siliceous ss, attitude: N35E, 13NW, subangular dark green to black clasts of volcanics or hornblende?, parallel laminated, no visible grading, local quartz on fracture surfaces, unconformably overlies the Kialagvik Fm: greenish-dark gray, fine, very fine and medium grained, poorly sorted, subangular, siliceous siltstone, siliceous very fine ss and medium ss, attitude: N43E, 11NW, brown to brownish-dark gray, top of Kialagvik, no fossils seen, some Manganese Oxide, 2-20 cm beds, much thinner than Shelikof above, pinch and swell, planar laminated. Unconformity: not well seen, 50-100 m fault with south side down passes 20-50 m from this point. This outcrop looked promising from below due to color and weathering nature, but is too siliceous.			04-DS-18
04-RR-19	57.4140 7	156.50631		S flank Bear Mountain, at 1,795'	Chisik Member, Naknek Formation	Late Jurassic	At basal Chisik Member conglomerate, just above Shelikof Formation and angular unconformity; conglomerate, fluvial with excellent cut and fill, ss channels, pinch out channels, 75+ meters to 100 m of conglomerate, 1 m to .5 m bedding discernable in hillside, attitude: N15W, 10SW. 19A, 19B: medium grained, brownish medium gray medium with coarse grained with sub rounded, poorly to very poorly sorted thin bedded, water soaked, porous, lithic subarenite, clasts: quartz 60%, biotite 2-3%, plag 5-10%, volcanics 20-30%.	04-RR-19A		04-RR-19B
04-RR-20	57.4158 4	156.50539		Deer Mountain	Chisik Member, Naknek Formation	Late Jurassic	Oil sand, hydrocarbon saturated, very dark gray to black, very poorly sorted, subrounded to rounded, generally punky to hammerstrike, appears saturated with hydrocarbon, lens in conglomerate section, 10 m thick, mostly buried with talus. 20A, 20B, 20C, 20D: black, punky, porous, massive coarse ss as above. Oil ss extends to both sides of this gully to Short Creek ss lenses in fluvial. Better ss and saturation than at Oil Creek locality. Wood debris rare to 3 cm x 15 cm.	04-RR-20C, 04-RR-20D		04-RR-20B 04-RR-20A
04-RR-21	57.7181 1	155.80354		Oil Creek drill site	No outcrop at drill site		Boiler, percussion bits, 'fish' (to extract down-hole stuff), wood derrick down, timbers to 18", looks like 1500-2000' of casing that is stacked and never used. Hydrocarbon? Mat of ?? Outside of 5 m long boiler that powered pulley system that cable system attached to 100 lb bit.			

04-RR-22	57.7664 9	155.63527	Puale bay, S side on ridge at 1,280'	Chisik Member?, Naknek Formation	Upper Jurassic	Light gray, medium and coarse grained very poorly sorted to poorly sorted subrounded and subangular quartz lithic arenite ss, this is lowermost Naknek Fm, 10 cm or so above unconformity with Shelikoff. 22A, 22B: Fluvial, thin-bedded, 2 to 20 cm, some parallel bedded, many crossbeds and scours, wavy bedding, disaggregated sand, regolith in blowouts on surface, also conglomerate, clasts cover this hillside, granitoid 40%, black, purple-black, green-black, maroon, volcanic fractures 40-50%, pebble to cobble (to 12 cm); Attitude N70E, 24NW.	04-RR-22A	04-RR-22B
04-RR-23	57.7633 0	155.63304	1 km down ridge toward ocean from 04-RR-23	Chisik Member, Naknek Formation	Late Jurassic	Brownish-very dark gray oil-charged ss and pebble ss, massive weathering, medium and coarse ss with pebbles (2-5%) to 2.5 cm, averaging 7mm. 23A: non-oil charged .3 m below oil ss. 23B: poorly sorted, subrounded, light-gray to medium gray to salt and pepper (rare), thinly planar crossbedded; oil charge only 30 cm x 5-8 m; Deer Mountain much more extensive, continuous, and impressive.	04-RR-23A	04-RR-23B
04-RR-24	57.7611 0	155.62860	Ridge north of Teresa Creek	Shelikof Formation		Near 04-RR-23, below unconformity. Attitude N57E, 13NE. Good ss bed, 100 m section, green-very dark gray, siliceous siltstone, manganese oxide, rare iron oxide, local ss, green to very dark gray, very fine grained. 24A: ss, thin platy weathering, very fine ss, plane-parallel and wavy or ripple-laminated 1-5 cm thick ss; total section is 1.5 m discontinuous siltstone above and below; siliceous siltstone, looks like impossible source material here; distal deposits, all off-shelf, no life forms seen. 24B: below 1.75 m ss package which is generally plane laminated with minor wavy beds--ripples--event sands with Tb-Tc+Td; load structures on first sand bed with groove casts; one 1 cm vertical feeding trace; there are several feeding traces but they do not penetrate ss to any degree.	04-RR-24A	04-RR-24B
04-RR-25	57.7578 7	155.63121	Puale Bay	Shelikof Formation	Middle Jurassic	Oil ss, rubble-crop 12-15 m section, very dark gray -dark brownish very dark gray to nearly black locally, medium to coarse grained ss with pebbles locally to 3-5 mm; weathered-back, rounded, slaby or platy weathered; not as black or rich looking as Deer Mtn. Chisik, but this looks like Chisik; there is a low angle section to East that is clearly dropped and rotated, this could be faulted down along this ridge; If this is Chisik, normal fault must have 100-100 m of down to the east movement.	04-RR-25B	04-RR-25A
04-RR-26	57.7471 7	155.68050	SE of Puale Bay, SE of Teresa Creek on adjacent ridge	Northeast Sandstone Member, Naknek Formation	Late Jurassic	Iron oxide trace in matrix, feldspar 10%, quartz 60-70%, dark green-gray volcanics 20%; tan, coarse grained, poorly sorted with 2-5% pebbles to 1 cm, locally moderately rounded, lithic quartz arenite; depositional environment high energy beds--marine or nonmarine? tidal channels? some cut and fill in crossbeds, herringbone crossbeds, bedding in this 1 m section is thin-bedded 1-3 cm weathered pattern.		
04-RR-27	57.7464 0	155.68227	SE of Puale Bay, SE of Teresa Ck	Shelikof Fm	Middle Jurassic	Dark brown, wet looking, opaque matrix ss in outcrop <1 m x 2 m; iron-saturated siltstone of Shelikof		04-RR-27A

04-RR-28	57.7391 2	155.68372	Teresa Creek, SE of Puale Bay @ 681'	Shelikof Fm	Middle Jurassic	30 m section of fine with lesser medium ss with rare pebbles=rafted in? floaters?; crossbeds=shallow water, shelfal deltafront? Hummocky? Lower shore face? ; volcanic clasts, poorly sorted, rocks similar to those at bottom of 04-RR-27; these rocks seem deposited in shallower water than those up-section in Shelikof.	04-RR-28A	04-RR-28B	
04-RR-29	57.7212 8	155.69423	SE on ridge adjacent to 04-RR-28	Shelikof Formation	Middle Jurassic	1-5 cm thick, very fine ss layers with 1-20 cm siliceous siltstone beds; between 70 and 80% of this 300 m section is siliceous siltstone with much less ss. 29A: 4 cm bed, plane-laminated medium greenish-medium gray, very fine ss, parallel beds and laminations, local wavy beds. Depositional environment? outer deltaic? off shelf? similar problem across creek to 04-RR-27 and 04-RR-28--until cross bedded ss shows up, delta front depositional environment seems required for crossbeds, hummocky beds, etc.			
04-RR-30	57.7191 2	155.68790	SE of Puale Bay and Teresa Creek	Shelikof Formation		Oil ss, about 4 m total thickness, in hillside and in stream; this is uppermost bed in Shelikof at this traverse with oil charge. 30A, 30B: non-oil bearing, light toned-green, very fine ss with 50-60% quartz, 30% volcanics, red chert? Found bright red radiolarian chert (2 cm x 2 cm as float), clasts in ss, could be chert but may be volcanic--very bright, more like chert; typical oil-charged rocks are dark-gray to dark-greenish dark gray to dark greenish very dark gray; weathering pattern typical--rounded, anomalous, crossbedded or with HCS or swaley bedding locally. 30C, 30D, 30 E: as above, very dark gray to black; impressive oil charge. 30F: at "unconformity" between siltstone and oil ss. This oil-charged ss is residue rich and similar to oil rocks in the Naknek Formation, Chisik Member at Deer Mountain. The conglomerate bed is also charged.	04-RR-30A, C, F	04-RR-30B, D	04-RR-30E

Company: **WALLY DOW**

Project #: **04-400-A**

Client ID	Lab ID	Sample Type	Depth	Prep	TOC Wt. %	S1 mg/g	S2 mg/g	S3 mg/g	Tmax	HI	OI	S1/TOC	PI	Verified
04-TJR-4G	WD000271	OTCP	-	NOPR	2.19	0.03	8.49	0.51	420	389	23	1	0.00	TOC RE
04-RR-11A	WD000272	OTCP	-	NOPR	0.81	0.30	0.58	0.32	444	72	40	37	0.34	
04-RR-11B	WD000273	OTCP	-	NOPR	0.57	0.09	0.33	0.28	465	58	49	16	0.21	
04-TJR-08	WD000274	OTCP	-	NOPR	0.54	0.08	0.33	0.13	461	61	24	15	0.19	
04-RR-13C	WD000275	OTCP	-	NOPR	0.23	0.02	0.17	0.15	545	74	65	9	0.10	
04-DS-10A	WD000276	OTCP	-	NOPR	0.20	0.00	0.10	0.26	497	50	130	0	0.00	
04-DS-10B	WD000277	OTCP	-	NOPR	0.18	0.01	0.10	0.13	544	56	72	5	0.09	
04-DS-11	WD000278	OTCP	-	NOPR	0.36	0.01	0.25	0.19	428	69	53	3	0.04	
04-DS-13A	WD000279	OTCP	-	NOPR	2.38	1.28	14.24	0.50	429	598	21	54	0.08	TOC RE
04-DS-14	WD000280	OTCP	-	NOPR	1.12	0.33	5.31	0.25	425	474	22	30	0.06	TOC RE

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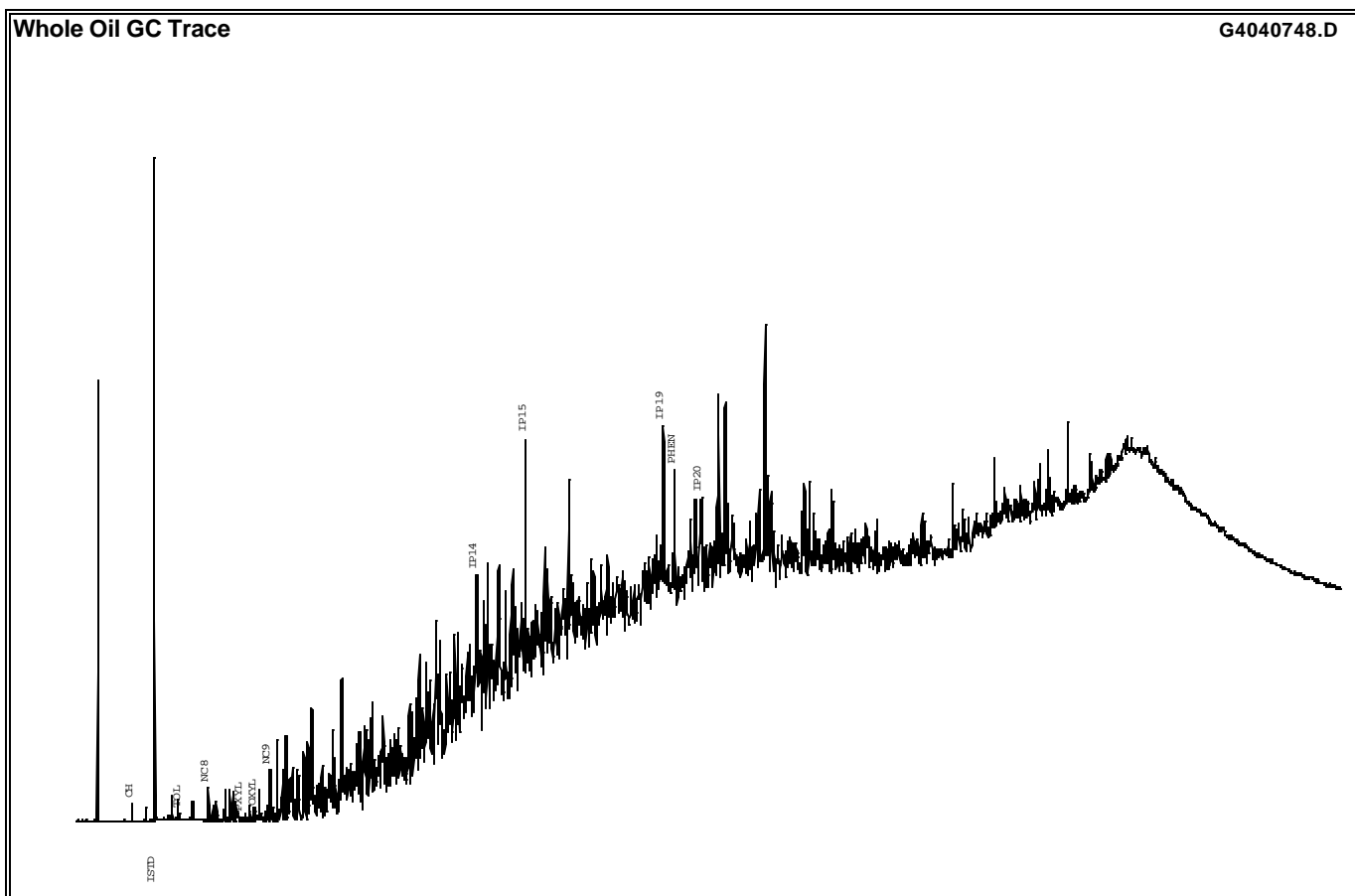
8701 New Trails Drive, The Woodlands, TX 77381-4241
Telephone: 281-681-2200
Facsimile: 281-681-0326
E-mail: info@baselinedgsi.com
Web Site: <http://www.baselinedgsi.com>

Baseline DGSi - Brazil

Rua Jardim Botânico 674 / 413
Jardim Botânico
22460-030 Rio de Janeiro (RJ) - Brazil
Telefone / fax: + 55.21 / 2259.5992
e-mail: office@reslabsolintec.com.br

Table 2. Organic geochemistry analyses of 10 outcrop samples

Company:	WALLY DOW	Client ID:	04-RR-14
Country:	UNITED STATES	Project #:	04-400-A
Basin:		Lab ID:	WD000281
Lease:		Sample Type:	OIL
Block:		Sampling Point:	
Field:		Formation:	
Well Name:	2004 DGGS	Geologic Age:	
Latitude:		Top Depth:	
Longitude:		Bottom Depth:	



WGC parameters	
Pristane/Phytane	1.36
Pristane/ <i>n</i> C ₁₇	
Phytane/ <i>n</i> C ₁₈	
<i>n</i> C ₁₈ / <i>n</i> C ₁₉	
<i>n</i> C ₁₇ / <i>n</i> C ₂₉	
CPI Marzi ⁴	
Normal Paraffins	0.2
Isoprenoids	2.4
Cycloparaffins	0.0
Branched (iso-) Paraffins	
BTX aromatics	0.0
Resolved unknowns	96.9

Thompson ¹	
A. BZ/ <i>n</i> C ₆	
B. TOL/ <i>n</i> C ₇	
C. (<i>n</i> C ₆ + <i>n</i> C ₇)/(CH+MCH)	
I. Isoheptane Value	
F. <i>n</i> C ₇ /MCH	
U. CH/MCP	
R. <i>n</i> C ₇ /2MH	
S. <i>n</i> C ₆ /22DMB	
H. Heptane Value	
MCH/ <i>n</i> C ₇	
mpXYL/ <i>n</i> C ₈	0.16

Mango ²	
P ₁	
P ₂	
P ₃	
5N ₁	
N ₂	
6N ₁	100.00
K ₁	
K ₂	
5N ₄ /6N ₁	
P ₃ /N ₂	
In(24DMP/23DMP)	

Halpern ³	
Tr ₁	
Tr ₂	
Tr ₃	
Tr ₄	
Tr ₅	
Tr ₇	
Tr ₈	
C ₁	
C ₂	
C ₃	
C ₄	
C ₅	

¹Thompson, K.F.M., 1983.GCA: V.47, p.303. ²Mango, F.D., 1994.GCA: V.58, p.895. ³Halpern, H.I., 1995, AAPG Bull.: V.79, p.801. ⁴Marzi, 1993, OrgG;20,1301.

Figure 3. Liquid hydrocarbon organic geochemistry, Oil Creek, Alaska Peninsula (part 1 of 3)

Peak Label	Compound Name	Ret. Time	Area	Height	ppt (Area)	ppt (Hght)
IC4	Iso-alkane C4					
NC4	Normal Alkane C4					
IC5	Iso-alkane C5					
NC5	Normal Alkane C5					
22DMB	2,2-Dimethylbutane					
CP	Cyclopentane					
23DMB	2,3-Dimethylbutane					
2MP	2-Methylpentane					
3MP	3-Methylpentane					
NC6	Normal Alkane C6					
22DMP	2,2-Dimethylpentane					
MCP	Methylcyclopentane					
24DMP	2,4-Dimethylpentane					
223TMB	2,2,3-Trimethylbutane					
BZ	Benzene					
33DMP	3,3-Dimethylpentane					
CH	Cyclohexane	8.242	465	220	0.02	0.02
2MH	2-Methylhexane					
23DMP	2,3-Dimethylpentane					
11DMCP	1,1-Dimethylcyclopentane					
3MH	3-Methylhexane					
1C3DMCP	1-cis-3-Dimethylcyclopentane					
1T3DMCP	1-trans-3-Dimethylcyclopentane					
3EP	3-Ethylpentane					
1T2DMCP	1-trans-2-Dimethylcyclopentane					
NC7	Normal Alkane C7					
ISTD	Internal Standard	10.296	87676	39522	3.44	3.44
MCH	Methylcyclohexane					
113TMCP	1,1,3,-Trimethylcyclopentane					
ECP	Ethylcyclopentane					
124TMCP	1,2,4-Trimethylcyclopentane					
123TMCP	1,2,3-Trimethylcyclopentane					
TOL	Toluene	12.705	223	72	0.01	0.01
NC8	Normal Alkane C8	15.345	1066	396	0.04	0.03
IP9	Isoprenoid C9					
MXYL	m-Xylene					
PXYL	p-Xylene	18.563	172	61	0.01	0.01
OXYL	o-Xylene	19.794	390	115	0.02	0.01
NC9	Normal Alkane C9	21.128	1965	634	0.08	0.06
IP10	Isoprenoid C10					
NC10	Normal Alkane C10					
IP11	Isoprenoid C11					
NC11	Normal Alkane C11					
NC12	Normal Alkane C12					
IP13	Isoprenoid C13					
IP14	Isoprenoid C14	40.529	8416	2029	0.33	0.18
NC13	Normal Alkane C13					
IP15	Isoprenoid C15	45.103	12834	3044	0.50	0.27
NC14	Normal Alkane C14					
IP16	Isoprenoid C16					
NC15	Normal Alkane C15					

Figure 3. Liquid hydrocarbon organic geochemistry, Oil Creek, Alaska Peninsula (part 2 of 3)

Company:	WALLY DOW	Client ID:	04-RR-14
Well Name:	2004 DGGS	Project #:	04-400-A
Depth:	-	Lab ID:	WD000281
Sampling Point:		File Name:	G4040748.D

Peak Label	Compound Name	Ret. Time	Area	Height	ppt (Area)	ppt (Hght)
NC16	Normal Alkane C16					
IP18	Isoprenoid C18					
NC17	Normal Alkane C17					
IP19	Isoprenoid C19 (Pristane)	58.000	13266	2288	0.52	0.20
PHEN	Phenanthrene	59.081	8044	1691	0.32	0.15
NC18	Normal Alkane C18					
IP20	Isoprenoid C20 (Phytane)	61.616	9720	1162	0.38	0.10
NC19	Normal Alkane C19					
NC20	Normal Alkane C20					
NC21	Normal Alkane C21					
C25HBI	Highly Branch Isoprenoid C25					
NC22	Normal Alkane C22					
NC23	Normal Alkane C23					
NC24	Normal Alkane C24					
NC25	Normal Alkane C25					
NC26	Normal Alkane C26					
NC27	Normal Alkane C27					
NC28	Normal Alkane C28					
NC29	Normal Alkane C29					
NC30	Normal Alkane C30					
NC31	Normal Alkane C31					
NC32	Normal Alkane C32					
NC33	Normal Alkane C33					
NC34	Normal Alkane C34					
NC35	Normal Alkane C35					
NC36	Normal Alkane C36					
NC37	Normal Alkane C37					
NC38	Normal Alkane C38					
NC39	Normal Alkane C39					
NC40	Normal Alkane C40					
NC41	Normal Alkane C41					

Figure 3. Liquid hydrocarbon organic geochemistry, Oil Creek, Alaska Peninsula (part 3 of 3)

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