



# COOK INLET PIPELINE INTEGRITY ASSESSMENT

## PRELIMINARY EXPERT RECOMMENDATIONS

UPDATE TO COOK INLET REGIONAL CITIZENS' ADVISORY COUNCIL

DECEMBER 6, 2019



## GOALS

- Anticipate potential problems as Cook Inlet pipeline infrastructure ages
- Recommend risk reduction measures for implementation *before* further loss-of-integrity issues
- Ensure high quality recommendations by gaining input from *experts, operators, and the Cook Inlet public*



## PHASES

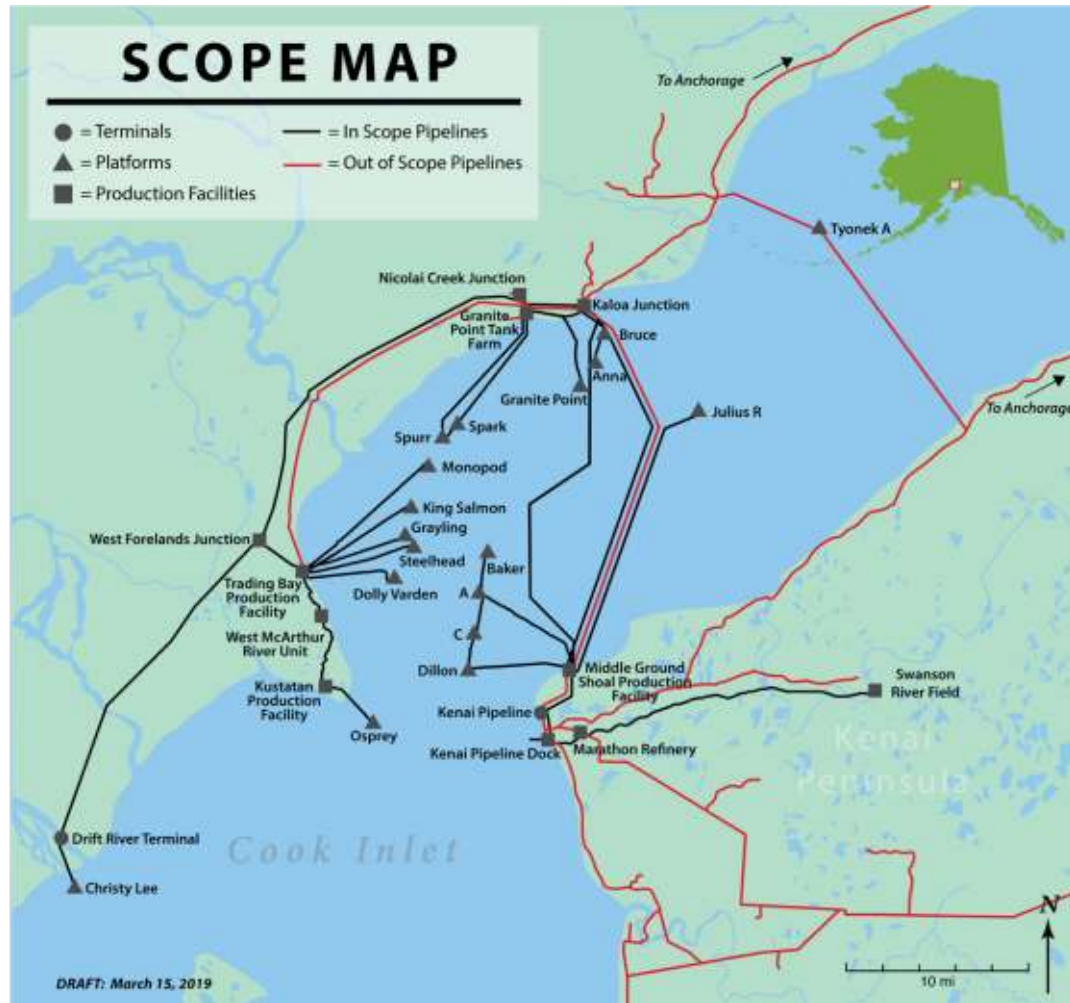
- **Phase 1** – Describe the regulatory framework for pipelines and inventory pipelines in Cook Inlet
- **Phase 2** – Validate and improve the inventory with the pipeline operators and investigate loss of integrity events
- **Phase 3** – Expert panel reviews information collected, interacts with the operators and public, and develops and documents their recommendations

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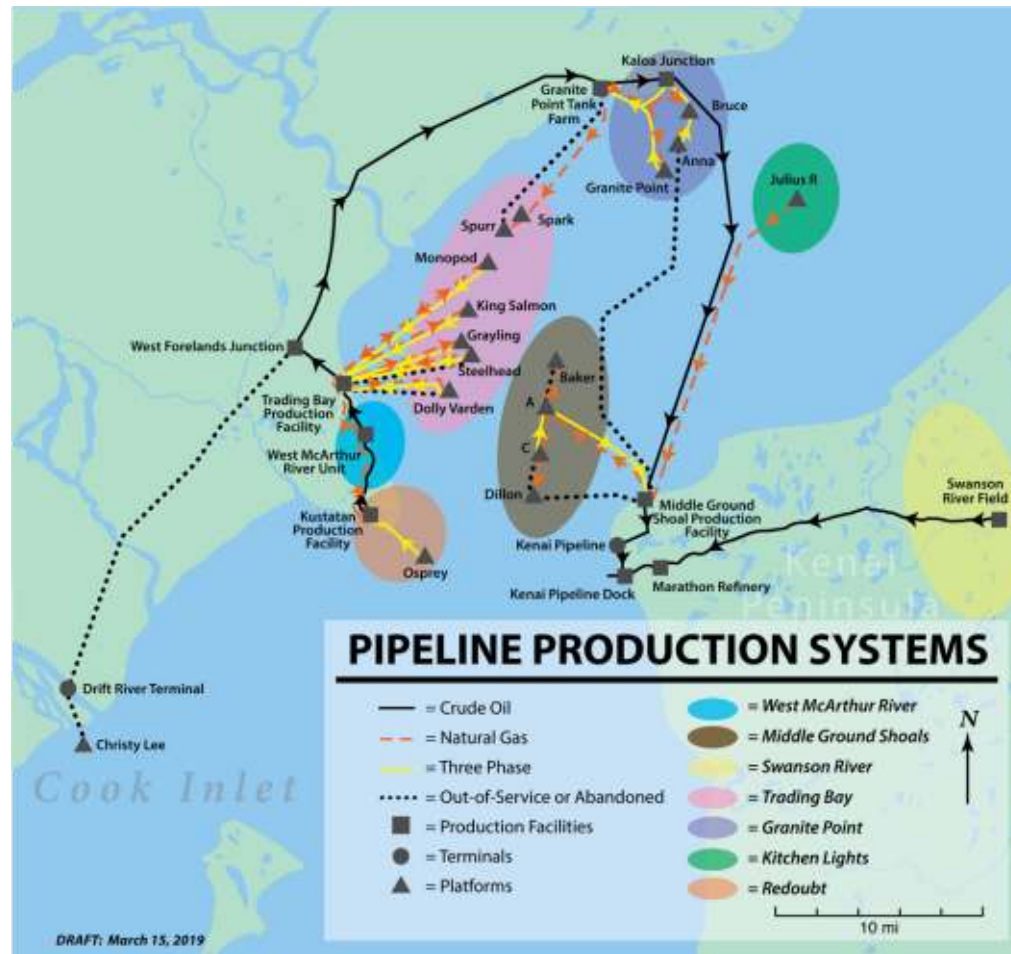
## SCOPE

- Cook Inlet area (on land and subsea)
- Pipelines that transport oil, gas, or three-phase liquid *associated with oil production*
- Preventing and promptly detecting spills (age, material, maintenance/integrity management, leak detection, security)
  
- So...**not** including:
  - Refined product
  - Gas lines associated with gas production or commercial distribution
  - Spill preparedness or response

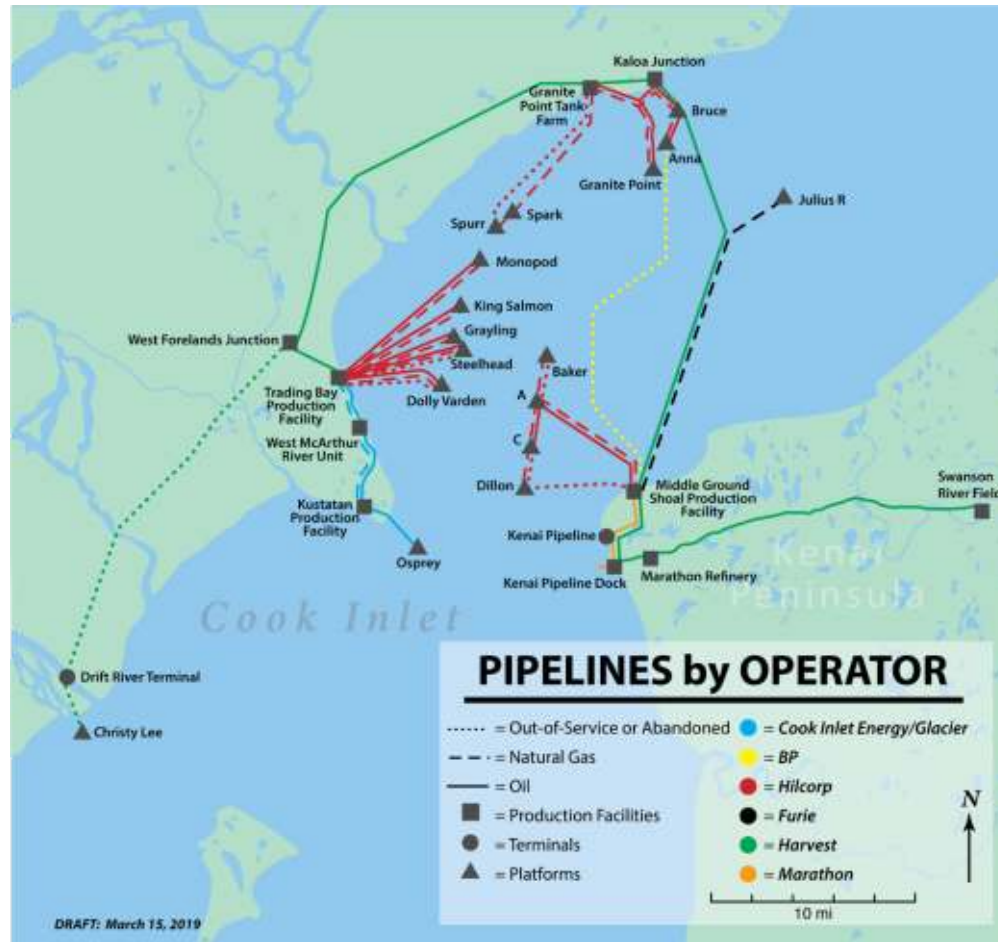
# SCOPE



# SYSTEMS



# OPERATORS





## EXPERT PANEL CHARTER

**Goal:** Maintain the structural integrity of Cook Inlet pipelines by recommending measures to reduce the risk of failures of this aging infrastructure.

**Charge:** provide recommendations on measures, programs, and practices to monitor and address common causes of failures identified in the analysis of spill data. These recommendations should focus on issues associated with the age-related factors.

The Expert Panel is **not** being charged with providing a critique of past or present integrity management and spill mitigation programs in the Cook Inlet area.

The Panel will strive for consensus in their recommendations.





# HAZARDS

- From ASME B 31.8S-2004 Managing System Integrity of Gas Pipelines
  - External corrosion
  - Internal corrosion
  - Stress corrosion cracking (eliminated as not considered to be a problem in Cook Inlet)
  - Incorrect operations
  - Manufacturing defects
  - Welding/fabrication defects
  - Equipment failure
  - Third party/mechanical damage
  - Weather/outside forces



## SCENARIOS

- Scenarios were considered with regards to
  - Probably frequency of occurrence
  - Potential impacts on human safety
  - Potential impacts on the environment
  - Potential socio-economic impacts
- Scenarios were not quantitatively ranked, but were used to guide discussions on recommendations

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## PRELIMINARY RECOMMENDATIONS – GENERAL

- Maintain up-to-date inventories of all pipelines, components, and important inspection and maintenance features
- Follow Common Ground Alliance best practice guidelines for underground utilities
- Develop and implement a systematic management-of-change program
- Apply recommendations to all lines not formally abandoned, whether or not they are currently in service

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## PRELIMINARY RECOMMENDATIONS – EXTERNAL CORROSION 1

- Conduct annual pipe-to-soil surveys at test stations.
- Conduct close-interval surveys if either:
  - The usual integrity test method is pressure testing and if one or more of the following conditions exist: degraded coating, there has been rectifier down time, mechanical damage exists, or there has been cathodic protection interference; or
  - In-line inspection (ILI) results indicate need for additional testing.
- Inventory cased crossings and conduct lower explosive limit test or electrical test to assess for damage. Remove casings and replace carrier pipes with heavy-wall carrier pipes, if possible.

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## PRELIMINARY RECOMMENDATIONS – EXTERNAL CORROSION 2

- Examine lines for crevice corrosion, including
  - conducting ILI using American Petroleum Institute (API) 570 piping inspection methodology, as appropriate, at metal-to-metal and other contact points;
  - installing insulators at points of metal-to-metal contact; and
  - conducting ultrasonic testing (UT) on risers if close metal contact is a threat.
- Examine lines for corrosion under insulation and limit potential for corrosion by
  - removing unnecessary insulation;
  - removing all insulation to conduct complete 3-year atmospheric corrosion inspections (rather than just spot-checking separate points along the line);
  - conducting radiographic testing (when insulation removal is not possible); and
  - using cages rather than insulation if personnel protection is the intent.
- Alternate UT and magnetic flux leakage testing technologies during scheduled integrity assessments to more completely capture anomalies. Examine all of the resulting images for problems, not just those at hot spots.

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## PRELIMINARY RECOMMENDATIONS – EXTERNAL CORROSION 3

- Examine lines for atmospheric corrosion (painted pipe exposed to the atmosphere) by:
  - visually inspecting lines for intact paint (follow API 570 guidelines);
  - conducting UT inspection if warranted by visual inspection; and
  - inspecting for corrosion under pipe supports and at penetrations.
- Ensure effective cathodic protection (CP) by:
  - determining if there is AC/DC interference and, if there is, mitigating it as appropriate;
  - inspecting rectifiers per requirements and consider use remote monitoring technology in lieu of manual inspections;
  - assessing the impact of shielding coatings when integrating CP and ILI assessments.
- Reduce potential corrosion at air-soil interfaces by regularly inspecting coatings and repairing them when needed.



## PRELIMINARY RECOMMENDATIONS – INTERNAL CORROSION

- Develop a written internal corrosion monitoring and mitigation program which makes use of available monitoring technologies, pigging, inhibitors/biocides, and lab testing. Have the program reviewed by a qualified corrosion engineer.
- Evaluate pre-1970s low-frequency electric resistance welded lines following TTO #5 and manage accordingly.
- Identify and inventory dead-leg and low-flow segments and mitigate issues with any high-risk segments.



## PRELIMINARY RECOMMENDATIONS – INCORRECT OPERATIONS

- Establish task-specific operating and maintenance procedures.
- Conduct a hazard analysis of operating and maintenance procedures.
- Ensure operator and contractors are qualified to implement assigned procedures.





## PRELIMINARY RECOMMENDATIONS – MANUFACTURING DEFECTS

- Implement a quality control program to ensure replacement components comply with current standards and specifications.

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## RECOMMENDATIONS – WELDING/FABRICATION DEFECTS

- Conduct radiographic testing or ultrasonic testing on 100 percent of piping welds during construction and repairs.
- Develop a quality assurance and verification program. Use qualified individuals working to engineered design specifications and procedures for all construction and off-site fabrication and apply engineered inspection and testing criteria to assure performance quality.
- Run a geometry pig during commissioning to identify defects and repair them before the line is put into service.

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## RECOMMENDATIONS – EQUIPMENT FAILURE

- Implement a maintenance program to address the failure risk of wear components such as seals, O-rings, and gaskets. The program should use predictive and preventative techniques to identify component failure levels and intervals and assure that components whose failure can result in a loss of primary containment are repaired or replaced within their useful service life prior to consequential failure.
- Prioritize maintenance for protective and high-consequence equipment (e.g., vibration shutdowns, seal failure detection, pig traps, overpressure equipment).
- Ensure adequate support structures for all ancillary small-bore piping and components to prevent vibratory fatigue.

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# PRELIMINARY RECOMMENDATIONS – THIRD PARTY/MECHANICAL DAMAGE

- *Onshore*

- Implement CGA Best Practices, emphasizing signage (check signs every spring, clear vegetation in late summer to ensure signs can be seen).
- Directly contact private landowners to ensure they know where pipelines cross their property.
- Maintain rights of way so that pipeline corridors are obvious.
- Identify and mitigate potential for vehicular damage to above-ground facilities.
- Evaluate and enhance security of pipelines, including locking valves at remote facilities.

- *Transitions across intertidal zone*

- Communicate with set-netters, Department of Natural Resources tide-land lease holders, and other beach users to ensure they know where pipelines are located and to ask them to report any potential problems with pipelines.

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## PRELIMINARY RECOMMENDATIONS – THIRD PARTY/MECHANICAL DAMAGE

- *Offshore*
  - Install signs at beaches that are visible to vessels offshore.
  - Ensure pipeline corridors are included on nautical charts and in the U.S. Coast Pilot or other navigation publications.
  - Include information on pipelines and anchoring risks in the Cook Inlet Harbor Safety Plan and distribute it to vessel operators.

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## PRELIMINARY RECOMMENDATIONS – WEATHER/OUTSIDE FORCES

- Use an inertial mapping tool during ILI to establish the location of each pipe and critical anomalies.
- Annually evaluate on-bottom stability and mitigate areas of concern (e.g., spans greater than 50 feet).
- Conduct comprehensive visual inspections in spring at low-low tide and mitigate problems identified.
- Protect aboveground piping and components from snow/ice fall damage.
- Secure subsea lines to prevent vortex induced vibration and inspect annually for displacement.



## PROJECT COMPLETION

- Recommendations have already been shared with ADEC and Cook Inlet operators
- Final report to be written



QUESTIONS?