Alaska Oil and Gas
Secure, Predictable, Prolific

A World Class Investment Opportunity

Office of the Commissioner
Alaska Department of Natural Resources
March 2019
Land Base
- 586,412 sq. miles—more than twice the size of Texas
- Larger than all but 18 sovereign nations
- More coastline than all other 49 states combined
- More than 3 million lakes; half of world’s glaciers
- Approximately 40% of the nation’s freshwater supply

Land Ownership
- Federal Land: more than 200 million acres
- State Land: Approx. 100 million acres of uplands, 60 million acres of tidelands, shore lands, and submerged lands, and 40,000 miles of coastline
- Native Corporation Land: 44 million acres
“... The road to energy dominance goes through the great state of Alaska ...”

-Ryan Zinke, US Secretary of Interior

- Alaska is a **premier petroleum province**
- Safe investment climate
- Stable business environment
- Established and predictable permitting system
- Decades of experience with oil, gas, and natural resource producers
- Established oil-field service companies
- Well-trained arctic-experienced workforce
**State of Alaska - Oil & Gas Resources**

**North Slope**
USGS estimates that Alaska’s North Slope has more oil than any other Arctic basin

- **OIL:** Est. 49 billion barrels of conventional oil ([USGS & BOEMRE, 2018](#))
- **GAS:** Est. 194 trillion cubic feet of conventional natural gas ([USGS & BOEMRE, 2018](#))

Alaska has world-class unconventional resources, including tens of billions of barrels of heavy oil, shale oil, and viscous oil, and hundreds of trillions of cubic feet of shale gas, tight gas, and gas hydrates

**Cook Inlet**
USGS estimates that significant undiscovered volumes of hydrocarbons remain to be found in the Cook Inlet:

- 19 trillion cubic feet of natural gas
- 600 million barrels of oil
- 46 million barrels of natural gas liquids

*Compared to most petroleum provinces, Alaska is relatively underexplored, with ~ 600 exploration wells on the North Slope, compared to Wyoming’s 19,000.*

*Alaska is one of the few places to explore both conventional and unconventional resources in the same basin*
GLOBAL ARCTIC OIL ESTIMATES

Arctic Alaska, 27%

Arctic Alaska Oil + NGL 36 Billion Barrels

UNDISCOVERED OIL
(billion barrels)

- >10
- 1-10
- <1

Area not quantitatively assessed
Area of low petroleum potential
GLOBAL ARCTIC GAS ESTIMATES

Arctic Alaska Gas
220 TCF Conventional

Arctic Alaska, 13%

West Siberian Basin, 39%

E. Barents Basin, 19%

GLOBAL ARCTIC GAS ESTIMATES

UNDISCOVERED GAS (trillion cubic feet)

- >100
- 6–100
- <6
- Area not quantitatively assessed
- Area of low petroleum potential

after USGS, 2008
Northern Alaska Locator Map

Chukchi Sea

Beaufort Sea

NPRA

ANWR 1002 Area

ANWR
MAJOR NORTH SLOPE OIL FIELDS
- OIL-PRONE BARROW ARCH PROVINCE -

Barrow Arch

NPRA (Federal)

Central North Slope State Lands

ANWR 1002

Alaska Division of Oil and Gas, 2006
**North Slope Petroleum Systems**

- **Rock Column Legend**
  - Nonmarine
  - Marine Shelf
  - Marine slope & basin
  - Condensed marine shale
  - Carbonates
  - Metasedimentary
  - Granite
  - Hiatus or erosion

- **Age**
  - Cenozoic
  - Cretaceous
  - Jurassic
  - Triassic
  - Permian
  - Mississippian
  - Pre-Mississippian

- **Rock Column**
  - Baseline
  - Nanushuk Fm
  - Torok Fm
  - Sea Bee Fm
  - Canning Fm
  - Schrader Bluff Fm
  - Prince Creek Fm
  - Sagavanirktok Fm
  - Tulavik Fm

- **Oil & Gas Accumulations**
  - Kuvium, Hammerhead
  - Ugnu, Badami, Sourdough
  - W. Sak, Schrader Bluff, Nikolaichuk, Orion, Polaris, Tabasco
  - Tarn, Melitwater
  - Umat, Fish Creek, Simpson, Plikpa, Willow, Gubik, E. Umat, Square Lake, Wolf Creek, Qumalik, Meade
  - Nanuk, Nuna/Moraine, Cassin, Smith Bay
  - Pt. Thomsen, Kuparuk, Pt. McIntyre, Mtn. Pt., Ft. McKinley, Naukuk, Burger, Waiakpa
  - Alpine, Lookout, Spark, Rendezvous
  - ft. (Nechelik)
  - South Barrow, East Barrow
  - Kemik
  - Prudhoe Bay, Northstar, Raven
  - Sandpiper, Kavik
  - Lisburne
  - Endicott, Liberty
  - * Oil accumulations (roman)
  - Gas accumulations (italics)

- **Petroleum Systems**
  - Kingak - Blankenship (oil source)
  - Shublik - Otuk (oil source)
  - Lisburne (Kuna) (oil source)
  - Endicott (Kekiktuk) (gas source)

- **Petroleum Plays**
  - Mostly Stratigraphic
  - Mostly Structural
  - Topset
  - Torok
  - Ellesmerian structural
  - Thrust Belt

Modified by Alaska Division of Oil and Gas staff from Bird and Houseknecht (2002) and Houseknecht (2003).
Several exciting Nanushuk and Torok Formation discoveries are at different stages of maturity.

Significant delineation drilling this winter in the Pikka-Horseshoe and Willow trends.

Interior Department reviewing 2013 restrictions on future leasing in northern NPRA.

USGS recently dramatically increased estimates of NPRA's undiscovered oil resource.
# Major Recent Brookian Discoveries

<table>
<thead>
<tr>
<th></th>
<th>Smith Bay</th>
<th>Willow</th>
<th>Pikka/Horseshoe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operator</strong></td>
<td>Caelus</td>
<td>ConocoPhillips</td>
<td>Armstrong</td>
</tr>
<tr>
<td><strong>Reservoir Formation</strong></td>
<td>Torok Fm</td>
<td>Nanushuk Fm</td>
<td>Nanushuk Fm</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>State Waters Offshore of NPRA</td>
<td>Federal Onshore Northeast NPRA</td>
<td>Onshore Colville Delta</td>
</tr>
<tr>
<td><strong>Road/Pipeline Tie-in</strong></td>
<td>~ 125 miles</td>
<td>~ 28 miles</td>
<td>~ 20 miles</td>
</tr>
<tr>
<td><strong>Trap type</strong></td>
<td>Turbidite Stratigraphic</td>
<td>Topset Stratigraphic</td>
<td>Topset Stratigraphic</td>
</tr>
<tr>
<td><strong>Net Pay</strong></td>
<td>183-223 ft (unconfirmed)</td>
<td>42-72 ft</td>
<td>&lt; 225 ft</td>
</tr>
<tr>
<td><strong>Oil Gravity</strong></td>
<td>40-45 deg API (est)</td>
<td>44 deg API</td>
<td>30 deg API</td>
</tr>
<tr>
<td><strong>Test Rate</strong></td>
<td>No Flow Tests</td>
<td>&lt; 3,200 bopd vertical</td>
<td>~ 2,100 bopd vertical; 4,600 bopd horizontal</td>
</tr>
<tr>
<td><strong>Contingent Recoverable Resource</strong></td>
<td>1.8-2.4 BBO (est)</td>
<td>300 MMBO</td>
<td>1.2 BBO</td>
</tr>
<tr>
<td><strong>Expected Production (Operator Releases)</strong></td>
<td>&lt; 200,000 bopd</td>
<td>40,000-100,000 bopd</td>
<td>&lt; 120,000 bopd</td>
</tr>
</tbody>
</table>
• Overall progradation of Nanushuk-Torok clinothem across foreland basin illustrated schematically as series of advancing shelf margins.
• Numerous higher-order sea-level fluctuations repeatedly set up potential for enhanced reservoir and stratigraphic traps.
• Play extends across central and western North Slope.
Basal Nanushuk Seismic Anomalies
- 1981 2-D data, NPR-A -

Inigok 1  North Inigok 1  North Kalikpik 1

SW  NE

HRZ – Hue Shale (oil source rock)

Tuluvak & Seabee Fms

Nanushuk Fm

Torok Fm

Fish Creek slumps

Public seismic line USGS 81-27
Pikka Discovery - Nanushuk Fm

Repsol Qugruk 3,
P&A 4/1/2013

Nanushuk Fm
(seismic topset facies)

Potential pay
(sandy lowstand wedge, seismic upper slope facies)

Known pay, 30 deg API on MDT

Top Torok Fm

upper facies tested 4,600 bopd in horizontal Q8 offset well

Qugruk 3 announced as multi-horizon discovery April 2013; Play type is characterized by stratigraphically-trapped shelf margin/lowstand wedge sandstones in lower Nanushuk and underlying sandy slope Torok Formation.
Willow discovery announced January, 2017 was a follow-up of this 2002 discovery. Play type is characterized by stratigraphically-trapped lowstand shoreface shelf margin sandstones in lower Nanushuk Formation.


Lower part of Nanushuk Fm (basal topset facies)

Willow interval: secondary objective with light oil/gas shows; Tinmiaq 2 and 6 wells confirmed discovery with up to 3,200 bopd test.

Top Torok Fm (uppermost slope facies)
Data are updated frequently and available for discounted purchase at http://dggs.alaska.gov/gmc/seismic-well-data.php
For decades, Alaska governors, lawmakers, and citizens alike have worked to open ANWR

- Recently passed legislation calls for two lease sales within 7 years
- Mean case of economically recoverable oil estimates over 600,000 barrels/day from ANWR.

More good news from Alaska’s Outer Continental Shelf:
- Eni permitted to expand Nikaitchuq
- Liberty teed up for development
- ASRC advancing Beaufort Sea plans

Huge opportunities for new investment
**Resource Potential From -Federally Managed Lands-**

**Tax Act – Coastal Plain Activity**
- BLM to administer an oil and gas leasing program in the Coastal Plain of ANWR
- Section 200001 PL 115-97 requires at least 2 lease sales to be held by 2024
- Each sale must offer 400,000 acres of highest hydrocarbon potential, up to 2,000 surfaces acres of Federal land to support production and support facilities
- SOA Royalty 50%

**NPR-A Activity**
- Oil and Gas Leasing
- ConocoPhillips(AK) continues progress
  - CD-5 production
  - GMT-1 began production October 2018
  - GMT-2 & Willow Development

**Sources:** DOI BLM

SOA authorizes water withdrawal & fish habitat permits for activities on federal lands
State of Alaska - Royalty Rate -

Offshore
Royalty Rate: 16.67%
SOA Royalty: 0 - 3 Miles 100%,
3 - 6 Miles 27%,
Greater than 6 Miles 0%

NPR-A
Royalty Rate: 12.5% or 16.67%
SOA Royalty: 0% (Mitigation Fund)

State Lands
Royalty Rate: 12.5% or 16.67%
SOA Royalty: 83% - 100%

ANWR
Royalty Rate: 16.67%
SOA Royalty: 50%

Coastal Plain
Arctic Strategic Transportation and Resources - ASTAR

- One of the primary **challenges** in producing resources in our state, its vast size.

- Arctic resource development is **especially dependent on infrastructure for** spill response, mobilization, sealifts, etc.

- **Lower the cost of energy**, basic goods, & utilities across the NS

- **Improve infrastructure** to provide **community security and improve public safety**

Enhancing access to create opportunities to strengthen cultural exchange and community connectivity
Cook Inlet Oil and Gas
- Undiscovered Resources (USGS) -

Undiscovered, Technically Recoverable Oil and Gas

- Mean conventional oil 599 MMBO
  - 372 MMBO in Tertiary Ss play
- Mean Conventional gas 13.7 TCF
  - 12.2 TCF in Tertiary Ss play
  - 1.5 in Mesozoic Ss play
- Mean unconventional gas 5.3 TCF
  - 0.6 TCF Mesozoic tight ss play
  - 4.7 TCF tertiary Coalbed play

Note: 1.2 TCF additional mean resource assessed in OCS waters (BOEM, 2011)
DNR is a **one-stop shop for investors & operators** seeking to develop natural resources in Alaska

- DNR/ Division of Oil and Gas (**DOG**) holds **lease sales twice annually**

- **North Slope exploration season takes place in winter** to minimize tundra impacts as authorized by Division of Mining Land and Water (**DMLW**)  

- DNR Office of Project Management and Permitting (**OPMP**) assists companies navigating the federal and state permitting process

- Division of Geologic and Geophysical Surveys (**DGGS**) provides **seismic and geological data**, available to the public, across the state

- The State Pipeline Coordinator (**SPC**) will provide all necessary assistance to permit pipelines to carry product
For more information contact:

DNR Commissioner’s Office
  • 907-269-8400

Division of Oil & Gas
  • 907-269-8800

Division of Geological & Geophysical Surveys
  • 907-451-5000
END OF PRESENTATION

>>>>>> EXTRA SLIDES<<<<<<<
MULTIPLE PERMITTING/APPROVAL PROCESSES RUN IN PARALLEL

**Federal**
- Notice of Intent
- Scoping
- Draft EIS
- Final EIS
- Record of Decision
  - USACE – Wetlands
  - USFS – Plan of Operations
  - E.O. 13175
  - Tribal Consultation
  - USFWS/NMFS
  - Endangered Species Act Consultation
  - NMFS
  - EFH Assessment

**State**
- DNR Plan of Operations/Development
- DNR Financial Assurances
- DEC Integrated Waste Management
- ADEC Waste Management, Air Quality, Water Quality
- DFG
- Fish Habitat Permits

**Local**
- Borough Plan
- City Plan
- Tribal Village Plan

**Federal Processes Can Drive - Timelines / NEPA**

**Federal Authorizations & Approvals**

**State Authorizations & Approvals**

**Local Consistency & Approvals**
Prudhoe Bay Field and Satellites