Columbia River Vessel Traffic Evaluation and Safety Risk Assessment

Scott J. Ferguson, ECY
WA ECY Prevention Section Manager, Spills Program
12 May 2016

DEPARTMENT OF
ECOLOGY
State of Washington

Agenda

- Introductions
- Welcome
  - Dale Jensen, Washington Ecology
- Study Background, Goals, and Timeline
  - Scott Ferguson, Washington Ecology
- Study Process and Methods
  - Dennis O'Mara, Det Norske Veritas (DNV-GL)
- Questions and Next Steps

Goals for this briefing

- Introduce the Columbia River vessel traffic evaluation and safety risk assessment
- Identify opportunities for tribes and stakeholders to participate

Washington Department of Ecology

Ecology's mission is to protect, preserve & enhance Washington's environment for current and future generations

OUR STRAGETIC PRIORITIES

- Reduce & prepare for climate impacts
- Prevent & reduce toxic threats
- Deliver integrated water solutions
- Protect & restore Puget Sound

Spills Prevention, Preparedness, and Response

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Spills Program Mission

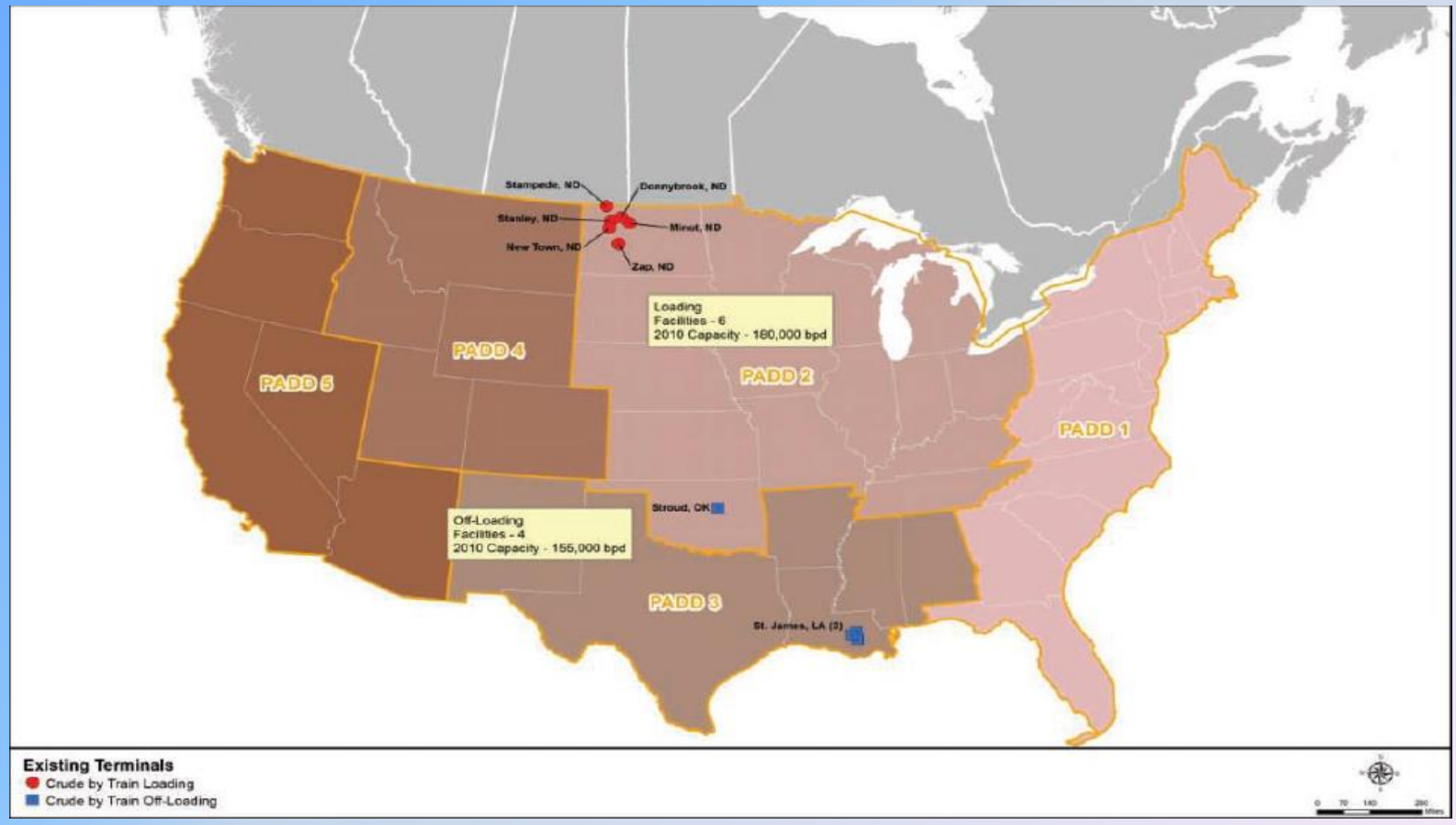
To protect Washington's environment, public health, and safety through a comprehensive spill *prevention*, *preparedness*, and *response* program.

Our spills goal is "zero spills"

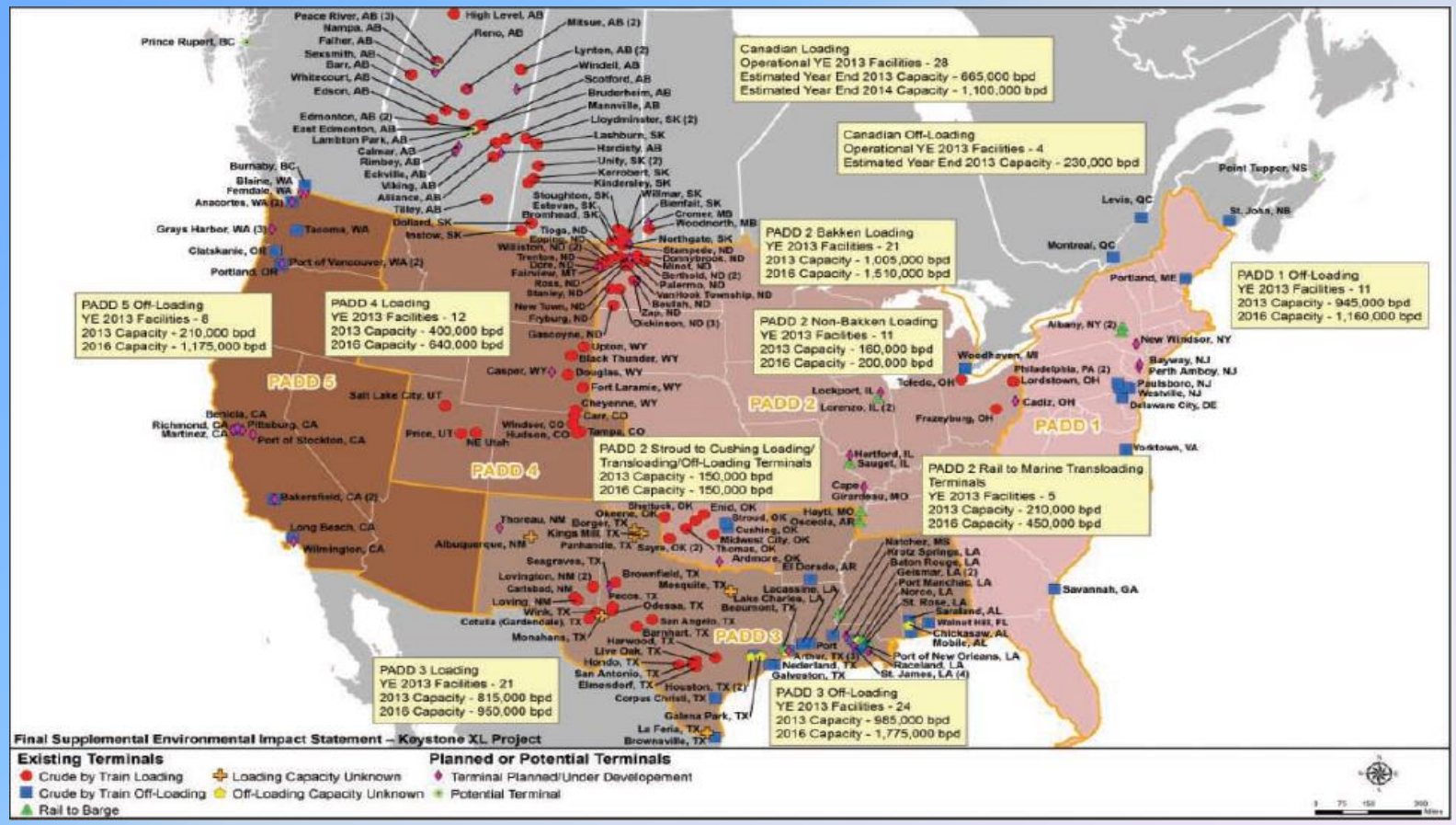
Changing energy picture

Changing energy picture

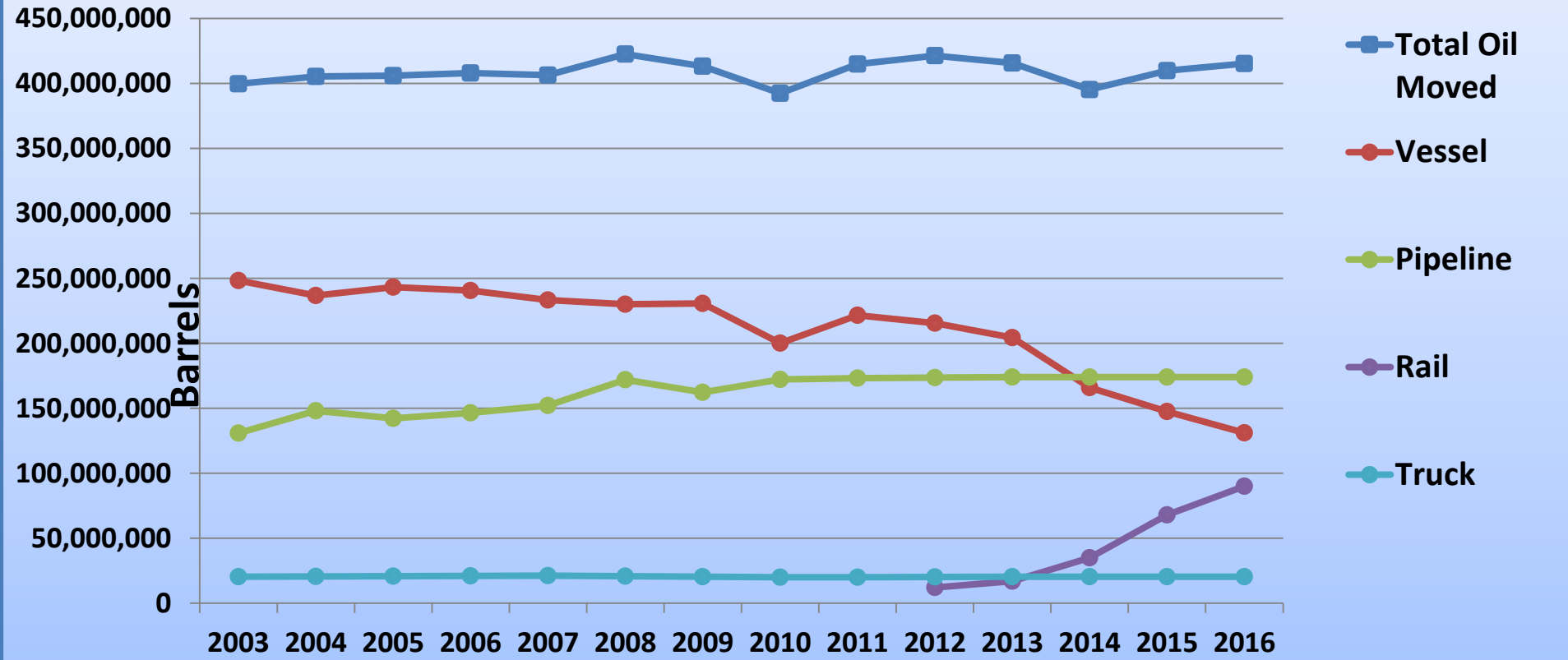
United States existing terminals 2010



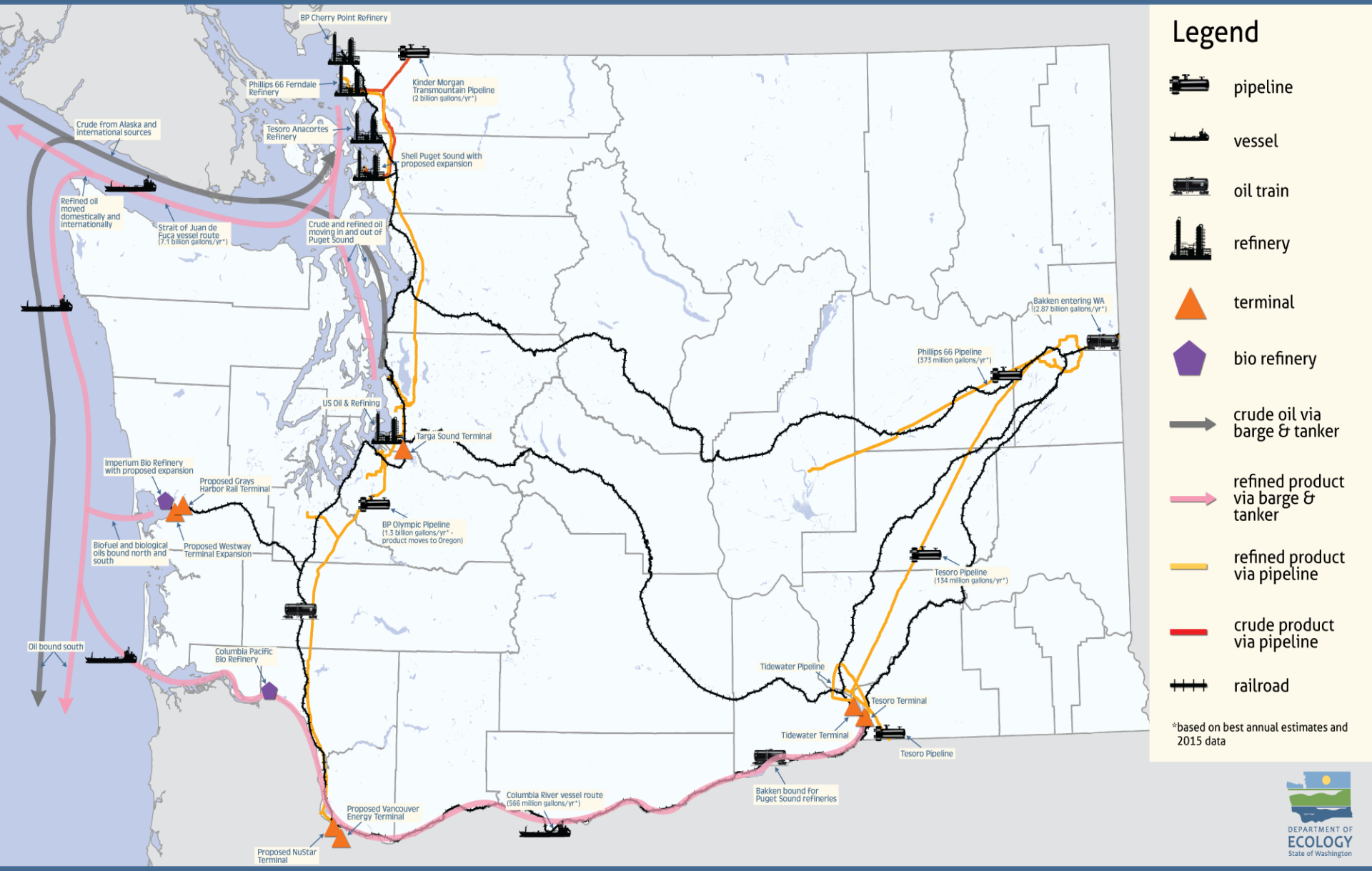
US existing and proposed terminals - 2013



Oil Moved by Transport Mode



OIL MOVEMENT IN & OUT OF WASHINGTON STATE



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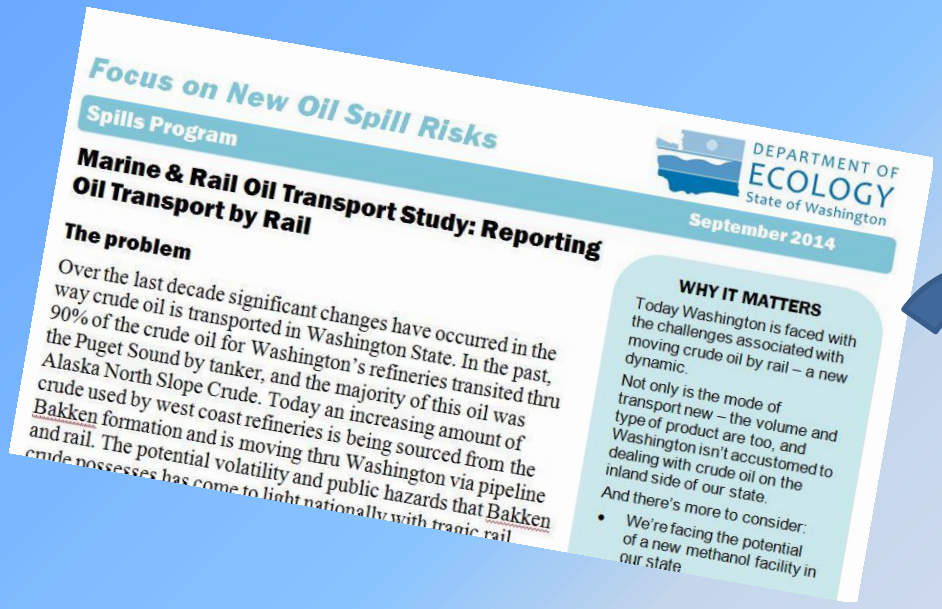
2014 Oil Transportation Study

Recommendations informed 2015 Oil Transportation Safety Act



Focus on New Oil Spill Risks

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September 2014

Marine & Rail Oil Transport Study: Reporting Oil Transport by Rail

The problem

Over the last decade significant changes have occurred in the way crude oil is transported in Washington State. In the past, 90% of the crude oil for Washington's refineries transited thru the Puget Sound by tanker, and the majority of this oil was Alaska North Slope Crude. Today an increasing amount of crude used by west coast refineries is being sourced from the Bakken formation and is moving thru Washington via pipeline and rail. The potential volatility and public hazards that Bakken crude possesses has come to light nationally with tragic rail

WHY IT MATTERS

Today Washington is faced with the challenges associated with moving crude oil by rail – a new dynamic.

Not only is the mode of transport new – the volume and type of product are too, and Washington isn't accustomed to dealing with crude oil on the inland side of our state.

And there's more to consider:

- We're facing the potential of a new methanol facility in our state

Engrossed Substitute House Bill 1449

ESHB 1449 Policy Activities

- **Planning**
  - Contingency planning requirements for rail
  - Geographic response planning
  - Local emergency planning (EMD)
- **Vessel Safety**
  - Vessel traffic risk assessment for Columbia River
  - Rulemaking authority for Grays Harbor (Pilotage Commission)
- **Other Policies**
  - New rail and pipeline reporting requirements
  - Equipment grants
  - Rail financial documentation (UTC)

Columbia River Vessel Traffic Evaluation and Safety Risk Assessment

- **Purpose**
  - Provide an evaluation and assessment to the Washington legislature of vessel traffic management and vessel traffic safety within and near the mouth of the Columbia River

Columbia River Vessel Traffic Evaluation and Safety Risk Assessment

- **Requirements**
  - Consult with US Coast Guard, Oregon Board of Maritime Pilots, Lower Columbia Region Harbor Safety Committee, Columbia River Bar Pilots, Columbia River Pilots, area tribes, public ports in Oregon and Washington, local governments, other appropriate entities
  - Assess and evaluate
    - Need for tug escorts for oil tankers, articulated tug barges, other waterborne vessels or barges
    - Best Achievable Protection
    - Required tug capabilities to ensure safe escort
  - Provide recommendations for
    - Vessel traffic management and vessel traffic safety on the Columbia River
    - Tug escort requirements for vessels transporting oil as bulk cargo

Columbia River Vessel Traffic Evaluation and Safety Risk Assessment

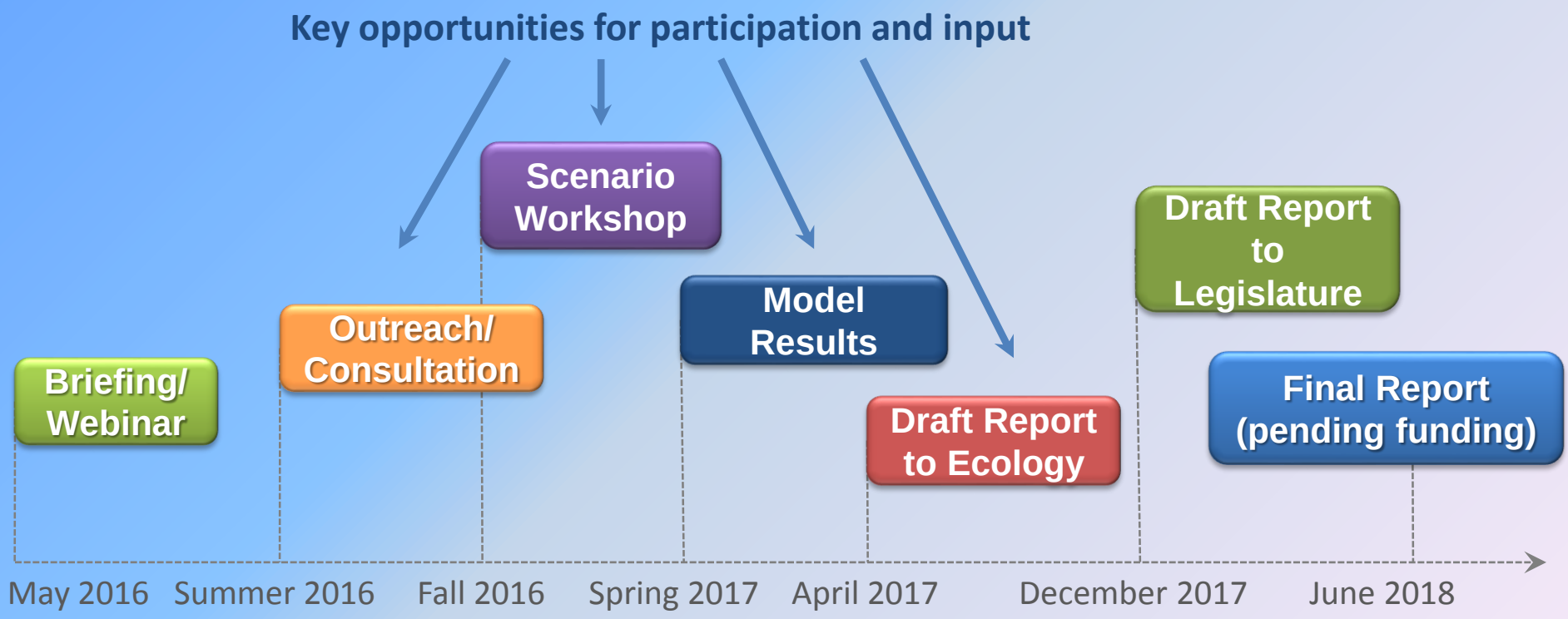
- **Project Roles**
  - Ecology
    - Project sponsor and lead
    - Communications, outreach and engagement
    - Report and recommendations
  - DNV-GL
    - Consultant conducting evaluation and assessment
  - LCRHSC Workgroup
    - Voluntary group of industry stakeholders
    - Provides input and feedback to Ecology and DNV-GL
  - Participating Tribes and Stakeholders
    - Provide input and feedback to Ecology and DNV-GL

Columbia River Vessel Traffic Evaluation and Safety Risk Assessment

- **Timeline**

Event	Date
Draft report to Ecology	April 1, 2017
Draft report to WA Legislature	December 15, 2017
Final report to Ecology	April 1, 2018
Final report to WA Legislature	June 30, 2018

Columbia River Vessel Traffic Evaluation and Safety Risk Assessment



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Thank you.

Scott Ferguson, Spills Prevention Section Manager

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DNV GL Project Role,
Team Members,
And
Timeline

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Trusted Independent 3rd Party

- We classify, certify, verify and test against regulatory requirements, rules, standards and recommended practices
- We develop new rules, standards and recommended practices
- We qualify new technologies and operational concepts
- We invest 5% of our revenue in R&D around strategic, operational or regulatory challenges

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Your Project Team

Bjørn Faanes
Project Sponsor
(Houston)

Dennis O'Mara
Project Manager
(Houston)

Technical/ Reporting

Outreach

Frederico Allevato
Outreach / Deputy PM
(Houston)

Bruce Moreira & Team
Local presence
(Portland / Seattle)

Verification Team
(Houston)

Cheryl Stahl

Aaron Brown

Modelling Team
(Houston)

Vincent Demay

Mia Matuszak

Tim Fowler
Global Lead
(UK)

CRVTSA
Process & Timeline

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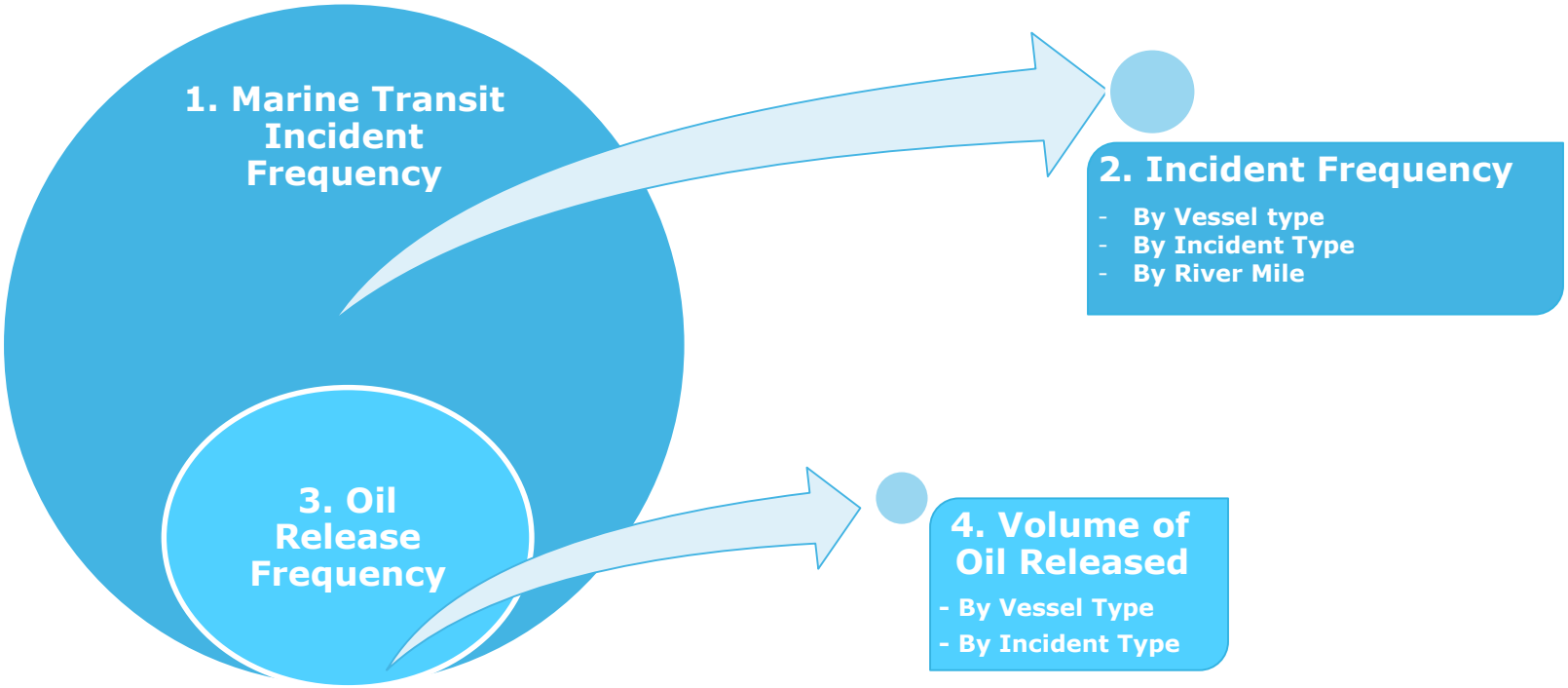
Providing Quantitative Answers



1. Could there be an incident?
2. If so, what are the key drivers?
3. Could the incident result in a release of oil?
4. If so, how much oil would be released?

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Risk Methodology Timeline

April / May 2016

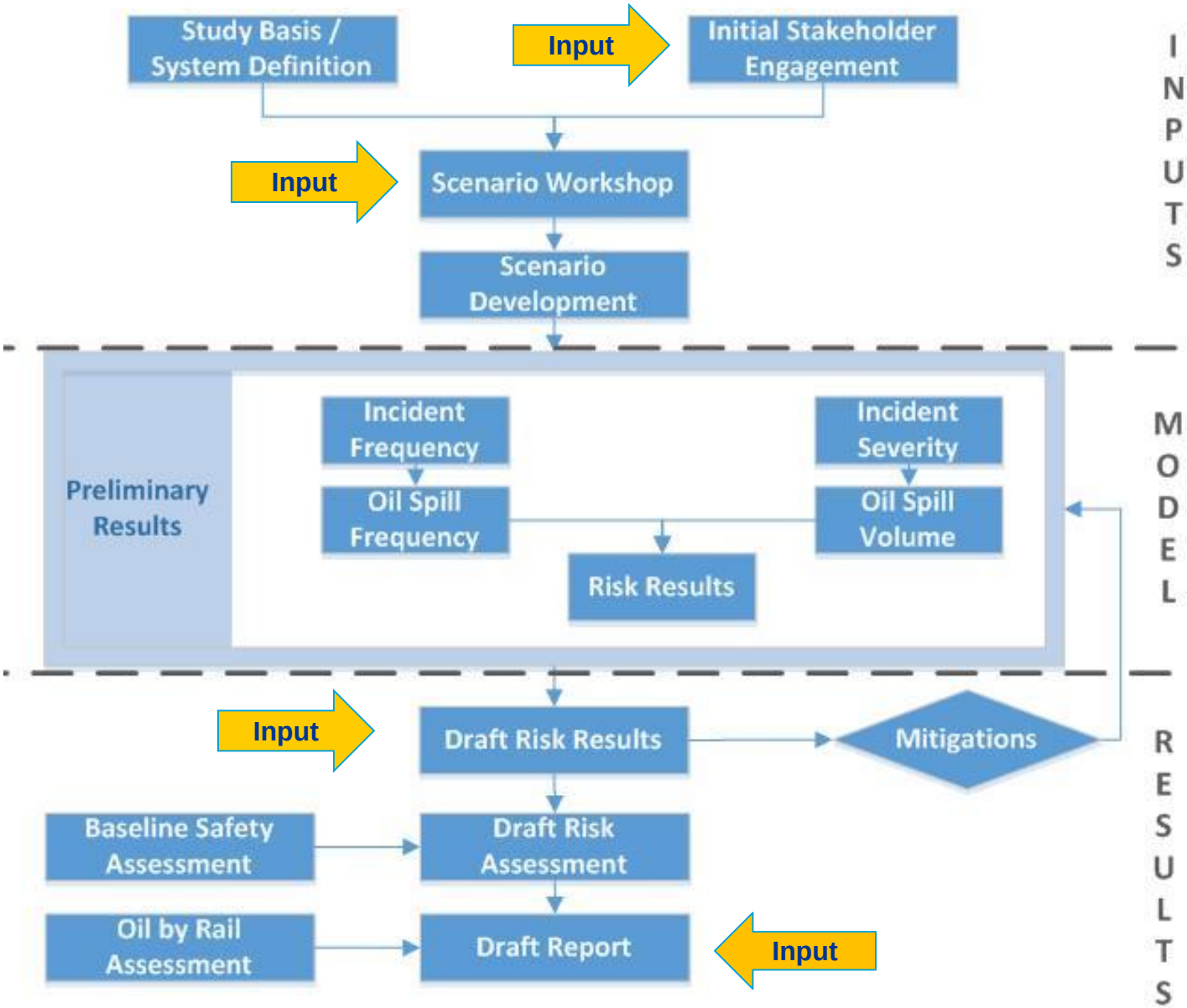
Sept / Oct 2016

Model Inputs Finalized

Dec 2016

Feb 2017

Apr 2017



MARCS Model History Basis and Validation

- MARCS = Marine Accident Risk Calculation System, DNV GL's Proprietary Model
- DNV GL has performed over 30 studies using the MARCS model around the world in the last 20 years.

Study Area	# of Studies	Reviewed/Validated by:
Columbia River	3	WA DoE, USCG, ODEQ
British Columbia	8	Transport Canada, National Energy Board, TERMPOL Committee
Eastern Canada	3	Transport Canada, National Energy Board, TERMPOL Committee
Alaska	6	National Academy of Sciences, Transportation Research Board, National Fish & Wildlife, USCG, Dept of Environmental Conservation (AK)
UK, Med Sea, Australia, Norway	9	UK HSE, SAFECO (EU), Australian Maritime safety Agency

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Traffic Modelling Process (MARCS)

- Typical Inputs/Assumptions:
  - Shipping traffic data (e.g. ship types, routes, transit frequencies)
  - Environmental data (e.g. visibility, wind sea state)
  - Marine shipping operational data (e.g. pilotage, escort tugs, etc.)
  - Waterway laws, regulations and rights are observed

- Incident Frequencies estimated for:
  - Collision
  - Drift grounding
  - Powered grounding

- Two Scenarios:
  - Current Conditions (e.g. 2015)
  - Future Predictions: set for a future date after proposed projects are operational

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MARCS Model Extents and Limitations

- Model predicts
  - Incident Frequencies
  - Areas of risk
  - Scale and probability of Oil Spill for each incident type and vessel type.

- Model does not
  - Predict specific event at specific location
  - Advocate for specific activity or policy change
  - Consider environmental, economic or social impact of incident

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Types of Marine Traffic Studied by CRVTSA

- CRVTSA will model traffic risk only for:
  - Commercial Fishing Vessel
  - Tug/Barge Traffic
  - General Cargo Vessel (Container, RO-RO, Tanker)
  - Passenger Vessel
  - Naval Vessel
  - Tankers/Carriers
  - Bulk Carrier Vessel

Spatial Analysis of AIS Vessel Traffic

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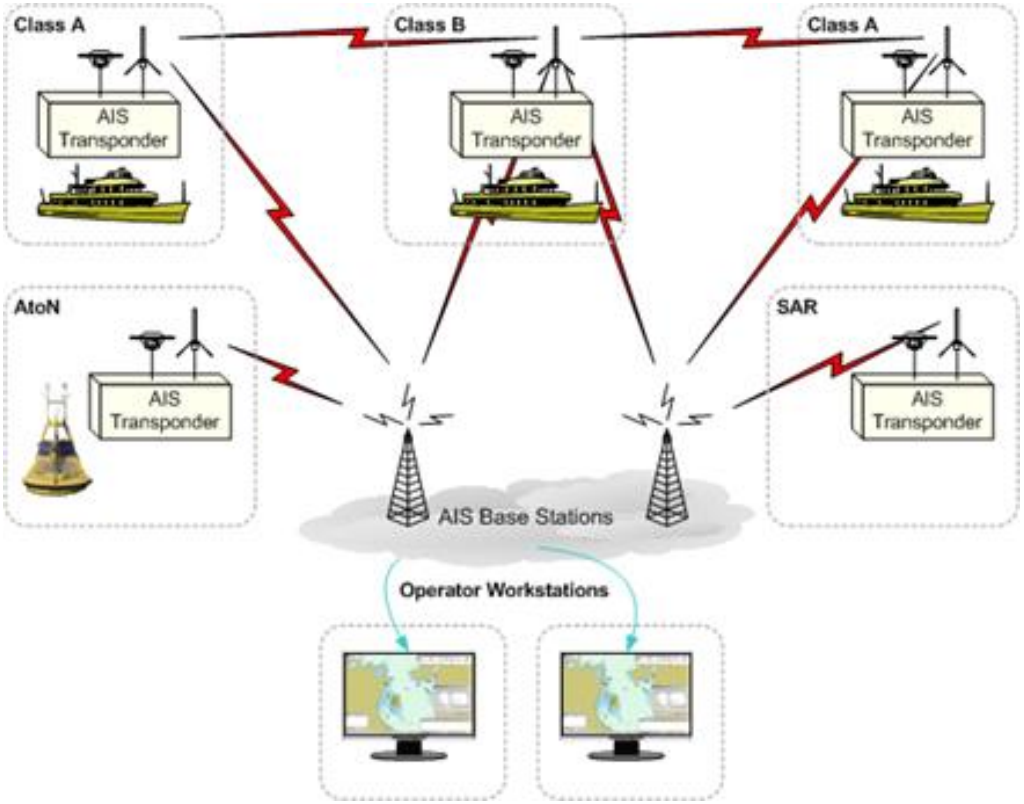
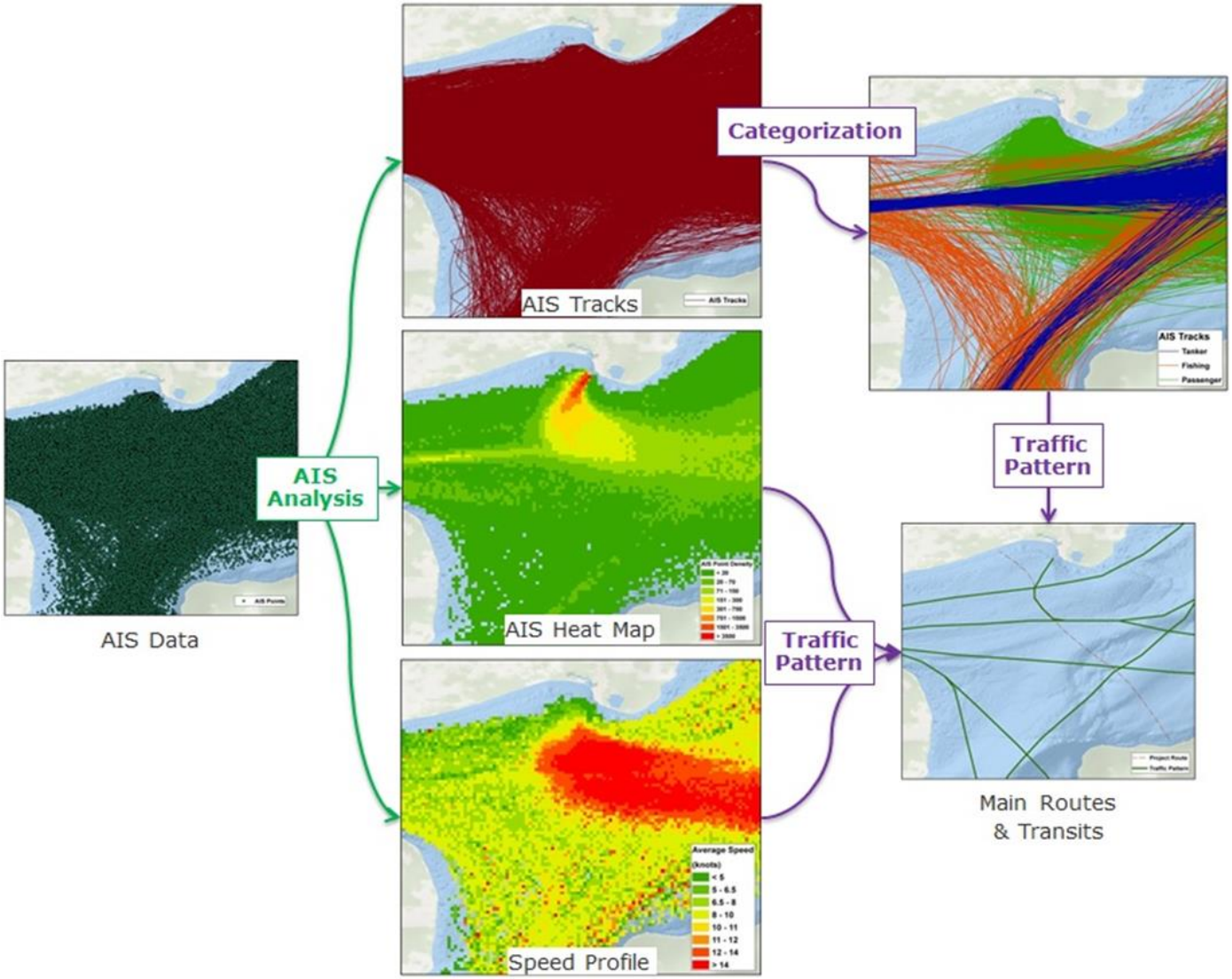
Automatic Identification System (AIS) tracking



- AIS required for:
  - all tankers,
  - high speed passenger vessels above 150Gt
  - all other ships above 300 Gt (and fishing > 45m loa)
  - Changes to the above requirements are ongoing, including more ships

Turning Raw Data into Useful Information



Study Basis:
Model Inputs and Assumptions

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Input Parameters : Modelling Cases

- Modelling Cases:
  - Characteristics of model parameters

Model Input/Parameter	Description	Impact on Model
Base Case Year and Target Year	Selection of a representative year for present-day traffic (Base Case Year) and a future Target Year for our risk calculations.	Determines which AIS data to use and overall temporal scope of model.
Vessel Traffic Growth Rate	This assumption impacts the change in overall vessel traffic density on the river between Base Case and Target Years.	Impact on overall traffic levels and absolute incident frequencies. Small effect on relative risk results
Proposed Projects to include in Model	There are several proposed projects on the river. Which of these to include in the model will need to be determined.	Will contribute to number of deep-draft vessels (bulkers, carriers and tankers) considered in the model.
Project Vessel Assumptions	For each Proposed Project that we do include in the model, we need to determine the number of vessel calls and vessel specs	Will contribute to number of deep-draft vessels (bulkers, carriers and tankers) considered in the model.

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Input Parameters: AIS Data

- AIS Data Processing
  - How do we use the AIS data (i.e. ship GPS records) in the model?

Model Input/Parameter	Description	Impact on Model
Vessel Categories	Determine vessel categories which accurately reflect common vessel types on the river.	This assumption is important for differentiating risk reduction options applied to each vessel type and for reporting purposes . Finally it's also critical to not group deep draft and non-deep draft vessels in same category.
Vessel Speeds	Although AIS data includes vessel speed we always manually verify the reasonableness of these speeds for given river segments.	This is an important input as vessel speed is an important parameter in determining incident outcomes.

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Vessel Categories

Vessel Category	Examples of Included AIS Vessel Types
Cargo/Carrier	Bulk carriers, container ships, general cargo ships, vehicles carrier, timber carriers
Passenger	Ro-Ro/Passenger ships, inland passenger ships, ferries
Service	Ice-breakers, military vessels
Tug	General tugs, towing vessels, barges, towing long and wide
Fishing	Trawlers, all fishing vessels
Pleasure	Pleasure crafts, yachts, sailing vessels
Tanker	LPG tankers, oil tankers, chemical tankers
Undefined	Vessels missing AIS data for vessel type
Other	Dredgers, pollution control vessels

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Input Parameters : Other Factors

- Other factors which can be input into model

Model Input/ Parameter	Description	Impact on Model
Risk Reduction Factors	The numerical value of the reduction factor applied for Safety Practices used on the river each should be evaluated with key experts and particularly Pilots. Factors can be specific for river miles.	These assumptions are key to making the model specific to the local operating environment. This is where local best practices and safety practices are given credit and quantified in the model.
Environmental Data	Assumptions related to how certain environmental data are used in the model. Examples: Visibility, Tide, Current.	This assumption impacts incident frequency results.
Supporting Data	We will consider using any relevant data or studies that are provided, including: • navigational incident data, • studies related to safety or operating conditions on the river, • market studies related to potential future projects.	Variable, depending on source.

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Oil-By-Rail Study

- Objective:
  - Estimate volume of oil to be transported to Columbia River terminals by rail.

- Separate analysis that will not affect vessel traffic model or model outputs.

- Seeking input/feedback related to material on Oil-by-Rail in Pacific NW, including:
  - Reports and studies
  - Data Sources
  - Market Studies
  - Local knowledge

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Sample Model Results

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Incident Risk by Vessel Type

Impacted Vessel	Cargo/ Carrier	Comm. Fishing	Other / Undef.	Passen-ger	Pleasure	Service	Tanker	Tug	Total
2020	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs
2030	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs	1 in XXX Yrs
Incremental % Increase	7.3%	8.4%	10.6%	10.6%	9.9%	7.9%	8.7%	11.2%	15.1%

**Results are made-up for presentation purposes.*

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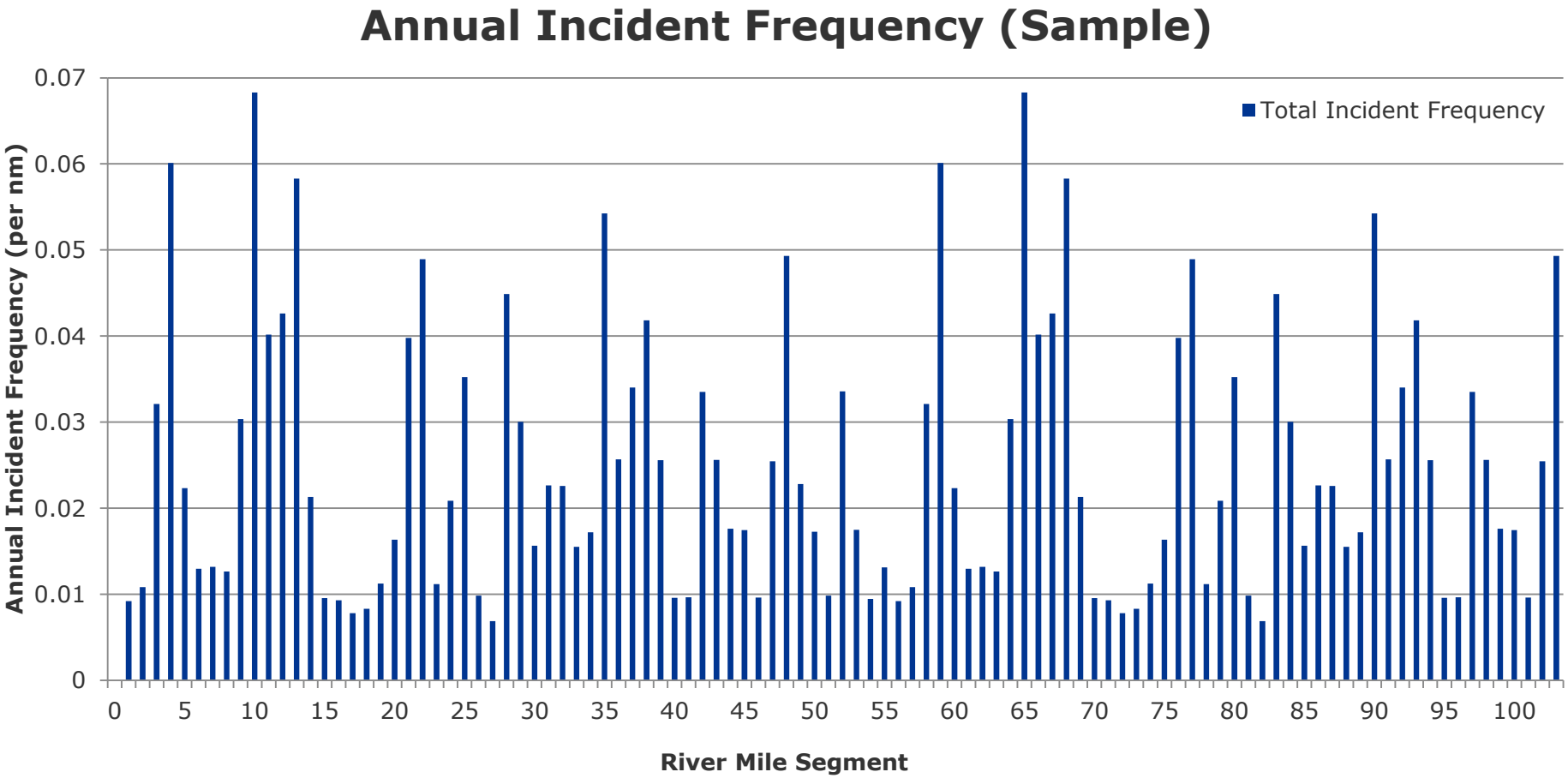
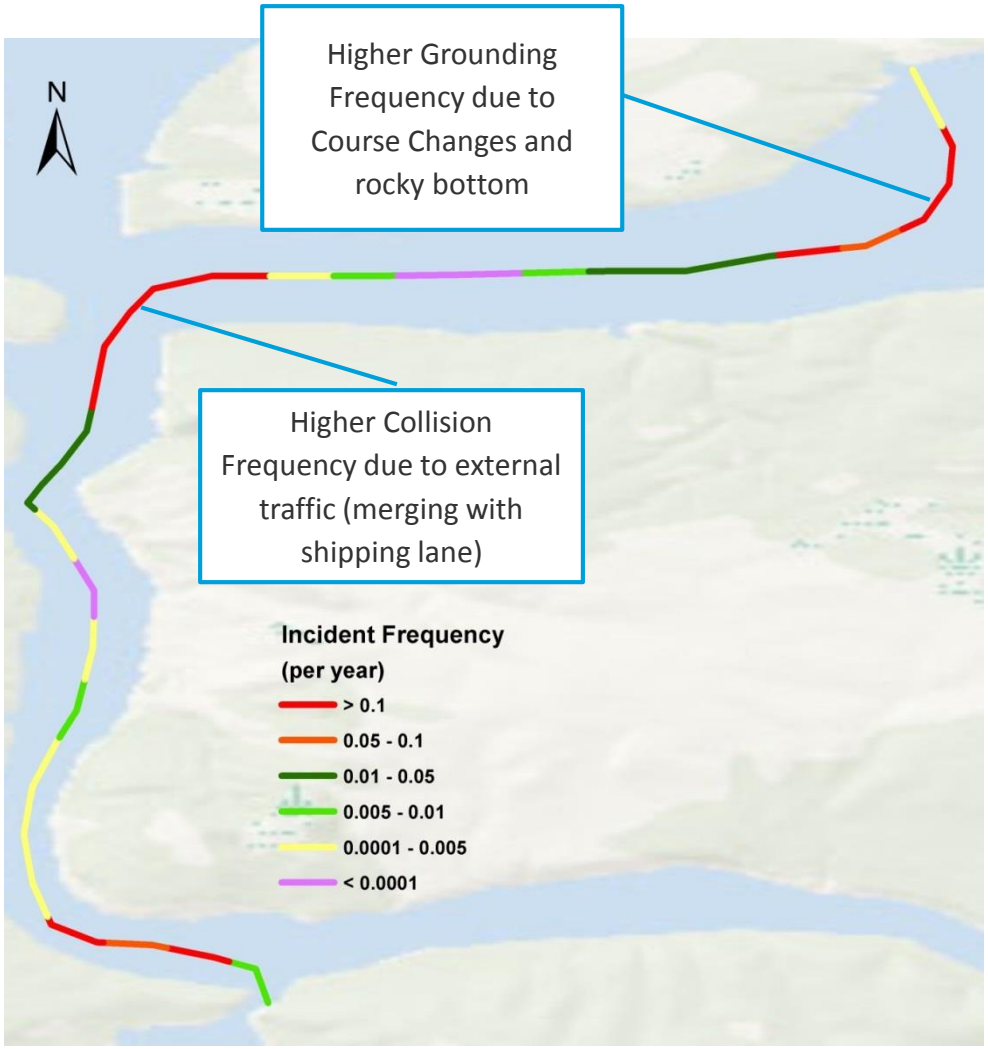
Annual Incident Frequency per Mile



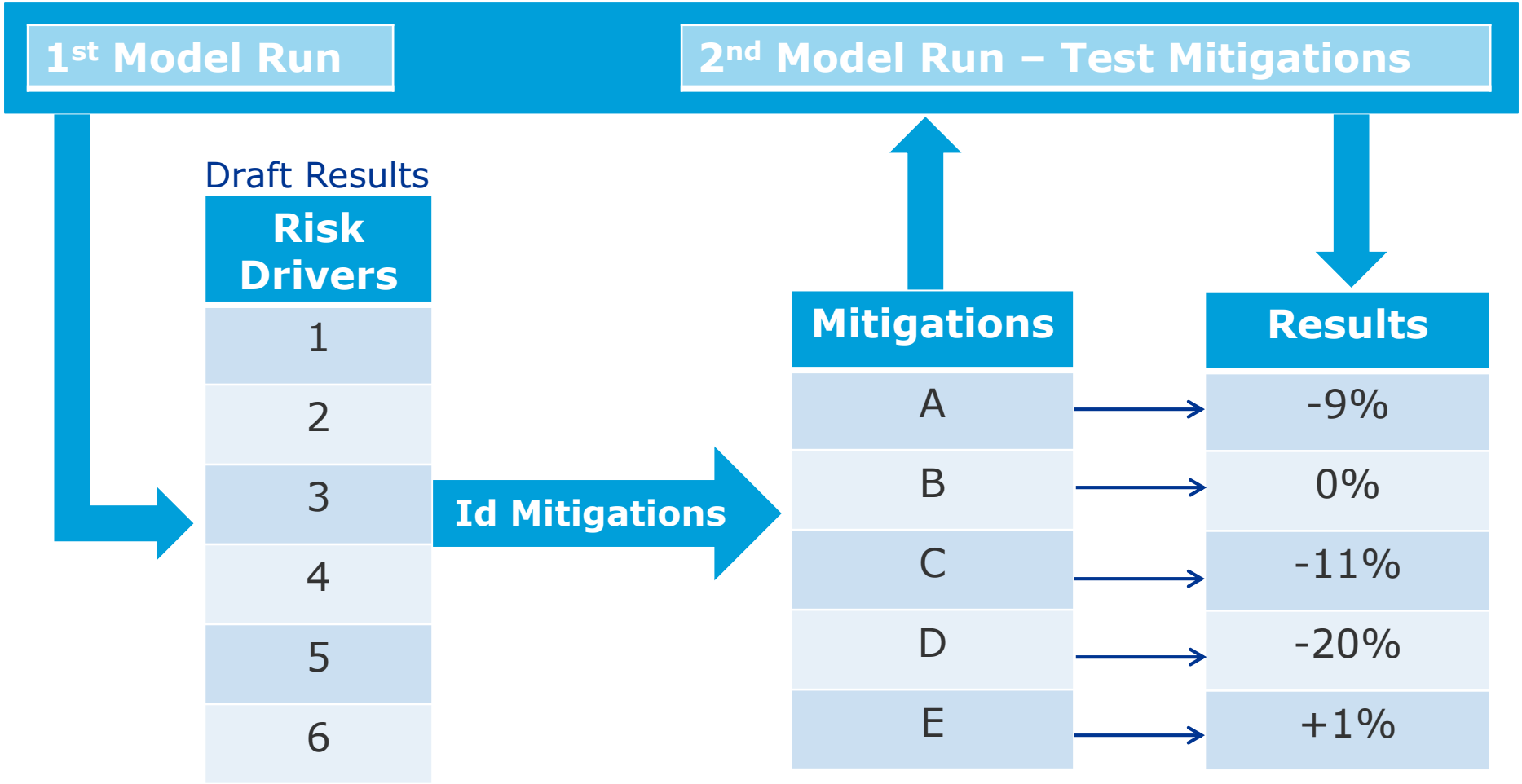
Risk Map

- Model shows incident frequency along shipping routes and identifies which part of the route has higher risk.
- Model can identify risk drivers, e.g.:
  - Grounding
  - Traffic Density
  - Visibility
  - Vessel operations
- Risk mitigations and future recommendations are based on key risk drivers.



Risk Drivers & Testing Mitigation Options

MARCS Model



Report Recommendations

- Report has mandate to include specific recommendations (ESHB 1449)

- Based on results of model and stakeholder engagement, report will discuss:
  - Need for tug escorts for oil tankers, articulated tug barges, and other towed waterborne vessels or barges,
  - By identifying risks, model can help identify best achievable protection,
  - By characterizing risks, model can determine required tug capabilities to ensure safe escort of vessels,
  - Recommendations on vessel traffic management and safety on the Columbia River.

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Opportunities for Engagement

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Opportunities for Engagement

Stage	Involvement Options
Initial Outreach & Data Gathering *May-Aug 2016*	Contact Ecology for Individual Meeting to Discuss Model Inputs Contact Ecology to Provide Data or Reports for Model Input
Scenario Workshop *Sep-Oct 2016*	Contact Ecology about Workshop
Draft Results Presentation *Dec 2016-Jan 2017*	Contact Ecology about Draft Results Presentation
Draft Report *Spring 2017*	Provide Comments To Ecology Regarding Report & Recommendations

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Questions?

Department of Ecology Contact

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