

Developing Alaska's Heavy Oil Resources

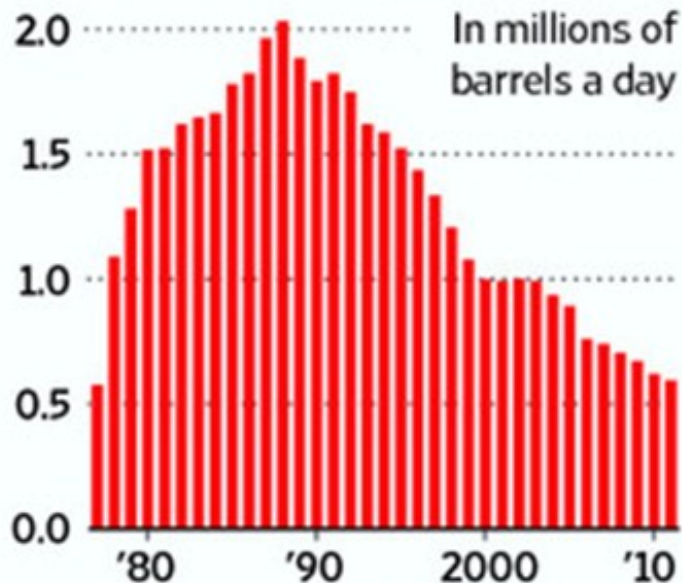
Stephen Yarbrow



Decreasing Conventional Oil Production Impacts The Trans-Alaska Pipeline

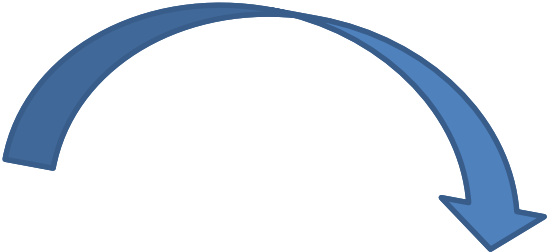
Slippery Slope

Average daily volume of the
Trans Alaska Pipeline System



Note: 2011 is through April 30. Volume is lower than expected due to a 148-hour shutdown in January.

Source: Alyeska Pipeline Service Co.

- 
- Harder to find conventional oil
 - Drilling is expensive
 - Sense of urgency
- 

Globally, 9 to 13 TRILLION barrels of Heavy Oil Assets, but -

- Hard to transport
- Sells for \$10 to \$20 LESS than light crude
- Only 1 out of 4 US refineries can process heavy oil



Shale



Heavy
Oil

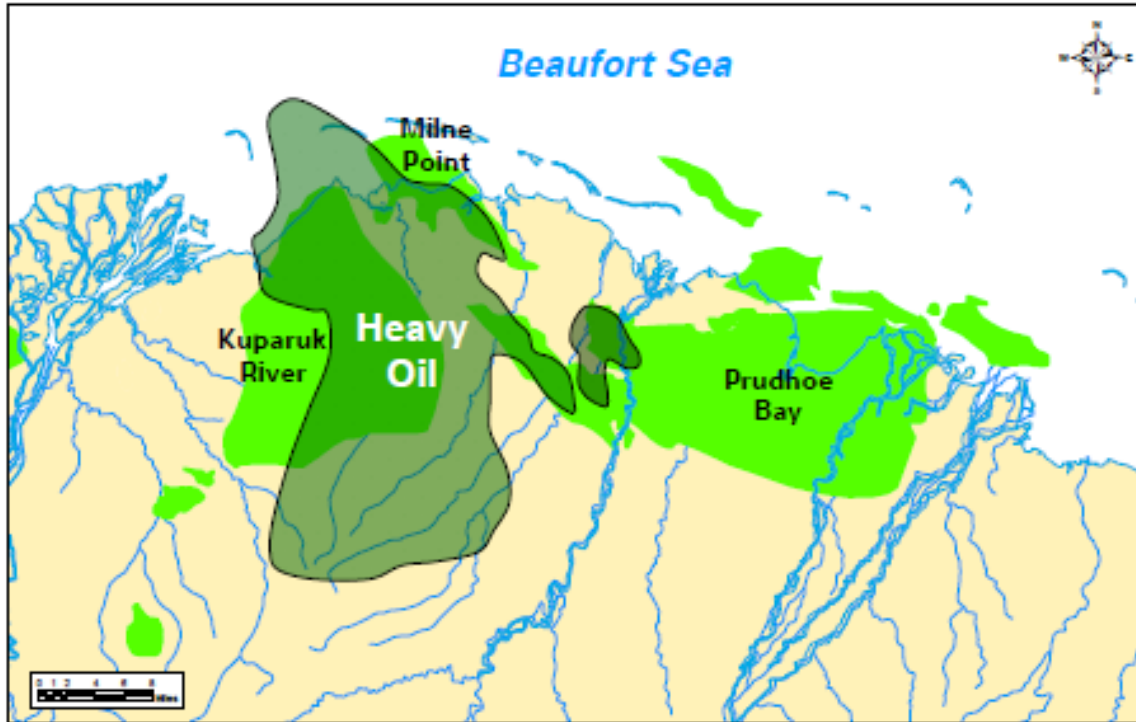


Bitumen



Oil Sands

Heavy Oil Fields in Alaska



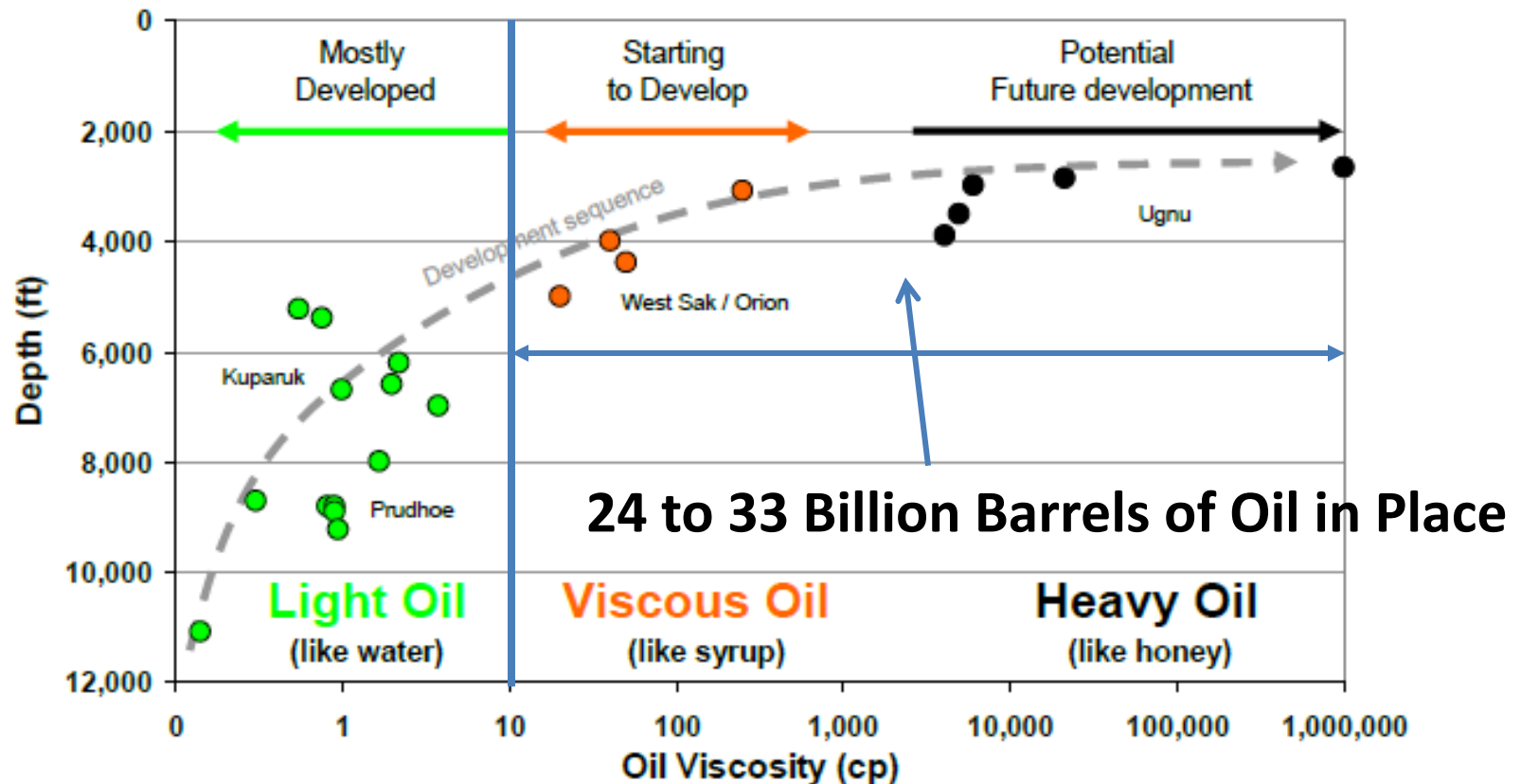
- 24 to 33 Billion Bbl Oil Total
- Schrader Bluff/West Sak
 - 12 Bbbls Oil
- Ugnu
 - 12 to 18 Bbbls Oil

Heavy oil is fairly shallow within 5000 ft. and on-land
Does not require off shore drilling.

Important Issues with Heavy Oil

- High viscosity flows very slowly: difficult to transport and wells produce at lower rates than light oil wells
 - Developments require lots of wells
 - Thermal techniques (e.g. steam) may be required for recovery but energy balance and environmental footprint are factors
- Heavy oil is depleted in hydrogen relative to light oil
 - Fewer refined products are derived from heavy oil
 - Heavy oil without upgrading sells at a lower price on the market

Physical Traits of Alaskan Heavy Oil



Barrier to development: The high viscosity prevents transport in the Trans-Alaska Pipeline

SuperCritical Water Extraction and Refining (SCWER)



Heavy Oil

+



Water

=



Light crude

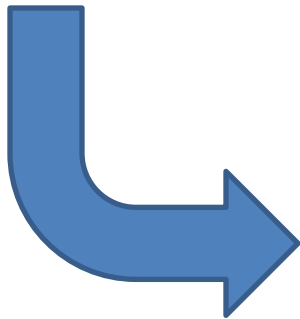
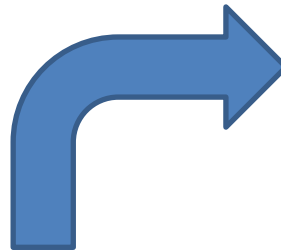
Use the **unique** properties of water at high temperatures and pressures to **make heavy oil into lighter, less viscous crude**

Actual Results with Asphalt/Sand

Asphalt Sample
(With Sand Fibers)



Product Oil
and Water

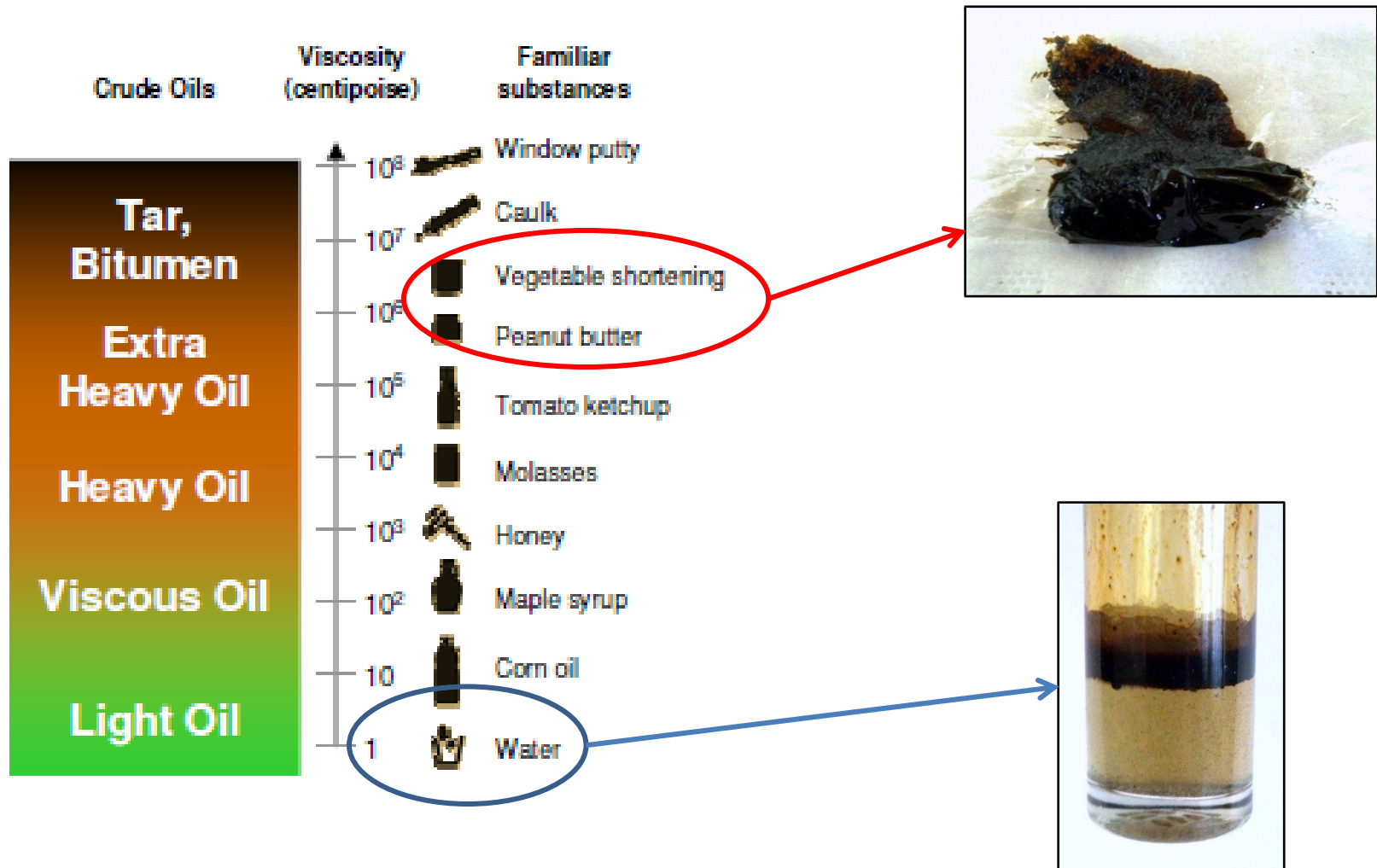


Upgraded Oil

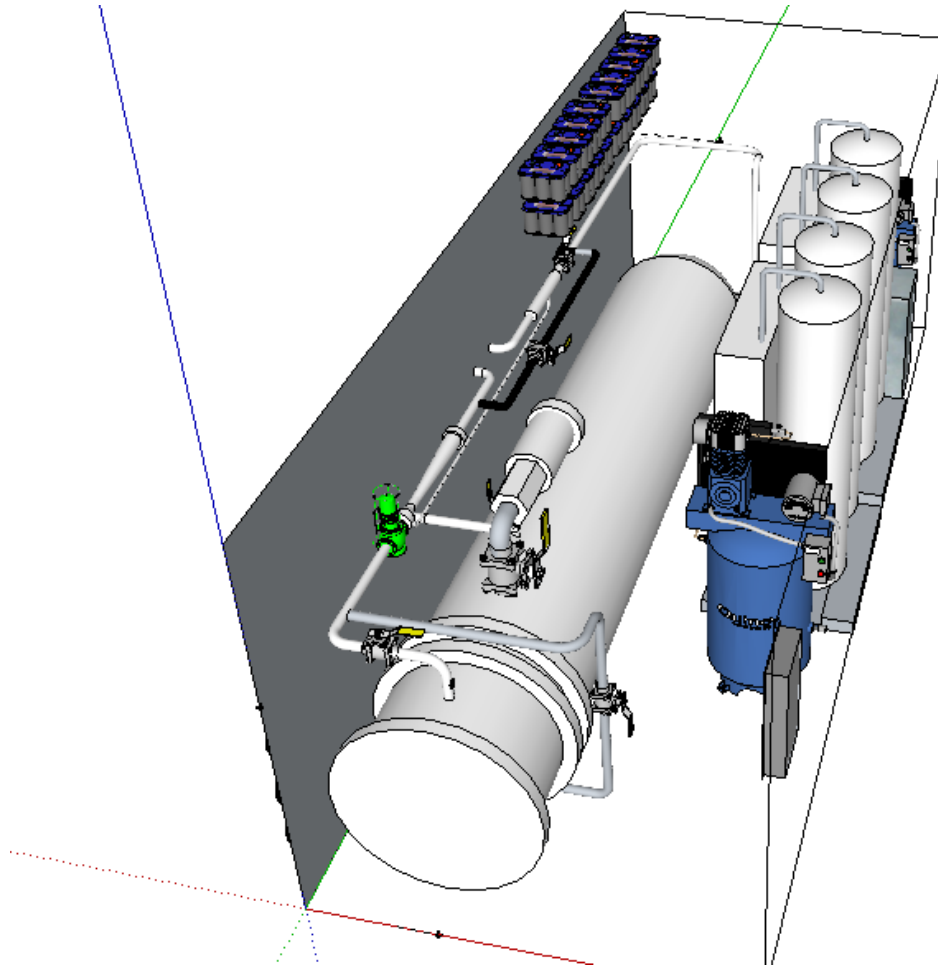
Water/Additives

Sand Particles

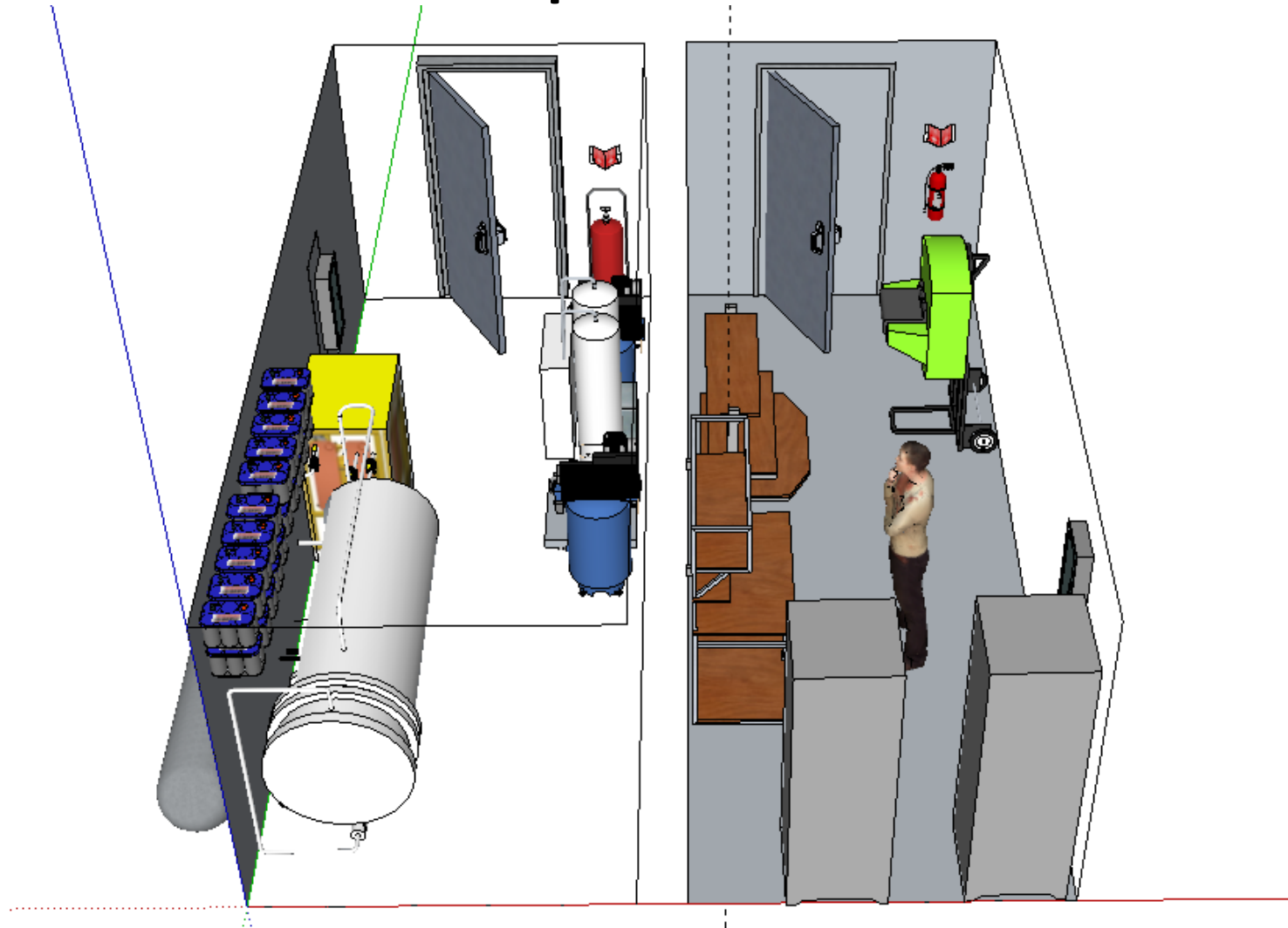
SCWER Processing Reduces Viscosity



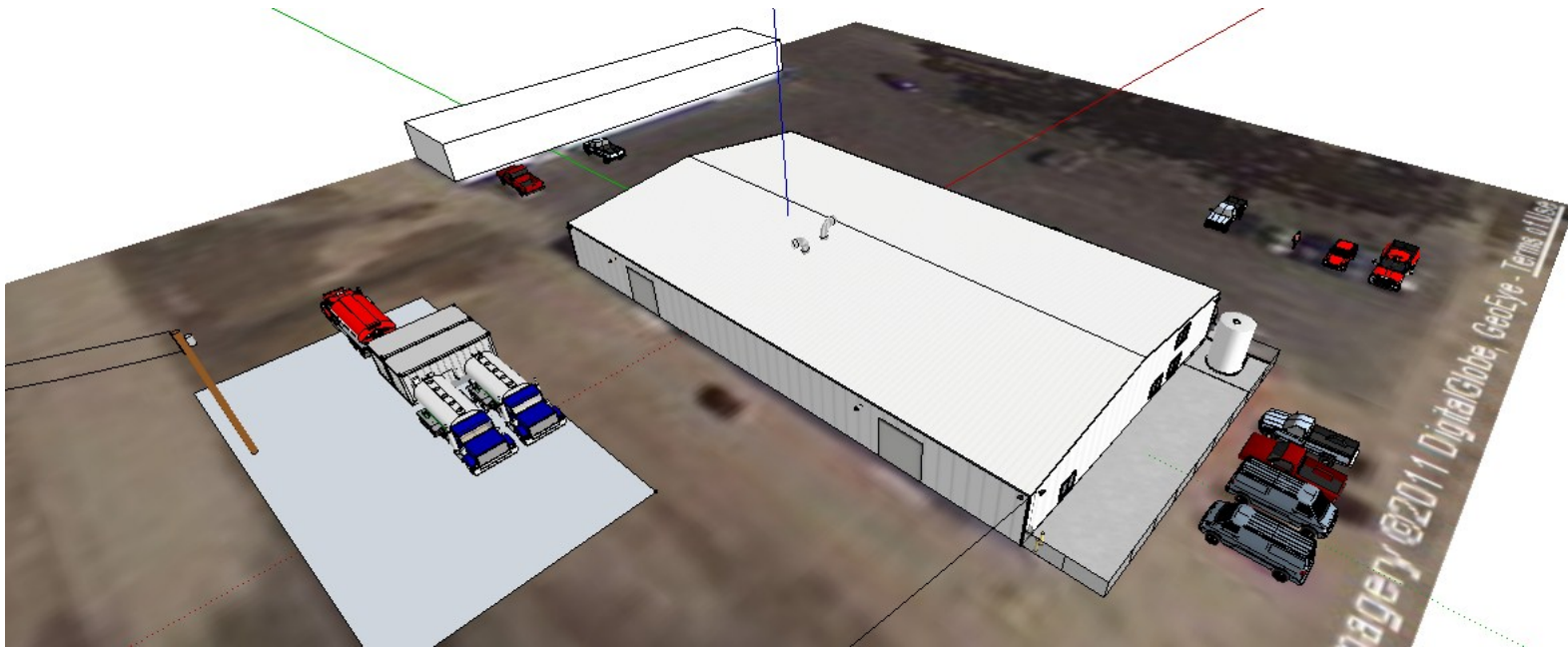
The SCWER Process uses Conventional Equipment



SCWER Pilot Process in Modular Transportainers



SCWER Pilot Located at Fairbanks Pipeline Training Center



Path Forward and Collaboration

- Develop collaboration with University of Alaska and Fairbanks Pipeline School
- Build and test 5 bbl/day unit
 - Leverage technical expertise with Alaska oil production at University of Alaska
 - Integrate with pipeline operations experience at Fairbanks Pipeline Center
- Use industrial experience gained from 5 bbl/day unit to build industrial unit (25 bbl/day) for North Slope production field trials

How SCWER adds Value

- Reduce the viscosity to allow transportation through conventional pipelines without additional heating, refining or solvent addition
- Increase the value of heavy crude with low API gravity (8 to 14) to a higher value crude ($>20^\circ$ API). This can increase the value per barrel of product oil by \$20 or more
- Process oil assets that were not financially feasible before, opening up new opportunities for profitable development

Positive Impact for Alaska

- Continue to provide 12% or more of US oil from Alaskan oil fields.
- Maintain and perhaps increase revenue from operating the Trans-Alaskan Pipeline
 - Maintain steady supply of jobs with the pipeline, oil field development, oil production and new jobs associated with SCWER processing
 - Maintain revenue stream for the state
- Alaska has vast 'unconventional oil' reserves which can ensure revenue for the State of Alaska for the foreseeable future, but the viscous, difficult to transport crude needs additional processing to be viable.

The Management Team

- Stephen Yarbrow, Heavy Oil Solutions/SNT Ventures, LLC
 - 27 years of process engineering, design and operations experience
 - Past experience at Phillips Petroleum Co.
- Mr. Gerry Myers, Heavy Oil Solutions
- Ms. Michelle Hoeft, Heavy Oil Solutions
- Important relationships for success
 - University of Alaska Petroleum Development Laboratory
 - Fairbanks Pipeline Training Facility

SCWER can provide more oil for the Trans-Alaska Pipeline

- Reduce the viscosity from 'honey' to 'water'
- Integrates with on-site equipment
- Leverages investment in conventional pipelines, trucks, refineries
- Design based on industrially proven technologies
 - Supercritical water oxidation of industrial waste
 - Standard Petrochemical equipment
 - Standard commodity chemicals