Exh. PE-01T
Witness: Phillip Essex

BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, Complainant, v. PUGET SOUND PILOTS, Respondent.	Docket TP-

TESTIMONY OF

PHILLIP ESSEX

ON BEHALF OF PUGET SOUND PILOTS

JUNE 29, 2022

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I. IDENTIFICATION OF WITNESS

Q: What is your name, business, and business address?

A: Phil Essex, President of Moorsom Consulting Group LLC, 7 Littleworth Lane, Sea Cliff, New York.

Q: Does Exhibit PE-02 accurately provide your educational and work history?

A: Yes, I spent almost 30 years of my career as a tonnage measurer for three international class societies (all delegated agencies by the U.S. Coast Guard), with 20 years of that time managing the U.S. tonnage divisions for two of those class societies, Det Norske Veritas (DNV) and Germanischer Lloyd (GL). I was the class societies point of contact for any administrative or technical matters related to U.S. flag vessels we provided services for.

Q: How would you describe the focus of your professional work?

A: I specialize in providing technical support with tonnage design for U.S. flagged vessels. By "tonnage design," I mean design strategies and methods that are used to limit or reduce a ship's registered gross tonnage or "GRT." By using these techniques, a shipowner can legally reduce a ship's GRT far below what one would expect relative to the vessel's actual size. I am regularly hired by shipowners and naval architecture firms to develop strategies to reduce a vessel's GRT below key U.S. regulatory thresholds.

Q: Do you have past experience that is relevant to the Puget Sound Pilots' determination that gross tonnage as measured under the 1969 International Convention on

Tonnage Measurement of Ships (the "Convention"), referred to as "GT ITC," is a more appropriate metric for determining pilotage rates than GRT?

A: Yes. While at the American Bureau of Shipping (ABS) I was the coordinator of services for the remeasurement of existing vessels previously utilizing GRT for their national flags that now require GT ITC tonnages to comply with the implementation of the ITC69 regulations. This included bulk carriers, roll-on/roll-off vessels, tankers, and container vessels. This project heightened between 1992 and 1994, which was the deadline for the remeasurement of existing vessels.

GT ITC is based on the overall volume of the ship. GRT is based on the overall volume less spaces that can be exempted (i.e., excluded) from tonnage. I want to note that during PSP's prior rate case in 2019, the parties sometimes referred to GT ITC as "IGT." The acronym "IGT," which I understand all parties intended to refer to gross tonnage as measured under the Convention's rules, is not used in our industry. To avoid confusion, throughout my testimony I will refer to tonnage calculated under the Convention's rules by the standard acronym, GT ITC.

II. PURPOSE OF TESTIMONY

Q: What is the purpose of your testimony?

A: I have been asked by the Puget Sound Pilots to describe the history and purpose of measuring tonnage. I have also been asked to describe the formulas used to calculate GT ITC and GRT for U.S. flagged vessels and to explain the key differences between the two methods. Lastly, I was asked to form an opinion as to which method is more appropriate for calculating pilotage, which I have done.

Q: What is your opinion as to whether GT ITC or GRT is a more appropriate metric for calculating pilotage?

A: Subject to certain assumptions that I describe in detail below, in my opinion that GT ITC is by far the better metric because it provides a much more accurate and consistent measurement of a vessel's true size.

A. Tonnage Measurement's Historical Objective is to Create a Level Playing Field with Respect to the Port Fees Charged to Oceangoing Ships.

Q: What is "tonnage," and what are its historic origins?

A: Tonnage is a measure of the volume of the ship. It is not the same as displacement or weight. Under the U.S. regulatory tonnage rules detailed in 46 CFR Part 69 Subpart C – Standard System (i.e., determination of GRT) one ton equates to 100 cubic feet. The concept of using a vessel's tonnage as a method of calculating port fees dates to early Roman times. Ships entering Roman ports were taxed based on the number of wine containers or "tuns" that were carried aboard. The dimensions of these containers, however, were not standardized. As a result, a ship trading in ancient Rome might lower its port fees relative to a competitor carrying an identical amount of cargo simply by increasing the physical size (and thereby reducing the number) of its tuns. Over the next several hundred years, various systems of measuring tonnage arose, all with the goal of measuring a ship's cargo volume to determine its port fees.

Q: How did the modern tonnage system originate?

A: The 19th century British Admiral George Moorsom – who is, not coincidentally, the namesake of my consulting firm – is generally credited as the founding father of modern

tonnage measurement. In 1849, the United Kingdom appointed Admiral Moorsom as the secretary of a commission to modernize ancient tonnage systems that were developed to apply to sailing vessels rather that the steamships that were rapidly coming to dominate maritime trade. Significant space aboard this new class of ship was required for boilers, machinery, and coal, which limited the ships' usable cargo or passenger space. As a result, steam ships were being assessed higher port fees than comparatively smaller sail ships with similar cargo capacity.

Moorsom's objective was to create a uniform system that would equitably charge port fees based on a ship's cargo capacity, while excluding space that served an operational rather than commercial purpose. To that end, the Moorsom System established rules to measure the internal volume of the entire ship. From that total, non-revenue producing or "deductible" spaces such as the ship's ballast and engine room are subtracted. The remaining internal volume is then converted to a tonnage measurement calculated as follows: Admiral Moorsom determined that if he divided the length of the underdeck (i.e., hull) of a vessel into equidistant intervals, and measured the area of the hull at each interval, these areas could be interpolated to determine the volume of the underdeck. The resulting volume divided by 100 would be the underdeck tonnage. Superstructure with shape such as a Focsle or Poop could be measured in a similar manner, and deckhouses which were basically rectangular in shape could be measured by a simple L x B x D /100 formula. An article that I co-authored titled An Owner's Guide to Tonnage Admeasurement that discusses among other things the Moorsom System is attached to my testimony as Exhibit PE-03.

Over the next approximately 100 years, the Moorsom System evolved to account for a ship's superstructure resulting in the current GRT formula, which can be expressed in

general terms as: hull volume + superstructure volume – exemptible spaces = GRT. As I explain in more detail below, however, the actual formula to calculate GRT varies significantly by jurisdiction.

Q: Did the Moorsom System succeed in standardizing tonnage measurement?

A: No. While there is no question that the Moorsom System revolutionized and greatly improved on previous methods of measuring tonnage, it failed to achieve international standardization. That is primarily because each maritime state adopted its own rules for determining which spaces within the ship's hull and superstructure were "exemptible" and, therefore, did not count toward the vessel's GRT as certified by either the flag state or their delegated agencies (usually class societies that are members of IACS, the International Association of Class Societies). For example, Great Britain includes salt water ballast in GRT while the United States does not. The result is that two ships of identical size and cargo capacity – one British flagged, the other American – will have different GRT.

Q: Was maritime states' disparate treatment of excludable spaces for measuring GRT problematic for international trade?

A: Yes. Differences among states' methods for calculating GRT created inequities based on a vessel's flag state. Specifically, vessels flagged by jurisdictions with more favorable GRT formulas (such as the United States) enjoyed an advantage over their foreign competitors by virtue of the fact that they could carry similar quantities of cargo while incurring lesser GRT-based port fees.

Q: How is GRT calculated in the United States?

A: In the United States, the regulations that govern tonnage are detailed in 46 CFR Part 69 Subparts B thru E, with additional interpretations of those regulations detailed in MTN 01-99 CH10 – USCG Tonnage Technical Policy. Subpart B covers the Convention System (i.e., GT ITC) while Subpart C covers the Standard System (i.e., GRT). GRT is calculated based on the total enclosed volume of the vessel, less specific spaces "exempted" from that total. A copy of the USCG Tonnage Technical Policy that addresses the relevant regulations is attached to my testimony as Exhibit PE-04.

Q: How does the measurement of GRT in the United States differ from other maritime states?

A: Relative to other maritime states, the U.S. system of GRT creates greater opportunity for the use of these strategies to artificially reduce tonnage. The two main gimmicks that are commonly used include the use of "deep framing" in the vessel's hull and "tonnage openings" in the ship's superstructure. A tonnage opening is an opening in the fore or aft bulkhead of a deckhouse of specified minimum dimensions. This makes the space leading off of this opening "open to the weather". If the internal layout of the deckhouse provides for a proper progression from that initial opening on the fore or aft bulkhead, it is entirely possible for the entire tier to be exempt from GRT.

The ease and success with which these strategies can be deployed to artificially reduce GRT under the U.S. system is hard to overstate. Under the U.S. system, tonnage gimmicks can be deployed to eliminate nearly all of a ship's superstructure from GRT. In fact, by using a mix of deep framing and tonnage opening techniques it is possible to reduce

the tonnage of a vessel by more than 97%, as demonstrated by the casino vessel "City of Lights I," ON 993836. According to the USCG's Port State Information Exchange database, this 223-foot ship was assigned a GT ITC of 3633 and a GRT of just 96 tons, representing a more than 37:1 spread between these two measurement systems. A printout from the USCG database showing the referenced ship specifications is attached as Exhibit PE-05. As Exhibit PE-05 demonstrates, a ship's GRT can be – and often is – wholly unrelated to the ship's true size.

Q: How did the international community address the inequities caused by non-standardized tonnage measurement?

A: In 1969, representatives of the International Maritime Organization gathered in London for the International Convention on Tonnage Measurement of Ships. The Convention's purpose was to develop a new system that would standardize tonnage internationally. The Convention concluded with the international adoption of a new method of measuring gross tonnage that is commonly referred to in the industry as GT ITC. The formula for calculating GT ITC is K_1V, where the K_1 coefficient is $0.2 + .02 \log V$ and V is the total enclosed volume of the vessel (both hull and superstructure) in cubic meters. A copy of the Final Act of the Conference, with attachments, including the International Convention on Tonnage Measurement of Ships, 1969, is attached as Exhibit PE-06.

Under the GT ITC system, which has been adopted by every significant maritime state, vessels of the same volumetric size and design are assessed the same tonnage regardless of their flag state. As of 1994, all new ships that may engage in international commerce are required to be measured and obtain an international tonnage certificate. My

understanding is that both of the Orca class roll-on/roll-off or "RoRo" ships operated by TOTE Maritime in coastwise trade between Puget Sound and southeast Alaska hold international tonnage certificates.

Q: Does the U.S. continue to use its domestic measure of GRT?

A: Yes, although it has adopted the Convention, the U.S. continues to use domestic GRT for certain purposes. This is largely an artifact of the extraordinary complexity of the United States' Code of Federal Regulations and the logistical problems associated with amending countless provisions that address or rely on GRT tonnage to GT ITC.

As demonstrated by the example of "City of Lights I", there can be huge discrepancies between GT ITC and GRT for a given vessel. In the late 1990's the U.S. Coast Guard undertook a study to see if an equivalency could be established for certain classes of vessels, such as passenger vessels. This equivalency would essentially mean that if the GT ITC was below a given value, it would be considered as if its assigned GRT was under 100 tons. This would enable naval architects to design ships without making any concessions in configuration to accommodate the tonnage rules such as deep framing and tonnage openings. At the time, a cutoff of 3,000 GT ITC was under consideration as all but the six largest "T" or "K" vessels were under that cap. If a vessel owner wanted a larger vessel than the equivalency permitted, the owner would still be able to design and build it but would be required to incorporate the reduction gimmicks to obtain the lower GRT. The intent of this equivalency was to permit the construction of more efficient vessels. Unfortunately, due to the complexity of developing equivalencies for all vessel types the project was dropped in late 2001. However, the U.S. recognizes GT ITC as the more accurate measure of a ship's

size as GT ITC tonnages are used for registry whereas GRT are used for primarily for regulatory applications.

B. GT ITC Provides a More Accurate Measure than GRT of a Ship's Size.

Q: What is the difference between the GRT and GT ITC measurement systems?

A: Conceptually, it is helpful to think of GT ITC as an "additive" measurement system whereas GRT is a "subtractive" system. For GT ITC, we measure the ship from the keel up, including all the enclosed volume of the hull and superstructure with very few exceptions. For GRT, we start with the overall "tonnage" of the hull and superstructure, and then subtract out exempted space to arrive at GRT. Exempted space includes salt water ballast in the underdeck and a number of categories in the superstructure, including public water closets, machinery space, light & air, companions (staircases going down), the galley and wheelhouse. It is also important to keep in mind that by the process of measurement we can additionally reduce the underdeck by the use of deep side or bottom frames, which reduces the measured sectional areas that are used to determine the underdeck tonnage.

In a nutshell, GRT can vary widely between vessels of like size based on differences in the ship's design and use of internal space. Conversely, vessels of like size will almost always have identical or nearly identical GT ITC because GT ITC better captures the total volume of a ship's interior spaces. This truer measure of the ship's volume, in turn, better correlates to other size metrics that are potentially relevant to piloting such as sail area, beam, and length overall.

Q: Could you give an example to illustrate the difference between GT ITC and GRT?

A: Yes. In preparing my testimony I reviewed the Declaration of Philip Morrell which I understand was filed by TOTE Maritime during PSP's last rate case in support of TOTE's request that its ships (unlike other vessels subject to PSP's tariff) be charged pilotage based on GRT rather than their GT ITC. In his declaration, Mr. Morrell compares TOTE's Orca class vessels, the M/V NORTH STAR and the M/V MIDNIGHT SUN to a container ship with similar GT ITC but significantly greater cargo capacity. The thrust of Mr. Morrell's testimony seems to be that this demonstrates that TOTE's ships are smaller and should therefore pay lower pilotage.

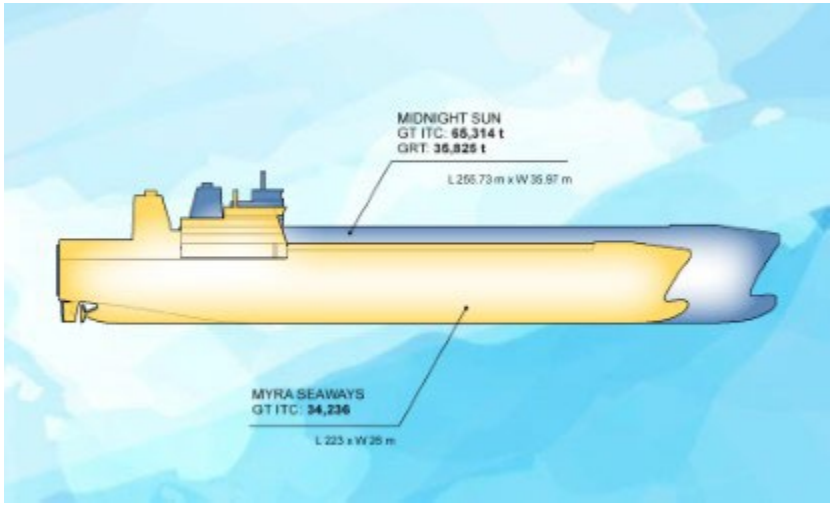
I strongly disagree with Mr. Morrell's characterization of the TOTE ships as being significantly smaller than the container ship that is referenced as a comparator in his declaration. In fact, I consider Mr. Morrell's decision to compare TOTE's RoRo ships to a container vessel to be highly misleading. Container ships, by virtue of their design, typically have less exempted space and greater cargo capacity than RoRo ships. Mr. Morrell could have presented the issue much more fairly by comparing TOTE's vessels to another RoRo ship of comparable GT ITC.

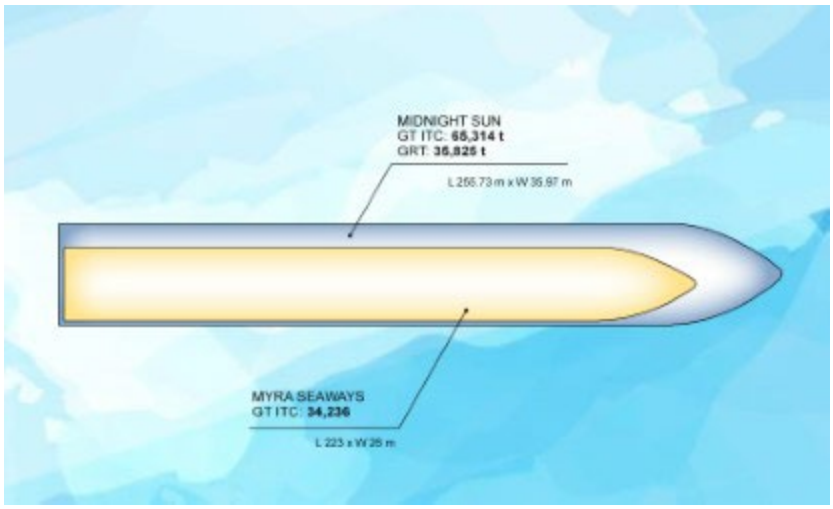
The fact that TOTE's vessels and the container ship referenced in Mr. Morrell's declaration have comparable GT ITC indicates to me that these two ships are approximately the same volumetric size. Comparing the TOTE vessel's GRT to the container ship' GT ITC, however, gives the false impression that the TOTE ship is much smaller. Put differently, the TOTE ships' GRT says far more about their tonnage design efficiency (likely achieved through the use of tonnage gimmicks to artificially increase excludable space) than it does

about their true size and, by extension, the relative difficulty of piloting these large ships. Non-apples-to-apples comparisons such as the one employed by Mr. Morrell can be (and in this case are) deceptive and are precisely what the Convention sought to eliminate by standardizing ships' measurement under the GT ITC system.

Q: Could you please give an example of what in your opinion would be a more appropriate comparator than the one previously offered by Mr. Morrell?

A: Yes. To aid that comparison, I would refer to the following graphics provided to me by PSP, which illustrate the size of the TOTE RoRo ship M/V MIDNIGHT SUN as compared to the Turkish flagged RoRo ship, M/V MYRA SEAWAYS:





In my opinion, the comparison of these two ships is "apples-to-apples" because the ships are of similar design in that they are both RoRo vessels. As these images show, the MYRA SEAWAYS (IMO 9422122) is a much smaller vessel that is more than 30 meters shorter and nearly 10 meters narrower than the MIDNIGHT SUN. The MYRA SEAWAYS' GT ITC is about half (52.4%) that of the MIDNIGHT SUN, which is consistent with what one would expect given the two ships' dramatic discrepancy in size. Yet the MYRA SEAWAYS' GT ITC is nearly equivalent to the TOTE ship's GRT, with a difference of just 4.5%. These images accurately show how GT ITC provides a consistent measure of ships' size that facilitates accurate comparison, whereas GRT does not.

Q: Can a ship's GRT be converted to GT ITC using a mathematical formula?

A: No. Because the two systems treat certain spaces within the ships' internal volume differently, the two measurements are not mutually convertible. Put differently, two ships of equal size will virtually always have the same (or very nearly the same) GT ITC, but may have very different GRT depending on design factors and the ships' respective flag states.

C. GT ITC is a More Appropriate Metric for Calculating Pilotage Rates than GRT.

Q: Have you formed an opinion as to whether GT ITC or GRT is the more appropriate metric for calculating pilotage rates?

A: Yes.

Q: What is that opinion?

A: My opinion is that GT ITC is by far a more appropriate metric for calculating pilotage rates than GRT.

Q: Is your opinion subject to any assumptions?

A: Yes. My opinion is subject to three key assumptions. My first assumption is that an appropriate metric for calculating pilotage rates is a metric that supports rates that are fair, just, and reasonable. This assumption is based on RCW 81.116.020(3), which requires the Washington Utilities and Transportation Commission ("UTC") to set rates that are fair, just, and reasonable. Implicit in this assumption is that pilotage rates should not discriminate based on a vessel's flag state or whether the ship is engaged in international or domestic trade.

My second assumption is that fair, just, and reasonable rates should give considerable weight to the relative difficulty and risk of piloting a particular ship. And my third, related assumption is that the relative risk and difficulty of piloting a vessel bears a strong causal relationship to that vessel's size. These assumptions are based upon my conversations with PSP representatives, my review of materials from the record in PSP's recent prior rate case, and my review of other materials including relevant federal and state regulations and pilotage tariffs and rate orders from other jurisdictions.

For example, I have reviewed the Declaration of Captain Stephan Moreno from PSP's prior rate case in which he testified that "risk is an element associated with the size of a vessel, and there are a number of factors related to ship size that require greater skills." I have also reviewed the UTC's Order 9 from PSP's prior rate case in which the UTC concurred in Captain Moreno's assessment and found that:

> For pilots bringing a ship into harbor, larger vessels pose relatively greater risk and should thus pay proportionally more in tariff rates. Capt. Moreno credibly testifies that the largest vessels pose greater risks when entering the Puget Sound and require greater expertise. He identifies several factors that make larger vessels more difficult to maneuver safely in confined waters. Given this testimony, we are persuaded that the larger vessels reasonably pose greater risks.

Order 9 at 107 ¶ 361.

PSP's and the UTC's finding of a causal relationship between ship size and the degree of risk and difficulty appears to be consistent with other regulations, including WAC 363-116-082, which prohibits less experienced pilots from piloting ships above a certain size as measured by GT ITC. Based on these authorities, for purposes of my testimony I assume that a metric that more accurately measures a vessel's size is a "more appropriate" metric for calculating pilotage rates.

Q: Would your opinion that GT ITC is a better metric for calculating pilotage than GRT change if you were to change your assumptions?

A: Not necessarily. Going back to Mr. Morrell's declaration, he claims that TOTE's Orca class vessels have about 25% of the cargo capacity of the comparator container ship of about equal GT ITC. If the objective of calculating pilotage was to charge rates in proportion to the expected value of a vessel's cargo, then NT ITC, or the calculation of a vessel's net tonnage

under the ITC69 system, would provide a means for comparing cargo vessels of differing capacity, as NT ITC is based on actual calculated volume of the cargo spaces.

I also note that the Orca class's upper two decks of cargo holds appear to be exempt from GRT due to the use of tonnage openings on the stern of the vessel at these two decks. Below is an image rendering of TOTE's Orca class ships (it is my understanding that the M/V MIDNIGHT SUN and M/V NORTH STAR are substantially identical sister ships) that is available online:

I have circled in blue what I believe based on my experience to be tonnage openings which, as I explain above, are one of two main gimmicks (the other being deep framing) that are commonly used to artificially reduce GRT. Assuming that the indicated areas are indeed tonnage openings (a fact that is readily verifiable from the ship's general arrangement and/or tonnage calculation, which I have not yet been able to obtain but are almost certainly in TOTE's possession), it contradicts the latter part of Mr. Morrell's testimony that the Orca class "contains

large volume of exempted space, or space not filled with cargo." This deck space would indeed be exempt due to the use of the GRT-reducing design gimmick but would certainly be used extensively for cargo.

In any event, my understanding is that the UTC rejected in PSP's last late case the idea that a ship's profitability should be a factor that is considered in calculating pilotage, and I offer no opinion on that score.

Q: Accepting your assumptions as described above, why in your opinion is GT ITC a more appropriate metric for calculating pilotage than GRT?

A: The reason is that, as I explained above, GT ITC more accurately measures a vessel's true size and, unlike GRT, it cannot be manipulated using tonnage gimmicks, as TOTE appears to have done in the design of its Orca class ships.

Q: In your opinion, would it be appropriate to charge some ships pilotage rates based on GT ITC and others based on GRT?

A: Not if the objective is to charge ships of the same size the same rate. For U.S. flag vessels, a ship's GRT is usually less (and often significantly less) than its GT ITC. TOTE's Orca class ships have a GT ITC to GRT spread of about 2:1. Ships that rely heavily on tonnage gimmicks such as the "City of Lights I" can achieve spreads of as much as 37:1 or greater. As a result, a hybrid system that charges some ships based on GT ITC and others based on GRT would discriminate (often heavily) in favor of the ships that are charged based on GRT.

Again, the comparison cited by Mr. Morrell in his declaration is a perfect example of this. If the objective is to use a ship's size as a proxy for the relative difficulty and skill of piloting

that vessel, then TOTE's vessels should pay approximately the same (or, to be more precise, slightly higher) pilotage rates than the comparator container ship that Mr. Morrell references in his prior testimony. However, under the hybrid system that I understand TOTE has proposed in which its two ships pay pilotage based on GRT while virtually every other cargo ship pays pilotage rates based on GT ITC, TOTE would receive a substantial windfall relative to ships of comparable size to the Orca class.

III. CONCLUSION.

Q: Does this conclude your testimony?

A: Yes.

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