Memorandum

Wednesday, May 25, 2016

Dear VTRA 2015 Working Group Members,

The purpose of the VTRA 2015 project is to update the VTRA 2010 project analysis. As was the case with the VTRA 2010 project, the focus of the VTRA 2015 analysis is on evaluating changes between VTRA 2015 What-If Cases relative to a VTRA 2015 Base Case and the changes between VTRA 2015 RMM Cases modeled on top of the VTRA 2015 What-if Cases relative to this VTRA 2015 Base Case. The purpose of this memo is to provide you with additional clarification beyond the presentation provided to you electronically on April 14, 2015 regarding the VTRA 2015 Model Calibration procedure that has been completed.

By calibrating the VTRA 2015 model to a total of 81 accidents involving both Cargo Focus Vessels and Tank Focus Vessels (about 25% of modelled VTRA Traffic), the analysis conducted with the VTRA 2015 model is more reflective of the vessel traffic risk in the VTRA Study Area than the VTRA 2010 model. The VTRA 2010 model relied on 4 accidents for accident calibration involving only BP Tankers and ATB/ITB's (about 1% of traffic modeled in the simulation). To model the risk of other Tankers, ATB/ITB's, Oil Barges and Cargo Focus Vessels, the VTRA 2010 model used an extrapolation technique from BP Tankers and ATB/ITB's to the broader set of focus vessels. While the 81 accidents used in the VTRA 2015 model may sound like a lot compared to the 4 accidents used in the VTRA 2005 and VTRA 2010 models, it is a factor of about 20 more (i.e. 81/4) whereas the Focus Vessel Traffic in the VTRA 2015 model is about a factor 25 higher (25%/1%) than the focus vessel traffic in the VTRA 2005 model.. The 81 calibration accidents for the VTRA 2015 model were gathered from a variety of data sources, collectively spanning 26 years, although some data sources only covered 12 years or 21 years of accident data. This is accounted for in the VTRA 2015 model calibration by evaluating the average number of accidents per year from each data source and merging that information, since the VTRA 2015 model is a Maritime Transportation System (MTS) simulation for a one year period.

On April 14, 2016 a presentation was provided to the VTRA 2015 Working Group in response to a review of these data sources by members of the VTRA 2015 Working Group and following a VTRA Working Group meeting on April 6, 2016 where that review was discussed amongst all stakeholders present. The salient points made in that April 14, 2016 presentation are:

1. Maritime traffic accidents with oil spills above 1 m^3 in the VTRA Study Area are infrequent events as evidenced by the most recent ones being a collision spill involving a Fishing Vessel (Tenyo Maru) and Cargo Focus Vessel (Tuo Hai) on July 22nd, 1991 and an Oil Barge (Barge 101) powered grounding spill in December of 1994.
2. The VTRA 2005 model pertained to BP Tankers and ATB/ITB's only and was calibrated to 4 accidents over an 11 year period (1995 – 2005) all pertaining to those Tankers and ATB/ITB's that visited the BP Cherry Point facility only (about 1% of VTRA model traffic) with no spill accidents.
3. The VTRA 2010 model was an update of the VTRA 2005 model expanding the risk analysis to all Tankers, ATB/ITB's and Oil Barges (i.e. the Tank Focus Vessels) and Cargo Focus vessels (combined about 25% of VTRA model traffic). This was achieved by relying solely on an extrapolation technique from the VTRA 2005 Focus Vessel Traffic (i.e. about 1% of VTRA model traffic) to the VTRA 2010 Focus Vessel Traffic (i.e. about 25% of VTRA model traffic).
4. The VTRA 2015 model is an update of the VTRA 2010 model by calibrating on accident data for both Tank Focus Vessels and Cargo Focus vessels rather than relying on the extrapolation technique of the VTRA 2010 model from BP Tank Focus Vessels to other VTRA 2010 Tank Focus Vessels and Cargo Focus Vessels. The accident data used to achieve that calibration were divided into two categories: (1) accidents within the spill category of 0 – 1 m^3 and (2) accidents within the spill category of 1 m^3 or more. The accident data used to calibrate the first category (0 – 1 m^3) contains 79 accidents obtained from the following datasets:
    a. 21 years (1995 – 2015) of data for Tank Focus Vessels (excluding Oil Barges) and Cargo Focus Vessels in US Waters of the VTRA study Area.
    b. 12 years (2001 – 2012) of data for Oil Barges in US Waters of the VTRA Study Area.

c. 12 years (2004 – 2015) of Tank Focus Vessel and Cargo Focus Vessels in Canadian Waters of the VTRA study Area.

The accident data to calibrate the second category (1 m^3 or more) contains 2 accidents obtained from the following dataset:

d. 26 years (1990 to 2015) of accident data for Tanks Focus Vessel and Cargo Focus Vessels with a spill size above 1 m^3 in the VTRA Study Area

With respect to the last data set, it is important to note that of the total VTRA model traffic about 75% is non-focus vessel traffic (that include fishing vessels). Focus Vessels in the VTRA 2010 and VTRA 2015 (25% of the VTRA Model Traffic) can collide with both non-focus vessels and focus vessels. The Tenyo Maru Oil Spill involved the collision of a Non-Focus Vessel (Tenyo Maru) with a Cargo Focus Vessel (Tuo Hai). The VTRA model takes the potential oil loss from both vessels involved in a potential collision into account. The Barge 101 Oil spill involved an Oil barge. Neither of these two accidents were used for calibration purposes in the VTRA 2005 model at that time, since they were not part of VTRA 2005 Focus Vessel traffic (1% of VTRA Model traffic). Through the extrapolation technique used in the VTRA 2010 model, they were also not used in the VTRA 2010 study. Since these two accidents do involve focus vessels in the VTRA 2015 model (which improves on the VTRA 2010 by not relying on this extrapolation technique) these two accident data points have been used in the calibration procedure of the VTRA 2015 model. The same reasoning applies to using other accidents for VTRA 2015 model calibration in the spill category from 0 – 1 m^3 involving those focus vessels that were not part of the VTRA 2005 study.

To explain further, both the collision of a Cargo Focus Vessel and a Fishing Vessel and the powered grounding of an Oil Barge resulting in oil spill above 1 m^3 are potential accidents that are within the realm of possibilities today. While the Barge 101 spill involved a single hull barge at the time, spills from double hull barges through powered grounding are accidents that could occur in the current environment. A recent publication Yip et. al (2011) shared with the VTRA 2015 Working Group by one of the VTRA 2015 Working Group members evaluated that: "*The results indicate that double hull design on average reduce the size of oils spill by 20% and 62% in tank barge and tanker ships accidents, respectively*". When applying an on average 20% spill reduction mentioned in Yip et. al (2011) to the 3.75 m^3 spill of the Barge 101 accident, the potential spill size of that accident remains well above 1 m^3, which further supports the use of this data point in the calibration of the VTRA 2015 model for Focus Vessels accidents with a potential spill size of 1 m^3 or more. The start of the time period of the data source (d) above to calibrate the VTRA 2015 model for potential accidents with spill above 1 m^3, i.e. 1990, is the year that the Oil Pollution Act (OPA), 1990 (EPA, 2016) was enacted. Thankfully, to calibrate the VTRA 2015 model for potential accidents of Focus Vessels since 1990 with a spill size above 1 m^3, the only two accidents that fall in that category in the VTRA Study Area are the Tenyo Maru (1991) and Barge 101 (1994) spills.

Given this information, there is not sufficient evidence to conclude that no oil spill could have happened, had the Barge 101 been a double hull barge at that time. As a result, applying the Precautionary Principle (Wikipedia, 2016) to data selection for risk analysis/risk management prescribes that both accidents above ought to be used in the VTRA 2015 model calibration of potential accidents with a spill size of 1 m^3 or more:

"*The precautionary principle (or precautionary approach) to risk management states that if an action or policy has a suspected risk of causing harm to the public, or to the environment, in the absence of scientific consensus (that the action or policy is not harmful), the burden of proof that it is not harmful falls on those taking an action that may or may not be a risk.*

The principle is used by policy makers to justify discretionary decisions in situations where there is the possibility of harm from making a certain decision (e.g. taking a particular course of action) when extensive scientific knowledge on the matter is lacking. The principle implies that there is a social responsibility to protect the public from exposure to harm, when scientific investigation has found a plausible risk. These protections can be relaxed only if further scientific findings emerge that provide sound evidence that no harm will result.

In some legal systems, as in Law of the European Union, the application of the precautionary principle has been made a statutory requirement in some areas of law.[citation needed]

Regarding international conduct, the first endorsement of the principle was in 1982 when the World Charter for Nature was adopted by the United Nations General Assembly, while its first international implementation was in 1987 through the Montreal Protocol. Soon after, the principle integrated with many other legally binding international treaties such as the Rio Declaration and Kyoto Protocol."

With respect to the VTRA 2015 model accounting for potential accident rate reduction over time, it is important to note that using the longer time window 1990 – 2015 for the VTRA 2015 model for data sources, rather than the shorter VTRA 2005 time window 1995 – 2005, has the effect of reducing the average number of potential accidents per year for VTRA 2015 model calibration. Recall 81 accidents were collected for VTRA 2015 model calibration for 25% of the VTRA model traffic over a longer time period, whereas 4 accidents were used for VTRA 2005 model calibration for 1% of the VTRA model traffic over a shorter time period. The presentation Van Dorp and Merrick (2016), electronically provided to the VTRA 2015 Working Group on April 14, 2016, demonstrated a reduction of running averages of number of accidents per year towards the year 2015 for both the 0 - 1 m^3 spill category and the 1 m^3 or more spill category. The average number of accidents per year evaluated at the end of the year 2015 using these 81 accident data points are the average accident number of accidents per that the VTRA 2015 model is calibrated to. Thus the VTRA 2015 model calibration does account for a reduction of potential number accidents per year over time up to the year 2015. As a side note, however, for Tank Focus Vessels over the time period from 1995 – 2005 that presentation also shows that the average combined collision and grounding number of accidents per year was lower than their average combined number of accidents per year for the time period from 2005 – 2015. The converse applies to allisions of Tank Focus Vessels and average number accidents per year of Cargo Focus Vessels, but still a reduction of the running average number of accidents per year is observed in years preceding 2015 and up to the year 2015, to which the VTRA 2015 model is calibrated.

In summary, marine traffic accidents with oil spills above 1 m^3 are infrequent events in the VTRA Study area. By applying the precautionary principle to data selection for risk assessment after a review of all the available data that we have by VTRA 2015 Working Group members, we arrived at the 81 vetted accident data points for VTRA 2015 model calibration provided in Van Dorp and Merrick (2016). The period 1990 – 2015 over which accident data was collected starts with the year that OPA '90 was enacted. Using these 81 accidents for the accident calibration of the VTRA 2015 model, the VTRA 2015 analysis improves the VTRA 2010 analysis and results in the best analysis that we can provide for the VTRA 2015 Base Case, the VTRA 2015 What-If Cases and VTRA 2015 RMM Case analyses moving forward. Finally, the focus of the VTRA 2015 analysis is on changes between the VTRA 2015 What-If Cases relative to a VTRA 2015 Base Case and the changes between VTRA 2015 RMM Cases modeled on top of the VTRA 2015 What-if Cases relative to the VTRA 2015 Base Case. The purpose of the VTRA 2015 project analysis is solely to inform policy decision makers and other stakeholders.

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References

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3. Yip, T.L., Talley, W.K., Jin, D. (2001). The Effectiveness of Double Hulls in Reducing Vessel Accident-Oil Spillage, Marine Pollution Bulletin, 62, 2427- 2423.
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