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Risk Assessment for ship-mediated introductions of aquatic nonindigenous species to the Great Lakes and freshwater St. Lawrence River

Évaluation du risque d'introduction d'espèces aquatiques non indigènes par les navires dans les Grands Lacs et la partie d'eau douce du fleuve Saint-Laurent

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ABSTRACT

Ballast water has historically been the predominant ship-mediated vector for aquatic nonindigenous species (NIS) introductions to Canada, while hull fouling is recognized as a leading sub-vector for the introduction of marine aquatic NIS worldwide. At least 182 aquatic NIS have established in the Great Lakes, making this one of the most highly invaded ecosystems globally. A series of regulatory changes enacted by Canada and the United States have slowed the rate of invasion and facilitated changes in invader characteristics. The objective of this report was to conduct a relative risk assessment of shipping vectors (hull fouling and ballast water) to the freshwater ports in the Great Lakes and the St. Lawrence River (GLSLR). First, the probability of introduction was estimated by combining the individual probabilities of successful transition through each stage of the invasion process (i.e., arrival, survival and establishment) based on ship arrival/ballast water discharge data and environmental conditions at GLSLR and potential source ports. Second, the potential magnitude of consequences of introduction was estimated based on the number of high impact ship-mediated NIS recorded for eco-regions of ports directly connected to GLSLR ports through shipping activities. The probability of introduction and potential magnitude of consequences were then combined for a final relative invasion risk rating. Finally, we identify priorities and make recommendations for future management needs.

A transit analysis shows that GLSLR ports are connected with international and coastal domestic ports, resulting in potential for species transfers *via* hull fouling and ballast water discharge. Laker vessels (those that operate exclusively in the GLSLR) appear to be the most important transport pathway of fouling and ballast-mediated NIS in the region. The final relative invasion risk for fouling NIS is intermediate for Montréal (Québec), Québec City (Québec) and Duluth-Superior (Minnesota-Wisconsin), and lower for the remaining top ports, with moderate uncertainty. The final invasion risk for ballast-mediated NIS is higher for Duluth-Superior, intermediate for Québec City and Montréal, and lower for the remaining top ports, with moderate uncertainty. It is important to note that results presented in this document are based on relative rankings among GLSLR top ports. Ports identified as higher risk in this study may not be high risk in a national scale considering the relatively low international shipping traffic in the region; these ratings will be recalibrated to differentiate risk among top ports from all Canadian regions in a subsequent national risk assessment.

RÉSUMÉ

Au Canada, l'introduction d'espèces aquatiques non indigènes par les navires se produit surtout au niveau des eaux de ballast, alors qu'à l'échelle mondiale, ce sont les salissures biologiques de la coque des navires qui sont reconnues comme principal sous-vecteur d'introduction. Au moins 182 espèces aquatiques non indigènes se sont établies dans les Grands Lacs, ce qui en fait l'un des écosystèmes les plus envahis au monde. Le Canada et les États-Unis ont modifié leur réglementation, permettant ainsi de réduire le taux d'invasion et de faciliter le changement des caractéristiques des espèces envahissantes. Ce rapport a pour objectif de conduire une évaluation relative des risques liés aux vecteurs d'introduction par navire (par les salissures biologiques de la coque et les eaux de ballast) dans les ports d'eau douce des Grands Lacs et du fleuve Saint-Laurent. Tout d'abord, la probabilité d'introduction a été estimée en combinant les probabilités de transition réussies à chaque étape du processus d'invasion (c.-à-d. l'arrivée, la survie et l'établissement), selon les données sur l'arrivées des navires et le déchargement des eaux de ballast et les conditions environnementales des Grands Lacs, du fleuve du Saint-Laurent et des ports d'origine potentiels. Deuxièmement, l'ampleur potentielle des conséquences de l'introduction a été estimée selon le nombre d'espèces non indigènes à fort impact étant associées aux bateaux dont les itinéraires connectaient les écorégions des Grands Lacs et du fleuve St-Laurent à des ports d'où peuvent provenir certaines espèces non indigènes. La probabilité d'introduction et l'ampleur des répercussions potentielles ont ensuite été combinées pour déterminer le risque final d'invasion. Enfin, nous avons établi les priorités et formulé des recommandations relativement aux besoins de gestion future.

Une analyse du transit montre que les ports des Grands Lacs et du Saint-Laurent sont reliés à des ports internationaux et nationaux ce qui favorise le transfert potentiel des espèces par l'entremise des salissures biologiques de la coque des navires et des eaux de ballast. Les cargos hors mer (qui ne se déplacent que sur les Grands Lacs et le fleuve Saint-Laurent) semblent constituer la voie de transport du plus grand nombre d'espèces aquatiques non indigènes par le biais des salissures biologiques de la coque et des eaux de ballast dans la région. Le risque relatif final d'invasion de telles espèces introduites par les salissures est intermédiaire à Montréal (au Québec), à Québec (au Québec) ainsi qu'à Duluth-Superior (au Minnesota-Wisconsin) et faible dans les autres ports principaux, avec un degré d'incertitude modéré. Le risque final d'invasion d'espèces aquatiques non indigènes introduites par les eaux de ballast est élevé à Duluth-Superior, intermédiaire à Québec ainsi qu'à Montréal et faible dans les autres ports importants, avec un degré d'incertitude modéré. Il est important de noter que les résultats présentés dans ce document sont basés sur des classements relatifs parmi les principaux ports des Grands Lacs et du Saint-Laurent. Les ports déterminés comme présentant un risque plus élevé dans le cadre de cette étude peuvent ne pas présenter de risque élevé à l'échelle nationale si l'on tient compte du trafic maritime international relativement faible dans la région; ces résultats seront revus dans le cadre d'une évaluation nationale du risque visant à déterminer le risque des principaux ports des régions canadiennes.

INTRODUCTION

Species that have established populations outside of their native range are known as nonindigenous species (NIS). The impact of NIS invasions has become increasingly problematic as globalization has increased both intentional and unintentional species transfers, allowing the establishment of NIS worldwide. NIS may impact recipient ecosystems by competing with native species for limited resources and disrupting the natural food web (Shea and Chesson 2002). In fact, NIS introductions are the second greatest cause of extinction globally and the greatest threat to biodiversity in freshwater ecosystems (MEA 2005; Lawler et al. 2006). NIS have caused irreparable damage to ecosystem function and natural resources in many terrestrial and aquatic systems (Carlton and Geller 1993; Allen and Humble 2002; Crooks 2002; Pimental et al. 2005). Resultant long-term economic consequences have impacted industry and society both directly and indirectly amounting to costs between $13.3 and $34.5 billion/year in Canada alone (Mack et al. 2000; MEA 2005; Colautti et al. 2006*a*). Examples of aquatic NIS impacts include the depletion of commercially important fisheries, increased industrial maintenance costs from NIS-fouled equipment, and the need for ongoing, costly mitigation programs. All ecosystems are vulnerable to, and may suffer severe impacts from, NIS unless comprehensive prevention and management programs are introduced (United States Congressional Office 1993).

The objective of this report is to conduct a semi-quantitative, relative risk assessment of two shipping vectors (hull fouling and ballast water) to freshwater ports in the Great Lakes and St. Lawrence River (GLSLR), as a sub-component of a national risk assessment for the four coasts of Canada (including also the West Coast, East Coast and Arctic Coast). Once all regional documents are completed, a national risk assessment will be completed which re-evaluates the relative risks on a national scale and addresses the following questions posed to the authors by formal science advice request in advance of the project:

1. What is the level of risk posed by ships transiting to, or from, Arctic ports for the introduction of AIS to Canadian waters;
2. What is the level of risk posed by ships operating within the ballast water exchange exemption zones on the East and West Coasts;
3. What is the level of risk posed by domestic shipping activities; and
4. Do current ballast water management regulations provide sufficient protection against ship-mediated AIS introductions?

In general, each regional report will provide a synopsis of biological invasion theory, the role of shipping vectors in species introductions, the history and concerns of AIS in the region, and the risk assessment. This particular document provides guidance on the relative risks of ship-mediated introductions within the GLSLR. This risk assessment is based upon the best available information and methodology, and was peer-reviewed at a workshop attended by international aquatic invasive species, shipping and risk assessment experts and was overseen by DFO's Centre of Expertise for Aquatic Risk Assessment.

THE BIOLOGICAL INVASION PROCESS

Founding individuals, known as propagules, must pass through multiple stages of the invasion process to be successfully introduced to a new location (Figure 1). First, the propagules must be taken up by, and survive conditions within, a transport vector to be moved from the source region to a new environment. Once released, the propagules must survive in the new

environment. If enough propagules successfully arrive, survive and form a reproductive population (Establishment), the recipient habitat can then act as a new source of propagules for secondary spread, making the process cyclical. The successful transition between any two stages of the invasion process is dependent on at least three factors: propagule pressure, physical-chemical requirements and biological requirements. Propagule pressure is a measure of the number of propagules released per event coupled with the number of release events over a given time period and is positively related to the probability of introduction (Wonham et al. 2000; Kolar and Lodge 2001; Colautti et al. 2006*b*). Physical-chemical and biological requirements also directly affect transition between invasion stages, with inhospitable environmental conditions (e.g., intolerable temperature, salinity, or substrate type) or community interactions (e.g., severe predation or limited food supply) decreasing the probability of introduction (Lockwood et al. 2006, 2009). Efforts to manage NIS introductions can target any or all stages of the invasion process, although preventative efforts focused at reducing propagule pressure at the transportation stage are regarded as most effective and cost-efficient (ISSG 2001; ANSTF 2007). Since transportation vectors are numerous, risk assessments identifying priority or high-risk vectors are necessary to direct limited resources for control efforts.

THE ROLE OF SHIPPING AS A PATHWAY OF AQUATIC NIS INTRODUCTIONS

Transportation vectors for aquatic NIS in Canada's freshwater and marine ecosystems include intentional (i.e., authorized stocking programs) and unintentional releases of aquatic species. Unintentional releases are associated with commercial shipping activities (e.g., ballast water discharge or hull fouling), escape from aquaculture facilities, and unauthorized releases of aquarium, bait fish, and ornamental pond species. Commercial shipping activities are of particular interest because shipping has been implicated in a substantial number of aquatic invasions globally and management strategies for this vector are relatively straight-forward and enforceable (Carlton 1985; Ruiz et al. 2000; MacIsaac et al. 2002; Leppäkoski et al. 2002; Grigorovich et al. 2002, 2003, Ruiz and Carlton 2003).

Ballast water has historically been the predominant ship-mediated vector for aquatic NIS introductions to Canada (Ricciardi 2001; de Lafontaine and Costan 2002). Natural adjacent water is pumped into ballast tanks to control the trim, stability and stresses on operational ships. Diverse communities of plankton present in the water column may be inadvertently pumped into ballast tanks during water uptake, transported to the destination port and subsequently released (Carlton 1985). In this way, ballast water transfer allows plankton to travel distances far greater than natural dispersal via active or passive mechanisms (Locke et al. 1993; Minton et al. 2005). Port sediments, and the associated benthic community, can also be resuspended and entrained in ballast tanks during uptake of ballast water (Bailey et al. 2003; Duggan et al. 2005; Kipp et al. 2010). Suspended sediments can settle out of ballast water and accumulate on the bottom of ballast tanks, providing good habitat for benthic life stages and resting eggs and serving as an additional transport vector for NIS (Bailey et al. 2005; Duggan et al. 2005, 2006). The amount of sediment and associated fauna resuspended and released during ballast discharge is thought to be low, but studies indicate ballasting operations may promote hatching of resting stages within ballast tanks such that individuals can enter the water column and be available for release (Bailey et al. 2005). Furthermore, water-sediment slurries may form in tanks with only residual ballast, providing an intermediate medium for NIS survival and introduction to recipient waters (Sutherland et al. 2009). The transfer of aquatic NIS *via* ballast water, slurry or sediment can be managed by regulating ballast practices since ballast water discharge is required to ultimately release individuals from ballast tanks. Conversely, the transport and release of taxa associated with the external underwater surfaces of a vessel, is not directly dependent on the

ship's ballast activities and is more difficult to manage (Carlton 1985; Minchin and Gollasch 2003). Ship hulls, sea chests, propellers and other underwater surfaces can harbour fouling organisms, such as algae, hydroids, bryozoans, barnacles and bivalves (i.e. sessile taxa), in dense colonies that offer crustaceans and other motile organisms structural habitat and protection against the shearing forces experienced during ship movement, hereafter generalized as 'hull fouling' (Gollasch 2002; Lewis et al. 2004). Fouling taxa can be detached from the hull or can release reproductive propagules at any time along a vessel transit, thereby potentially establishing a nonindigenous population in any location through which the vessel travels. In fact, hull fouling is recognized as a leading vector for the introduction of marine aquatic NIS worldwide (Carlton 1985; Gollasch 2002; Coutts et al. 2003). Anchor chains, which are submerged in water at port and relatively protected during transit, are an additional, potentially important mechanism of ship-mediated introductions (West et al. 2007). However, because anchor chains are understudied as a vector of introductions, we are not able to assess its relative importance here. While shipping activities may also be important vectors for terrestrial NIS introductions through the movement of wood dunnage and/or infested cargo containers, the analysis of ship-mediated terrestrial introductions is beyond the scope of this study.

Ship type, ship size and trade patterns influence the invasion risk associated with a given vessel and the relative risk posed by each vector within that vessel (Simkanin et al. 2009). Vessels that rely heavily on ballast water for cargo operations, such as bulk carriers and tankers, are high-risk for transportation of aquatic NIS *via* ballast water and sediment. Risk is concordant with ship size since ship size influences the amount and capacity of ballast tanks. Vessels that do not regularly discharge ballast water, such as passenger vessels, barges and tugboats, are less important for introductions *via* ballast water and sediment. Trans-oceanic vessels have been considered to be most high-risk for aquatic NIS introductions because they provide a mechanism for the fauna of distant ports to be exchanged (Carlton 1985), however domestic or coastal vessels have the potential to contribute to the secondary spread of established aquatic NIS (Humphrey 2008; Simkanin 2009; Sutherland et al. 2009; Rup et al. 2010).

More recently, hull fouling has been identified as an important vector of marine NIS. In contrast to ballast water, ship type does not influence risk because all vessels have the capacity to transport fouling organisms on exterior surfaces, regardless of ballasting practices. Like ballast water, the risk associated with hull-fouling introductions can increase with ship size, because larger ships have a greater underwater surface area on which propagules can attach. Hull fouling risk is also influenced by season, mooring time, elapsed time since antifouling application, vessel speed and trade route (Coutts 1999; Ruiz and Smith 2005; Sylvester and MacIsaac 2010). As mooring time and/or time since last antifouling coating increase, the risk associated with a given vessel increases because more fouling organisms are able to accumulate (Coutts 1999; Sylvester and MacIsaac 2010). The invasion risk decreases as vessel speed increases, because high speeds can remove or kill organisms attached to the hull (Coutts and Taylor 2004). In addition to the level of risk, trade patterns influence the type of introductions that can be expected from a vector. In the case of hull fouling, the shipping route influences the conditions to which organisms are exposed during transit thereby influencing survival rates. Ships that trade coastally are more likely to be a risk for invasion than ships that must pass through high-salinity oceanic waters (Sylvester and MacIsaac 2010). However, some fouling organisms, such as bryozoans and isopods, are capable of surviving broad changes in salinity (0 – 37 ppt), temperature (9.9 – 31.6 °C), latitude (32°) and longitude (43°) (Davidson et al. 2008).

Consideration of factors affecting NIS introductions can be used to better predict high-risk introduction vectors for Canada. Given that these factors will affect invasion risk in different ways for different recipient regions, risk must be assessed separately for the different regions of Canada. Here, we conduct a risk assessment for ship-mediated introductions of aquatic NIS to freshwater ports in the Great Lakes and St. Lawrence River (GLSLR) as a sub-component of a national risk assessment for ship-mediated introductions to Canada.

BALLAST WATER MANAGEMENT REGULATIONS

While invasion rates have steadily increased over the past 150 years in the Great Lakes, a series of regulatory changes enacted by Canada and the United States have slowed the rate of invasion and facilitated changes in invader characteristics (Dextrase 2002; Bailey et al. 2011). Here we will review Canadian, American and International regulations applicable to the region, highlighting the changes that have occurred over time.

Ballasted transoceanic ships have been considered risky for aquatic NIS introductions because each ship can discharge a large volume of ballast which can contain a large number of propagules. On average, ships in the Great Lakes region discharge 5,190 m^3 of ballast water, whereas ships in the Pacific and Atlantic regions discharge 13,915 m^3 and 39,842 m^3 respectively (Humphrey 2008). To prevent aquatic NIS introductions in the GLSLR, Canada adopted the 'Voluntary Guidelines for Control of Ballast Water Discharges from Ships Proceeding to the St. Lawrence River and Great Lakes' in 1989 (Transport Canada 2007). These guidelines encouraged all ships to perform ballast water exchange (BWE) outside the Economic Exclusive Zone (located at 200 nautical miles from the coast) and in locations where depths are not less than 2,000 m. In 1993, BWE was made mandatory by the United States, requiring all transoceanic vessels travelling to the Great Lakes with ballast water to complete BWE at sea (USCG 1993). In 2000, Canada established mandatory regulations requiring all vessels entering and operating in Canadian waters, that are at least 50 m in length with a minimum ballast capacity of eight m^3, to undertake ballast water exchange at sea (Transport Canada 2007), with following exceptions:

(i) ships that operate exclusively in Canadian waters,
(ii) ships that operate exclusively in the American waters of the Great Lakes or the French waters of St. Pierre and Miquelon when outside Canadian waters,
(iii) search and rescue vessels,
(iv) vessels used in government non-commercial service,
(v) ships that carry only permanent ballast in sealed tanks.

Ballast water exchange is a process in which a ship exchanges ballast water loaded near shore with open-ocean saltwater. Empirical studies indicate that BWE purges 80 – 100% of coastal planktonic organisms entrained at the source port and is particularly effective (>99%) in reducing the abundance of freshwater taxa (Gray et al. 2007; Ruiz and Reid 2007; Bailey et al. 2011). It is hypothesized that any open-ocean taxa present in exchanged ballast tanks will not thrive in coastal and freshwater environments and will be low-risk for invasion. To maximize BWE efficacy, vessels practicing empty-refill exchange must replace a minimum of 95% of their ballast water, whereas flow-through exchange must pump through a minimum of three tank volumes through each ballast tank (Canada Shipping Act 2006). Ballast water exchange must occur ≥ 200 nautical miles from land where water depth is ≥ 2000 meters and must achieve a final salinity of ≥ 30 parts per thousand (Canada Shipping Act 2006). If the vessel does not pass an area that meets the minimum requirements during its voyage, Canada will accept exchange

in an area ≥ 50 nautical miles from shore where the water depth is ≥ 500 meters (Levings and Foreman 2004). There is also an alternate exchange zone in the Laurentian Channel east of 63°W longitude available for vessels which are unable to successfully complete ballast exchange before entering the GLSLR that can be utilized between December 1 and May 1 after receiving permission from Transport Canada.

Prior to 2006, ships declaring no ballast on board (NOBOB) were exempt from BWE because ballast tanks were considered empty by industrial standards. Further research revealed that ships declaring NOBOB can contain tonnes of unpumpable residual water, slurry and/or sediment that may introduce NIS during multi-port ballast operations (Bailey et al. 2003; Colautti et al. 2003; Duggan et al. 2005; Sutherland et al. 2009). The risk was considered significant at least for the Great Lakes, where ships declaring NOBOB can represent up to 90% of vessel traffic (MacIsaac et al. 2002; Colautti et al. 2003). As a result, Canada implemented the *Ballast Water Control and Management Regulations* requiring tank flushing of unpumpable residuals as well as BWE, such that all ballast tanks entering Canadian waters are managed (Canada Shipping Act 2006). Similar to BWE, tank flushing involves rinsing 'empty' tanks with open-ocean water in an area ≥ 200 nautical miles from shore to achieve a final salinity of ≥ 30 parts per thousand (Transport Canada 2007; SLSDC 2008). Additionally, the uptake of sediment must be minimized, must be monitored and removed on a regular basis, and, when possible, should be deposited at a reception facility.

Further, the U.S. Coast Guard, Transport Canada, and the two St. Lawrence Seaway Corporations formed a Ballast Water Working Group to standardize inspection and enforcement for ships on the Seaway in 2005. Regulations have been strictly enforced and inspection rates reached 87% by 2006 (Bailey et al. 2011). Approximately 10% of ballast tanks (630 tanks) of ships arriving to the Great Lakes and St. Lawrence River between 2005 and 2007 were non-compliant with exchange regulations (Bailey et al. 2011). Non-compliant ships are required to either (i) retain all non-compliant ballast water on board while in Canadian waters, (ii) exchange ballast water at a specified location, (iii) discharge ballast water at a specified location, or (iv) treat ballast water in accordance with an approved method (Canada Shipping Act 2006). As of yet, no alternative treatments have been approved, although ongoing research is evaluating the efficacy of sodium chloride brine as an emergency treatment for non-compliant tanks (Bradie et al. 2010; Wang 2011).

The International Maritime Organization (IMO), an agency of the United Nations that works to improve maritime safety and prevent pollution from ships, introduced the *International Convention for the Control and Management of Ships Ballast Water and Sediments,* also known as the Ballast Water Convention in February 2004 (IMO 2004). This convention set maximum allowable discharge limits, known as the IMO D-2 discharge standard, for organisms and indicator microbes released with ballast water after ballast treatment. In addition to maximum discharge limits, the Convention requires that BWE be completely phased out and replaced by on-board treatment systems by 2016. There are at least 41 treatment systems in development that use various mechanisms such as filtration, biocides, heat exposure, electric pulse treatment, ultraviolet rays, ultrasound, magnetic fields, deoxygenation, and antifouling coatings to eliminate ballast water taxa (NRC 1996; Environment Canada 2007; Lloyd's Register 2007; Mamlook et al. 2008). Presently no treatment systems have been approved for freshwater; no treatment systems have been approved for use in Canada.

Domestic vessels are exempt from current ballast water regulations, but those operating in the GLSLR are required to observe the *Voluntary Management Practices to Reduce the Transfer of*

Aquatic Nuisance Species Within the Great Lakes by U.S. and Canadian Domestic Shipping established in 2001 (GLSLS 2009). These regulations recommend vessel operators should (i) conduct ballasting operations in deep water when possible, (ii) maintain ballast records, (iii) inspect sediment accumulation annually, (iv) clean ballast tanks to remove sediment when necessary, and (v) co-operate with scientific sampling, analysis and testing programs when possible.

HISTORY OF AQUATIC NIS IN THE GREAT LAKES AND THE ST. LAWRENCE RIVER

The Laurentian Great Lakes form the world's largest freshwater system, holding 21% of the world's water supply and covering 244,000 km^2 (U.S. EPA 2006). The Great Lakes is one of the most ecologically diverse areas in North America, containing a variety of unique habitats that provide a home for over 150 fish species and 50 native plant communities (OMNR 2009). The St. Lawrence River, which contains freshwater, brackish-water and marine regions, connects the Great Lakes to the Atlantic Ocean (Figure 2). Natural barriers prevented large ocean-going ships from traversing the entire passage until 1959, when a series of locks and canals were constructed and the Great Lakes St. Lawrence Seaway was opened. The Seaway stretches 3,700 km and supports the livelihood and activities of 25% of Canada's population (GLSLS 2007). It is home to 15 major ports and 121 regional ports, and is controlled by the St. Lawrence Seaway Management Corporation (Canada) and the St. Lawrence Seaway Development Corporation (U.S.) (GLSLS 2009; Rup et al. 2010).

The establishment of aquatic NIS is the greatest environmental problem threatening the Great Lakes (GLSLS 2007). Invasion rates and patterns have changed over time and these changes can be attributed to the evolution of the Seaway and changes in the shipping vector. Before 1900, ships used solid ballast, such as rock, sand, and mud, in place of ballast water. Solid ballast often contained seeds and terrestrial insects and it was not uncommon for nonindigenous plant and insect species to be found in locations where ballast was commonly discharged (Mills et al. 1993; Ricciardi 2006). When technological advances permitted use of ballast water to replace solid ballast, the influx of terrestrial NIS slowed and aquatic NIS became more prevalent; since ballast water intake screens do not exclude the uptake of small organisms, a series of fish, zooplankton and phytoplankton invasions occurred (Ricciardi 2006). Historically, most established aquatic NIS in the Great Lakes originated from Europe or Asia, and 69% of recent invaders originate from the Ponto-Caspian region (de Lafontaine and Costan 2002; Ricciardi 2006). These individuals are likely the result of secondary introduction events after establishment in the Baltic Sea and lower Rhine River areas (Colautti et al. 2003). In total, at least 182 aquatic NIS have established in the Great Lakes, making the system one of the most highly invaded ecosystems globally (Mills et al. 1993; Dextrase 2002; Ricciardi 2006). Approximately 58 – 85% of the established aquatic NIS result from unintentional introductions and 55 – 70% of these invaders have been transported to the Great Lakes by ballast water (Mills et al. 1993; Ricciardi 2001; Holeck et al. 2004; Ricciardi 2006; NRC 2008). The requirement for BWE and tank flushing appears to have significantly decreased the risk of ballast-mediated invasions in the GLSLR (Bailey et al. 2011), although these strategies do not provide 100% protection. A series of salinity-tolerant invaders discovered in the Great Lakes in the late 1990s and early 2000s indicates that further management of ballast water may be warranted or that alternate vectors of introduction needed to be addressed (Grigorovich et al. 2003; Duggan et al. 2005; Ricciardi 2006).

Much destruction has accompanied invasions to the Great Lakes as is well illustrated by high-impact invaders such as the sea lamprey (*Petromyzon marinus)* and zebra mussel (*Dreissena*

polymorpha). The parasitic sea lamprey entered the Great Lakes *via* the Erie Canal in the 1820s (GLSLS 2009) and preyed on native fish, contributing to a massive decline in Great Lakes fish populations and major losses in commercial fisheries revenues. Zebra mussels, which were first reported in Lake St. Clair in 1988 and likely introduced *via* ballast water discharge (Mills et al. 1993), have caused extensive damage by altering the physical and chemical properties of the Great Lakes water and outcompeting native species. Zebra mussels have caused problems for industry by fouling water intake valves and other industrial equipment and have cost Canadians hundreds of millions of dollars in control and eradication programs (Dextrase 2002). The Chinese mitten crab (*Eriocheir sinensis*), a catadromous species that was first noted in Lake Erie but has not established a permanent population in the Great Lakes, was recently found multiple times along the St. Lawrence River (de Lafontaine et al. 2008). These sightings have raised major concern because the mitten crab may be able to establish stable populations in the St. Lawrence River by gaining access to the brackish or salt waters of the estuary for reproduction (de Lafontaine et al. 2008). If established, the crab can cause structural damage to shorelines owing to their burrowing activities; it can also impact commercial fisheries by damaging fishing nets and eating fish bait (de Lafontaine et al. 2008). At least 17 high risk aquatic NIS, many of which originate from the Ponto-Caspian region, have been identified as potential future invaders in the Great Lakes (Ricciardi and Rasmussen 1998); one of these predicted species, *Hemimysis anomala* (mysid shrimp), was reported from Lake Michigan and Lake Ontario in 2006 (Pothoven et al. 2007). Although these very destructive NIS are not representative of all NIS, the large impacts caused by a small proportion of aquatic NIS validate the need for comprehensive prevention and control programs (Ricciardi and Kipp 2008).

SPECIFIC ISSUES OF CONCERN TO THE GLSLR REGION

BALLAST-MEDIATED INVASIONS *VIA* DOMESTIC SHIPPING ACTIVITIES

Domestic shipping operations account for 90% of ship traffic in the GLSLR (Rup et al. 2010). This includes both Canadian and American vessels since the Great Lakes region is a binational waterway and both are considered domestic. Domestic vessels can be classified as ‘Lakers’, which operate exclusively within the GLSLR, or ‘coastal domestic vessels’ which operate between ports in the GLSLR and coastal ports within Canada’s Exclusive Economic Zone. Ships that operate in the French waters of St. Pierre and Miquelon when outside of Canadian waters will also be considered here as ‘coastal domestic vessels’ because, like other domestic vessels, they are exempt from ballast water regulations.

Nine species native to rivers of the North American east coast or the St. Lawrence River have established in the Great Lakes, four of which are believed to have been introduced by ballast transfer (de Lafontaine and Costan 2002; Ricciardi 2006). Additionally, at least 13 NIS which first established in the St. Lawrence River have since invaded the Great Lakes (de Lafontaine and Costan 2002). Although there are many plausible pathways for these events, the movement of ballast water by domestic vessels may be an important mechanism (de Lafontaine and Costan 2002; Ricciardi 2006). As such, the risk posed by unregulated domestic ballast exchange must be examined. Here, we assess Lakers and coastal domestic vessels separately because they have unique characteristics that will influence risk.

Lakers

Lakers are responsible for 95% of ballast water discharges in the GLSLR, equivalent to 68 million tonnes of ballast water being moved between, and within, the region annually (Rup et al. 2010). Ballast water originating from the St. Lawrence River could transport new NIS to the Great Lakes proper, if species native to the River are not native to the Lakes. Less than 1% of Laker movements transfer ballast water from the St. Lawrence River to the Great Lakes, but this represents a significant volume – nearly equivalent to the total ballast entering the system annually from transoceanic and coastal domestic vessels combined (Rup et al. 2010). As such, Lakers may be an important vector for the introduction of aquatic NIS to the Great Lakes. Of even greater concern, however, is the potential for secondary transport of aquatic NIS within the GLSLR (Rup et al. 2010). Lakers could facilitate rapid, widespread distribution of NIS introduced at any one port within the region (by any vector) (Niimi 2004; Ricciardi 2006; Rup et al. 2010). NIS propagules released by Lakers are likely to be in healthier condition than organisms transported by transoceanic vessels because of shorter voyage duration, leading to higher survival rate (Lavoie et al. 1999).

Coastal domestic vessels

Coastal vessels are a primary concern for introductions to the GLSLR because short domestic voyages, such as those between Canada's East coast and the Great Lakes, are expected to transfer more healthy organisms than would likely be transferred by long foreign voyages (Lavoie et al. 1999). Similar to Lakers, coastal domestic ballast water could act as a source of new NIS to the GLSLR region if species native to coastal ports are not native to the GLSLR. Coastal domestic voyages could also facilitate 'stepping stone' transfers, or secondary spread of NIS initially introduced to coastal ports (by any vector).

HULL FOULING

Hull fouling has historically received little attention in the Great Lakes, since less than 3% of established aquatic NIS are believed to have been introduced *via* this pathway (Mills et al. 1993). In 2008, use of the highly effective tributyl tin-based anti-fouling paint was banned by international Convention, which may result in a subsequent increase in fouling organisms transported by vessels. Hull fouling is known to be an important vector for the transfer of marine and coastal aquatic NIS (Carlton 1985; Gollasch 2002; Coutts 2003), but until recently its importance in freshwater environments was unknown. Drake and Lodge (2007) raised concern about the potential for hull fouling as an invasion vector to the Great Lakes, but a comprehensive study has since suggested that hull fouling is relatively unimportant for primary introductions of aquatic NIS to the Great Lakes (Sylvester and MacIsaac 2010). The low invasion risk is likely due to the fact that vessels must pass through high salinity marine water *en route* to the Great Lakes, which will likely kill nonindigenous freshwater taxa that could survive in Great Lakes' habitat. Coastal and marine taxa are more likely to survive transoceanic passage, and as such, hull fouling introductions are likely higher risk for marine and brackish-water ports in the St. Lawrence River. Hull fouling could, however, be an important vector for the secondary spread of established freshwater aquatic NIS within the Great Lakes *via* Lakers and coastal domestic vessels. Canada does not currently have domestic hull fouling regulations, although it has supported the adoption of international guidelines for control and management of ships' biofouling.

METHODS

STUDY AREA

We defined the study area, hereafter referred to as the 'Great Lakes – St. Lawrence River' (GLSLR) region, to all freshwater ports in the five Great Lakes: Lake Superior, Lake Michigan, Lake Huron, Lake Erie, and Lake Ontario, and the St. Lawrence River, up to and including Québec City (Québec)(El-Sabh and Murty 1990) (Figure 2). The remaining marine part of the St. Lawrence River – the Upper Estuary, Lower Estuary, and Gulf of the St. Lawrence – will be considered in the East Coast risk assessment.

DETERMINING HULL FOULING-MEDIATED INVASION RISK

The relative risk posed by a NIS is the product of the probability of introduction and the consequences of introduction. The risk assessment for hull fouling-mediated introductions used a three-step process, following the methods of Orr (2003) and the National Code on Introductions and Transfers of Aquatic Organisms (DFO 2009*;* Figure 3). First, the probability of introduction was estimated by combining the individual probabilities of successful transition through each stage of the invasion process (i.e., arrival, survival and establishment), based on ship arrival data and environmental conditions at GLSLR ports. Second, the potential magnitude of consequences of introduction was estimated based on the number of high impact hull fouling-mediated NIS recorded for eco-regions of ports directly connected to GLSLR ports through ship traffic. Finally, the probability of introduction and potential magnitude of consequences were combined for a final relative invasion risk rating. To ensure that uncertainty is characterized in a standardized way for each component of the assessment, we assigned levels of uncertainty, ranging from very high to very low, based on the quality of data available for analysis (Table 1).

Step 1A: Estimating Probability of Arrival (Hull Fouling)

A comprehensive database of annual merchant vessel arrivals was assembled for the GLSLR region, for each of the three shipping pathways defined in Table 2. Data for the 90 Lakers operating during 2005-2007 was obtained as annual averages from Rup et al. (2010), which originally referenced the Canadian Coast Guard's Information System on Marine Navigation (INNAV) and the US National Ballast Information Clearinghouse (NBIC). We excluded arrivals to saline ports on the St. Lawrence River (i.e., all ports east of Québec City) recorded by Rup et al. (2010) because these ports were beyond the geographic scope of the current study. Data for coastal domestic and international merchant vessel transits in the five Great Lakes and the St. Lawrence River (west of, and including, Valleyfield, Québec), between 2005 and 2007, were obtained as annual averages from INNAV and the US Coast Guard's National Vessel Movement Centre (NVMC)(M. Minton, National Ballast Information Clearinghouse, unpublished data).

Transit data for coastal domestic and international merchant vessel arrivals to ports east of Valleyfield, up to and including Québec City in 2006, were obtained from INNAV. Canada requires all commercial vessels to report to INNAV when entering each Canadian Maritime Communications and Traffic Services Zone, while voluntary reporting typically occurs within each zone for emergency safety reasons. Information reported to INNAV includes arrival and departure events, and cargo and ballast operations at ports. We limited our analysis of raw shipping data to arrivals in a 12-month period because of the large volume of data and time constraints. We used shipping data from 1 January 2006 to 31 December 2006 because data from 2006 were the only complete data available to us in 2009 when the study was initiated. We

include only merchant vessels in this risk assessment since information on non-merchant vessels was not included in all data sources. Some ports in the GLSLR (e.g., Duluth (Minnesota) and Superior (Wisconsin)) were combined due to reporting differences among data sources and close physical proximity following Rup et al. 2010.

We used the number of vessel arrivals as a proxy for propagule pressure and colonization pressure (i.e., the number of species) of fouling NIS potentially arriving at ports, and hereafter use the term 'propagule supply' to describe a joint measure of propagule and colonization pressure. We recognize that the number of vessel arrivals is a coarse proxy for propagule supply as the actual number of NIS individuals and species arriving to the recipient environment have not been quantified. Sailing speed, port layover time, anti-fouling management, and voyage history can all affect the propagule supply associated with hull fouling of individual ships (Minchin and Gollasch 2003; Coutts and Taylor 2004; Sylvester and MacIsaac 2010), but due to data limitations these factors could not be incorporated here.

A ranking system was used to convert the number of vessel arrivals into a relative probability of arrival, where the maximum number of annual arrivals to a single port was divided into five equal categories (Table 3). The choice of five equal categories assumes a positive linear relationship between the two variables, which is consistent with general invasion theory; however, because the number of arrivals is a very coarse proxy for the actual propagule supply received by hull fouling, the associated uncertainty is moderate. Due to the large number of ports in the region and limited time and resources available to complete the risk assessment, we arbitrarily prioritized the top three ports in each vessel category, based on the probability of arrival, for further assessment. It was noted during the peer review that ports ranked below the top three sometimes had values only marginally lower than those ports selected for full assessment; given additional resources in the future, analyses of additional ports below the top three (in all vessel categories) may be of interest.

Step 1B: Estimating Probability of Survival (Hull Fouling)

After being released into a new environment, introduced propagules must survive in the recipient environment in order for an invasion to occur. Species-specific risk assessments typically estimate probability of survival by comparing environmental conditions of native and recipient ranges using data-intensive environmental niche models (e.g. Therriault and Herborg 2007; Therriault et al. 2008a, b). Vector-based risk assessments, involving hundreds to thousands of species, each with individual habitat requirements, prohibit the use of such complex models. While coarse comparison of environmental similarity between source and recipient regions is manageable, the case of hull fouling is further complicated by the potentially long history of species accumulation at a variety of ports. Species encrusted on vessels can represent a menagerie of sources, with the most recent port-of-call contributing perhaps only a very small fraction of the total fouling community (Fofonoff et al. 2003; Mineur et al. 2007). Source-recipient port comparisons would require data on all ports visited since the vessel was last cleaned in drydock, as well the mooring duration at each port and application of any fouling management practices. Since our dataset included only information on the last port-of-call, we could only assign probabilities of survival at a very coarse level. While hull fouling is documented as an important vector of NIS to coastal marine habitats, the risk for fouling by transoceanic vessels appears much lower for freshwater habitats (Sylvester and MacIsaac 2010); therefore, recipient ports which are exclusively freshwater (salinity <2 parts per thousand) were assigned the lowest probability of survival for fouling by the international and coastal shipping categories while all other ports were categorized as highest probability of

survival. This estimate carries a moderate level of uncertainty since salinity can vary both spatially and temporally with a single port. For Laker vessels, the probability of survival was categorized as highest since these vessels operate exclusively within a single habitat type – while there are few freshwater fouling organisms in the GLSLR able to attach to Laker hulls, any which do so would be expected to survive environmental conditions at subsequent GLSLR ports.

Step 1C: Calculating Probability of Introduction (Hull Fouling)

The probabilities of arrival and survival were calculated as separate, independent events. However, because the overall probability of introduction is dependent on the sequential occurrence of arrival and survival, a minimum probability approach was used to determine the overall probability that all stages are passed successfully (Orr 2003; DFO 2009). For example, given a very low probability of arrival and a very high probability of survival, the overall probability of introduction would be very low, because high survival probabilities are offset by a very low number of arriving individuals made available to survive. Due to the very large number of potential hull-fouling species, we were unable to estimate the probability that a reproductive population of any one NIS could establish at a recipient GLSLR port or become widespread within Canada (but see section 3.5 on ship-mediated secondary spread). Excluding these two stages of invasion from the analysis essentially sets their probabilities at the highest level since the minimum probability approach retains the value of the component with the lowest rating. The minimum probability approach is widely used in qualitative risk assessments (e.g., Canadian Food Inspection Agency Weed Risk Assessment Guidelines, Aquatic Nuisance Species Task Force, and Commission for Environmental Cooperation Risk Assessment Guidelines) and produces risk ratings most consistent with quantitative risk approaches (Koops and Cudmore 2009). In contrast, we retained the highest level of uncertainty for any one stage of invasion as the uncertainty associated with the probability of introduction.

Step 2: Estimating the Magnitude of Consequences (Hull Fouling)

Predicting potential impacts of NIS involves evaluating the physical-chemical requirements of the NIS and their interactions with native species at recipient sites; a species-specific estimate for potential impact (Colautti and MacIsaac 2004; Lockwood et al. 2006). Again, predicting potential impact for a vector-based risk assessment is complicated by the wide range of possible NIS associated with the vector. Since up-to-date, port-specific lists of native species and established NIS are not available for most ports, we compiled a list of high impact fouling NIS for connected source ports using data from the Nature Conservancy's Marine Invasive Database (Molnar et al. 2008; available at http://conserveonline. org/ workspaces/ global.invasive.assessment). High-impact NIS are defined as introduced species that disrupt multiple species, ecosystem function, and/or keystone or threatened species. The database includes 81 high impact fouling NIS in 232 coastal ecoregions; we created an inland GLSLR ecoregion by applying the same criteria as Molnar et al. (2008) against the 182 established NIS listed in the Great Lakes Aquatic Nonindigenous Species Information System (available at http://www.glerl.noaa.gov/res/Programs/ glansis/glansis.html). We then tabulated the number of high impact fouling NIS recorded for the ecoregion of each source port directly connected to each top GLSLR port, assuming that each connected port may be a donor of all high impact fouling NIS established within the ecoregion; therefore, multiple tally counts are given to a single NIS that could originate from multiple source ports.

A ranking system was used to convert the cumulative number of high impact NIS connected to each top GLSLR port into a relative magnitude of consequences, where the maximum value was divided into five equal categories (Table 4). Again, the choice of five equal categories assumes a positive linear correlation, consistent with general theory to date. Because the list of high impact species was available for ecoregions rather than specific ports, does not account for species that may cause high impacts in new recipient regions despite low or negligible impact in source regions, and does not account for high impact species that are native to the source region, the level of uncertainty associated with magnitude of consequences was considered moderate.

Step 3: Calculating the Final Invasion Risk (Hull Fouling)

The probability of introduction (Step 1) and magnitude of consequences (Step 2) of hull fouling-mediated NIS were combined into a final relative invasion risk based on a symmetrical mixed-rounding matrix that reduces the final ratings to three levels (modified from Therriault and Herborg 2007; Table 5). The colouring of this matrix was determined by consensus at the peer review meeting to be the most balanced approach for assigning levels of risk; however, the matrix can easily be changed to accommodate differing risk tolerance levels by risk managers and/or stakeholders. The highest level of uncertainty assigned to either probability of introduction or magnitude of consequences was retained as the uncertainty associated with the final invasion risk.

ESTIMATING SHIP-MEDIATED SECONDARY SPREAD (HULL FOULING)

The dataset assembled to estimate the probability of arrival provided opportunity to estimate the potential for secondary spread of fouling NIS from top GLSLR ports to other Canadian ports by fouling of domestic ships. Recognizing that NIS introduced via hull fouling may spread by a variety of natural and anthropogenic vectors other than hull fouling, for which we have no information, this measure of secondary spread was not incorporated into the probability of introduction. Further, it was not clear if spread should be included in a vector-based risk assessment as a component of the probability of introduction or the magnitude of consequences, since the extent of secondary spread can influence the magnitude of impact. However, we include the information here as a valuable resource that could be used to direct hull fouling management activities.

Assuming that each vessel arriving to a GLSLR port would subsequently depart to a next port-of-call, the number of coastal domestic and Laker arrivals at each top port was used as a surrogate measure for the number of coastal domestic and Laker departures from GLSLR top ports. A ranking system was used to convert the data into a relative probability of spread, where the maximum value was divided into five equal categories (Table 6). Again, the choice of five equal categories assumes a positive linear correlation, consistent with general theory to date. The level of uncertainty is considered moderate for the same reasons described for probability of arrival for hull fouling.

DETERMINING BALLAST-MEDIATED INVASION RISK

A three step process, similar to that outlined above for hull fouling, was utilized to determine the relative level of invasion risk posed by ballast water (Figure 4). First, the probability of introduction was estimated by combining the individual probabilities of successful transition through each stage of the invasion process (i.e., arrival and survival), based on ballast water

discharge data and environmental similarity between source and recipient ports. Second, the potential magnitude of consequences of introduction was estimated based on the number of high impact ballast-mediated NIS recorded for eco-regions of source ports. Finally, the probability of introduction and potential magnitude of consequences were combined for a final invasion risk rating. To ensure that uncertainty is characterized in a standardized way for each component of the assessment, we assigned levels of uncertainty, ranging from very high to very low, based on the quality of data available for analysis (Table 1). We recognize that residual sediments in ballast tanks may increase the propagule supply associated with ballast water discharge by commercial vessels (Bailey et al. 2007); however, we did not have adequate data to evaluate this vector for this study.

Step 1A: Estimating Probability of Arrival (Ballast Water)

Ballast water information for merchant vessels that arrived at all GLSLR ports during the study period was obtained from Rup et al. (2010), NBIC, and Transport Canada's Ballast Water Database (TCBWD). Summarized ballast information for Lakers was obtained from Rup et al. (2010), which originally referenced INNAV and NBIC, and included ports within the same geographic boundary as described for vessel arrivals (see above). Similar to the hull fouling analysis above, we excluded ballast water discharged at ports east of Québec City as these ports were beyond the geographic scope of this study. Ballast information for coastal domestic and international vessels that arrived at freshwater ports in the five Great Lakes and freshwater ports in the St. Lawrence River (from Duluth-Superior (Minnesota-Wisconsin) to Valleyfield (Québec)) during 1 January 2007 to 31 December 2007 were obtained from NBIC, TCBWD, NVMC, and INNAV (M. Minton, NBIC, unpublished data).

Ballast information for coastal domestic and international merchant vessels at remaining freshwater ports between Valleyfield and Québec City was obtained for 2006 from TCBWD. All vessels with a ballast capacity greater than eight m^3 are required to file ballast water reports prior to the first port-of-call in Canadian waters. These reports contain information on the ballast history for each vessel transit, ballast tank capacities and management activities. Only merchant vessels were considered for ballast water assessment because other vessel types carry very little or no ballast water and do not consistently report ballast activities to Canadian or American authorities. We cross-referenced ballast water activities reported to the TCBWD with cargo activities reported to INNAV. Cargo and ballast information is typically reported to INNAV in binary format (load or unload; volumes are not reported), and all reports are date and time coded.

Because vessels operating within Canadian waters are not required to report ballast activities to Transport Canada, ballast information had to be reconstructed from INNAV data for coastal domestic transits. Following the method of Rup et al. (2010), we assumed that ballast water was discharged when cargo was loaded for 594 transits. We assigned discharge volumes based on either the deadweight tonnage of these ships with a correction factor of 0.5 for merchant bulks, tankers and chemicals or 0.3 for merchant generals, merchant containers, and roll-on/roll-off vessels based on correlations between cargo weight and ballast water volume (C.J. Wiley, Transport Canada, Sarnia, Ontario, personal communication, 2010), or the discharge volume of sister ships in the same vessel class size (see Rup et al. 2010). All ballast water transported by coastal domestic and Laker vessels was assumed to be unmanaged, hereafter referred to as "direct" water, since domestic transits are exempt from ballast water management regulations. The last port-of-call was assumed to be the ballast source for all coastal domestic and Laker discharges, unless voluntary reports to the TCBWD were available. We found 30 incomplete

reports to the TCBWD with missing discharge volume and exchange status; we assigned discharge volumes to these transits based on information obtained within each report, such as the volume onboard, exchanged volume, and source volume. For ease of summary, the geographic location of ballast water sources was condensed into regions, including the Arctic, North-west Atlantic, North-east Atlantic, Western-central Atlantic, Eastern-central Atlantic, South-east Atlantic, and Mediterranean and Black Sea, as described by the Food and Agriculture Organization (FAO 2009; Figure 5) and as used in past ballast water studies (e.g., Amoako-Atta and Hicks 2004; Simard and Hardy 2004; Claudi and Ravishankar 2006).

The volume of foreign ballast water discharged by international vessels was corrected to account for reduction in propagule supply due to mandatory management activities[1]. This correction was also applied to ballast water discharged by coastal domestic vessels that reported conducting voluntary ballast water exchange to Transport Canada. Ballast water exchange can reduce propagule supply by flushing out most entrained organisms and killing those that remain *via* osmotic stress associated with rapid salinity change (Wonham et al. 2001; Ruiz and Smith 2005). However, some viable NIS propagules entrained at the source port may remain viable in tanks despite full compliance by ships (Wonham et al. 2001; Levings and Foreman 2004; Ruiz and Smith 2005). A correction factor of 0.1 for ships with ballast water from saline ports, or 0.01 for freshwater ports, was applied to the reported volumes of exchanged ballast water to estimate propagule supply. These values were derived from ballast water exchange efficacy rates, as determined by total zooplankton abundance, reported for saline water (90%) and freshwater (99%) ports, respectively (Ruiz and Smith 2005; Gray et al. 2007). Ballast water discharged by international and coastal domestic merchant vessels and Lakers was evaluated separately because vessels in different operational regions will likely carry different species assemblages with different characteristics and requirements affecting invasion risk. The volume of ballast water discharged at each port in the database is a sum of the three-year average reported by Rup et al. (2010), the single-year ballast information from NBIC-NVMC (M. Minton, NBIC, unpublished data) and the single-year data from TCBWD-INNAV.

We used the corrected volume of ballast water discharged as a proxy for the propagule supply of NIS potentially arriving at ports by ballast water. Ballast volume acts like a scaling coefficient, where large volumes are more likely to transport larger propagule pressure, but can also transport low propagule pressure. While propagule pressure associated with the ballast water of any single vessel is expected to be more directly related to physico-chemical and/or geographic-seasonal factors like water salinity, age of ballast water and management practices than total volume (Aguirre-Macedo et al. 2008; Burkholder et al. 2007; McCollin et al. 2008; Villac and Kaczmarska 2011), the available dataset did not include these data. While imperfect, the use of volume is consistent with previous studies (Drake and Lodge 2004; Herborg et al. 2007; Simkanin et al. 2009).

A ranking system was used to convert the volume of ballast water discharged into a relative probability of arrival, where the maximum mean annual corrected volume of ballast water discharged at a single GLSLR port was divided into five equal categories (Table 7). The choice of five equal categories assumes a positive linear relationship between the two variables, which

[1] The dataset originally compiled for this study indicated that ~7% of foreign ballast water discharged at GLSLR ports in 2006 may have been directly discharged without exchange. The peer review group decided that using the original dataset would result in an overestimation of current (2011) invasion risk due to the intensive inspection regime initiated in the GLSLR region by 2007. As a result, the numbers have been adjusted to reflect current risk, assuming 100% compliance with regulations by all international vessels.

is consistent with general invasion theory; recognizing that the volume of ballast water discharged is a robust but not a direct measurement of the propagule supply within the water, the associated uncertainty level was set as low. Due to the large number of ports in the region and limited time and resources available to complete the risk assessment, we arbitrarily prioritized the top three ports in each vessel category, based on the probability of arrival, for full assessment.

Step 1B: Estimating Probability of Survival (Ballast Water)

Following the reasoning outlined in section 3.2, Step 1B, we conduct a comparison of the environmental similarity between source and recipient ports of ballast water to estimate the probability of survival. Environmental similarity analysis between NIS source and recipient ports is common in ballast water risk assessments (see Hilliard et al. 1997; Gollasch and Leppäkoski 1999; Hayes and Hewitt 2001; Mills and Thomas 2006; Herborg et al. 2007; Keller et al. 2010). The main advantage of this approach is that it rapidly assesses the likelihood of NIS survival post-arrival based on the environmental conditions of the source and recipient sites (Barry et al. 2008). All ports directly connected to each top GLSLR port as a source of ballast water were noted, allowing identification of source-recipient port-pairs. Following methodology of Keller et al. (2010) we selected four parameters to estimate environmental similarity between port-pairs, including annual average water temperature, mean water temperature during the warmest month, mean water temperature during the coldest month and annual average salinity. We recognize that additional variables such as pH, dissolved oxygen, tidal range, rainfall, day length and ice cover can influence species survival potential at the recipient environment. However, we focused our analysis on temperature and salinity because they are fundamental physical factors for survival and reproduction of aquatic organisms (Kinne 1963; Anger 1991; Browne and Wanigasekera 2000; Verween et al. 2007). In addition, including variables that are not related to invasion risk for some or all potential NIS can dramatically influence the sensitivity of the environmental similarity measure (Barry et al. 2008).

Following Keller et al. (2010), environmental similarity between top ports and global ports was calculated using Euclidean distance in four-dimensional space. Euclidean distance was used because it is a simple method to measure linear distance and is commonly used to measure environmental similarity between two locations (Barry et al. 2008). Sensitivity analysis revealed that salinity was the most influential variable in this calculation, and thus had approximately equal overall weight in the outcome as the three temperature parameters (Keller et al. 2010). We obtained data for the four environmental parameters for 6,651 global ports from Keller et al. (2010). In addition, we interpolated data for these four environmental parameters in ArcGIS 10 (ESRI Inc.) for 56 Arctic ports not included in Keller et al. (2010) using data from the World Ocean Atlas (Antonov et al. 2006; Locarnini et al. 2006). All environmental values were standardized using a z-transformation so that each variable had equal weight in the calculation. Euclidean distance values between each top port and all connected source ports were averaged to obtain a final rating for survival potential.

A ranking system was used to convert the average Euclidean distance value for each port into a relative probability of survival, where the maximum value for any single source-recipient port-pair (of all possible global port-pairs, not just those that were identified as connected in this dataset) was divided into five equal categories (Table 8). Again, the choice of five equal categories assumes a positive linear correlation, consistent with general theory to date. This estimate carries a moderate level of uncertainty since spatial and temporal variation in salinity at a single port are likely not well represented by the annual average salinity.

Further, we recognized that biological interactions may also enhance or impede NIS survival at the recipient port (Colautti and MacIsaac 2004) but we were unable to assess these interactions due to the large number of species potentially associated with the ballast water vector.

Step 1C: Calculating Probability of Introduction (Ballast Water)

As described above for hull fouling, probabilities of arrival and survival were combined into a probability of introduction using the minimum probability method, while retaining the highest level of uncertainty. Probabilities of establishment and spread were not included in this risk assessment, but information about potential for ship-mediated secondary spread is provided below.

In addition, to identify potentially important source ports of ballast-mediated NIS, we overlaid propagule supply and environmental similarity measures between all connecting port-pairs ArcGIS 10. Port-pairs in the upper two categories for both components were considered most likely sources of NIS due to sufficient propagule supply and environmental matching (Orr 2003).

Step 2: Estimating the Magnitude of Consequences (Ballast Water)

Similar to the methodology described above for hull fouling, we compiled a list of high impact ballast-mediated NIS for connected source ports using the Nature Conservancy's Marine Invasive Database (Molnar et al. 2008). The database includes a total of 90 high impact ballast-mediated NIS in 232 ecoregions. We first tabulated the number of high impact ballast-mediated NIS recorded for the ecoregion of each source port directly connected to each top GLSLR port, assuming that each connected port may be a donor of all high impact ballast-mediated NIS established within the ecoregion; therefore, multiple tally counts are given to a single NIS that could originate from multiple source ports.

A ranking system was used to convert the cumulative number of high impact NIS connected to each top GLSLR port into a relative magnitude of consequences, where the maximum value was divided into five equal categories (Table 9). Again, the choice of five equal categories assumes a positive linear correlation, consistent with general theory to date. Because the list of high impact species was available for ecoregions rather than specific ports, does not account for species that may cause high impacts in new recipient regions despite low or negligible impact in source regions, and does not account for high impact species that are native to the source region, the level of uncertainty associated with magnitude of consequences was considered moderate.

Step 3: Calculating Final Invasion Risk (Ballast Water)

The probability of introduction (Step 1) and magnitude of consequences (Step 2) of ballast-mediated NIS were combined into a final relative invasion risk based on a symmetrical mixed-rounding matrix, as described above for hull fouling (Table 5). The highest level of uncertainty assigned to either probability of introduction or magnitude of consequences was retained as the uncertainty associated with the final invasion risk.

ESTIMATING SHIP-MEDIATED SECONDARY SPREAD (BALLAST WATER)

As described in Section 3.3 above, the assembled dataset provided opportunity to estimate the potential for secondary spread of ballast-mediated NIS from top GLSLR ports to other Canadian

ports by domestic ships, but was not considered comprehensive enough to include as a probability of spread in the risk assessment. We were unable to estimate the volume of ballast water being transferred among ports since coastal domestic and Laker vessels are not required to submit ballast water report forms, and we could not reasonably assign a given volume of ballast loaded per ship due to the multi-port, variable cargo activities of domestic vessels in the GLSLR. Instead, we assessed only the number of ballast water uptake events, assuming that all vessels that discharged cargo subsequently loaded ballast water before departing for the next domestic port-of-call. Essentially, the number of ballast water uptakes at each top GLSLR port was calculated by subtracting the number of ballast water discharge events from the number of arrivals, for all coastal domestic and Laker vessels. A ranking system was used to convert the data into a relative probability of spread, where the maximum value was divided into five equal categories (Table 10). Again, the choice of five equal categories assumes a positive linear correlation, consistent with general theory to date. The level of uncertainty is considered moderate for the same reasons described for probability of arrival for ballast water.

RESULTS AND DISCUSSION

VESSEL ARRIVALS IN THE GLSLR REGION

A total of 12,928 distinct merchant vessel arrivals were recorded during a 12-month period at 117 active GLSLR ports based on the combined data from INNAV, Minton et al. (in preparation) and Rup et al. (2010). Lakers contributed the greatest number of vessel arrivals (n = 9,175), followed by international merchant vessels (n = 2,785) and coastal domestic merchant vessels (n = 968). Vessel arrivals were evenly distributed in the region with the exception of Lake Superior where fewer ship visitations were noted (Figure 6).

Probability of Arrival (Hull Fouling)

International Merchant Vessels

We identified 2,785 distinct international merchant vessel arrivals at 43 GLSLR ports during the study period. Montréal (Québec), Québec City (Québec) and Sorel-Tracy (Québec) were the top three ports receiving the greatest number of international merchant vessel arrivals with Montréal having the highest probability for arrival of hull-mediated NIS (Table 11). Arrival probabilities for the remaining GLSLR ports ranged from lowest to intermediate. Port locations are shown in Figure 7.

Our results suggest that Montréal has the highest probability for arrival of foreign fouling NIS propagules. However, many of these propagules may not be able to survive transit as they are typically exposed to long voyages, with potentially high traveling speeds, in a wide range of temperatures and salinities which can decrease survival and invasion risk (Coutts 2003; Coutts and Taylor 2004). Further, species that do survive transoceanic transits are less likely to survive in the freshwater environment of the GLSLR region. A comprehensive hull fouling study in the Great Lakes found that hull fouling from international vessels poses a low introduction risk for new NIS capable of surviving in the region (Sylvester and MacIsaac 2010). Therefore, the actual number of viable propagules arriving at the recipient port may be low. However, there are fouling organisms (e.g., bryozoans and isopods) capable of tolerating a wide range of salinities (0 – 37 ppt) and temperatures (9.9 – 31.6 °C; Davidson et al. 2008), thus the potential for successful hull-mediated NIS introductions across regions cannot completely be disregarded (Lewis et al. 2006).

Coastal Domestic Merchant Vessels

We identified 968 distinct coastal domestic merchant vessel arrivals at 41 GLSLR ports during the study period. Montréal, Québec City and Sorel-Tracy were the top three ports receiving the greatest number of coastal domestic merchant vessel arrivals (Table 12), although all GLSLR ports ranged from lowest to lower potential for arrival of hull-mediated NIS. Port locations are shown in Figure 7.

Coastal domestic merchant vessels have shorter voyage times and travel within similar latitudes compared to international merchant vessels and therefore are more likely to transport viable fouling organisms to GLSLR ports. However, fouling organisms on coastal domestic vessels traveling to GLSLR ports will experience variation in temperature and salinity during the voyage, and therefore only fouling organisms able to tolerate such variation have the potential to remain viable once delivered to the destination port.

Lakers

A total of 9,175 distinct Laker arrivals were reported at 112 GLSLR ports during the study period. Duluth-Superior (Minnesota-Wisconsin), Detroit-Ecorse (Michigan) and Cleveland (Ohio) were the top three ports receiving the greatest number of Laker arrivals with Duluth-Superior as the only port with a higher probability for arrival of hull-mediated NIS (Table 13). Arrival probabilities for the remaining ports ranged from lowest (not shown in Table 13) to intermediate. Port locations are shown in Figure 7.

Viable fouling organisms are more likely to be transported to GLSLR ports by Lakers compared to international and coastal domestic merchant vessels because Lakers generally travel shorter distances within similar latitudes and therefore expose fouling organisms to less variation in temperature and salinity (Coutts and Taylor 2004). Given the region of operation, Lakers would be expected to contribute only to the spread of native nuisance species and established NIS (Carlton and Hodder 1995; Lavoie et al. 1999).

Probability of Survival (Hull Fouling)

All of the top ports considered in this risk assessment have annual average salinities <2 parts per thousand and are considered freshwater ports. Survival probabilities for hull fouling-mediated NIS *via* international and coastal domestic vessels were therefore defined as lowest since these vessels transit through high salinity waters before entering and arriving at Great Lakes ports (Table 14). Since Laker vessels transit exclusively between freshwater ports in the GLSLR, survival of (freshwater) taxa potentially transported by Lakers was assigned highest probability.

Probability of Introduction (Hull Fouling)

Duluth-Superior has a higher probability for introduction of hull fouling-mediated NIS *via* Laker traffic (Table 14). Probability of introduction for the remaining top ports in each vessel category ranged from lowest to intermediate, thus hull fouling-mediated NIS introduction is less likely at these ports.

Magnitude of Consequences (Hull Fouling)

The cumulative number of high impact fouling NIS at each top port by vessel category ranged from 35 to 1,433 representing 88 distinct NIS (Table 15; Appendix H). Montréal was rated highest for magnitude of potential consequences of NIS *via* international merchant vessels, with a cumulative number of 1,433 high impact fouling NIS representing 73 distinct NIS. Québec City was rated higher for magnitude of potential consequences *via* international merchant vessels, with a cumulative number of 975 high impact fouling NIS representing 75 distinct NIS. The remaining GLSLR top ports were rated lowest to intermediate for magnitude of potential consequences of fouling NIS.

Final Invasion Risk (Hull Fouling)

No top GLSLR port received a higher risk for hull fouling-mediated invasions (Table 16). Three top ports have an intermediate risk for invasion, including Montréal, Québec City and Duluth-Superior. The invasion risk for the 6 remaining top ports was lower.

SECONDARY SPREAD BY HULL FOULING

Duluth-Superior has the highest potential to act as a source for hull fouling-mediated spread of NIS within Canada (Table 17). Duluth-Superior is a top port for Laker arrivals. Detroit-Ecorse is also a top port for Laker arrivals and has a higher potential for hull fouling-mediated NIS spread. Fouling NIS introduced to these ports have the greatest probability of spreading to other Canadian ports by domestic transport pathways. As a result, these top ports may serve as hubs for stepping stone invasions if fouling NIS successfully establish at these sites. The probability of spread for the remaining top ports ranged from lowest to intermediate and therefore may play a less prominent role in the spread of fouling NIS within Canada.

BALLAST WATER DISCHARGES IN THE GLSLR REGION

During the study period, merchant vessels conducted 5,683 ballast water discharges, releasing approximately 73,573,813 m^3 of ballast water at 84 GLSLR ports (Table 18). After correcting for the reduction in propagule supply as a result of ballast water exchange, the volume discharged was 72,342,194 m^3, indicating that the majority of ballast water discharged in the GLSLR originates from Canadian ports. Approximately 94% of the corrected total volume originated from Canadian and U.S. ports in the GLSLR, while 4% originated from Canadian coastal ports and the remaining 2% originated from foreign ports in various FAO regions (Table 19). Ports in the GLSLR and North-west Atlantic were the greatest contributor of direct ballast water to the GLSLR region because Lakers and coastal domestic vessels travelling within Canadian waters and the U.S. exemption zone are exempt from ballast water management.

Ballast water discharges were evenly distributed in the GLSLR region, with the exception of Lake Superior where fewer discharge events occurred. However, ports in Lake Superior received relatively greater volumes of total ballast water and direct ballast water during the study period (Figure 8).

Probability of Arrival (Ballast Water)

International Merchant Vessels

During the study period, international merchant vessels discharged a total of 4,890,414 m^3 of ballast water at 34 GLSLR ports. The total discharged volume included 3,539,803 m^3 of direct domestic water and 1,334,739 m^3 of exchanged foreign water to which a correction factor was applied to account for the reduced propagule supply due to mid-ocean exchange (refer to Section 3.4 Step 1A for details). Québec City, Sorel-Tracy (Québec) and Montréal were the top three GLSLR ports receiving the greatest combined volume of domestic direct and exchanged (with correction factor applied) ballast water discharged by international merchant vessels (Table 20), however the probability of arrival of ballast-mediated NIS *via* international merchant vessels was lowest for all top GLSLR ports. Port locations are shown in Figure 9.

Ballast water from international source ports must now be exchanged or flushed on the open ocean, which dramatically reduces potential propagule supply to Canadian ports (Bailey et al. 2011). Therefore, ballast water discharged by international merchant vessels may no longer play a prominent role in introducing NIS from foreign sources.

Coastal Domestic Merchant Vessels

During the same period, coastal domestic merchant vessels discharged a total of 1,980,604 m^3 of ballast water at 22 GLSLR ports. Nearly all ballast water moved by coastal domestic merchant vessels was discharged directly, although voluntary ballast water exchange was reported for 7,429 m^3. Québec City, Montréal and Toronto (Ontario) were the top three GLSLR ports receiving the greatest combined volume of ballast water discharged by coastal domestic vessels (Table 21). The probability of arrival of ballast-mediated NIS *via* coastal domestic merchant vessel discharges was lowest for all top GLSLR ports. Port locations are shown in Figure 9.

Ballast water discharged by coastal domestic vessels may have a higher propagule supply compared to international vessels due to the inverse relationship between duration of voyage and propagule survival – plankton are more likely to survive the environmental conditions and resist predation and competition inside a ballast tank over a shorter period of time (Lavoie et al. 1999; Verling et al. 2005; Simkanin et al. 2009). However, coastal domestic vessels likely play a more prominent role in the spread of native nuisance species and/or established NIS, rather than the introduction of new NIS from foreign sources (Carlton and Hodder 1995; Lavoie et al. 1999).

Lakers

Lakers discharged a total of 66,702,794 m^3 ballast water at 80 GLSLR ports. All ballast water moved by Lakers was discharged directly as Lakers are exempt from ballast management regulations and do not transit offshore to a suitable location where exchange can be conducted. Duluth-Superior, Two Harbors (Minnesota) and Presque Isle-Marquette (Michigan) were the top three ports receiving the greatest total volume of direct ballast water from Lakers (Table 22). Duluth-Superior had the highest probability for ballast-mediated NIS arrival *via* Laker vessel discharges while probabilities for the remaining top ports ranged from lowest to lower. Port locations are shown in Figure 9.

Ballast water discharged by Laker vessels may have a higher propagule supply compared to international vessels due to the inverse relationship between duration of voyage and propagule survival – plankton are more likely to survive the environmental conditions and resist predation

and competition inside a ballast tank over a shorter period of time (Lavoie et al. 1999; Verling et al. 2005; Simkanin et al. 2009). However, Lakers likely play a more prominent role in the spread of native nuisance species and/or established NIS, rather than the introduction of new NIS from foreign sources (Carlton and Hodder 1995; Lavoie et al. 1999).

Probability of Survival (Ballast Water)

International Merchant Vessels

Thirty-three foreign, 17 coastal domestic, and 18 GLSLR ballast water source ports were identified and evaluated for environmental similarity with Québec City (Table 23). The overall probability of survival at Québec City was higher, with 33 source ports having higher or highest environmental similarity to Québec City. However, all connected ports with higher or highest environmental similarity with Québec City also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Québec City (Figure 10). A list of global ports with highest environmental similarity to Québec City is provided in Appendix A; NIS originating from these ports would have the highest probability for survival if introduced to Québec City.

Eighteen foreign, 11 coastal domestic and 12 GLSLR ballast water source ports were identified and evaluated for environmental similarity with Sorel-Tracy (Table 24). The overall probability of survival at Sorel-Tracy was higher, with 24 source ports having higher or highest environmental similarity to Sorel-Tracy. However, all connected ports with higher or highest environmental similarity to Sorel-Tracy also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Sorel-Tracy (Figure 11). A list of global ports with highest environmental similarity to Sorel-Tracy is provided in Appendix B; NIS originating from these ports would have the highest probability for survival if introduced to Sorel-Tracy.

Forty-four foreign, 10 coastal domestic and 25 GLSLR ballast water source ports were identified and evaluated for environmental similarity with Montréal (Table 25). The overall probability of survival at Montréal was higher, with 41 source ports having higher or highest environmental similarity to Montréal. However, all connected ports with higher or highest environmental similarity with Montréal also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Montréal (Figure 12). A list of global ports with highest environmental similarity to Montréal is provided in Appendix C; NIS originating from these ports would have the highest probability for survival if introduced to Montréal.

Coastal Domestic Merchant Vessels

Eleven coastal domestic and 22 GLSLR ballast water source ports were identified and evaluated for environmental similarity with Québec City (Table 26). The overall probability of survival at Québec City was higher, with 23 source ports having higher or highest environmental similarity to Québec City. However, all connected ports with higher or highest environmental similarity with Québec City also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Québec City (Figure 13).

Twelve coastal domestic and 14 GLSLR ports were identified and evaluated for environmental similarity with Montréal (Table 27). The overall probability of survival at Montréal was higher, with 16 source ports having higher or highest environmental similarity to Montréal. However, all connected ports with higher or highest environmental similarity with Montréal also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Montréal (Figure 14).

One coastal domestic ballast water source port, Québec City, was identified and evaluated for environmental similarity with Toronto (Table 28). The environmental similarity between Toronto and Québec City indicates highest probability of survival. However, Québec City does not appear to be a likely source for ballast-mediated NIS because of low propagule supply (Figure 15). A list of global ports with highest environmental similarity to Toronto is provided in Appendix D; NIS originating from these ports would have the highest probability for survival if introduced to Toronto.

Laker Ballast Water Discharge

Fifty-nine GLSLR ballast water source ports were identified and evaluated for environmental similarity with Duluth-Superior (Table 29). The overall probability of survival at Duluth-Superior was highest, with all 59 source ports having higher or highest environmental similarity to Duluth-Superior. Burns Harbor (Indiana), Nanticoke (Ontario) and St. Clair (Michigan) were identified as potential sources of ballast-mediated NIS to Duluth-Superior having both relatively high propagule supply and environmental similarity (Figure 16). The remaining connected ports are unlikely sources of ballast-mediated NIS due to relatively low propagule supply. A list of global with highest environmental similarity to Duluth-Superior is provided in Appendix E; NIS originating from these ports would have the highest probability for survival if introduced to Duluth-Superior.

Thirty-six GLSLR ballast water source ports were identified and evaluated for environmental similarity with Two Harbors (Table 30). The overall probability of survival at Two Harbors was highest, with all 36 source ports having higher or highest environmental similarity to Two Harbors. Gary (Indiana) was identified as a potential source of ballast-mediated NIS to Two Harbors having both relatively high propagule supply and environmental similarity (Figure 17). The remaining connected ports are unlikely sources of ballast-mediated NIS due to relatively low propagule supply. A list of global ports with highest environmental similarity to Two Harbors is provided in Appendix F; NIS originating from these ports would have the highest probability for survival if introduced to Two Harbors.

Forty-three GLSLR ballast water source ports were identified and evaluated for environmental similarity with Presque Isle-Marquette (Table 31). The overall probability of survival at Presque Isle-Marquette was highest, with 42 source ports having highest, and one source port having higher environmental similarity to Presque Isle-Marquette. However, all connected ports with higher or highest environmental similarity with Montréal also had relatively low propagule supply, making these locations unlikely sources of ballast-mediated NIS to Presque Isle-Marquette (Figure 18). A list of global ports having highest environmental similarity to Presque Isle-Marquette is provided in Appendix G; NIS originating from these ports would have the highest probability for survival if introduced to Presque Isle-Marquette.

Probability of Introduction (Ballast Water)

Duluth-Superior has the highest probability for introduction of ballast-mediated NIS *via* Lakers (Table 32). Probability of introduction for the remaining top ports in each vessel category ranged from lowest to lower, thus ballast–mediated NIS introduction is less likely at these ports.

Magnitude of Consequences (Ballast Water)

The cumulative number of high impact ballast-mediated NIS at each top port by vessel category ranged from 3 to 868, representing 83 distinct NIS (Table 33; Appendix I). Montréal was rated highest for magnitude of potential consequences of NIS *via* international merchant vessels, with a cumulative number of 868 high impact ballast-mediated NIS (78 distinct NIS). Québec City was rated higher for magnitude of potential consequences of NIS *via* international merchant vessels, with a cumulative number of 625 high impact ballast-mediated NIS (75 distinct NIS). The remaining top ports from all vessel categories rated lowest to intermediate for magnitude of potential consequences by ballast-mediated NIS. It is noted that some of the high impact species identified in Appendix I have already established in the GLSLR region with ship ballast being the most probable transport vector including *Cercopagis pengoi*, *Dreissena polymorpha*, and *Neogobius melanostomus.*

Final Invasion Risk (Ballast Water)

Duluth-Superior has higher invasion risk for ballast-mediated invasions *via* Laker ballast water discharge (Table 34). For the remaining top ports, 2 had intermediate invasion risk and 6 had lower invasion risk for ballast-mediated NIS invasions.

SECONDARY SPREAD BY BALLAST WATER

Montréal and Québec City have highest and higher potential for ballast-mediated spread of NIS within Canada, respectively (Table 35). Both ports are top ports for international and coastal domestic merchant vessel traffic and therefore may serve as hubs for stepping stone invasions if ballast-mediated NIS successfully establish at these ports. Spread potential for the remaining top ports ranged from lowest to intermediate potential and therefore these ports may play a less prominent role in the spread of ballast-mediated NIS within Canada.

THE FUTURE OF SHIP-MEDIATED INVASIONS IN THE GLSLR REGION

Effective ballast management regulations coupled with an intensive inspection regime for international vessels appear to have successfully reduced the future risk of introduction of new NIS from foreign ports (Bailey et al. 2011). Ballast water management systems utilizing technologies like filtration and chlorination can further reduce invasion risk by lowering propagule pressure more consistently than exchange methods; these systems are expected to be required for international vessels arriving to the GLSLR by 2016 (IMO 2004; Canada Shipping Act 2006). As a result, this study indicates that unregulated domestic vessels, particularly Lakers, should be the focus of future efforts to reduce impacts of NIS in the GLSLR. Given the very high probabilities for survival in this study, and that the annual volume of ballast water moved within the GLSLR by domestic ships is 20-100 times greater than the historical annual volume of water released by international vessels (Ruiz and Reid 2007), domestic shipping is a very important mechanism for spread of NIS. While management of spread is a lower priority than management of new introductions, taking action to reduce rapid and widespread dispersal of NIS has been recommended to reduce the magnitude of ecological and economic impacts of NIS (Lodge et al. 1998; Floerl et al. 2009).

The results presented in this report are based on current shipping patterns and environmental conditions; any changes to one or both factors in the future would lead to changes in ship-mediated invasion risk. In particular, recent efforts to increase shipping traffic along ‘Highway

H_2O' could result in higher propagule pressure to the GLSLR region and/or establish new connections with highly environmentally similar global source ports – such as those listed in Appendices A through G. Further, climate change scenarios predict both thermal and physical changes in the GLSLR which could impact analyses of environmental similarity between connected source and donor ports (Magnuson et al. 1997). A reanalysis of environmental similarity between donor and recipient port-pairs, using environmental variables as projected under climate change, may be useful to predict future invasion risk in the region.

CONCLUSIONS

- Freshwater ports of the Great Lakes and St. Lawrence River (GLSLR) are connected to international and coastal domestic ports, resulting in potential for species transfers *via* hull fouling and/or ballast water discharge.
- More than 90% of ship arrivals and ballast water discharge originated from domestic ports, making domestic vessels an important mechanism for movement (secondary spread) of nonindigenous species (NIS) in the GLSLR region.
- The final invasion risk for nonindigenous species *via* hull fouling was intermediate for Montréal (Québec), Québec City (Québec) and Duluth-Superior (Minnesota-Superior), and lower for all remaining top GLSLR ports.
- Duluth-Superior was identified as having higher overall invasion risk for NIS *via* ballast water, with Québec City and Montréal having intermediate invasion risk, and all remaining top GLSLR ports having lower final invasion risk.
- Burns Harbor (Indiana), Nanticoke (Ontario), and St. Clair (Michigan) are potentially important sources of ballast-mediated NIS for Duluth-Superior due to relatively high propagule supply and environmental similarity.
- Biological sampling of ship vectors should be conducted at top GLSLR ports to further quantify relative invasion risk with consideration of species-specific and site-specific characteristics.
- Future research and/or monitoring activities in the GLSLR should be prioritized at the top ports identified as higher risk by this assessment.
- It is important to note that results presented in this document are based on a relative risk ranking system, allowing prioritization of ports within the GLSLR. Relative rankings may change in the comprehensive national risk assessment considering differences in intensity of shipping traffic and environmental conditions across regions.

REFERENCES

Aguirre-Macedo, M.L., Vidal-Martinez, V.M., Herrera-Silveira, J.A., Valdes-Lozanos, D.S., Herrera-Rodriguez, M., and Olvera-Novoa, M.A. 2008. Ballast water as a vector of coral pathogens in the Gulf of Mexico: the case of the Cayo Arcas coral reef. Mar. Pollut. Bull. 56(9): 1570-1577.

Allen, E.A. and Humble, L.M. 2002. Nonindigenous species introductions: a threat to Canada's forests and forest economy. Can. J. Plant. Pathol. 24(2): 103-110.

Amoako-Atta, S. and Hicks, D.W. 2004. GIS decision support system for prevention of ballast water-borne species introductions. Proceedings, 24th Annual ESRI International User Conference, August 9-13, 2004, San Diego, California. 12 p.

Anger, K. 1991. Effects of temperature and salinity on the larval development of the Chinese mitten crab *Eriocheir sinensis* (Decapoda: Grapsidae). Mar. Ecol. Prog. Ser. 72:103-110.

[ANSTF] Aquatic Nuisance Species Task Force. 2007. Aquatic Nuisance Species Task Force strategic plan (2007–2012) [online]. Available from http://anstaskforce.gov/plan.php [accessed 12 November 2009].

Antonov, J.I., Locarnini, R.A., Boyer, T.P., Mishonov, A.V., and Garcia, H.E. 2006. World Ocean Atlas 2005, Volume 2: Salinity. *Edited by* S. Levitus. NOAA Atlas NESDIS 62, U.S. Government Printing Office, Washington, D.C. 182 p.

Bailey, S.A., Duggan, I.C., van Overdijk, C.D.A., Jenkins, P.T., and MacIsaac, H.J. 2003. Viability of invertebrate diapausing eggs collected from residual ballast sediment. Limnol. Oceanogr. 48(4): 1701-1710.

Bailey, S.A., Duggan, I.C., Jenkins, P.T., and MacIsaac, H.J. 2005. Invertebrate resting stages in residual ballast sediment of transoceanic ships. Can. J. Fish. Aquat. Sci. 62(5): 1090-1103.

Bailey, S.A., Duggan, I.C., Nandakumar, K., and MacIsaac, H.J. 2007. Sediments in ships: Biota as biological contaminants. Aquat. Ecosyst. Health Manage. 10(1): 93-100.

Bailey, S.A., Deneau, M.G., Jean, L., Wiley, C.J., Leung, B., and MacIsaac, H.J. 2011. Has management reduced the risk of ballast-mediated species introduction to the Great lakes? Environ. Sci. Technol. (in press); submitted Dec 10, 2010.

Barry, S.C., Hayes, K.R., Hewitt, C.L., Behrens, H.L., Dragsund, E., and Bakke, S.M. 2008. Ballast water risk assessment: principles, processes, and methods. ICES J. Mar. Sci. 65(2):121-131.

Bradie, J.N., Bailey, S.A., van der Velde, G., and MacIsaac, H.J. 2010. Brine-induced mortality of non-indigenous invertebrates in residual ballast water. Mar. Environ. Res. 70(5): 395-401.

Browne, R.A. and Wanigasekera, G. 2000. Combined effects of salinity and temperature on survival and reproduction of five species of *Artemia*. J. Exp. Mar. Biol. Ecol. 244(1): 29-44.

Burkholder, J.M., Hallegraeff, G.M., Melia, G., Cohen, A., Bowers, H.A., Oldach, D.W., Parrow, M.W., Sullivan, M.J., Zimba, P.V., Allen, E.H., Kinder, C.A., and Mallin, M.A. 2007. Phytoplankton and bacterial assemblages in ballast water of US military ships as a function of port of origin, voyage time, and ocean exchange practices. Harmful Algae 6(4): 486-518.

Canada Shipping Act. 2006. Ballast Water Control and Management Regulations (SOR/2006-129) [online]. Available from http://laws.justice.gc.ca/en/SOR-2006-129/ [accessed 20 November 2009].

Carlton, J.T. 1985. Trans-oceanic and interoceanic dispersal of coastal marine organisms: The biology of ballast water. Oceanogr. Mar. Biol. 23: 313-371.

Carlton, J.T. and Geller, J.B. 1993. Ecological roulette: The global transport of nonindigenous marine organisms. Science 261(5117): 78-82.

Carlton, J.T. and Hodder, J. 1995. Biogeography and dispersal of coastal marine organisms: experimental studies on a replica of a 16th-century sailing vessel. Mar. Biol. 121(4): 721-730.

Claudi, R. and Ravishankar, T.J. 2006. Quantification of risks of alien species introductions associated with ballast water discharge in the Gulf of St. Lawrence. Biol. Inv. 8(1): 25-44.

Colautti, R.I., Niimi, A.J., van Overdijk, C.D.A., Mills, E.L., Holeck, K., and MacIsaac, H.J. 2003. Spatial and temporal analysis of shipping vectors to the Great Lakes. *In* Invasion pathways: analysis of invasion patterns and pathway management. *Edited by* G.M. Ruiz, J.T. Carlton and R.N. Mack. Island Press, Washington, D.C. p. 227-246.

Colautti, R.I. and MacIsaac, H.J. 2004. A neutral terminology to define 'invasive' species. Divers. Distrib. 10(2): 135-141.

Colautti, R.I., Bailey, S.A., van Overdijk, C.D.A., Amundsen, K., and MacIsaac, H.J. 2006*a*. Characterised and projected costs of nonindigenous species in Canada. Biol. Inv. 8(1): 45-59.

Colautti, R.I., Grigorovich, I.A., and MacIsaac, H.J. 2006*b*. Propagule pressure: A null model for Biological Invasions. Biol. Inv. 8(5): 1023-1037.

Coutts, A.D.M. 1999. Hull fouling as a modern vector for marine Biological Invasions; investigation of merchant vessels visiting northern Tasmania. Theisis (M.Sc.) Australian Maritime College, Launceston, Australia.

Coutts, A.D.M., Moore, K.M., and Hewitt, C.L. 2003. Ships' sea-chests: An overlooked transfer mechanism for non-indigenous marine species? Mar. Pollut. Bull. 46(11): 1510-1513.

Coutts, A.D.M. and Taylor, M.D. 2004. A preliminary investigation of biosecurity risks associated with biofouling on merchant vessels in New Zealand. New Zealand Journal of Marine and Freshwater Research 38(2): 215-229.

Crooks, J.A. 2002. Characterizing ecosystem-level consequences of biological invasions: the role of ecosystem engineers. Oikos 97(2): 153-166.

Davidson, I.C., McCann, L.D., Fofonoff, P.W., Sytsma, M.D., and Ruiz, G.M. 2008. The potential for hull-mediated species transfers by obsolete ships on their final voyages. Diversity and Distribution 14(3): 518-529.

de Lafontaine, Y. and Costan, G. 2002. Introduction and transfer of alien aquatic species in the Great Lakes-St. Lawrence River Drainage Basin. *In* Alien invaders in Canada's Waters, Wetlands, and Forests. *Edited by* R. Claudi, P. Nantel, and E. Muckle-Jeffs. Natural Resources Canada, Ottawa, Ontario, p. 219-231.

de Lafontaine, Y., Sévigny, J.M., Calvé, R., G., V., Despatie, S.P., and Veilleux, E. 2008. Chinese mitten crabs (Eriocheir sinensis) in the St. Lawrence River and Estuary, Canada: new records and risk of invasion. Aquatic Invasions 3(2): 153-163.

Dextrase, A. 2002. Preventing the introduction and spread of alien aquatic species in the Great Lakes. *In* Alien invaders in Canada's Waters, Wetlands, and Forests. *Edited by* R. Claudi, P. Nantel, and E. Muckle-Jeffs. Natural Resources Canada, Ottawa, Ontario, p. 219-231.

[DFO] Fisheries and Oceans Canada. 2009. National code on introductions and transfers of aquatic organisms [online]. Available from http://www.dfo-mpo.gc.ca/science/enviro/ais-eae/code/app-ann-4-eng.htm [accessed 1 December 2009].

Drake, J.M. and Lodge, D.M. 2004. Global hot spots of Biological Invasions: evaluating options for ballast-water management. Proceeding of the Royal Society B 271(1539): 575-580.

Drake, J.M. and Lodge, D.M. 2007. Hull fouling is a risk factor for intercontinental species exchange in aquatic ecosystems. Aquatic Invasions 2(2): 121-137.

Duggan, I.C., van Overdijk, C.D.A., Bailey, S.A., Jenkins, P.T., Limen, H., and MacIsaac, H.J. 2005. Invertebrates associated with residual ballast water and sediments of cargo-carrying ships entering the Great Lakes. Can. J. Fish. Aquat. Sci. 62(11): 2463-2474.

Duggan, I.C., Bailey, S.A., van Overdijk, C.D.A., and MacIsaac, H.J. 2006. Invasion risk of active and diapausing invertebrates from residual ballast in ships entering Chesapeake Bay. Mar. Ecol. Prog. Ser. 324: 57-66.

El-Sabh,M.I. and Murty,T.S. 1990. Mathematical modelling of tides in the St. Lawrence Estuary. *In* Oceanography of a large-scale estuarine system: The St. Lawrence. *Edited by* M.I. El-Sabh and N. Silverberg. Coastal and Estuarine Studies 39. pp 10-50.

Environment Canada. 2007. Balancing Act: Ballast Water Treatment Technologies to Address Invasive Species Problem. Envirozine, Issue 77, Feature 3 [online]. Available from [accessed 20 November 2009].

[FAO] Food and Agricultural Organization of the United Nations. 2009. FAO major fishing areas [online]. Available from http://www.fao.org/fishery/cwp/handbook/H/en [accessed 20 November 2009].

Floerl, O., Inglis, G.J., Dey, K., and Smith, A. 2009. The importance of transport hubs in stepping-stone invasions. J. Appl. Ecol. 46(1): 37-45.

Fofonoff, P.W., Ruiz, G.M., Steves, B., and Carton, J.T. 2003. In ships or on ships? Mechanisms of transfer and invasion for non-native species to the coasts of North America. *In* Invasive species: vectors and management strategies. *Edited by* G.M. Ruiz and J.T. Carlton. Island Press, Washington. p. 415-438.

[GLSLS] Great Lakes St. Lawrence Seaway. 2007. Great Lakes St. Lawrence Seaway Study [online]. Available from http://www.glsls-study.com/English%20Site/home.html [accessed November 5 2009].

[GLSLS] Great Lakes St. Lawrence Seaway. 2009. Great Lakes St. Lawrence Seaway System [online]. Available from http://greatlakes-seaway.com/en/ [accessed 20 November 2009].

Gollasch, S. and Leppäkoski, E. 1999. Initial risk assessment of alien species in Nordic coastal waters. Nordic Council of Ministers, Copenhagen, Denmark. 244 p.

Gollasch, S. 2002. The importance of ship hull fouling as a vector of species introductions into the North Sea. Biofouling 18(2): 105-121.

Gray, D.K., Johengen, T.H., Reid, D.F., and MacIsaac, H.J. 2007. Efficacy of open-ocean ballast water exchange as a means of preventing invertebrate invasions between freshwater ports. Limnol. Oceanogr. 52(6): 2386-2397.

Grigorovich, I.A., MacIsaac, H.J., Shadrin, N.V., and Mills, E.L. 2002. Patterns and mechanisms of aquatic invertebrate introductions in the Ponto-Caspian region. Can. J. Fish. Aquat. Sci. 59(7): 1189-1208.

Grigorovich, I.A., Colautti, R.I., Mills, E.L., Holeck, K., Ballert, A.G., and MacIsaac, H.J. 2003. Ballast-mediated animal introductions in the Laurentian Great Lakes: retrospective and prospective analyses. Can. J. Fish. Aquat. Sci. 60(6): 740-756.

Hayes, K.R. and Hewitt, C.L. 2001. Risk assessment framework for ballast water introductions – Volume 2, CRIMP Technical Report 21. CSIRO Divisions of Marine Research, Hobart, Australia. 198 p.

Herborg, L.M., Jerde, C.L., Lodge, D.M., Ruiz, G.M., and MacIsaac, H.J. 2007. Predicting invasion risk using measures of introduction effort and environmental niche models. Ecol. Appl. 17(3): 663-674.

Hilliard, R.W., Hutchings, P.A., and Raaymakers, S. 1997. Ballast water risk assessment for twelve Queensland ports. Stage 5: Executive summary and synthesis of stages 1-4. EcoPort Monograph Series,14. Ports Corporation of Queensland, Brisbane, Australia, 34 p.

Holeck, K.T., Mills, E.L., MacIsaac, H.J., Dochoda, M.R., Colautti, R.I., and Ricciardi, A. 2004. Bridging troubled waters: Biological Invasions, transoceanic shipping, and the Laurentian Great Lakes. Bioscience 54(10): 919-929.

Humphrey, D.B. 2008. Characterizing ballast water as a vector for nonindigenous zooplankton transport. Thesis (M.Sc.) The University of British Columbia, Vancouver, B.C.

[IMO] International Maritime Organization. 2004. International convention for the control and management of ships' ballast water and sediments. Adopted 13 February 2004.

[ISSG] Invasive Species Specialist Group. 2001. IUCN guidelines for the prevention of biodiversity loss caused by alien invasive species [online]. Available from [accessed on 20 November 2009].

Keller, R.P., Drake, J.M., Drew, M.B., and Lodge, D.M. 2010. Linking environmental conditions and ship movements to estimate invasive species transport across the global shipping network. Divers. Distribut. 17(1): 93-102.

Kinne, O. 1963. The effect of temperature and salinity on marine and brackish water animals. I. Temperature. Oceanogr. Mar. Biol. Annu. Rev. 1(1): 301-340.

Kipp, R., Bailey, S.A., MacIsaac, H.J., and Ricciardi, A. 2010. Transoceanic ships as vectors for nonindigenous freshwater bryozoans. Divers. Distrib. 16(1): 77-83.

Kolar, C.S. and Lodge, D.M. 2001. Progress in invasion biology: predicting invaders. Trends Ecol. Evol.16(4): 199-204.

Koops, M and Cudmore, B. 2009. A comparison and evaluation of qualitative approaches to the assessment of risk from invasive species. Oral presentation,16th International Conference on Aquatic Invasive Species, Montréal, QC, 19 – 23 September 2009.

Lavoie, D.M., Smith, L.D., and Ruiz, G.M. 1999. The potential for intracoastal transfer of non indigenous species in the ballast water of ships. Estuarine Coastal Shelf Sci. 48(5): 551-564.

Lawler, J.J., White, D., Neilson, R.P., and Blaustein, A.R. 2006. Predicting climate-induced range shifts: model differences and model reliability. Global Change Biol. 12(8): 1568-1584.

Leppäkoski, E., Gollasch, S., Gruszka, P., Ojaveer, H., Olenin, S., and Panov, V. 2002. The Baltic - a sea of invaders. Can. J. Fish. Aquat. Sci. 59(7): 1175-1188.

Levings, C.D. and Foreman, M.G.G. 2004. Ecological and oceanographic criteria for alternate ballast water exchange zones in the Pacific Region. DFO Can. Sci. Advis. Sec. Res. Doc. 2004/118, 43 p.

Lewis, P.N., Riddle, M.J., and Hewitt, C.L. 2004. Management of exogenous threats to Antarctica and the sub-Antarctic islands: balancing risks from TBT and nonindigenous marine organisms. Mar. Pollut. Bull. 49(11): 999-1005.

Lewis, P.N., Bergstrom, D.M., and Whinam, J. 2006. Barging in: A temperate marine community travels to the sub-Antarctic. Biol. Inv. 8(4): 787-795.

Lloyd's Register. 2007. Ballast water treatment technology: current status [online]. Available from [accessed 6 July 2009].

Locarnini, R.A., Mishonov, A.V., Antonov, J.I., Boyer, T.P., and Garcia, H.E. 2006. World Ocean Atlas 2005, Volume 1: Temperature. *Edited by* S. Levitus. NOAA Atlas NESDIS 61, U.S. Government Printing Office, Washington, D.C. 182 p.

Locke, A., Reid, D.M., Vanleeuwen, H.C., Sprules, W.G., and Carlton, J.T. 1993. Ballast water exchange as a means of controlling dispersal of fresh-water organisms by ships. Can. J. Fish. Aquat. Sci. 50(10): 2086-2093.

Lockwood, J., Hoopes, M., and Marchetti, M. 2006. Invasion ecology. Wiley-Blackwell Publishing, Oxford, United Kingdom.

Lockwood, J.L., Blackburn, T.M., and Cassey, P. 2009. The more you introduce the more you get: the role of colonization pressure and propagule pressure in invasion ecology. Divers. Distrib. 15(5): 904-910.

Lodge, D.M., Stein, R.A., Brown, K.M., Covich, A.P., Brönmark, D., Garvey, J.E., and Klosiewski, S.P. 1998. Predicting impact of freshwater exotic species on native biodiversity: Challenges in spatial scaling. Aust. J. Ecol. 23(1): 53-67.

Magnuson, J.J., Webster, K.E., Assel, R.A., Bowser, C.J., Dillon, P.J., Eaton, G., Evans, H.E., Fee, E.J., Hall, R.I., Mortsch, L.R., Schindler, D.W., and Quinn, F.H. 1997. Potential effects of climate changes on aquatic systems: Laurentian Great Lakes and Precambrian Shield region. Hydrol.Processes 11(8): 825-871.

MacIsaac, H.J., Robbins, T.C., and Lewis, M.A. 2002. Modelling ships' ballast water as invasion threats to the Great Lakes. Can. J. Fish. Aquat. Sci. 59(7): 1245-1256.

Mack, R.N., Simberloff, D., Lonsdale, W.M., Evans, H., Clout, M., and Bazzaz, F.A. 2000. Biotic invasions: Causes, epidemiology, global consequences, and control. Ecol. Appl. 10(3): 689-710.

Mamlook, R., Badran, O., Abu-Khader, M.M., Holdo, A., and Dales, J. 2008. Fuzzy sets analysis for ballast water treatment systems: best available control technology. Clean Technol. Environ. Policy 10(4): 397-407.

McCollin, T., Shanks, A.M., and Dunn, J. 2008. Changes in zooplankton abundance and diversity after ballast water exchange in regional seas. Mar. Pollut. Bull. 56(5): 834-844.

[MEA] Millennium Ecosystem Assessment. 2005. Millennium ecosystem assessment: sub-global assessments [online]. Available from http://maps.grida.no/go/graphic/millennium-ecosystem-assessment-sub-global-assessments [accessed 28 May 2009].

Mills, E.L., Leach, J.H., Carlton, J.T., and Secor, C.L. 1993. Exotic species in the Great lakes: A history of biotic crises and anthropogenic introductions. J. Great Lakes Res. 19(1): 1-54.

Mills, J. and Thomas, M. 2006. Risk assessment procedures with respect to the proposed ballast water management regulations – Great Lakes and St. Lawrence Region. BMT Fleet Technology Limited 6027c.DRF Rev 1. 39 p.

Minchin, D. and Gollasch, S. 2003. Fouling and ships' hulls: how changing circumstances and spawning events may result in the spread of exotic species. Biofouling 19(S1): 111-122.

Mineur, F., Johnson, M.P., Maggs, C.A., and Stegenga, H. 2007. Hull fouling on commercial ships as a vector of macroalgal introduction. Mar. Biol. 151(4): 1299-1307.

Minton, M.S., Verling, E., Miller, A.W., and Ruiz, G.M. 2005. Reducing propagule supply and coastal invasions via ships: effects of emerging strategies. Front. Ecol. Environ. 3(6): 304-308.

Molnar, J.L., Gamboa, R.L., Revenga, C., and Spalding, M.D. 2008. Assessing the global threat of invasive species to marine biodiversity. Front. Ecol. Environ. 6(9): 485-492.

Niimi, A.J. 2004. Role of container vessels in the introduction of exotic species. Mar. Pollut. Bull. 49(9-10): 778-782.

[NRC] National Research Council. 1996. Stemming the tide: Controlling introductions of nonindigenous species by ships' ballast water. National Academy Press, Washington, D.C.

[NRC] National Research Council. 2008. Great Lakes shipping, trade, and aquatic invasive species. Special Report 291, Transportation Research Board, Washington, D.C.

[OMNR] Ontario Ministry of Natural Resources. 2009. Great Lakes: Living systems [online]. Available from http://www.mnr.gov.on.ca/en/Business/GreatLakes/index.html [accessed on 3 November 2009].

Orr, R. 2003. Generic nonindigenous aquatic organisms risk analysis review process. *In* Invasive Species: Vectors and Management Strategies. *Edited by* G.M. Ruiz and J.T. Carlton. Island Press, Washington. p. 415-455.

Pimental, D., Zuniga, R., and Morrison, D. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. Ecol. Econ.52(3): 276-288.

Pothoven, S.A., Grigorovich, I.A., Fahnenstiel, G.L., and Balcer, M.D. 2007. Introduction of the Ponto-Caspian bloody-red mysid *Hemimysis anomala* into the Lake Michigan basin. Journal of Great Lakes Research 33(1): 285-292.

Ricciardi, A. and Rasmussen, J.B. 1998. Predicting the identity and impact of future biological invaders: a priority for aquatic resource management. Can. J. Fish. Aquat. Sci. 55(7): 1759-1765.

Ricciardi, A. 2001. Facilitative interactions among aquatic invaders: is an "invasional meltdown" occurring in the Great Lakes? Can. J. Fish. Aquat. Sci. 58(12): 2513-2525.

Ricciardi, A. 2006. Patterns of invasion in the Laurentian Great Lakes in relation to changes in vector activity. Divers. Distrib. 12(4): 425-433.

Ricciardi, A. and Kipp, R. 2008. Predicting the number of ecologically harmful exotic species in an aquatic system. Divers. Distrib. 14(2): 374-380.

Ruiz, G.M., Fofonoff, P.W., Carlton, J.T., Wonham, M.J., and Hines, A.H. 2000. Invasion of coastal marine communities in North America: Apparent patterns, processes, and biases. Annu. Rev. Ecol. Syst. 31: 481-531.

Ruiz,G.M. and Carlton,J.T. (Eds.) (2003) Invasive species: Vectors and management strategies. Island Press. Washington, D.C. 520 p.

Ruiz, G.M. and Smith, G. 2005. Biological study of container vessels at the port of Oakland. Smithsonian Environmental Research Center Available from serc.si.edu/labs/marine_invasions/publications/PortOakfinalrep.pdf [accessed 20 November 2009].

Ruiz, G.M. and Reid, D.F. 2007. Current state of understanding about the effectiveness of ballast water exchange (BWE) in reducing aquatic nonindigenous species (ANS) introductions to the Great Lakes Basin and Chesapeake Bay, USA: Synthesis and analysis of existing information. NOAA Technical Memorandum GLERL-142, National Ocean and Atmospheric Administration, Ann Arbor, MI.

Rup, M.P., Bailey, S.A., Wiley, C.J., Minton, M.S., Whitman Miller, A., Ruiz, G.M., and MacIsaac, H.J. 2010. Domestic ballast operations on the Great Lakes: Potential importance of Lakers as a vector for introduction and spread of nonindigenous species. Can. J. Fish. Aquat. Sci. 67(2): 256-268.

[SLSDC] Saint Lawrence Seaway Development Corporation. 2008. Seaway regulations and rules: periodic update, various categories. Code of Federal Regulations 33-CFR Part 401, 208; Fed. Regist.

Shea, K. and Chesson, P. 2002. Community ecology theory as a framework for Biological Invasions. Trends Ecol. Evol.17(4): 170-176.

Simard, N. and Hardy, M. 2004. The Laurentian Channel as an alternative ballast water exchange zone: risks, analysis and recommendations. DFO Can. Sci. Advis. Sec. Res. Doc 2001/120.

Simkanin, C., Davidson, I., Falkner, M., Sytsma, M., and Ruiz, G. 2009. Intra-coastal ballast water flux and the potential for secondary spread of non-native species on the US West Coast. Mar. Pollut. Bull. 58(3): 366-374.

Sutherland, T.F., Levings, C.D., and Wiley, C. 2009. Quantifying aquatic invasive species in accumulated ballast sediment residuals - "swish": preliminary results. Unpubl. rep. prepared for Fisheries and Oceans Canada Aquatic Invasive Species program.

Sylvester, F. and MacIsaac, H. 2010. Is vessel hull fouling an invasion threat to the Great Lakes? Divers. Distrib.. 16(1): 132-143.

Therriault T.W., Herborg L.M., Locke, A., and McKindsey, C.W. 2008a. Risk assessment for Chinese mitten crab (*Eriocheir* sinensis) in Canadian waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2008/041.

Therriault T.W., Herborg L.M., Locke, A., and McKindsey, C.W. 2008b. Risk assessment for European green crab (*Carcinus maenas*) in Canadian waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2008/042.

Therriault T.W. and Herborg L.M. 2007. Risk assessment for two solitary and three colonial tunicates in both Atlantic and Pacific Canadian waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/063.

Transport Canada. 2007. A guide to Canada's ballast water control and management regulations. TP 13617E. Environmental Protection, Transport Canada, Ottawa.

United States Congressional Office. 1993. Harmful non-indigenous species in the United States, OTF-F-565. Washington, DC: US GPO.

[US EPA] United States Environmental Protection Agency. 2006. Great Lakes Fact Sheet [online]. Available from http://epa.gov/grtlakes/factsheet.html [accessed 22 October 2009].

[USCG] United States Coast Guard. 1993. Ballast water management for vessels entering the Great Lakes. Code of Federal Regulations 33-CFR Part 151.1510.

Verling E., Ruiz, G.M., Smith, L.D., Galil, B., Miller, A.W., and Murphy, K.R. 2005. Supply-side invasion ecology: characterizing propagule pressure in coastal ecosystems. Proc. R. Soc. Lond. B 272(1569): 1249-1257.

Verween, A., Vincs, M., and Degraer, S. 2007. The effect of temperature and salinity on the survival of *Mytilopsis leucophaeata* larvae (Mollusca, Bivalvia): The search for environmental limits. J. Exp. Mar. Biol. Ecol. 348(1):111-120.

Villac, M.C. and Kaczmarska, I. 2011. Estimating propagule pressure and viability of diatoms detected in ballast tank sediments of ships arriving at Canadian ports. Mar. Ecol. Prog. Ser. 425: 47-61.

Wang, T.N. 2011. Efficacy of NaCl brine for treatment of ballast water against freshwater invasions. Thesis (M.Sc.) Great Lakes Institute for Environmental Research, The University of Windsor, Windsor, ON.

West, E.J., Bames, P.B., Wright, J.T., and Davis, A.R. 2007. Anchors aweigh: Fragment generation of invasive Caulerpa taxifolia by boat anchors and its resistance to desiccation. Aquat. Bot. 87(3): 196-202.

Wonham, M.J., Carlton, J.T., Ruiz, G.M., and Smith, L.D. 2000. Fish and ships: relating dispersal frequency to success in Biological Invasions. Mar. Biol. 136(6): 1111-1121.

Wonham, M.J., Walton, W.C., Ruiz. G.M., Frese, A.M., and Galil, B.S. 2001. Going to the source: role of the invasion pathway in determining potential invaders. Mar. Ecol. Prog. Ser. 215: 1-12.

TABLES

Table 1. Description of uncertainty levels (level of knowledge; source of data), modified from Therriault and Herborg (2007).

Level of uncertainty	Description
Very high	Little or no scientific information; no supporting data
High	Limited scientific information; circumstantial evidence
Moderate	Moderate level of scientific information; first hand, unsystematic observations
Low	Substantial scientific information; expert opinion
Very low	Extensive scientific/systematic information; peer-reviewed data sources/information

Table 2. Vessel classification system based on operational region and ship type with corresponding definitions and examples.

Vessel classification	Definition/Example
Operational region	
Laker	Vessels that operated exclusively within the GLSLR region during the study period and are not required to conduct ballast exchange/flushing
Coastal domestic	Vessels that operated exclusively within the Canadian Exclusive Economic Zone (EEZ) during the study period and are not required to conduct ballast exchange/flushing
International	Vessels that operated outside of the Canadian EEZ for at least part of the study period and are required to conduct ballast exchange/flushing prior to entering the Canadian EEZ; some vessels will move domestic ballast water (not required to exchange/flush) on subsequent voyages within the EEZ
Ship type	
Merchant	Bulk carriers, tankers, general cargo, and roll on/roll off vessels

Table 3. Ranking system for probability of arrival of NIS to GLSLR ports via hull fouling, based on the annual number of vessel arrivals to each GLSLR port by vessel type.

Annual number of vessel arrivals	P(Arrival)
896 – 1,118	Highest
672 – 895	Higher
448 - 671	Intermediate
224 - 447	Lower
0 - 223	Lowest

Table 4. Ranking system for magnitude of consequences of invasion by hull fouling-mediated species, based on cumulative number of high impact NIS recorded by Molnar et al. (2008) in ecoregions of all ports directly connected to each GLSLR top port.

Cumulative number of high impact fouling NIS	Magnitude of consequence
1,148 – 1,434	Highest
861 – 1,147	Higher
574 – 860	Intermediate
287 – 573	Lower
0 – 286	Lowest

Table 5. Matrix used to combine probability of introduction and magnitude of consequences of introduction into final risk rankings, modified from Therriault and Herborg (2007); green = lower risk, yellow = intermediate risk and red = higher risk.

		P (Introduction)				
		Lowest	**Lower**	**Intermediate**	**Higher**	**Highest**
Consequence	**Highest**					
	Higher					
	Intermediate					
	Lower					
	Lowest					

Table 6. Ranking system for probability of spread of NIS among Canadian ports via hull fouling based on annual number of vessel departures from top GLSLR ports by coastal domestic and Laker vessels.

Number of annual vessel departures	P(Spread)
600 - 749	Highest
450 – 599	Higher
300 – 449	Intermediate
150 – 299	Lower
0 – 149	Lowest

Table 7. Ranking system for probability of arrival of NIS to GLSLR ports via ballast water, based on annual corrected volume of ballast water discharged at a single GLSLR port.

Annual corrected volume of ballast water discharged (m^3)	P(Arrival)
16,247,989 – 20,309,985	Highest
12,185,992 – 16,247,988	Higher
8,123,995 – 12,185,991	Intermediate
4,061,998 – 8,123,994	Lower
0 – 4,061,997	Lowest

Table 8. Ranking system for probability of survival of NIS at top GLSLR ports, based on environmental distance between top GLSLR ports and all connected ballast water source ports.

Environmental distance	P(Survival)
0.00 – 1.12	Highest
1.13 – 2.24	Higher
2.25 – 3.36	Intermediate
3.37 – 4.48	Lower
4.49 – 5.60	Lowest

Table 9. Ranking system for magnitude of consequences of introduction of ballast-mediated species, based on cumulative number of high impact NIS recorded by Molnar et al. (2008) in ecoregions of all ports directly connected to each GLSLR top port.

Cumulative number of high impact ballast-mediated NIS	Magnitude of consequence
696 – 869	Highest
522 – 695	Higher
348 – 521	Intermediate
174 – 347	Lower
0 – 173	Lowest

Table 10. Ranking system for probability of spread of NIS among Canadian ports via ballast water, based on the annual number of ballast water uptake events at top GLSLR ports by coastal domestic and Laker vessels.

Annual number of uptake events	P(Spread)
172 – 214	Highest
129 – 171	Higher
86 – 128	Intermediate
43 – 85	Lower
0 – 42	Lowest

Table 11. Arrival statistics for international merchant vessels at the top 10 GLSLR ports. The asterisk (*) denotes the top three ports for this vessel category. Note that Cleveland and Toledo had the same number of vessel arrivals and therefore were both included as rank #10.

Top ports	Annual number of arrivals	P(Arrival) at port
Montréal, QC*	1,118	Highest
Québec City, QC *	559	Intermediate
Sorel-Tracy, QC*	241	Lower
Hamilton, ON	133	Lowest
Trois-Rivières, QC	128	Lowest
Bécancour, QC	116	Lowest
Contrecœur, QC	67	Lowest
Toronto, ON	43	Lowest
Valleyfield, QC	41	Lowest
Cleveland, OH	40	Lowest
Toledo, OH	40	Lowest

Table 12. Arrival statistics for coastal merchant vessels at the top 10 GLSLR ports. The asterisk (*) denotes the top three ports for this vessel category.

Top ports	Annual number of arrivals	P(Arrival) at port
Montréal, QC*	269	Lower
Québec City, QC*	208	Lowest
Sorel-Tracy, QC*	123	Lowest
Hamilton, ON	54	Lowest
Toledo, OH	53	Lowest
Côte Ste-Catherine, QC	49	Lowest
Trois-Rivières, QC	36	Lowest
Valleyfield, QC	18	Lowest
Burns Harbor, IN	17	Lowest
Bécancour, QC	14	Lowest

Table 13. Arrival statistics for Lakers at the top 10 GLSLR ports. The asterisk (*) denotes the top three ports for this vessel category.

Top ports	Annual number of arrivals	P(Arrival) at port
Duluth-Superior, MN-WI*	748	Higher
Detroit-Ecorse, MI*	507	Intermediate
Cleveland, OH*	366	Lower
Presque Isle-Marquette, MI	327	Lower
Toledo, OH	318	Lower
Calcite, MI	305	Lower
Nanticoke, ON	272	Lower
Sault Ste. Marie, ON	254	Lower
Stoneport, MI	250	Lower
Two Harbors, MN	234	Lower

Table 14. Probability of introduction of hull-mediated NIS to top GLSLR ports, by vessel category, with level of uncertainty indicated in brackets below each column heading.

	P(Arrival) (moderate)	P(Survival) (moderate)	P(Introduction) (moderate)
International merchant vessels			
Montréal, QC	Highest	Lowest	Lowest
Québec City, QC	Intermediate	Lowest	Lowest
Sorel-Tracy, QC	Lower	Lowest	Lowest
Coastal domestic merchant vessels			
Montréal, QC	Lower	Lowest	Lowest
Québec City, QC	Lowest	Lowest	Lowest
Sorel-Tracy, QC	Lowest	Lowest	Lowest
Laker merchant vessels			
Duluth-Superior, MN-WI	Higher	Highest	Higher
Detroit-Ecorse, MI	Intermediate	Highest	Intermediate
Cleveland, OH	Lower	Highest	Lower

Table 15. Magnitude of consequences of introduction of hull fouling-mediated species at top GLSLR ports, by vessel category, based on the cumulative number of high impact NIS recorded by Molnar et al. (2008) in ecoregions of all ports directly connected to each GLSLR top port.

	Cumulative number of high impact fouling NIS	**Magnitude of consequence**
International merchant vessels		
Montréal, QC	1,433	Highest
Québec City, QC	975	Higher
Sorel-Tracy, QC	651	Intermediate
Coastal domestic merchant vessels		
Montréal, QC	112	Lowest
Québec City, QC	136	Lowest
Sorel-Tracy, QC	35	Lowest
Laker merchant vessels		
Duluth-Superior, MN-WI	126	Lowest
Detroit-Ecorse, MI	110	Lowest
Cleveland, OH	364	Lower

Table 16. Relative invasion risk to top GLSLR ports by hull fouling NIS, by vessel category, with level of uncertainty indicated in brackets below each column heading.

	P(Introduction) (moderate)	**Magnitude of consequence** (moderate)	**Invasion risk** (moderate)
Top ports for international merchant arrivals			
Montréal, QC	Lowest	Highest	Intermediate
Québec City, QC	Lowest	Higher	Intermediate
Sorel-Tracy, QC	Lowest	Intermediate	Lower
Top ports for coastal domestic merchant arrivals			
Montréal, QC	Lowest	Lowest	Lower
Québec City, QC	Lowest	Lowest	Lower
Sorel-Tracy, QC	Lowest	Lowest	Lower
Top ports for Laker merchant arrivals			
Duluth-Superior, MN-WI	Higher	Lowest	Intermediate
Detroit-Ecorse, MI	Intermediate	Lowest	Lower
Cleveland, OH	Lower	Lower	Lower

Table 17. Departure statistics for coastal domestic and Laker vessels from top GLSLR ports as a measure of potential for hull-mediated secondary spread.

	Annual number of departures	P(Spread)
Top ports for international merchant vessels		
Montréal, QC	291	Lower
Québec City, QC	278	Lower
Sorel-Tracy, QC	145	Lowest
Top ports for coastal domestic merchant vessels		
Montréal, QC	291	Lower
Québec City, QC	278	Lower
Sorel-Tracy, QC	145	Lowest
Top ports for Laker merchant vessels		
Duluth-Superior, MN-WI	749	Highest
Detroit-Ecorse, MI	512	Higher
Cleveland, OH	369	Intermediate

Table 18. Discharge statistics at GLSLR ports, by source of ballast water, for a 12 month period. Correction factors (10% for saline and 1% for freshwater source ports, respectively) were applied to account for reduction in propagule supply due to exchange/flushing. 'Direct' refers to water that was not exchanged prior to discharging.

Number of discharge events	Ballast water discharge volume (m^3)							
	Grand total	Corrected foreign exchanged		Corrected coastal domestic exchanged		Domestic direct (saline water)	Domestic direct (freshwater)	Corrected total
		10%	1%	10%	1%			
5683	73,573,813	123,936	954	1,442	89	1,609,319	70,606,454	72,342,194

Table 19. Discharge statistics at GLSLR ports, by ballast water source region, for a 12 month period. Corrected total volume reflects adjustments to account for reduction in propagule supply due to exchange/flushing.

FAO source region	Ballast water volume discharged (m^3)	
	Total	**Corrected Total**
Great Lakes	70,617,086.38	70,606,542.76
NW Atlantic	2,042,491.52	1,652,636.45
NE Atlantic	223,956.94	22,396.69
North Sea	219,031.45	21,903.15
WC Atlantic	110,640.60	11,064.06
EC Atlantic	99,505.18	9,950.52
Mediterranean	75,676.30	7,567.63
unknown	66,071.90	6,607.19
Black Sea	32,349.00	3,324.90
Gulf of Mexico	30,382.80	3,038.28
NW Pacific	17,377.60	1,737.76
Arctic	10,808.00	1,080.80
Baltic Sea	9,205.40	920.54
WC Pacific	3,923.90	392.39
EC Pacific	3,535.80	353.58
Persian Gulf	3,079.70	307.97
E Indian Ocean	2,819.00	281.90
SW Atlantic	2,257.90	225.79
SE Atlantic	2,081.52	208.15
SE Pacific	813.00	81.30
Red Sea	718.80	71.88

Table 20. Ballast water discharge statistics for international merchant vessels at the top 10 GLSLR ports. Correction factors (10% for saline and 1% for freshwater source ports, respectively) were applied to account for reduction in propagule supply due to exchange/flushing. 'Direct' refers to water that was not exchanged prior to discharging. The asterisk (*) denotes the top three ports for this vessel category.

Top 10 ports	Number of discharge events	Annual volume of ballast water discharge (m^3)						
		Grand total	Corrected foreign exchanged		Coastal domestic direct	Great Lakes direct	Corrected total	P(Arrival)
			10%	1%				
Québec City, QC*	232	1,708,777	39,247	80	452,589	855,768	1,347,684	Lowest
Sorel-Tracy, QC*	86	951,871	19,291	69	209,172	542,899	771,431	Lowest
Montréal, QC*	208	994,436	24,697	143	177,595	555,567	758,002	Lowest
Trois-Rivières, QC	31	252,173	3,765	57	37,804	171,003	212,629	Lowest
Duluth-Superior, MN-WI	129	354,936	17,430	119	65,990	102,730	186,269	Lowest
Sarnia, ON	27	121,081	4,419	192	30,820	26,888	62,319	Lowest
Thunder Bay, ON	15	82,408	2,040	89	17,470	35,652	55,251	Lowest
Hamilton, ON	13	62,541	958	0	41,214	11,748	53,920	Lowest
Contrecœur, QC	14	83,345	3,351	0	18,841	30,992	53,184	Lowest
Toledo, OH	13	57,329	1,872	14	8,853	28,369	39,108	Lowest

Table 21. Ballast water discharge statistics for coastal domestic merchant vessels at the top 10 GLSLR ports. Correction factors (10% for saline and 1% for freshwater source ports, respectively) were applied to account for reduction in propagule supply due to exchange/flushing. 'Direct' refers to water that was not exchanged prior to discharging. The asterisk (*) denotes the top three ports for this vessel category.

Top 10 ports	Number of discharge events	Annual volume of ballast water discharge (m^3)			
		Grand total	Coastal domestic direct	Great Lakes direct	P(Arrival)
Québec City, QC*	117	1,050,130	268,382	781,748	Lowest
Montréal, QC*	76	405,786	149,969	255,817	Lowest
Toronto, ON*	7	94,170	0	94,170	Lowest
Sorel-Tracy, QC	22	78,184	41,723	36,461	Lowest
Nanticoke, ON	11	61,569	41,259	20,310	Lowest
Sarnia, ON	10	47,935	4,800	43.135	Lowest
Goderich-Owen Sound, ON	3	40,562	0	40,562	Lowest
Thunder Bay, ON	3	35,350	0	35,350	Lowest
Duluth-Superior, MN-WI	2	31,135	13,875	17,260	Lowest
Two Harbors, MN	2	30,020	0	30,020	Lowest

Note that 7,429 m^3 of ballast water voluntarily exchanged by coastal domestic vessels was not destined for a top 10 ports, thus the ‘Corrected total’ volume is equal to the ‘Grand total’ and is omitted from this table.

Table 22. Ballast water discharge statistics for Lakers at the top 10 GLSLR ports. Correction factors (10% for saline and 1% for freshwater source ports, respectively) were applied to account for reduction in propagule supply due to exchange/flushing. 'Direct' refers to water that was not exchanged prior to discharging. The asterisk (*) denotes the top three ports for this vessel category.

Top 10 ports	Number of discharge events	Annual volume of ballast water discharge (m^3)		
		Grand total	Great Lakes direct	P(Arrival)
Duluth-Superior, MN-WI*	704	20,309,985	20,309,985	Highest
Two Harbors, MN*	233	7,936,582	7,936,582	Lower
Presque Isle-Marquette, MI*	301	3,499,006	3,499,006	Lowest
Calcite, MI	286	3,410,533	3,410,533	Lowest
Stoneport, MI	244	2,969,045	2,969,045	Lowest
Port Inland, MI	201	2,384,524	2,384,524	Lowest
Toledo, OH	182	2,353,340	2,353,340	Lowest
Thunder Bay, ON	194	2,184,032	2,184,032	Lowest
Silver Bay, MN	147	2,160,780	2,160,780	Lowest
Bruce Mines-Thessalon-Meldrum-Serpent Harbour, ON	222	2,118,398	2,118,398	Lowest

Note that all ballast water moved by Lakers was discharged directly, thus the ‘Corrected total’ volume is equal to the ‘Grand total’ and is omitted from this table.

Table 23. Environmental distance between Québec City and source ports connected via ballast water discharge by international merchant vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

Source port	Source port country	Environmental distance	P(Survival)
Albany*	United States	0.62	Highest
Algiers	Algeria	3.48	Lower
Baie-Comeau	Canada	3.00	Intermediate
Baltimore*	United States	1.72	Higher
Barranquilla	Colombia	4.18	Lower
Bécancour*	Canada	0.02	Highest
Bronte*	Canada	0.34	Highest
Camden*	United States	1.21	Higher
Cap-aux-Meules	Canada	2.33	Intermediate
Casablanca	Morocco	3.54	Lower
Chatham*	Canada	2.06	Higher
Chesapeake	United States	2.64	Intermediate
Cienfuegos	Cuba	4.08	Lower
Clarkson*	Canada	0.34	Highest
Come By Chance	Canada	2.40	Intermediate
Contrecœr*	Canada	0.17	Highest
Corner Brook*	Canada	1.14	Higher
Corpus Christi	United States	3.09	Intermediate
Côte-Sainte-Catherine*	Canada	0.31	Highest
Cuxhaven*	Germany	1.98	Higher
Djen-Djen	Algeria	3.54	Lower
Eemshaven	Netherlands	2.37	Intermediate
Ferrol	Spain	3.10	Intermediate
Gaspé*	Canada	2.18	Higher
Gijon	Spain	3.10	Intermediate
Goose Bay*	Canada	0.86	Highest
Greenore	Ireland	2.27	Intermediate
Halifax*	Canada	1.70	Higher
Hamburg*	Germany	1.97	Higher
Hamilton*	Canada	0.37	Highest
Havana	Cuba	4.46	Lower
Immingham	United Kingdom	2.73	Intermediate
Iqaluit	Canada	3.14	Intermediate
Les Méchins	Canada	2.60	Intermediate
Liverpool*	United Kingdom	1.71	Higher
Long Pond	Canada	2.69	Intermediate
Marystown	Canada	2.62	Intermediate
Mayagüez	Puerto Rico	4.45	Lower
Mississauga*	Canada	0.31	Highest
Montréal*	Canada	0.34	Highest
New York & New Jersey*	United States	1.48	Higher
Norfolk	United States	2.64	Intermediate
Oakville*	Canada	0.34	Highest
Oshawa*	Canada	0.32	Highest
Philadelphia*	United States	1.21	Higher

Port Alfred*	Canada	1.95	Higher
Port Cartier	Canada	2.28	Intermediate
Port Everglades	United States	4.66	Lowest
Port Menier	Canada	2.32	Intermediate
Portland (Maine)	United States	2.46	Intermediate
Porvoo*	Finland	0.63	Highest
Providence*	United States	1.08	Highest
Rimouski	Canada	2.75	Intermediate
San Juan	Puerto Rico	4.54	Lowest
San Pedro*	Argentina	2.10	Higher
Sapele	Nigeria	4.01	Lower
Sarnia*	Canada	0.38	Highest
Sault Ste. Marie*	Canada	0.43	Highest
Savannah	United States	2.44	Intermediate
Savona-Vado	Italy	3.14	Intermediate
Searsport*	United States	1.03	Highest
Sept-Iles	Canada	2.55	Intermediate
Sorel-Tracy*	Canada	0.19	Highest
St. Barbe	Canada	2.49	Intermediate
St. Pierre Bank	Canada	2.39	Intermediate
Toronto*	Canada	0.31	Highest
Trois-Rivières*	Canada	0.02	Highest
Wilmington (North Carolina)	United States	3.32	Intermediate
Overall		**2.04**	**Higher**

Table 24. Environmental distance between Sorel-Tracy and source ports connected via ballast water discharge by international merchant vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

Source port	Source port country	Environmental distance	P(Survival)
Agioi Theodoroi	Greece	3.31	Intermediate
Antwerp*	Belgium	0.90	Highest
Aughinish*	Ireland	1.39	Higher
Baie-Comeau	Canada	2.82	Intermediate
Baton Rouge	United States	2.37	Intermediate
Bécancour*	Canada	0.18	Highest
Brake*	Germany	2.15	Higher
Brunswick	United States	3.44	Lower
Canso	Canada	2.36	Intermediate
Casablanca	Morocco	3.49	Lower
Chicoutimi*	Canada	0.40	Highest
Contrecœr*	Canada	0.03	Highest
Dartmouth*	Canada	1.41	Higher
Detroit-Ecorse*	United States	0.37	Highest
Dunkirk	France	2.73	Intermediate
Ereğli	Turkey	2.43	Intermediate
Fall River*	United States	1.28	Higher
Ghent*	Belgium	0.94	Highest
Hamilton*	Canada	0.35	Highest
Les Méchins	Canada	2.71	Intermediate
Mayagüez	Puerto Rico	4.37	Lower
Montréal*	Canada	0.15	Highest
New Haven	United States	2.30	Intermediate
New York & New Jersey*	United States	1.34	Higher
Newport News	United States	2.52	Intermediate
Oshawa*	Canada	0.33	Highest
Port Alfred*	Canada	2.00	Higher
Port Cartier	Canada	2.35	Intermediate
Québec*	Canada	0.19	Highest
Sarnia*	Canada	0.30	Highest
Sept-Iles	Canada	2.65	Intermediate
Sheet Harbour	Canada	2.33	Intermediate
Summerside*	Canada	2.10	Higher
Sydney	Canada	2.38	Intermediate
Toronto*	Canada	0.35	Highest
Trois-Rivières*	Canada	0.18	Highest
Valleyfield*	Canada	0.11	Highest
Varna*	Bulgaria	1.51	Higher
Vlissingen	Netherlands	2.57	Intermediate
Windsor*	Canada	0.34	Highest
Yonkers*	United States	0.93	Highest
Overall		**1.62**	**Higher**

Table 25. Environmental distance between Montréal and source ports connected via ballast water discharge by international merchant vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

Source port	Source port country	Environmental distance	P(Survival)
Acajutla	El Salvador	4.57	Lowest
Amsterdam*	Netherlands	1.10	Highest
Antofagasta	Chile	3.22	Intermediate
Antwerp*	Belgium	0.89	Highest
Argentia	Canada	2.80	Intermediate
Baie-Comeau	Canada	2.90	Intermediate
Baltimore*	United States	1.46	Higher
Bay City*	United States	0.21	Highest
Beaumont	United States	3.15	Intermediate
Bécancour*	Canada	0.32	Highest
Bilbao	Spain	2.26	Intermediate
Brake*	Germany	2.15	Higher
Bronte*	Canada	0.35	Highest
Cap-aux-Meules	Canada	2.44	Intermediate
Casablanca	Morocco	3.44	Lower
Ceuta	Spain	3.32	Intermediate
Cienfuegos	Cuba	3.89	Lower
Clarkson*	Canada	0.34	Highest
Cleveland*	United States	0.39	Highest
Constantza*	Romania	1.45	Higher
Contrecœur*	Canada	0.17	Highest
Corner Brook*	Canada	1.32	Higher
Côte-Sainte-Catherine*	Canada	0.03	Highest
Dublin	Ireland	3.00	Intermediate
Ereğli*	Turkey	1.77	Higher
Fos	France	3.04	Intermediate
Fredericia*	Denmark	1.70	Higher
Freeport	Bahamas	3.87	Lower
Gaspé	Canada	2.28	Intermediate
Genoa	Italy	3.01	Intermediate
Ghent*	Belgium	0.92	Highest
Gioia Tauro	Italy	3.44	Lower
Gros-Cacouna*	Canada	1.94	Higher
Hamburg*	Germany	2.00	Higher
Hamilton*	Canada	0.35	Highest
Havana	Cuba	4.29	Lower
Holyrood	Canada	2.46	Intermediate
Immingham	United Kingdom	2.81	Intermediate
Kuujjuaq	Canada	2.86	Intermediate
Le Havre	France	2.84	Intermediate
Lisbon	Portugal	2.25	Intermediate
Liverpool*	United Kingdom	1.76	Higher
Livorno	Italy	3.12	Intermediate
Long Pond	Canada	2.85	Intermediate

Maceió	Brazil	4.57	Lowest
Milwaukee*	United States	0.37	Highest
Mississauga*	Canada	0.40	Highest
Moa	Cuba	4.60	Lowest
Morehead City	United States	3.66	Lower
Nanticoke*	Canada	0.25	Highest
New Haven	United States	2.27	Intermediate
New York & New Jersey*	United States	1.24	Higher
Oakville*	Canada	0.36	Highest
Oshawa*	Canada	0.37	Highest
Oswego*	United States	0.29	Highest
Philadelphia*	United States	0.89	Highest
Port Alfred*	Canada	2.04	Higher
Port Cartier	Canada	2.40	Intermediate
Praia Mole	Brazil	4.22	Lower
Québec*	Canada	0.34	Highest
Rimouski	Canada	2.97	Intermediate
Rio Haina	Dominican Republic	4.57	Lowest
Slaerno	Italy	3.08	Intermediate
Santiago	Cuba	4.40	Lower
Sarnia*	Canada	0.26	Highest
Sault Ste. Marie*	Canada	0.66	Highest
Savannah*	United States	2.17	Higher
Sept-Iles*	Canada	2.72	Higher
Sorel-Tracy*	Canada	0.15	Highest
Southampton*	Canada	1.93	Higher
St. Barbe	Canada	2.63	Intermediate
St. Petersburg*	Russia	0.65	Highest
Thamesport*	United Kingdom	1.68	Higher
Toronto*	Canada	0.40	Highest
Trois-Rivières*	Canada	0.32	Highest
Valencia	Spain	3.36	Intermediate
Valleyfield*	Canada	0.05	Highest
Vitoria	Brazil	3.69	Lower
Wilmington	United States	3.16	Intermediate
Overall		**2.05**	**Higher**

Table 26. Environmental distance between Québec City and source ports connected via ballast water discharge by coastal domestic merchant vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

Source port	Source port country	Environmental distance	P(Survival)
Baie-Comeau	Canada	2.69	Intermediate
Bath*	Canada	0.40	Highest
Bécancour*	Canada	1.28	Higher
Bowmanville*	Canada	0.30	Highest
Bronte*	Canada	0.34	Highest
Chatham*	Canada	2.06	Higher
Clarkson*	Canada	0.34	Highest
Contrecœr*	Canada	0.17	Highest
Corner Brook*	Canada	1.14	Higher
Corunna*	Canada	0.40	Highest
Côte-Sainte-Catherine*	Canada	0.31	Highest
Fairport*	United States	0.68	Highest
Hamilton*	Canada	0.37	Highest
Holyrood	Canada	2.38	Intermediate
Iqaluit	Canada	3.14	Intermediate
Johnstown Harbour*	Canada	0.31	Highest
Long Pond	Canada	2.69	Intermediate
Montréal*	Canada	0.34	Highest
Morrisburg Harbour*	Canada	0.23	Highest
Nanticoke*	Canada	0.52	Highest
Oakville*	Canada	0.34	Highest
Ogdensburg*	United States	0.31	Highest
Port Alfred*	Canada	1.95	Higher
Port Cartier	Canada	2.28	Intermediate
Port-aux-Basques	Canada	2.38	Intermediate
Rimouski	Canada	2.75	Intermediate
Sarnia*	Canada	0.38	Highest
Sept-Iles	Canada	2.55	Intermediate
Sorel-Tracy*	Canada	0.19	Highest
St. John's	Canada	2.70	Intermediate
Stephenville	Canada	2.38	Intermediate
Toronto*	Canada	0.31	Highest
Trois-Rivières*	Canada	0.02	Highest
Overall		**1.17**	**Higher**

Table 27. Environmental distance between Montréal and source ports connected via ballast water discharge by coastal domestic merchant vessels. The asterisk (*) denotes source ports that received higher or highest probability of survival.

Source port	Source port country	Environmental distance	P(Survival)
Arviat	Canada	3.25	Intermediate
Bath*	Canada	0.40	Highest
Bowmanville*	Canada	0.30	Highest
Bronte*	Canada	0.35	Highest
Broughton Island	Canada	4.16	Lower
Cape-aux-Meules	Canada	2.44	Intermediate
Cape Dorset	Canada	4.13	Lower
Clarkson*	United States	0.34	Highest
Corunna*	Canada	0.25	Highest
Côte-Sainte-Catherine*	Canada	0.31	Highest
Goose Bay*	Canada	0.86	Highest
Hamilton*	Canada	0.35	Highest
Holyrood	Canada	2.46	Intermediate
Iqaluit	Canada	3.14	Intermediate
Little Narrows*	Canada	0.39	Highest
Long Pond	Canada	2.69	Intermediate
Nanticoke*	Canada	0.52	Highest
Oakville*	Canada	0.36	Highest
Oswego*	Canada	0.29	Highest
Port Alfred*	Canada	2.04	Higher
Québec*	Canada	0.34	Highest
Rimouski	Canada	2.97	Intermediate
Sept-Iles	Canada	2.55	Intermediate
Sorel-Tracy*	Canada	0.19	Highest
St. John's	Canada	2.70	Intermediate
Trois-Rivières*	Canada	0.02	Highest
Overall		**1.45**	**Higher**

Table 28. Environmental distance between Toronto and source ports connected via ballast water discharge by coastal domestic merchant vessels.

Source port	Source port country	Environmental distance	P(Survival)
Québec City	Canada	0.31	Highest
Overall		**0.31**	**Highest**

Table 29. Environmental distance between Duluth-Superior and source ports connected via ballast water discharge by Lakers. The asterisk (*) denotes source ports that received higher or highest probability of survival.

Source port	Source port country	Environmental distance	P(Survival)
Alpena*	United States	0.32	Highest
Ashtabula*	United States	0.91	Highest
Buffalo*	United States	0.90	Highest
Burns Harbor*	United States	0.76	Highest
Calcite*	United States	0.18	Highest
Cedarville Harbor*	United States	0.06	Highest
Charlevoix Harbor*	United States	0.40	Highest
Chicago*	United States	0.71	Highest
Clarkson*	United States	0.51	Highest
Cleveland*	United States	0.98	Highest
Conneaut*	United States	0.91	Highest
Courtright*	Canada	0.61	Highest
Detroit-Ecorse*	United States	0.81	Highest
Erie*	United States	0.90	Highest
Escanaba*	United States	0.36	Highest
Essexville*	United States	0.80	Highest
Fairport*	United States	0.96	Highest
Gary*	United States	0.74	Highest
Goderich*	Canada	0.43	Highest
Grand Haven*	United States	0.52	Highest
Green Bay*	United States	0.68	Highest
Hamilton*	Canada	0.50	Highest
Habour Beach*	United States	0.38	Highest
Huron*	United States	0.60	Highest
Indiana Harbor*	United States	0.76	Highest
Little Current*	Canada	0.43	Highest
Lorain*	United States	1.02	Highest
Ludington*	United States	0.29	Highest
Marquette*	United States	0.07	Highest
Marysville*	United States	0.60	Highest
Menominee*	United States	0.44	Highest
Midland*	Canada	0.39	Highest
Milwaukee*	United States	0.41	Highest
Monroe*	United States	1.07	Highest
Montréal*	Canada	0.72	Highest
Morrisburg Harbour*	Canada	0.61	Highest
Muskegon*	Untied States	0.46	Highest
Nanticoke*	Canada	0.80	Highest
Ontonagon*	United States	0.04	Highest
Port Cartier*	Canada	2.22	Higher
Port Dolomite*	United States	0.11	Highest
Québec*	Canada	0.46	Highest
Saginaw*	United States	0.83	Highest
Sandusky*	United States	1.09	Highest
Sarnia*	Canada	0.59	Highest

Sault Ste. Marie*	Canada	0.10	Highest
Serpent Harbour*	Canada	0.10	Highest
Silver Bay*	United States	0.46	Highest
Sorel-Tracy*	Canada	0.62	Highest
St. Clair*	United States	0.61	Highest
Stoneport*	United States	0.17	Highest
Sturgeon Bay Harbor*	United States	0.18	Highest
Taconite Harbor*	United States	0.46	Highest
Thunder Bay*	Canada	0.41	Highest
Toledo*	United States	1.10	Highest
Toronto*	Canada	0.41	Highest
Two Harbors*	United States	0.34	Highest
Welland*	Canada	0.81	Highest
Windsor*	Canada	0.78	Highest
Overall		**0.59**	**Highest**

Table 30. Environmental distance between Two Harbors and source ports connected via ballast water discharge by Lakers. The asterisk (*) denotes source ports that received higher or highest probability of survival.

Source port	Source port country	Environmental distance	P(Survival)
Alpena*	United States	0.64	Highest
Ashtabula*	United States	1.24	Higher
Buffalo*	United States	1.23	Higher
Burns Harbor*	United States	1.09	Highest
Calumet*	United States	0.28	Highest
Charlevoix Harbor*	United States	0.73	Highest
Cleveland*	United States	1.31	Higher
Conneaut*	United States	1.23	Higher
Courtright*	Canada	0.94	Highest
Detroit-Ecorse*	United States	1.14	Higher
Duluth-Superior*	United States	0.34	Highest
Erie*	United States	1.23	Higher
Escanaba*	United States	0.69	Highest
Essexville*	United States	1.14	Higher
Gary*	United States	1.07	Highest
Grand Haven*	United States	0.84	Highest
Green Bay*	United States	1.01	Highest
Hamilton*	Canada	0.82	Highest
Huron*	United States	1.37	Higher
Indiana Harbor*	United States	1.09	Highest
Long Point*	Canada	1.14	Higher
Lorain*	United States	1.35	Higher
Marquette*	United States	0.28	Highest
Monroe*	United States	1.40	Higher
Munising*	United States	0.28	Highest
Muskegon*	Untied States	0.77	Highest
Nanticoke*	Canada	1.13	Higher
Ontonagon*	United States	0.37	Highest
Sandusky*	United States	1.42	Higher
Sault Ste. Marie*	Canada	0.42	Highest
Silver Bay*	United States	0.15	Highest
St. Clair*	United States	0.94	Highest
Sturgeon Bay Harbor*	United States	0.50	Highest
Superior, Wisconsin*	Untied States	0.33	Highest
Taconite Harbor*	United States	0.12	Highest
Toledo*	United States	1.43	Higher
Overall		**0.87**	**Highest**

Table 31. Environmental distance between Presque Isle-Marquette and source ports connected via ballast water discharge by Lakers. The asterisk (*) denotes source ports that received higher or highest probability of survival.

Source port	Source port country	Environmental distance	P(Survival)
Alpena*	United States	0.37	Highest
Ashtabula*	United States	0.96	Highest
Bay City*	United States	0.86	Highest
Buffalo*	United States	0.95	Highest
Buffington*	United States	0.81	Highest
Burns Harbor*	United States	0.81	Highest
Calcite*	United States	0.23	Highest
Cedarville*	United States	0.10	Highest
Charlevoix*	United States	0.45	Highest
Chicago*	United States	0.76	Highest
Cleveland*	United States	1.03	Highest
Conneaut*	United States	0.95	Highest
Courtright*	Canada	0.66	Highest
Detroit-Ecorse*	United States	0.86	Highest
Drummond Island*	United States	0.23	Highest
Erie*	United States	0.95	Highest
Escanaba*	United States	0.41	Highest
Essexville*	United States	0.86	Highest
Fairport*	United States	1.01	Highest
Gary*	United States	0.79	Highest
Gladstone*	United States	0.41	Highest
Green Bay*	United States	0.73	Highest
Hamilton*	Canada	0.54	Highest
Harbor Beach*	United States	0.43	Highest
Indiana Harbor*	United States	0.81	Highest
Lorain*	United States	1.07	Highest
Manistee*	United States	0.28	Highest
Manitowoc*	United States	0.26	Highest
Marine City-Marysville*	Untied States	0.66	Highest
Midland*	Canada	0.44	Highest
Milwaukee*	United States	0.46	Highest
Muskegon*	United States	0.49	Highest
Nanticoke*	Canada	0.85	Highest
Saginaw*	United States	0.89	Highest
Sarnia*	Canada	0.65	Highest
Sault Ste. Marie*	Canada	0.14	Highest
Stoneport*	United States	0.22	Highest
Sturgeon Bay Harbor*	United States	0.22	Highest
Toledo*	United States	1.15	Higher
Trenton*	Canada	0.73	Highest
Two Harbors*	United States	0.25	Highest
Windsor*	Canada	0.83	Highest
Wyandotte*	United States	1.02	Highest
Overall		**0.64**	**Highest**

Table 32. Probability of introduction of ballast-mediated NIS to top GLSLR ports, by vessel category, with level of uncertainty in brackets below each column heading.

	P(Arrival) (low)	**P(Survival)** (moderate)	**P(Introduction)** (moderate)
International merchant vessel ballast water discharges			
Québec City, QC	Lowest	Higher	Lowest
Sorel-Tracy, QC	Lowest	Higher	Lowest
Montréal, QC	Lowest	Higher	Lowest
Coastal domestic merchant vessel ballast water discharges			
Québec City, QC	Lowest	Higher	Lowest
Montréal, QC	Lowest	Higher	Lowest
Toronto, ON	Lowest	Highest	Lowest
Laker merchant vessel ballast water discharges			
Duluth-Superior, MN-WI	Highest	Highest	Highest
Two Harbors, MN	Lower	Highest	Lower
Presque Isle-Marquette, MI	Lowest	Highest	Lowest

Table 33. Magnitude of potential consequences of introduction of ballast-mediated species at top GLSLR ports, by vessel category, based on the cumulative number of high impact NIS recorded by Molnar et al. (2008) in ecoregions of all ports directly connected to each top port.

	Cumulative number of high impact ballast-mediated NIS	**Magnitude of consequence**
International merchant ballast water discharges		
Québec City, QC	625	Higher
Sorel-Tracy, QC	413	Intermediate
Montréal, QC	868	Highest
Coastal domestic merchant vessel ballast water discharges		
Québec City, QC	160	Lowest
Montréal, QC	111	Lowest
Toronto, ON	3	Lowest
Laker merchant vessel ballast water discharges		
Duluth-Superior, MN-WI	433	Intermediate
Two Harbors, MN	254	Lower
Presque Isle-Marquette, MI	330	Lower

Table 34. Relative invasion risk to top GLSLR ports by ballast-mediated NIS, by vessel category, with level of uncertainty indicated in brackets below each column heading.

	P(Introduction) (moderate)	**Magnitude of consequence** (moderate)	**Invasion risk** (moderate)
Top ports for international merchant ballast water discharges			
Québec City, QC	Lowest	Higher	Intermediate
Sorel-Tracy, QC	Lowest	Intermediate	Lower
Montréal, QC	Lowest	Highest	Intermediate
Top ports for coastal domestic merchant ballast water discharges			
Québec City, QC	Lowest	Lowest	Lower
Montréal, QC	Lowest	Lowest	Lower
Toronto, ON	Lowest	Lowest	Lower
Top ports for Laker merchant ballast water discharges			
Duluth-Superior, MN-WI	Highest	Intermediate	Higher
Two Harbors, MN	Lower	Lower	Lower
Presque Isle-Marquette, MI	Lowest	Lower	Lower

Table 35. Ballast water uptake statistics for coastal domestic merchant and Laker vessels at top GLSLR ports as a measure of potential for ballast-mediated secondary spread.

	Annual number of ballast water uptake events	**P(Spread)**
Top ports for international merchant vessels		
Québec City, QC	138	Higher
Sorel-Tracy, QC	119	Intermediate
Montréal, QC*	212	Highest
Top ports for coastal domestic merchant vessels		
Québec City, QC	138	Higher
Montréal, QC	212	Highest
Toronto, ON	93	Intermediate
Top ports for Laker merchant vessels		
Duluth-Superior, MN-WI	44	Lower
Two Harbors, MN	1	Lowest
Presque Isle-Marquette, MI	27	Lowest

FIGURES

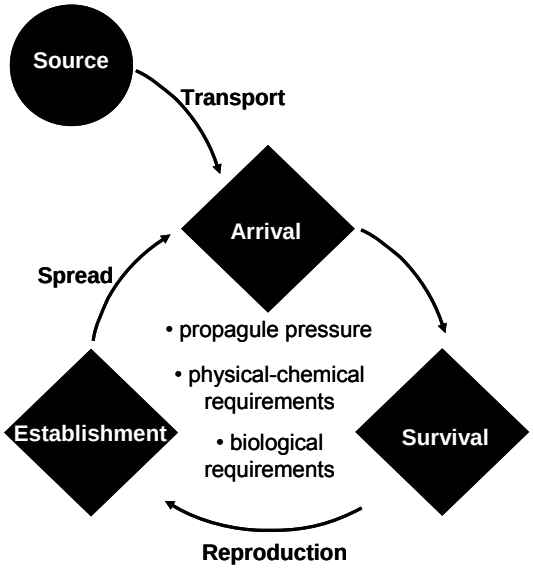


Figure 1. Stages of the biological invasion process.

Figure 2. Map of the Great Lakes - St. Lawrence River (GLSLR) region, which includes the five Great Lakes and all freshwater ports in the St. Lawrence River, up to and including Québec City. The broken line demarcates the limit of the GLSLR region as defined in this risk assessment.

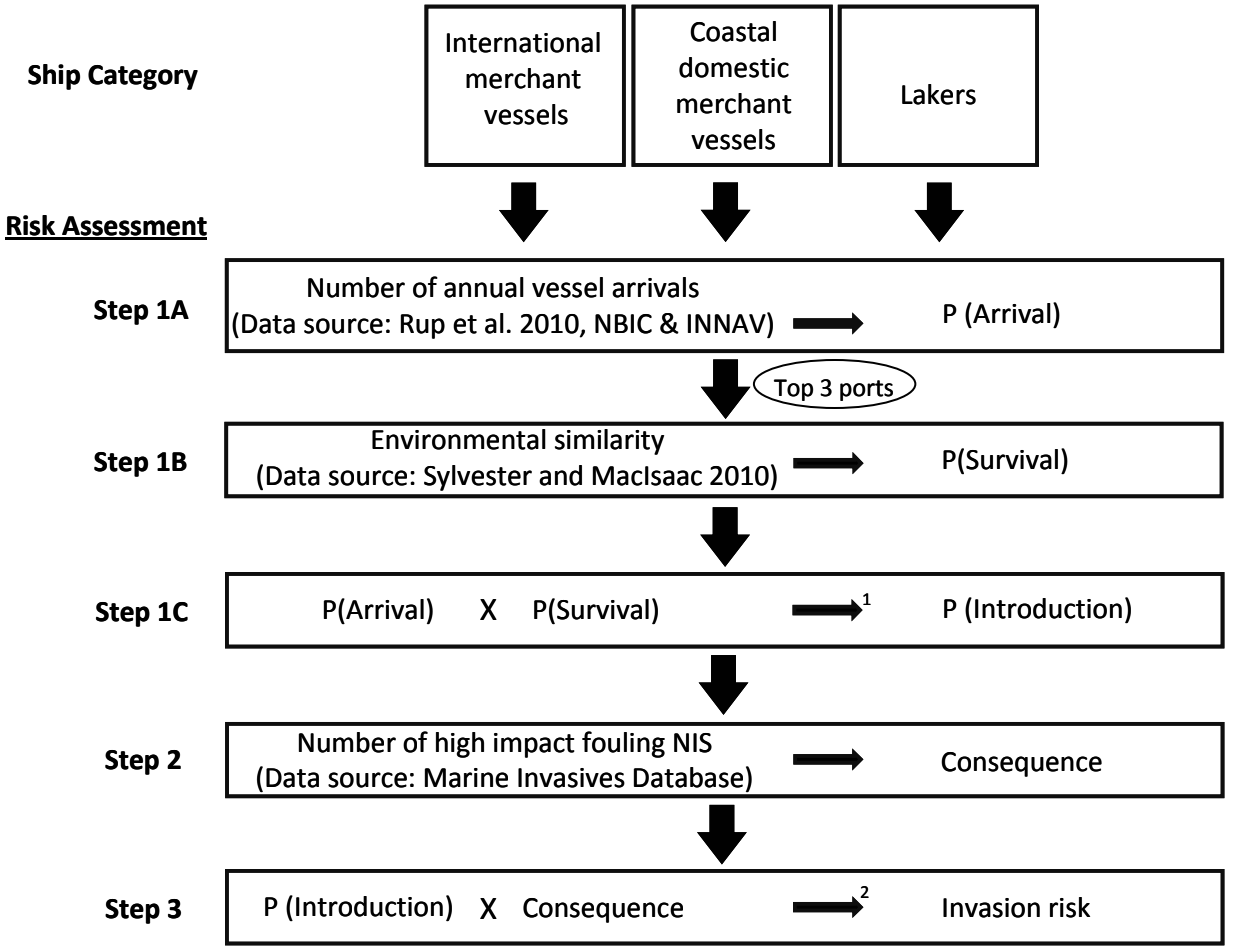
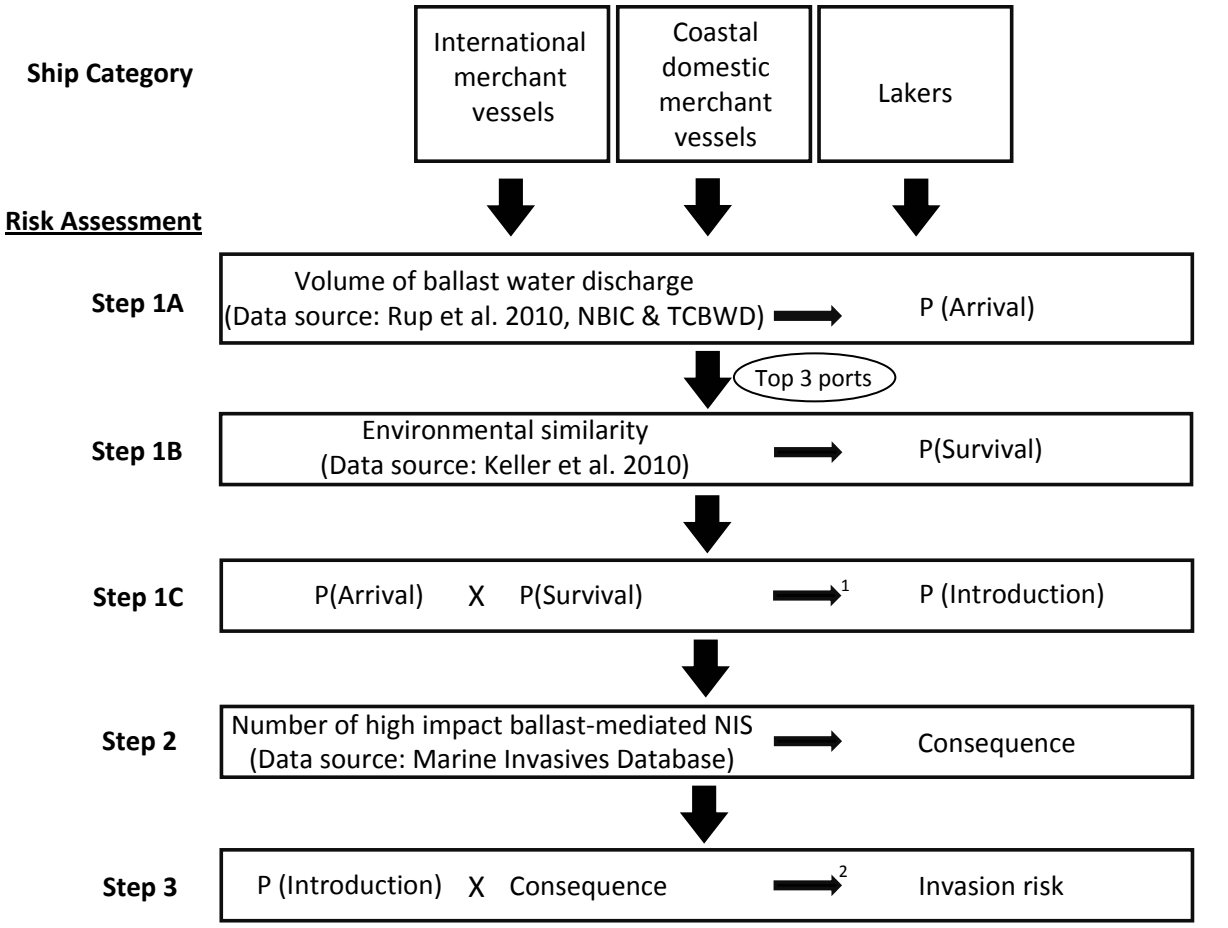


Figure 3. Flow chart illustrating steps for risk assessment of hull fouling-mediated invasions. A filtering approach was used after Step 1A to prioritize the risk assessment to the top three GLSLR ports for each ship category.



[1]Minimum probability approach; [2]Mixed rounding symmetrical approach

Figure 4. Flow chart illustrating steps for risk assessment of ballast-mediated invasions. A filtering approach was used after Step 1A to prioritize the risk assessment to the top three GLSLR ports for each ship category.

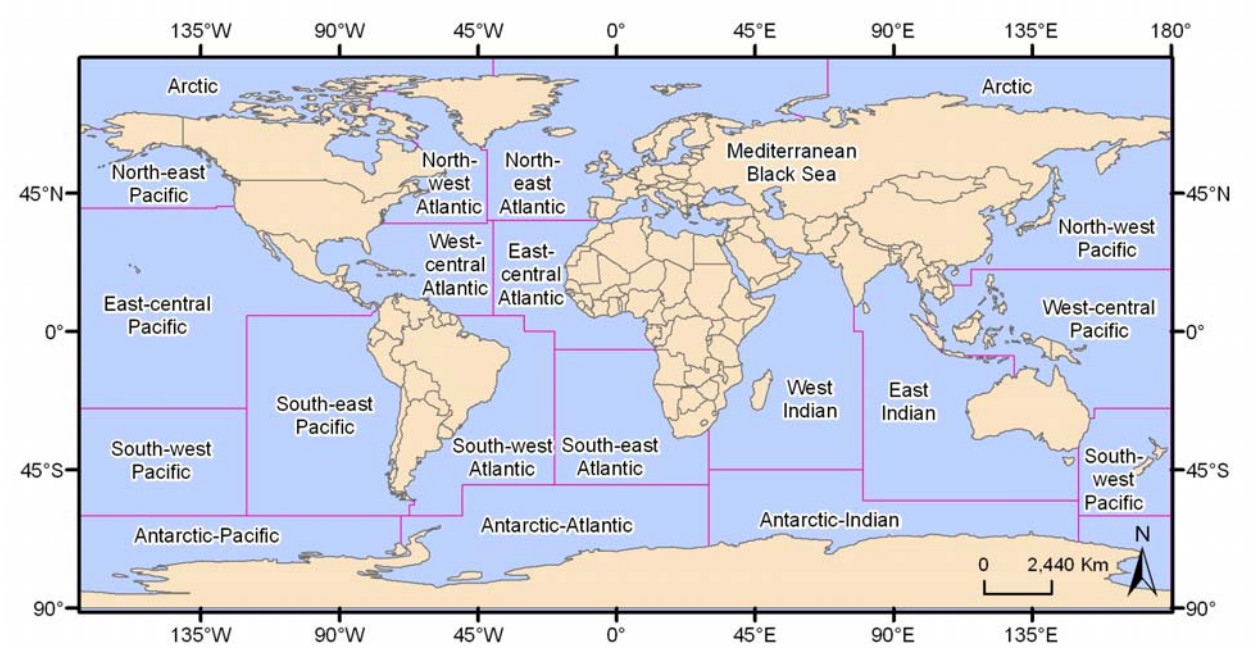


Figure 5. Map illustrating regions of ballast water origin, following the ocean areas designated by the Food and Agriculture Organization of the United Nations (FAO).

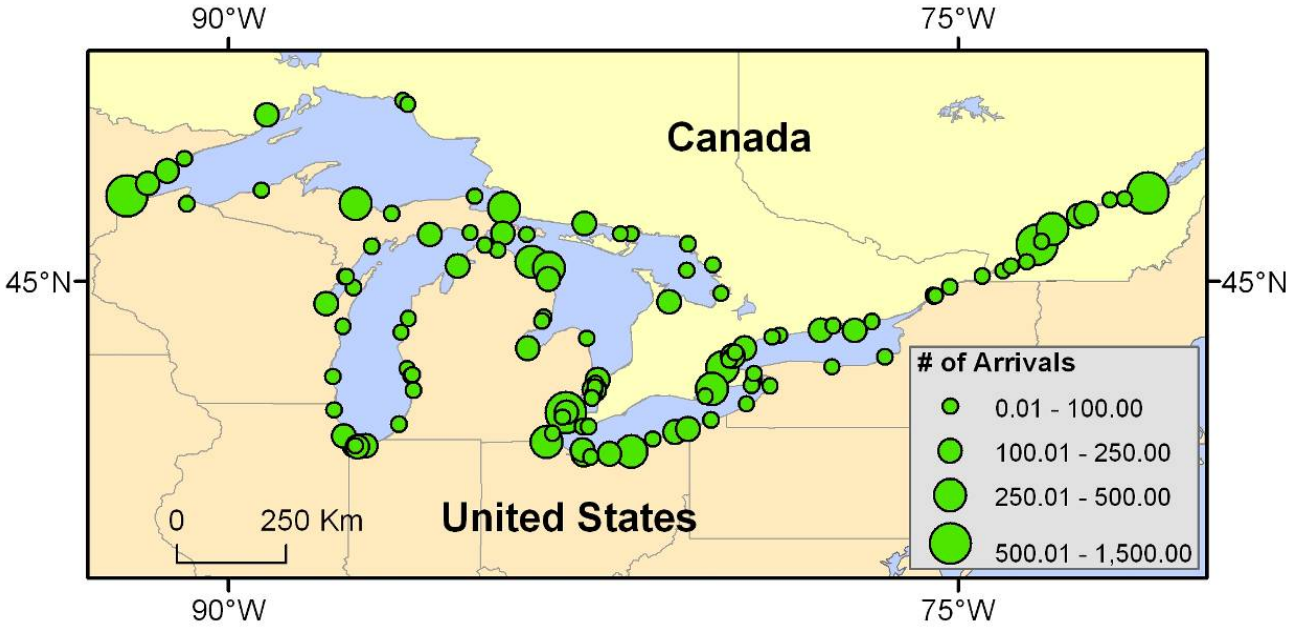


Figure 6. Map illustrating the spatial distribution of vessel arrivals in the GLSLR region. Lakes are, from left to right, Superior, Michigan, Huron, Erie, and Ontario.

Figure 7. Map illustrating locations of all top GLSLR ports based on the number of vessel arrivals for all vessel categories.

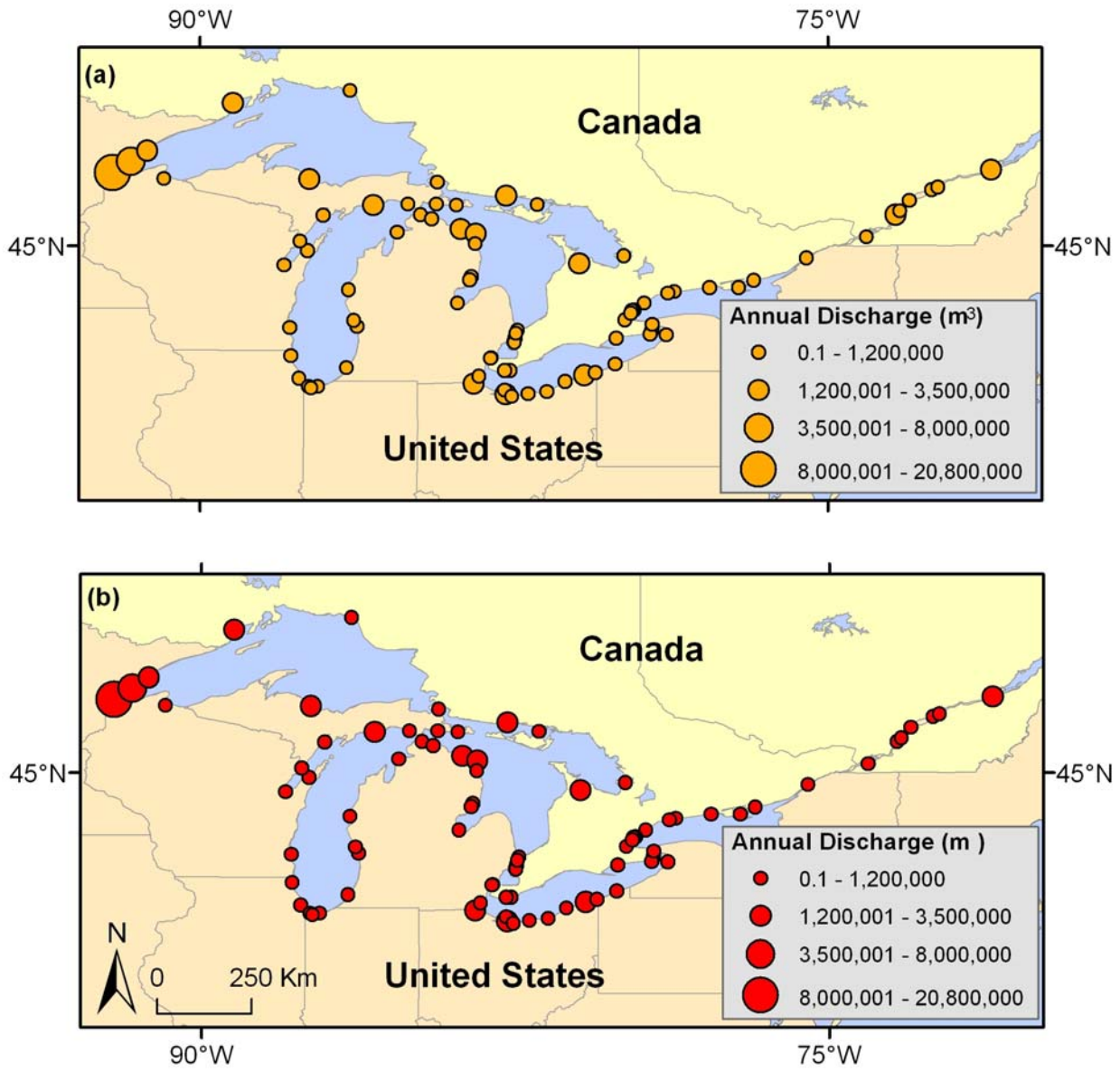


Figure 8. Map illustrating spatial patterns of (a) annual ballast water discharges and (b) combination of direct and foreign exchanged (with correction factor applied) ballast water discharges in the GLSLR region. Lakes are, from left to right, Superior, Michigan, Huron, Erie, and Ontario.

Figure 9. Map illustrating locations of all top GLSLR ports based on the annual volume of ballast water discharged by all merchant vessels; correction factors were applied to account for reduction in propagule supply due to ballast water exchange.

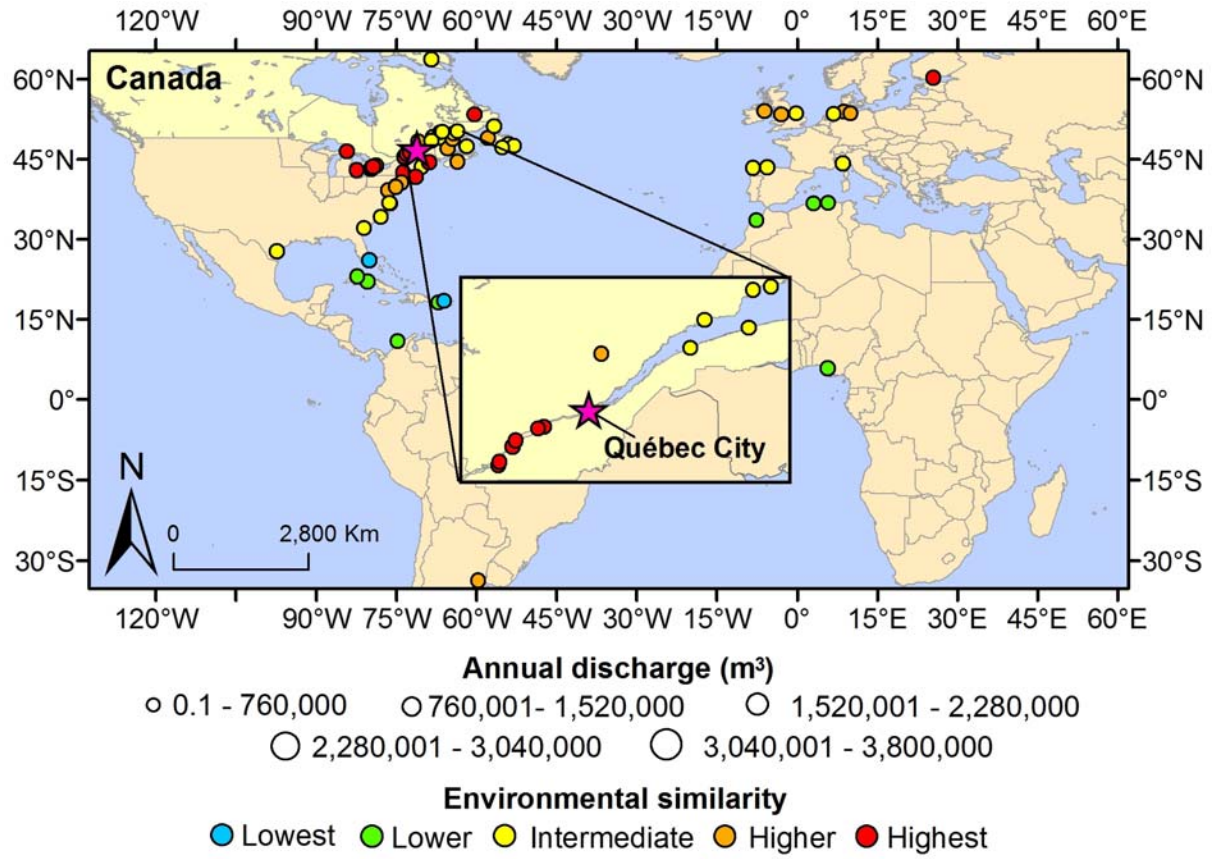


Figure 10. Map illustrating propagule supply and environmental similarity between Québec City and source ports connected via international merchant vessel ballast water discharges.

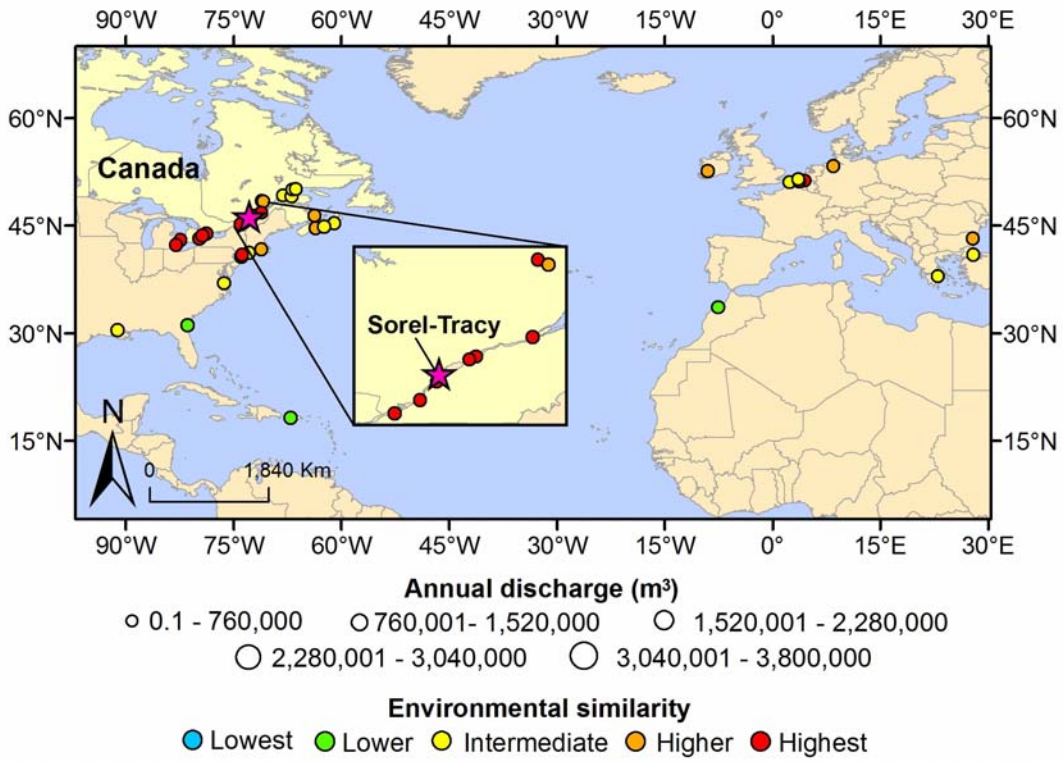


Figure 11. Map illustrating propagule supply and environmental similarity between Sorel-Tracy and source ports connected via international merchant vessel ballast water discharges.

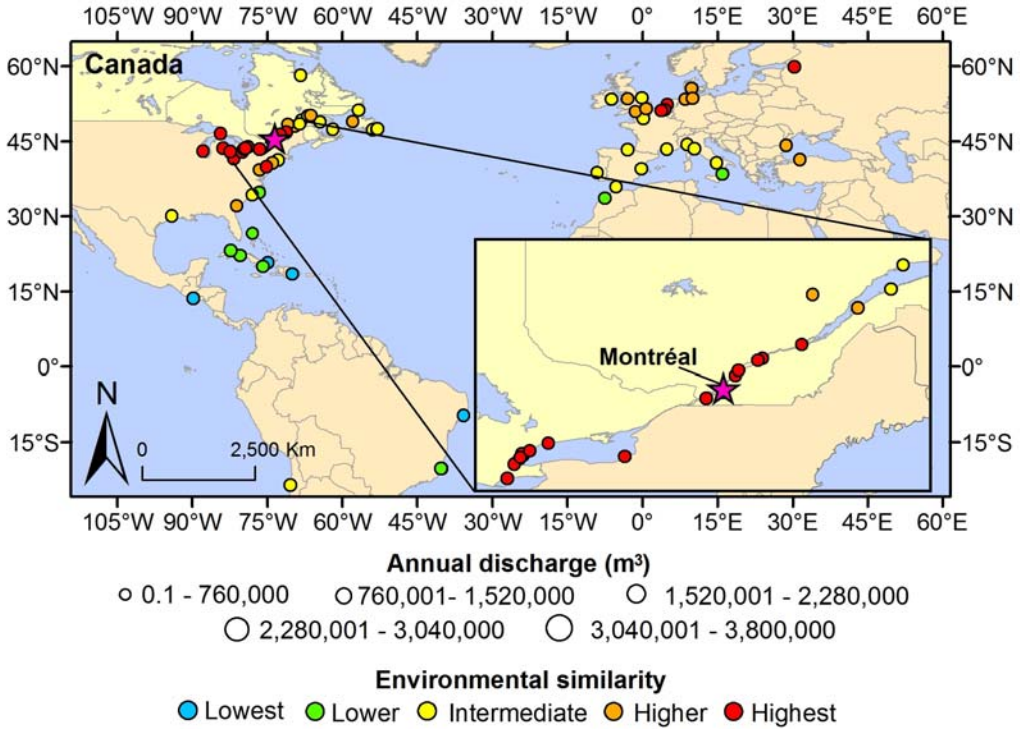


Figure 12. Map illustrating propagule supply and environmental similarity between Montréal and source ports connected via international merchant vessel ballast water discharges.

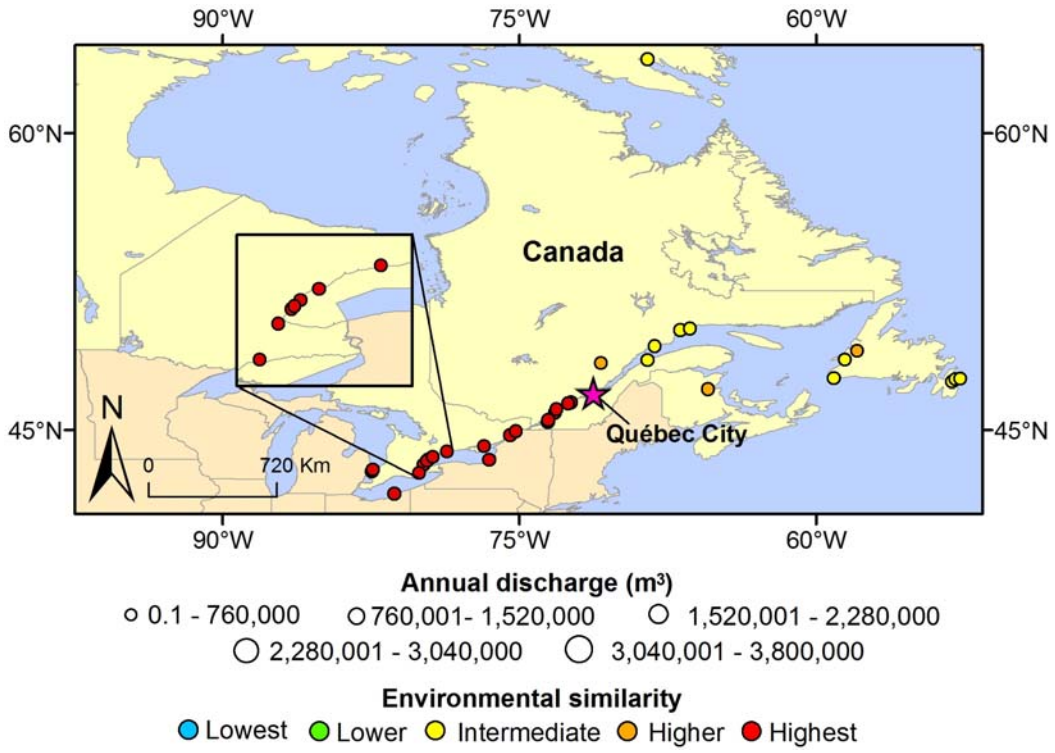


Figure 13. Map illustrating propagule supply and environmental similarity between Québec City and source ports connected via coastal domestic merchant vessel ballast water discharges.

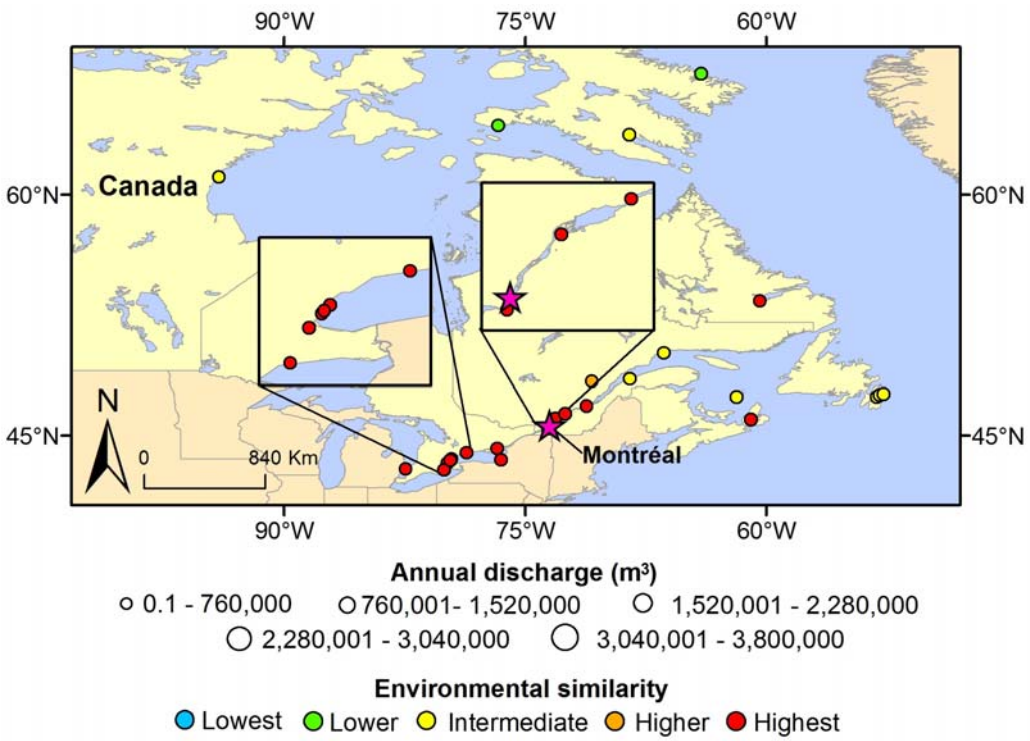


Figure 14. Map illustrating propagule supply and environmental similarity between Montréal and source ports connected via coastal domestic merchant vessel ballast water discharges.

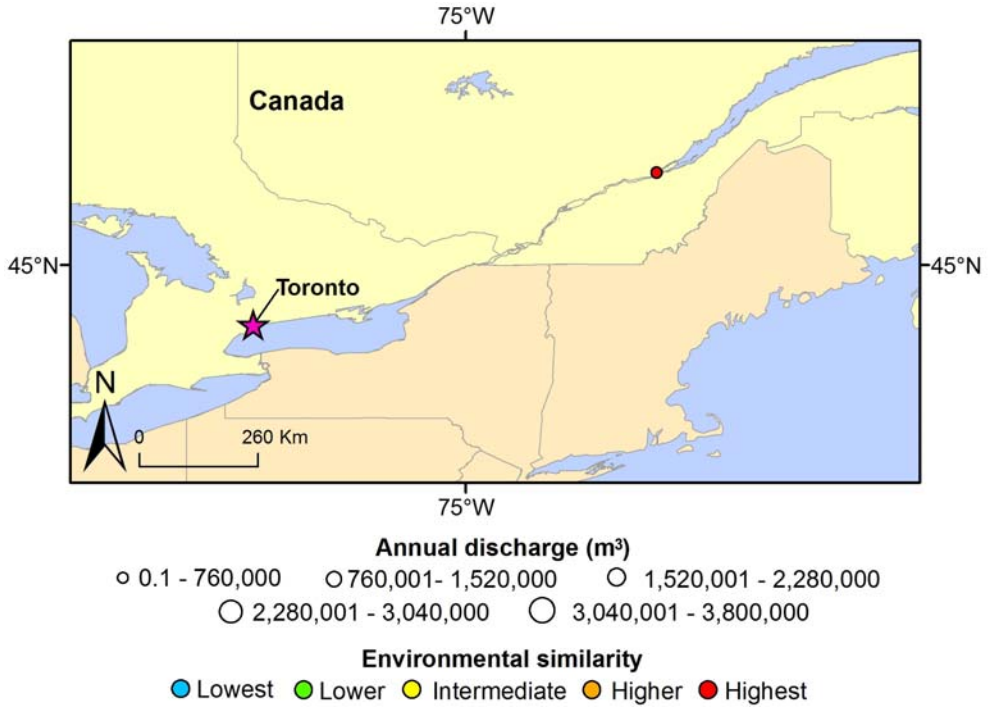


Figure 15. Map illustrating propagule supply and environmental similarity between Toronto and source ports connected via coastal domestic merchant vessel ballast water discharges.

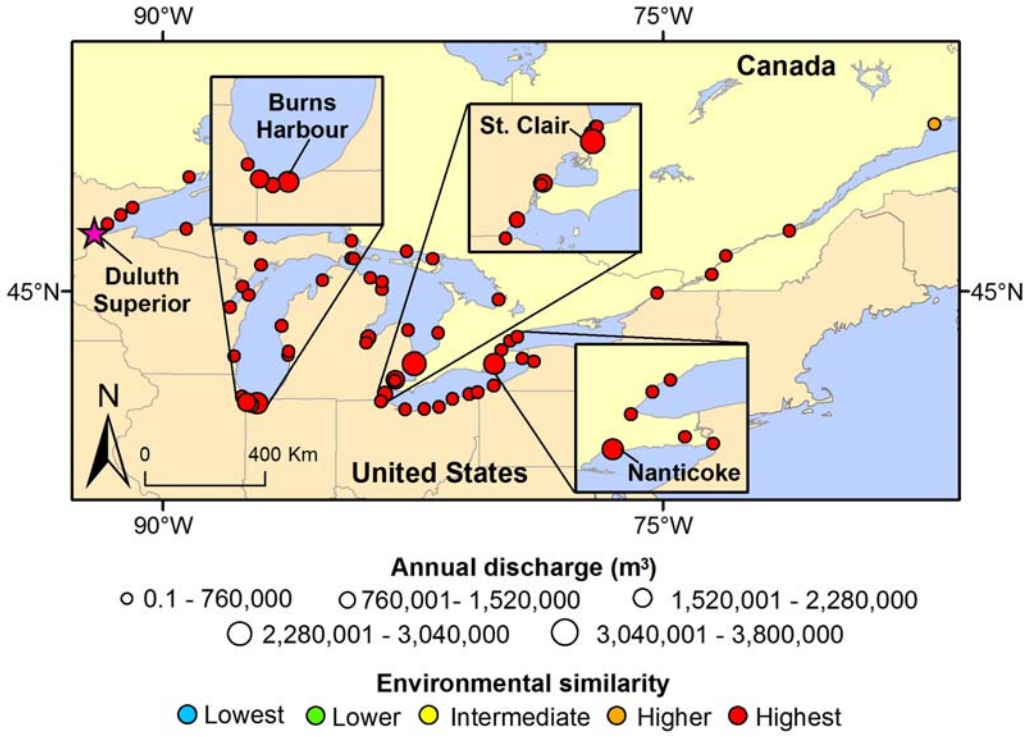


Figure 16. Map illustrating propagule supply and environmental similarity between Duluth-Superior and source ports connected via Laker merchant vessel ballast water discharges.

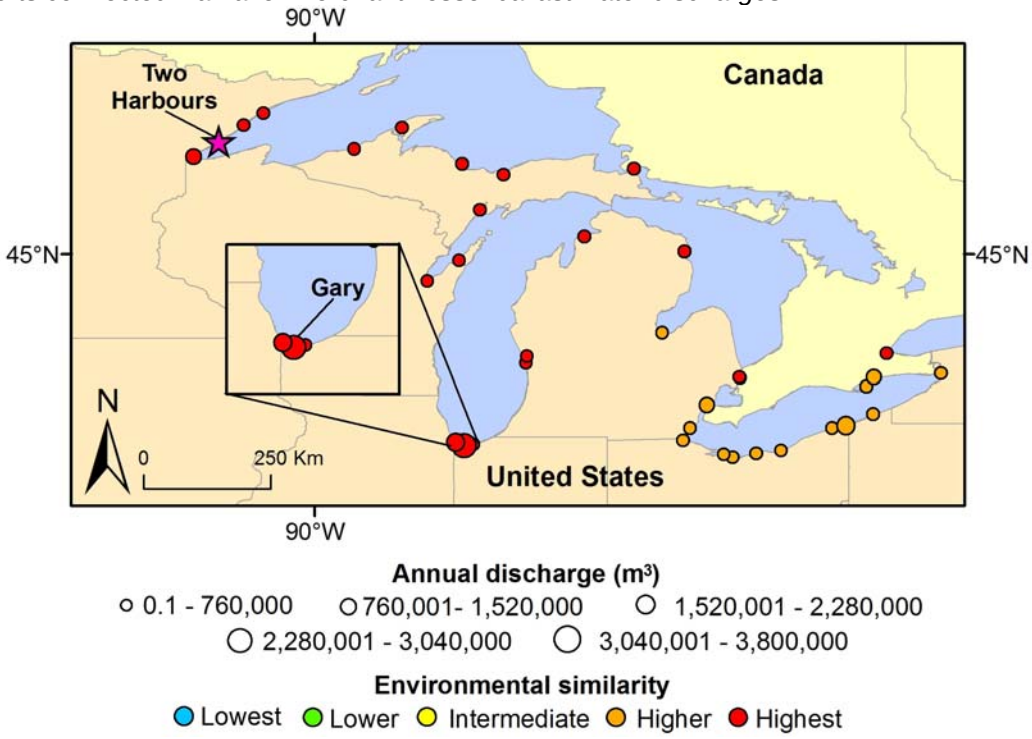


Figure 17. Map illustrating propagule supply and environmental similarity between Two Harbors and connected source ports via Laker merchant vessel ballast water discharges.

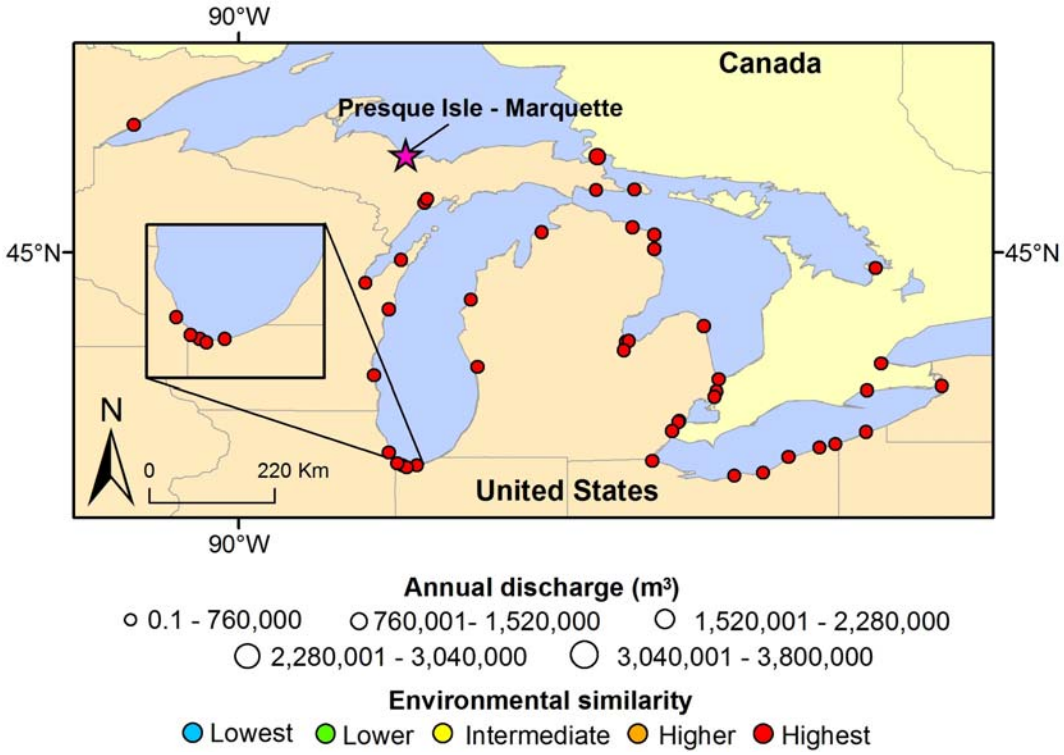


Figure 18. Map illustrating propagule supply and environmental similarity between Presque Isle-Marquette and connected source ports via Laker merchant vessel ballast water discharges.

APPENDICES

Appendix A. List of global ports that have highest environmental similarity to Quebéc City. NIS originating from these ports have the highest potential for survival if introduced at Québec City.

Name	Country	Latitude	Longitude	Environmental Distance
Eckero	ALD	60.22	19.60	0.77
Farjsundet	ALD	60.23	20.02	1.02
Finstrom	ALD	60.25	19.92	1.02
Langnasudd	ALD	60.12	20.30	1.04
Mariehamn	ALD	60.10	19.93	1.08
Korneuburg	AUT	48.37	16.33	0.68
Linz	AUT	48.32	14.30	0.56
Vienna	AUT	48.22	16.37	0.75
Antwerp	BEL	51.24	4.41	0.90
Baasrode	BEL	51.05	4.17	0.92
Balen	BEL	51.17	5.17	0.87
Boom	BEL	51.08	4.37	0.89
Brussels	BEL	50.83	4.32	0.89
Buggenhout	BEL	51.02	4.20	0.91
Burcht	BEL	51.20	4.33	0.92
Chatelineau	BEL	50.42	4.52	0.83
Dendermonde	BEL	51.03	4.12	0.92
Doel	BEL	51.32	4.27	0.93
Engis	BEL	50.58	5.40	0.81
Ertvelde	BEL	51.20	3.78	0.96
Geel	BEL	51.15	4.97	0.87
Genk	BEL	50.94	5.50	0.86
Ghent	BEL	51.09	3.75	0.94
Grimbergen	BEL	50.93	4.37	0.88
Grobbendonk	BEL	51.20	4.75	0.88
Haren	BEL	50.90	4.38	0.88
Hemiksem	BEL	51.15	4.34	0.89
Hermalle sous Huy	BEL	50.55	5.37	0.81
Hingene	BEL	51.12	4.27	0.91
Hoboken	BEL	51.17	4.33	0.91
Humbeek	BEL	50.97	4.38	0.88
Kallo	BEL	51.25	4.28	0.92
Kapelle op den Bos	BEL	51.02	4.37	0.89
Kruibeke	BEL	51.17	4.32	0.91
Kwaadmechelen	BEL	51.10	5.15	0.87
Lanaken	BEL	50.88	5.65	0.86
Langerbrugge	BEL	51.12	3.75	0.94
Liefkenshoek	BEL	51.30	4.28	0.93
Liege	BEL	50.64	5.57	0.82
Lillo	BEL	51.30	4.30	0.93
Lixhe	BEL	50.73	5.70	0.83
Maasmechelen	BEL	50.97	5.70	0.85
Marly	BEL	50.88	4.38	0.88
Mechelen	BEL	51.03	4.47	0.89

Melle	BEL	51.00	3.80	0.91
Merksem	BEL	51.23	4.48	0.90
Nameche	BEL	50.47	4.98	0.82
Niel	BEL	51.12	4.33	0.91
Olen	BEL	51.15	4.87	0.87
Puurs	BEL	51.07	4.27	0.91
Rieme	BEL	51.17	3.77	0.95
Ruisbroek	BEL	50.78	4.28	0.89
Rumst	BEL	51.07	4.42	0.89
Rupelmonde	BEL	51.13	4.28	0.91
Schelle	BEL	51.13	4.32	0.91
Schoten	BEL	51.25	4.50	0.90
Seilles	BEL	50.50	5.08	0.80
Sint-Kruis-Winkel	BEL	51.15	3.80	0.95
Temse	BEL	51.13	4.22	0.91
Terdonk	BEL	51.15	3.78	0.95
Terhagen	BEL	51.08	4.38	0.89
Tessenderlo	BEL	51.07	5.08	0.87
Tielrode	BEL	51.12	4.22	0.91
Tisselt	BEL	51.03	4.37	0.89
Val St. Lambert	BEL	50.57	5.47	0.81
Verbrande Brug	BEL	50.95	4.38	0.88
Vilvoorde	BEL	50.95	4.42	0.88
Willebroek	BEL	51.05	4.35	0.89
Wintham	BEL	51.10	4.28	0.91
Wondelgem	BEL	51.08	3.72	0.94
Zelzate	BEL	51.20	3.80	0.96
Zutendaal	BEL	50.92	5.57	0.86
Zwyndrecht	BEL	51.22	4.33	0.92
Kozloduy	BGR	43.78	23.72	1.05
Lom	BGR	43.83	23.20	0.97
Rousse	BGR	43.83	25.97	0.97
Silistra	BGR	44.10	27.25	0.97
Amherstburg	CAN	42.10	-83.08	0.72
Baddeck	CAN	46.10	-60.73	0.80
Bath	CAN	44.17	-76.77	0.40
Batiscan	CAN	46.52	-72.23	0.06
Bayside	CAN	45.17	-67.13	0.84
Becancour	CAN	46.40	-72.38	0.02
Bella Coola	CAN	52.38	-126.77	1.08
Belleville	CAN	44.13	-77.37	0.34
Bowmanville	CAN	43.90	-78.67	0.30
Boylston	CAN	45.45	-61.52	0.95
Britt	CAN	45.77	-80.58	0.32
Brockville	CAN	44.60	-75.63	0.34
Bronte	CAN	43.40	-79.70	0.34
Bruce Mines	CAN	46.27	-83.72	0.50
Burlington	CAN	43.32	-79.75	0.37
Cardinal	CAN	44.78	-75.33	0.36
Chicoutimi	CAN	48.43	-71.08	0.21

Clarkson	CAN	43.50	-79.60	0.34
Cobourg	CAN	43.95	-78.17	0.32
Colborne	CAN	44.00	-77.88	0.32
Collingwood	CAN	44.50	-80.23	0.33
Contrecœur	CAN	45.88	-73.20	0.17
Cornwall	CAN	45.02	-74.72	0.31
Corunna	CAN	42.88	-82.45	0.40
Côte Ste-Catherine	CAN	45.41	-73.58	0.31
Country Harbour	CAN	45.22	-61.73	0.98
Courtright	CAN	42.80	-82.45	0.40
Erieau	CAN	42.25	-81.93	0.64
Fort Erie	CAN	42.93	-78.95	0.61
Fredericton	CAN	45.95	-66.65	0.10
Gananoque	CAN	44.32	-76.15	0.46
Goderich	CAN	43.75	-81.75	0.38
Gold River	CAN	49.68	-126.12	0.97
Goose Bay	CAN	53.35	-60.42	0.86
Grondines	CAN	46.75	-72.03	0.18
Hamilton	CAN	43.23	-79.85	0.37
Hay River	CAN	60.85	-115.70	0.87
Houston	CAN	54.40	-126.65	0.99
Humberstone	CAN	42.90	-79.25	0.58
Iona	CAN	45.97	-60.80	0.44
Isaac’s Harbour	CAN	45.17	-61.65	1.07
Killarney	CAN	45.97	-81.52	0.41
Kingston	CAN	44.20	-76.50	0.45
Kingsville	CAN	42.02	-82.72	0.74
Kitimat	CAN	54.00	-128.70	0.75
Lanoraie	CAN	45.97	-73.18	0.17
Lauzon	CAN	46.82	-71.15	0.09
Leamington	CAN	42.05	-82.62	0.75
Levis	CAN	46.82	-71.18	0.00
Little Current	CAN	45.97	-81.92	0.26
Little Narrows	CAN	45.98	-60.98	0.39
Long Sault	CAN	45.02	-74.90	0.24
Marathon	CAN	48.75	-86.38	0.99
Meldrum Bay	CAN	45.92	-83.10	0.46
Michipicoten Harbour	CAN	47.95	-84.92	0.69
Midland	CAN	44.75	-79.93	0.31
Montréal	CAN	45.50	-73.55	0.34
Mooretown	CAN	42.85	-82.47	0.39
Morrisburg	CAN	44.93	-75.18	0.23
Nanticoke	CAN	42.82	-80.07	0.52
Nelson	CAN	49.47	-117.30	0.85
Oakville	CAN	43.43	-79.67	0.34
Ocean Falls	CAN	52.35	-127.70	1.03
Oshawa	CAN	43.87	-78.83	0.32
Ottawa	CAN	45.40	-75.70	0.22
Owen Sound	CAN	44.58	-80.95	0.31
Parry Sound	CAN	45.37	-80.05	0.29

Pelee Island	CAN	41.75	-82.67	0.79
Picton	CAN	44.00	-77.13	0.41
Pointe-aux-Trembles	CAN	45.63	-73.48	0.26
Port Alberni	CAN	49.23	-125.00	0.92
Port Burwell	CAN	42.63	-80.80	0.53
Port Colborne	CAN	42.87	-79.25	0.59
Port Credit	CAN	43.55	-79.60	0.31
Port Dalhousie	CAN	43.20	-79.27	0.41
Port Dover	CAN	42.78	-80.20	0.49
Port Hope	CAN	43.95	-78.28	0.31
Port Maitland	CAN	42.87	-79.58	0.55
Port McNicoll	CAN	44.75	-79.80	0.32
Port Stanley	CAN	42.67	-81.22	0.52
Port Weller	CAN	43.23	-79.22	0.44
Prescott	CAN	44.72	-75.52	0.31
Québec	CAN	46.82	-71.20	0.00
Sarnia	CAN	42.98	-82.42	0.38
Sault Ste. Marie	CAN	46.52	-84.33	0.43
Sombra	CAN	42.70	-82.47	0.41
Sonora	CAN	45.07	-61.92	1.01
Sorel	CAN	46.05	-73.12	0.19
Spragge	CAN	46.22	-82.67	0.30
St. Catharines	CAN	43.17	-79.27	0.39
St. Romuald	CAN	46.75	-71.23	0.00
St. Stephen	CAN	45.20	-67.28	0.43
Ste. Croix	CAN	46.63	-71.73	0.07
Thessalon	CAN	46.25	-83.55	0.49
Thorold	CAN	43.08	-79.17	0.55
Three Rivers	CAN	46.35	-72.55	0.04
Thunder Bay	CAN	48.42	-89.22	0.85
Tobermory	CAN	45.23	-81.65	0.45
Toronto	CAN	43.63	-79.38	0.31
Tracy	CAN	46.02	-73.17	0.14
Valleyfield	CAN	45.22	-74.08	0.29
Wallaceburg	CAN	42.60	-82.40	0.40
Welland	CAN	42.97	-79.22	0.52
Weymouth	CAN	44.45	-66.02	0.88
Wheatley	CAN	42.08	-82.43	0.65
Whitby	CAN	43.85	-78.92	0.31
Windsor	CAN	42.32	-83.05	0.50
Basle	CHE	47.55	7.57	0.72
Dandong	CHN	40.13	124.40	1.05
Fujin	CHN	47.25	132.02	0.43
Harbin	CHN	45.73	126.60	0.51
Heihe	CHN	50.23	127.47	0.45
Jiamusi	CHN	46.80	130.35	0.42
Panjin	CHN	41.12	122.07	0.96
Panshi	CHN	42.92	126.03	0.44
Tongjiang	CHN	47.63	132.50	0.43
Chvaletice	CZE	50.02	15.43	0.57

Ústí nad Labem	CZE	50.67	14.03	0.55
Aken	DEU	51.85	12.03	0.66
Andernach	DEU	50.42	7.38	0.78
Anklam	DEU	53.87	13.68	0.84
Aschaffenburg	DEU	49.95	9.17	0.69
Barth	DEU	54.37	12.73	0.87
Bendorf	DEU	50.42	7.58	0.76
Berlin	DEU	52.53	13.42	0.64
Berne	DEU	53.18	10.50	0.73
Bingen	DEU	49.95	7.90	0.75
Bodenwerder	DEU	51.97	9.50	0.72
Boizenburg	DEU	53.38	10.73	0.73
Bonn	DEU	50.72	7.08	0.84
Brandenburg	DEU	52.40	12.52	0.66
Braunschweig	DEU	52.25	10.50	0.72
Brohl	DEU	50.42	7.30	0.74
Castrop Rauxel	DEU	51.55	7.30	0.84
Cologne	DEU	50.93	7.00	0.86
Deggendorf	DEU	48.83	12.97	0.58
Dormagen	DEU	51.10	6.95	0.87
Dortmund	DEU	51.53	7.45	0.83
Duisburg	DEU	51.43	6.75	0.87
Dusseldorf	DEU	51.25	6.77	0.87
Eisenhuttenstadt	DEU	52.15	14.62	0.55
Emmerich	DEU	51.85	6.25	0.86
Erftstadt	DEU	50.80	6.75	0.82
Essen	DEU	51.45	7.02	0.84
Frankfurt	DEU	50.12	8.67	0.71
Geesthacht	DEU	53.43	10.38	0.73
Gelsenkirchen	DEU	51.50	7.08	0.84
Germersheim	DEU	49.22	8.38	0.82
Gernsheim	DEU	49.75	8.47	0.77
Greifswald	DEU	54.10	13.38	0.88
Haren	DEU	52.80	7.25	0.89
Havelberg	DEU	52.83	12.07	0.67
Heringsdorf	DEU	53.97	14.17	0.83
Hohenhorn	DEU	53.47	10.37	0.73
Hömberg	DEU	51.45	6.72	0.87
Hoya	DEU	52.80	9.13	0.75
Ibbenburen	DEU	52.28	7.73	0.80
Karlsruhe	DEU	49.05	8.33	0.83
Kehl	DEU	48.58	7.83	0.80
Koblenz	DEU	50.33	7.58	0.73
Krefeld	DEU	51.33	6.57	0.87
Kroslin	DEU	54.13	13.75	0.91
Ladebow	DEU	54.10	13.45	0.88
Lahnstein	DEU	50.30	7.62	0.73
Lauenburg	DEU	53.38	10.55	0.73
Lauterbach	DEU	54.33	13.52	0.93
Leer	DEU	53.22	7.45	0.90

Leeseringen	DEU	52.58	9.13	0.75
Leverkusen	DEU	51.02	7.03	0.82
Lubmin	DEU	54.12	13.60	0.86
Ludwigshafen am Rhein	DEU	49.47	8.45	0.81
Magdeburg	DEU	52.13	11.62	0.65
Mainz	DEU	50.00	8.28	0.73
Mannheim	DEU	49.48	8.47	0.81
Minden	DEU	52.30	8.90	0.75
Monheim	DEU	51.12	6.82	0.87
Moselkern	DEU	50.18	7.37	0.74
Mukran	DEU	54.48	13.58	0.96
Mulheim	DEU	50.95	7.05	0.84
Neckarsteinach	DEU	49.43	8.80	0.68
Neuss	DEU	51.20	6.70	0.87
Neuss/Dusseldorf	DEU	51.20	6.70	0.87
Neuwied	DEU	50.43	7.48	0.78
Nienburg	DEU	52.63	9.22	0.75
Nuremberg	DEU	49.45	11.05	0.60
Orsoy	DEU	51.53	6.68	0.87
Osnabruck	DEU	52.27	8.03	0.77
Papenburg	DEU	53.08	7.38	0.84
Passau	DEU	48.58	13.47	0.57
Peenemunde	DEU	54.12	13.77	0.91
Peine	DEU	52.32	10.22	0.72
Porz	DEU	50.88	7.05	0.84
Regensburg	DEU	49.02	12.12	0.55
Remagen	DEU	50.57	7.22	0.78
Rheinhausen	DEU	51.42	6.73	0.87
Rinteln	DEU	52.20	9.08	0.74
Rosslau	DEU	51.90	12.27	0.66
Rostock	DEU	54.15	12.10	0.90
Ruhrort	DEU	51.45	6.73	0.87
Salzgitter	DEU	52.22	10.33	0.72
Sassnitz	DEU	54.52	13.63	0.96
Speyer	DEU	49.30	8.43	0.82
Stralsund	DEU	54.32	13.10	0.89
Sturzelberg	DEU	51.12	6.80	0.87
Stuttgart	DEU	48.78	9.20	0.69
Tangermunde	DEU	52.57	11.97	0.67
Ueckermunde	DEU	53.73	14.28	0.88
Urdingen	DEU	51.35	6.67	0.87
Vallendar	DEU	50.40	7.62	0.76
Vierow	DEU	54.10	13.57	0.86
Walsum	DEU	51.53	6.68	0.87
Warnemunde	DEU	54.18	12.08	0.93
Weissenthurm	DEU	50.42	7.48	0.78
Wesel	DEU	51.65	6.60	0.87
Wesseling	DEU	50.83	7.00	0.82
Wolgast	DEU	54.05	13.78	0.91
Worms	DEU	49.63	8.35	0.79

Wurzburg	DEU	49.78	9.93	0.63
Aggersund	DNK	57.02	9.28	1.02
Allinge	DNK	55.28	14.80	1.02
Fur	DNK	56.83	9.00	1.01
Gudhjem	DNK	55.22	14.97	0.90
Hammeren	DNK	55.28	14.75	1.02
Hammerhavn	DNK	55.27	14.75	1.02
Hasle	DNK	55.18	14.70	1.01
Hvalpsund	DNK	56.68	9.20	0.79
Logstor	DNK	56.97	9.25	0.79
Nekso	DNK	55.07	15.15	0.93
Nykobing	DNK	56.80	8.87	0.99
Ronne	DNK	55.10	14.70	1.01
Skarrehage	DNK	56.95	8.87	0.96
Skive	DNK	56.57	9.03	0.80
Stege	DNK	54.98	12.28	0.99
Stubbekobing	DNK	54.88	12.03	0.92
Svaneke	DNK	55.13	15.15	0.93
Tejn	DNK	55.23	14.83	1.02
Thisted	DNK	56.95	8.70	0.86
Vang	DNK	55.27	14.75	1.02
Bekker	EST	59.45	24.67	0.65
Dirhami	EST	59.22	23.50	0.89
Forby	EST	59.00	23.17	0.86
Haapsalu	EST	58.95	23.53	0.66
Heltermaa	EST	58.87	23.07	0.75
Kuivastu	EST	58.58	23.40	0.73
Kunda	EST	59.52	26.55	0.84
Lehtma	EST	59.05	22.70	0.93
Loksa	EST	59.58	25.72	0.85
Meeruse	EST	59.45	24.68	0.64
Miiduranna	EST	59.50	24.82	0.92
Montu	EST	57.95	22.12	0.78
Muuga	EST	59.50	24.97	0.92
Narva Joesuu	EST	59.47	28.05	0.58
Paldiski	EST	59.35	24.05	0.92
Paljassaare	EST	59.45	24.70	0.64
Parnu	EST	58.38	24.48	0.59
Peetri	EST	59.45	24.73	0.64
Prangli Island	EST	59.63	25.00	0.86
Rohukula	EST	58.90	23.42	0.75
Roomassaare	EST	58.22	22.52	0.73
Saaremaa Harbour	EST	58.53	22.23	0.78
Sillamae	EST	59.40	27.78	0.58
Tallinn	EST	59.45	24.75	0.64
Veere	EST	58.45	22.05	0.74
Virtsu	EST	58.58	23.55	0.66
Dalsbruk	FIN	60.03	22.52	0.68
Frojdbole	FIN	60.15	19.92	1.08
Galtby	FIN	60.18	21.58	0.96

Hamina	FIN	60.57	27.18	0.54
Hanko	FIN	59.82	22.97	0.95
Helsinki	FIN	60.17	24.95	0.56
Houtskar	FIN	60.22	21.37	0.98
Imatra	FIN	61.17	28.83	0.41
Inkoo	FIN	60.05	24.02	0.72
Isnas	FIN	60.40	26.00	0.61
Joensuu	FIN	62.60	29.75	0.53
Joutseno	FIN	61.13	28.48	0.41
Kantvik	FIN	60.08	24.38	0.71
Kaskinen	FIN	62.38	21.22	1.09
Kaukas	FIN	61.07	28.22	0.41
Kaukopaa	FIN	61.25	28.87	0.45
Kemi	FIN	65.73	24.57	0.86
Kokkila	FIN	60.33	22.87	0.69
Korpo	FIN	60.15	21.55	0.96
Kotka	FIN	60.47	26.95	0.79
Koverhar	FIN	59.88	23.22	0.94
Kristiinankaupunki	FIN	62.27	21.32	0.68
Kronvik	FIN	63.05	21.52	0.72
Kuopio	FIN	62.85	27.50	0.49
Kustavi	FIN	60.57	21.33	0.73
Kuuslahti	FIN	63.12	27.75	0.46
Lapaluoto	FIN	64.67	24.42	0.80
Lappeenranta	FIN	61.07	28.25	0.41
Lappohja	FIN	59.90	23.27	0.95
Lappvik	FIN	59.90	23.27	0.95
Lauritsala	FIN	61.08	28.33	0.41
Loviisa	FIN	60.45	26.23	0.58
Luvia	FIN	61.33	21.57	0.71
Mantyluoto	FIN	61.58	21.50	0.69
Martinniemi	FIN	65.22	25.28	0.77
Maxmo	FIN	63.20	22.03	0.75
Merikarvia	FIN	61.85	21.47	0.73
Mjosund	FIN	60.22	22.47	0.66
Mustola	FIN	61.07	28.30	0.41
Naantali	FIN	60.47	22.02	0.66
Nyhamn	FIN	62.17	21.33	0.68
Olkiluoto	FIN	61.25	21.50	0.70
Oulu	FIN	65.00	25.47	0.73
Parainen	FIN	60.28	22.30	0.67
Pateniemi	FIN	65.08	25.40	0.75
Perno	FIN	60.45	26.05	0.60
Pori	FIN	61.48	21.80	0.72
Puhos	FIN	62.10	29.92	0.50
Raahe	FIN	64.68	24.48	0.84
Rahja	FIN	64.20	23.73	0.81
Rauma	FIN	61.13	21.50	0.71
Ristiina	FIN	61.53	27.42	0.48
Roytta	FIN	65.77	24.15	0.87

Salo	FIN	60.38	23.17	0.70
Savonlinna	FIN	61.90	28.92	0.46
Siilinjarvi	FIN	63.08	27.67	0.47
Sipoo	FIN	60.37	25.32	0.63
Skogby	FIN	59.92	23.32	0.95
Skoldvik	FIN	60.30	25.55	0.60
Skuru	FIN	60.10	23.55	0.70
Stromma	FIN	60.18	22.90	0.69
Summa	FIN	60.53	27.12	0.54
Svartback	FIN	60.28	25.53	0.60
Taalintehdas	FIN	60.02	22.52	0.68
Tammisaari	FIN	59.98	23.43	0.68
Teijo	FIN	60.25	22.95	0.69
Tolkkinen	FIN	60.33	25.58	0.60
Tornio	FIN	65.85	24.15	0.85
Tupavuori	FIN	60.45	22.07	0.66
Turku	FIN	60.43	22.22	0.65
Uusikaupunki	FIN	60.80	21.40	0.71
Vaasa	FIN	63.10	21.62	0.72
Valkom	FIN	60.42	26.27	0.58
Varkaus	FIN	62.33	27.83	0.45
Vartsala	FIN	60.33	23.02	0.70
Vastanfjard	FIN	60.05	22.65	0.68
Veitsiluoto	FIN	65.70	24.62	0.86
Annay-sous-Lens	FRA	50.47	2.87	0.94
Bethune	FRA	50.53	2.63	0.98
Bonniéres	FRA	49.03	1.58	0.98
Chalon-sur-Saône	FRA	46.78	4.83	0.89
Conflans	FRA	48.98	2.10	0.99
Duclair	FRA	49.45	0.87	1.04
Elbeuf	FRA	49.28	1.12	1.01
Gaillon	FRA	49.17	1.32	0.98
Grand Couronne	FRA	49.37	0.98	1.04
Grigny	FRA	45.62	4.78	0.96
La Mailleraye	FRA	49.48	0.77	1.04
Le Trait	FRA	49.47	0.80	1.04
Les Andelys	FRA	49.25	1.43	0.98
Lille	FRA	50.65	3.08	0.94
Lille	FRA	50.65	3.08	0.94
Lillebonne	FRA	49.52	0.53	1.06
Limay	FRA	48.97	1.78	0.96
Lyon	FRA	45.77	4.83	0.96
Mantes	FRA	48.98	1.72	0.96
Paris	FRA	48.87	2.33	1.04
Petit Couronne	FRA	49.37	1.00	1.04
Port Jerome	FRA	49.47	0.53	1.09
Radicatel	FRA	49.42	0.48	1.10
Rouen	FRA	49.48	1.08	1.02
St. Etienne du Rouvray	FRA	49.37	1.12	1.02
St. Wandrille	FRA	49.53	0.75	1.03

Strasbourg	FRA	48.57	7.70	0.80
Vernon	FRA	49.08	1.48	0.98
Villeneuve-la-Garenne	FRA	48.92	2.30	1.04
Villeneuve-le-Roi	FRA	48.73	2.40	1.05
Villequier	FRA	49.50	0.67	1.06
Althorpe Wharf	GBR	53.57	-0.73	1.03
Anderton	GBR	53.27	-2.52	1.09
Aylesford	GBR	51.27	0.47	1.07
Barton	GBR	53.47	-2.37	1.08
Beckingham	GBR	53.40	-0.83	1.01
Beverley	GBR	53.85	-0.43	1.09
Burton upon Stather	GBR	53.65	-0.68	1.04
Dalmuir	GBR	55.90	-4.43	1.10
Drax	GBR	53.73	-0.98	1.02
Flixborough	GBR	53.62	-0.68	1.03
Gainsborough	GBR	53.40	-0.77	1.00
Glasgow	GBR	55.87	-4.28	1.09
Gloucester	GBR	51.87	-2.22	1.05
Goole	GBR	53.70	-0.87	1.04
Grove Wharf	GBR	53.60	-0.68	1.03
Gunness	GBR	53.58	-0.72	1.03
Gunness Wharf	GBR	53.58	-0.68	1.03
Halling	GBR	51.37	0.01	1.03
Howdendyke	GBR	53.75	-0.87	1.04
Irlam	GBR	53.43	-2.42	1.09
Irwell	GBR	53.47	-2.35	1.08
Keadby	GBR	53.60	-0.67	1.03
Knottingley	GBR	53.72	-1.23	1.03
London	GBR	51.50	-0.07	1.05
Manchester	GBR	53.47	-2.28	1.07
Neap House	GBR	53.62	-0.67	1.03
Northwich	GBR	53.27	-2.53	1.09
Old Kilpatrick	GBR	55.92	-4.45	1.10
Paisley	GBR	55.85	-4.43	1.10
Partington	GBR	53.43	-2.43	1.09
Renfrew	GBR	55.87	-4.40	1.10
Selby	GBR	53.78	-1.07	1.02
Thorne	GBR	53.62	-0.97	1.01
Winnington	GBR	53.28	-2.52	1.09
Budapest	HUN	47.50	19.03	0.89
Klaipeda	LTU	55.72	21.13	0.73
Engure	LVA	57.17	23.23	0.79
Labrags	LVA	56.98	21.37	0.91
Liepaja	LVA	56.52	21.02	0.82
Mersrags	LVA	57.37	23.13	0.73
Pavilosta	LVA	56.90	21.18	0.81
Riga	LVA	56.97	24.10	0.61
Roja	LVA	57.50	22.82	0.71
Salacgriva	LVA	57.75	24.37	0.64
Skulte	LVA	57.32	24.40	0.62

Ventspils	LVA	57.40	21.55	0.82
Chisinau	MDA	47.02	28.83	0.72
Aalst	NLD	51.38	5.45	0.88
Alblasserdam	NLD	51.87	4.62	0.82
Ameide	NLD	51.95	4.95	0.81
Amsterdam	NLD	52.37	4.90	1.08
Arnhem	NLD	51.97	5.88	0.86
Assen	NLD	53.00	6.57	0.87
Axel Sassing	NLD	51.28	3.87	1.02
Bergambacht	NLD	51.93	4.78	0.81
Bergen-op-Zoom	NLD	51.50	4.27	1.05
Bolnes	NLD	51.90	4.57	0.82
Bruinisse	NLD	51.67	4.10	0.97
Capelle aan den Yssel	NLD	51.92	4.57	0.82
Culemborg	NLD	51.95	5.22	0.87
Deest	NLD	51.88	5.67	0.87
Den Bommel	NLD	51.72	4.28	0.97
Dintelmond	NLD	51.67	4.38	0.93
Dinteloord	NLD	51.63	4.37	0.93
Dodewaard	NLD	51.90	5.63	0.87
Dordrecht	NLD	51.80	4.65	0.82
Druten	NLD	51.88	5.62	0.87
Eindhoven	NLD	51.43	5.50	0.88
Fijnaart	NLD	51.63	4.48	0.92
Geertruidenberg	NLD	51.72	4.87	0.89
Gendt	NLD	51.87	5.98	0.86
Gorinchem	NLD	51.82	4.98	0.89
Grave	NLD	51.75	5.75	0.88
Groot-Ammers	NLD	51.92	4.83	0.81
Hardinxveld	NLD	51.82	4.85	0.81
Heerewaarden	NLD	51.82	5.38	0.88
Heerjansdam	NLD	51.83	4.57	0.82
Heijen	NLD	51.68	5.98	0.87
Hellevoetsluis	NLD	51.82	4.13	1.06
Hendrik Ido Ambacht	NLD	51.85	4.62	0.82
Heusden	NLD	51.73	5.15	0.88
Huissen	NLD	51.92	5.92	0.86
Kinderdijk	NLD	51.88	4.63	0.82
Krimpen aan den Yssel	NLD	51.90	4.58	0.82
Lekkerkerk	NLD	51.92	4.63	0.82
Lithoyen	NLD	51.82	5.43	0.88
Lobith	NLD	51.87	6.13	0.86
Maasbracht	NLD	51.13	5.87	0.86
Maashees	NLD	51.57	6.03	0.88
Maassluis	NLD	51.92	4.25	0.89
Maastricht	NLD	50.85	5.68	0.85
Made	NLD	51.68	4.80	0.90
Middelharnis	NLD	51.78	4.20	1.00
Millingen aan den Rijn	NLD	51.87	6.03	0.86
Moerdijk	NLD	51.70	4.62	0.93

Nieuw Lekkerland	NLD	51.88	4.63	0.82
Nieuwerkerk aan den Yssel	NLD	51.97	4.58	0.82
Nijmegen	NLD	51.83	5.83	0.88
Numansdorp	NLD	51.72	4.42	0.96
Ooltgensplaat	NLD	51.68	4.33	0.95
Oosterhout	NLD	51.62	4.87	0.89
Oss	NLD	51.77	5.52	0.88
Ouderkerk	NLD	51.93	4.60	0.82
Oudewater	NLD	52.03	4.88	1.09
Ouwerkerk	NLD	51.63	3.98	1.05
Overschie	NLD	51.93	4.42	0.84
Paal	NLD	51.35	4.12	1.06
Papendrecht	NLD	51.83	4.63	0.82
Raamsdonksveer	NLD	51.70	4.92	0.89
Renkum	NLD	51.97	5.73	0.86
Rhenen	NLD	51.95	5.57	0.87
Ridderkerk	NLD	51.87	4.58	0.82
Rijswijk	NLD	51.78	5.02	0.88
Roermond	NLD	51.20	5.98	0.87
Rotterdam	NLD	51.90	4.48	0.83
Sas van Ghent	NLD	51.23	3.80	0.97
Schiedam	NLD	51.90	4.40	0.86
‘sGravendeel	NLD	51.77	4.60	0.82
‘sHertogenbosch	NLD	51.70	5.30	0.90
Sliedrecht	NLD	51.83	4.75	0.81
Slikkerveer	NLD	51.88	4.60	0.82
Sluiskil	NLD	51.30	3.83	1.03
Spijk	NLD	51.87	5.05	0.88
St. Annaland	NLD	51.62	4.10	0.90
Stavenisse	NLD	51.58	4.00	1.05
Stein	NLD	50.97	5.77	0.85
Swalmen	NLD	51.22	6.02	0.87
Tegelen	NLD	51.35	6.13	0.88
Tiel	NLD	51.88	5.45	0.87
Tilburg	NLD	51.55	5.07	0.88
Venlo	NLD	51.37	6.17	0.88
Vlaardingen	NLD	51.90	4.35	0.86
Waalwijk	NLD	51.70	5.07	0.88
Wageningen	NLD	51.97	5.67	0.87
Wanssum	NLD	51.53	6.08	0.88
Wartena	NLD	53.15	5.90	1.00
Werkendam	NLD	51.80	4.90	0.81
Willemstad	NLD	51.68	4.40	0.94
Zaltbommel	NLD	51.80	5.20	0.89
Zuilichem	NLD	51.80	5.12	0.89
Zwijndrecht	NLD	51.82	4.65	0.82
Fiborgtangen	NOR	63.72	11.17	1.04
Herre	NOR	59.10	9.53	0.87
Hoylandsbygdi	NOR	59.77	5.78	1.07
Hoylandssundet	NOR	59.78	5.80	1.05

Langangen	NOR	59.08	9.80	1.05
Levanger	NOR	63.75	11.30	1.05
Lofallstrand	NOR	60.02	6.00	0.97
Menstad	NOR	59.17	9.65	0.81
Porsgrunn	NOR	59.13	9.65	0.86
Skien	NOR	59.20	9.62	0.87
Steinkjer	NOR	64.02	11.50	1.10
Verdal	NOR	63.78	11.43	1.06
Darlowo	POL	54.43	16.38	0.77
Elblag	POL	54.17	19.40	0.75
Frombork	POL	54.35	19.67	0.80
Gdansk	POL	54.35	18.65	0.84
Gdynia	POL	54.53	18.55	0.91
Kolobrzeg	POL	54.18	15.57	0.79
Kozle	POL	50.32	18.13	0.55
Niechorze	POL	54.10	15.07	0.78
Nowa Sol	POL	51.80	15.72	0.59
Plock	POL	52.53	19.67	0.43
Police	POL	53.55	14.60	0.81
Puck	POL	54.72	18.35	0.81
Stepnica	POL	53.65	14.63	0.81
Swinoujscie	POL	53.93	14.28	0.88
Szczecin	POL	53.42	14.55	0.81
Tczew	POL	54.08	18.77	0.78
Ustka	POL	54.58	16.87	0.95
Wladyslawowo	POL	54.80	18.42	0.93
Wroclaw	POL	51.08	17.00	0.57
Pyongyang	PRK	39.00	125.75	1.00
Songnim	PRK	38.73	125.62	1.10
Bazias	ROM	44.80	21.40	0.90
Braila	ROM	45.25	27.98	0.93
Bucharest	ROM	44.42	26.12	0.93
Calarasi	ROM	44.18	27.32	1.00
Galatz	ROM	45.42	28.08	0.92
Giurgiu	ROM	43.90	25.97	1.00
Oltenitza	ROM	44.03	26.58	0.99
Orsova	ROM	44.70	22.37	0.74
Tulcea	ROM	45.17	28.82	0.86
Turnu Severin	ROM	44.63	22.67	0.93
Akhtubinsk	RUS	48.33	46.17	0.92
Annenskiy Most	RUS	60.72	37.08	0.51
Astrakhan	RUS	46.37	48.07	0.88
Bagaevskaya	RUS	47.32	40.38	0.88
Balakhna	RUS	56.48	43.62	0.11
Balakovo	RUS	52.07	47.77	0.45
Baltiysk	RUS	54.65	19.90	0.85
Belyy Ruchey	RUS	60.90	36.83	0.53
Berezniki	RUS	59.43	56.82	0.39
Brusnichnoye	RUS	60.78	28.73	0.52
Cheboksary	RUS	56.13	47.23	0.10

Cherepovets	RUS	59.15	37.83	0.36
Chkalovsk	RUS	56.75	43.23	0.13
Gorokhovets	RUS	56.18	42.70	0.11
Igarka	RUS	67.50	86.67	1.05
Kalach-na-Donu	RUS	48.72	43.48	0.69
Kaliningrad	RUS	54.72	20.52	0.73
Kamyshin	RUS	50.08	45.40	0.63
Kanonerskiy Is.	RUS	59.90	30.22	0.45
Kazan	RUS	55.75	49.17	0.08
Khabarovsk	RUS	48.50	135.17	0.37
Kineshma	RUS	57.45	42.12	0.22
Kirovsk	RUS	59.87	30.98	0.48
Komsomolsk-na-Amure	RUS	50.53	136.98	0.48
Kondopoga	RUS	62.20	34.28	0.56
Konstantinovsk	RUS	47.55	41.10	0.81
Kostroma	RUS	57.77	40.93	0.18
Kotlas	RUS	61.25	46.65	0.47
Krasnoyarsk	RUS	56.08	92.77	0.37
Krasnyye Barrikady	RUS	46.20	47.85	0.91
Kronshtadt	RUS	60.00	29.77	0.49
Lomonosov	RUS	59.83	29.80	0.51
Mago	RUS	53.25	140.22	0.65
Medvezhyegorsk	RUS	62.93	34.47	0.66
Mondoma	RUS	59.93	37.47	0.48
Naberezhnyye Chelny	RUS	55.68	52.30	0.11
Nadvoitsy	RUS	63.93	34.33	0.75
Navashino	RUS	55.55	42.18	0.08
Nikolayevsk	RUS	53.13	140.72	0.69
Nikolayevskaya	RUS	47.60	41.48	0.84
Nizhnekamsk	RUS	55.42	51.88	0.11
Nizhnetambovskoye	RUS	50.93	138.17	0.53
Nizhniy Novgorod	RUS	56.33	44.00	0.12
Nizhnyaya Gavan	RUS	52.40	140.43	0.64
Novgorod	RUS	58.50	31.33	0.32
Novocheboksarsk	RUS	56.10	47.48	0.08
Olya	RUS	45.78	47.53	0.97
Otradnoye	RUS	59.77	30.80	0.47
Pechora	RUS	65.23	57.30	0.81
Perm	RUS	58.02	56.17	0.27
Petrodvorets	RUS	59.88	29.92	0.47
Petrozavodsk	RUS	61.77	34.32	0.58
Pionerskiy	RUS	54.93	20.20	0.74
Podporozhye	RUS	60.92	34.03	0.46
Primorsk	RUS	60.37	28.63	0.53
Priozersk	RUS	61.02	30.13	0.51
Pudozh	RUS	61.83	36.53	0.52
Rybinsk	RUS	58.02	38.87	0.28
Samara	RUS	53.17	50.17	0.25
Saratov	RUS	51.50	45.92	0.53
Segezha	RUS	63.70	34.32	0.75

Semikarakorsk	RUS	47.55	41.10	0.81
Shlisselburg	RUS	59.93	31.13	0.48
Solikamsk	RUS	59.67	56.75	0.42
Sosnovka	RUS	56.23	51.28	0.11
St. Petersburg	RUS	59.93	30.30	0.45
Svetlyy	RUS	54.63	20.15	0.74
Syzran	RUS	53.17	48.48	0.28
Taganrog	RUS	47.20	38.95	1.10
Tatyanka	RUS	45.93	48.28	0.98
Tolyatti	RUS	53.53	49.40	0.20
Tomsk	RUS	56.50	85.08	0.36
Ust Donets	RUS	47.67	40.95	0.82
Ust-Luga	RUS	59.67	28.30	0.57
Volgodonsk	RUS	47.50	42.12	0.81
Volgograd	RUS	48.75	44.50	0.75
Volzhskiy	RUS	48.82	44.73	0.84
Voznesenye	RUS	61.02	35.47	0.47
Vyborg	RUS	60.72	28.73	0.52
Vysotsk	RUS	60.63	28.57	0.52
Vytegra	RUS	61.07	36.45	0.47
Yakutsk	RUS	62.02	129.73	0.86
Yaroslavl	RUS	57.57	39.87	0.19
Zelenodolsk	RUS	55.83	48.50	0.07
Apatin	SCG	45.67	19.00	0.87
Belgrade	SCG	44.80	20.47	1.01
Bezdam	SCG	45.83	18.93	0.87
Kladovo	SCG	44.60	22.55	0.93
Mitrovica	SCG	42.90	20.87	0.59
Novi Becej	SCG	45.58	20.13	0.91
Novi Sad	SCG	45.27	19.83	0.90
Pancevo	SCG	44.87	20.67	1.04
Bratislava	SVK	48.15	17.12	0.69
Komarno	SVK	47.77	18.08	0.76
Aelvenaes	SWE	59.37	13.18	0.58
Ahus	SWE	55.93	14.32	1.09
Amal	SWE	59.05	12.72	0.59
Ar	SWE	57.92	18.95	0.92
Arvika	SWE	59.67	12.58	0.59
Balsta	SWE	59.55	17.55	0.67
Bergkvara	SWE	56.38	16.08	1.01
Borgholm	SWE	56.88	16.65	0.96
Bungenas	SWE	57.82	19.08	0.92
Byxelkrok	SWE	57.30	17.03	0.91
Dalaro	SWE	59.13	18.42	0.93
Degerhamn	SWE	56.35	16.42	0.99
Edsvalla	SWE	59.43	13.23	0.58
Elleholm	SWE	56.17	14.73	0.86
Enkoping	SWE	59.63	17.08	0.73
Farjestaden	SWE	56.65	16.47	0.99
Farosund	SWE	57.87	19.07	0.92

Fiskeback	SWE	57.87	14.10	0.68
Fittja	SWE	59.23	17.85	0.65
Forsmark	SWE	60.42	18.20	0.99
Furillen	SWE	57.77	19.00	0.88
Furusund	SWE	59.65	18.90	0.94
Gamleby	SWE	57.90	16.42	0.81
Gefle	SWE	60.67	17.17	0.80
Grisslehamn	SWE	60.10	18.82	0.99
Gruvon	SWE	59.33	13.12	0.58
Hallekis	SWE	58.67	13.42	0.60
Hallstavik	SWE	60.05	18.60	0.98
Haparanda	SWE	65.83	24.13	0.87
Haraholmen	SWE	65.23	21.63	0.83
Hargshamn	SWE	60.17	18.48	0.98
Hasselby	SWE	59.37	17.82	0.65
Hernosand	SWE	62.63	17.93	0.79
Hoglunda	SWE	59.42	13.25	0.58
Hogmarso	SWE	59.65	18.85	0.94
Honsater	SWE	58.63	13.45	0.60
Hornefors	SWE	63.62	19.90	0.79
Hudiksvall	SWE	61.72	17.12	1.02
Iggesund	SWE	61.65	17.10	1.02
Kagehamn	SWE	64.83	21.03	0.85
Kalix	SWE	65.85	23.13	0.93
Kallvik	SWE	57.88	16.72	1.02
Kallviken	SWE	64.33	21.37	0.81
Kalmar	SWE	56.67	16.37	0.99
Kalmarsand	SWE	59.53	17.52	0.67
Kapellskar	SWE	59.72	19.00	0.98
Kappelshamn	SWE	57.85	18.78	0.92
Karlshamn	SWE	56.17	14.87	0.88
Karlskrona	SWE	56.17	15.60	0.87
Karlstad	SWE	59.38	13.52	0.58
Klintehamn	SWE	57.38	18.20	0.87
Koping	SWE	59.52	16.00	0.69
Kopmannebro	SWE	58.77	12.52	0.58
Kristinehamn	SWE	59.32	14.12	0.58
Krokstad	SWE	59.10	12.92	0.57
Kungsor	SWE	59.43	16.10	0.66
Kyrkebyn	SWE	59.27	13.07	0.58
Landsort	SWE	58.73	17.87	0.96
Lidkoping	SWE	58.50	13.17	0.60
Liljeholmsviken	SWE	59.32	18.00	0.65
Ljustero	SWE	59.52	18.63	0.70
Loudden	SWE	59.33	18.13	0.65
Lulea	SWE	65.58	22.17	0.85
Mariestad	SWE	58.72	13.83	0.59
Marsviken	SWE	58.67	16.95	0.69
Mem	SWE	58.48	16.42	0.68
Monsteras	SWE	57.03	16.47	0.85

Morbylanga	SWE	56.53	16.37	0.99
Motala	SWE	58.53	15.07	0.59
Munksund	SWE	65.28	21.48	0.85
Norrkoping	SWE	58.60	16.20	0.68
Norrsundet	SWE	60.95	17.17	0.78
Norrtalje	SWE	59.75	18.70	0.72
Norsbron	SWE	59.42	13.23	0.58
Nykoping	SWE	58.75	17.02	0.69
Nynashamn	SWE	58.90	17.95	0.96
Oaxen	SWE	55.97	17.72	0.94
Orebro	SWE	59.28	15.18	0.60
Oregrund	SWE	60.33	18.45	0.97
Ornskoldsvik	SWE	63.27	18.72	0.78
Oskarshamn	SWE	57.27	16.45	0.84
Otterbacken	SWE	58.95	14.05	0.61
Oxelosund	SWE	58.67	17.12	0.95
Pataholm	SWE	56.92	16.43	0.98
Ronehamn	SWE	57.17	18.53	0.96
Ronneby	SWE	56.17	15.30	0.87
Rundvik	SWE	63.53	19.45	0.82
Saffle	SWE	59.13	12.93	0.57
Sandhamn	SWE	59.28	18.90	0.95
Sankt Anna	SWE	58.33	16.70	0.69
Simpevarp	SWE	57.42	16.67	1.04
Simrishamn	SWE	55.55	14.37	1.06
Sjotorp	SWE	58.83	14.00	0.60
Skattkar	SWE	59.42	13.70	0.58
Skelleftea	SWE	64.73	20.95	0.88
Skoghall	SWE	59.32	13.45	0.55
Skutskar	SWE	60.65	17.40	0.73
Slite	SWE	57.70	18.82	0.96
Slottsbron	SWE	59.33	13.10	0.58
Soderhamn	SWE	61.32	17.10	1.03
Soderkoping	SWE	58.48	16.33	0.69
Sodertalje	SWE	59.20	17.63	0.92
Solvesborg	SWE	56.05	14.58	0.87
Soraker	SWE	62.50	17.50	0.78
Spesshult	SWE	59.07	12.92	0.57
Stavsnas	SWE	59.28	18.68	0.94
Stockholm	SWE	59.32	18.05	0.65
Stocksund	SWE	59.38	18.05	0.65
Stora Vika	SWE	58.93	17.78	0.96
Storugns	SWE	57.83	18.80	0.92
Straa	SWE	57.90	19.03	0.92
Strangnas	SWE	59.38	17.03	0.72
Studsvik	SWE	58.75	17.28	0.69
Sturko	SWE	56.08	15.67	0.87
Sundsvall	SWE	62.42	17.33	0.85
Taxinge	SWE	59.22	17.37	0.68
Torko	SWE	56.15	15.40	0.87

Trelleborg	SWE	55.37	13.15	0.84
Umea	SWE	63.70	20.35	1.07
Uppsala	SWE	59.87	17.65	0.54
Valdemarsvik	SWE	58.20	16.60	0.69
Vaxholm	SWE	59.38	18.33	0.67
Vesteras	SWE	59.60	16.43	0.68
Vestervik	SWE	57.75	16.65	1.01
Visby	SWE	57.65	18.28	0.86
Ystad	SWE	55.43	13.83	0.84
Cherkassy	UKR	49.43	32.05	0.43
Dneprodzerzhinsk	UKR	48.50	34.62	0.57
Dnepropetrovsk	UKR	48.48	35.00	0.61
Kiev	UKR	50.42	30.50	0.40
Kremenchug	UKR	49.05	33.42	0.48
Mariupol	UKR	47.05	37.50	1.04
Reni	UKR	45.43	28.30	0.92
Tyaginka	UKR	46.75	33.05	0.72
Zaporozhye	UKR	47.83	35.17	0.75
Albany	USA	42.65	-73.75	0.62
Allyns Point	USA	41.43	-72.07	0.85
Alpena	USA	45.05	-83.43	0.33
Alsen	USA	42.18	-73.92	0.58
Ashland	USA	46.58	-90.90	0.31
Ashtabula	USA	41.92	-80.82	0.63
Bangor	USA	44.80	-68.78	0.26
Bath	USA	43.90	-69.82	0.59
Bay City	USA	43.58	-83.88	0.50
Bayfield	USA	46.80	-90.80	0.38
Belfast	USA	44.42	-69.00	0.79
Benton Harbour	USA	42.12	-86.45	0.49
Beverly	USA	46.82	-119.92	0.92
Brevort	USA	46.00	-85.03	0.33
Buchanan	USA	41.20	-73.92	0.95
Bucksport	USA	44.57	-68.80	0.53
Buffalo	USA	42.88	-78.88	0.60
Buffington	USA	41.63	-87.42	0.51
Burns Harbour	USA	41.63	-87.18	0.51
Calcite	USA	45.40	-83.78	0.36
Catskill	USA	42.22	-73.88	0.58
Cedarville	USA	45.98	-84.35	0.44
Cementon	USA	42.13	-73.92	0.63
Charlevoix	USA	45.32	-85.22	0.28
Cheboygan	USA	45.67	-84.47	0.32
Chicago	USA	41.83	-87.63	0.48
Clayton	USA	44.23	-76.08	0.48
Cleveland	USA	41.52	-81.72	0.70
Conneaut	USA	41.97	-80.57	0.62
Coxsackie	USA	42.33	-73.80	0.60
Detour	USA	45.97	-83.88	0.46
Detroit	USA	42.33	-83.03	0.53

Duluth	USA	46.73	-92.15	0.46
Erie	USA	42.17	-80.08	0.62
Escanaba	USA	45.78	-87.07	0.28
Essexville	USA	43.60	-83.83	0.50
Fairport	USA	41.77	-81.32	0.68
Ferrysburg	USA	43.08	-86.23	0.42
Gary Harbour	USA	41.60	-87.35	0.50
Grand Haven	USA	43.07	-86.25	0.43
Grand River	USA	41.73	-81.28	0.67
Green Bay	USA	44.52	-88.00	0.37
Harbour Beach	USA	43.83	-82.65	0.33
Holland (MI)	USA	42.78	-86.22	0.45
Huron	USA	41.40	-82.58	0.73
Hyde Park	USA	41.78	-73.93	0.64
Indiana Harbour	USA	41.67	-87.50	0.51
Kalama	USA	46.02	-122.83	0.98
Kenosha	USA	42.58	-87.82	0.31
Kewaunee	USA	44.45	-87.52	0.36
Kingston	USA	41.87	-73.97	0.63
Lafayette	USA	40.40	-86.88	0.93
Lorain	USA	41.47	-82.17	0.73
Ludington	USA	43.97	-86.45	0.49
Mackinaw City	USA	45.75	-84.73	0.32
Manistee	USA	44.25	-86.33	0.50
Manitowoc	USA	44.10	-87.63	0.35
Marblehead	USA	41.53	-82.72	0.80
Marine City	USA	42.72	-82.48	0.40
Marinette	USA	45.12	-87.62	0.28
Marquette	USA	46.60	-87.38	0.52
Marysville	USA	42.92	-82.48	0.39
Menominee	USA	45.13	-87.62	0.29
Milton	USA	41.60	-73.95	0.76
Milwaukee	USA	43.05	-87.87	0.31
Monroe	USA	41.92	-83.33	0.76
Mossville	USA	40.80	-89.57	0.95
Muskegon	USA	43.18	-86.23	0.41
New London	USA	41.40	-72.10	0.95
Newburgh	USA	41.50	-74.08	0.77
Ogdensburg	USA	44.70	-75.50	0.31
Olympia	USA	47.05	-122.90	1.01
Ontonagon	USA	46.87	-89.30	0.42
Oswego	USA	43.47	-76.53	0.53
Peekskill	USA	41.25	-73.92	0.95
Peoria	USA	40.68	-89.58	0.95
Pittsburgh (PA)	USA	40.43	-80.00	0.83
Point Pleasant	USA	38.88	-82.12	1.07
Port Dolomite	USA	45.97	-84.27	0.39
Port Huron	USA	42.98	-82.43	0.38
Port Inland	USA	45.97	-85.87	0.36
Port Washington	USA	43.38	-87.87	0.32

Portland (OR)	USA	45.57	-122.73	1.01
Poughkeepsie	USA	41.68	-73.88	0.64
Providence	USA	41.80	-71.38	1.08
Racine	USA	42.73	-87.80	0.31
Ravena	USA	42.47	-73.80	0.61
Rensselaer	USA	42.65	-73.73	0.62
Rochester (NY)	USA	43.28	-77.60	0.44
Rockport (MI)	USA	45.20	-83.38	0.36
Rogers City	USA	45.40	-83.83	0.36
Roseton	USA	41.57	-74.00	0.67
Saginaw	USA	43.45	-83.92	0.52
Sandusky	USA	41.45	-82.73	0.78
Searsport	USA	44.45	-68.92	1.03
Sheboygan	USA	43.75	-87.70	0.38
Shippensburg	USA	40.03	-77.52	0.89
Silver Bay	USA	47.28	-91.27	0.91
Somerset	USA	41.78	-71.13	1.02
South Brewer	USA	44.78	-68.78	0.26
South Haven	USA	42.45	-86.25	0.46
St. Clair	USA	42.82	-82.47	0.40
St. Joseph	USA	42.08	-86.50	0.51
Stoneport	USA	45.28	-83.43	0.37
Stony Point	USA	41.23	-73.97	0.95
Superior	USA	46.72	-92.08	0.46
Taconite Harbour	USA	47.50	-90.92	0.88
The Dalles	USA	45.58	-121.18	0.73
Toledo	USA	41.70	-83.47	0.78
Tomkins Cove	USA	41.27	-73.98	0.95
Tonawanda	USA	43.02	-78.88	0.60
Troutdale	USA	45.53	-122.38	1.02
Troy	USA	42.73	-73.68	0.61
Two Harbours	USA	47.02	-91.67	0.77
Umatilla	USA	45.92	-119.33	1.05
Vancouver	USA	45.63	-122.67	1.01
Waddington	USA	44.85	-75.20	0.23
Waukegan	USA	42.37	-87.83	0.38
Whitefish Point	USA	46.75	-84.95	0.55
Willbridge	USA	45.57	-122.75	1.01
Winterport	USA	44.63	-68.85	0.46
Wiscasset	USA	44.00	-69.67	0.59
Wyandotte	USA	42.18	-83.15	0.67
Yonkers	USA	40.95	-73.83	1.10
Zilwaukee	USA	43.47	-83.92	0.52

Appendix B. List of global ports that have highest environmental similarity to Sorel-Tracy. NIS originating from these ports have the highest potential for survival if introduced at Sorey-Tracy.

Name	Country	Latitude	Longitude	Environmental Distance
Eckero	ALD	60.22	19.60	0.91
Korneuburg	AUT	48.37	16.33	0.61
Linz	AUT	48.32	14.30	0.55
Vienna	AUT	48.22	16.37	0.66
Antwerp	BEL	51.24	4.41	0.90
Baasrode	BEL	51.05	4.17	0.92
Balen	BEL	51.17	5.17	0.87
Boom	BEL	51.08	4.37	0.89
Brussels	BEL	50.83	4.32	0.90
Buggenhout	BEL	51.02	4.20	0.90
Burcht	BEL	51.20	4.33	0.92
Chatelineau	BEL	50.42	4.52	0.84
Dendermonde	BEL	51.03	4.12	0.92
Doel	BEL	51.32	4.27	0.93
Engis	BEL	50.58	5.40	0.83
Ertvelde	BEL	51.20	3.78	0.95
Geel	BEL	51.15	4.97	0.87
Genk	BEL	50.94	5.50	0.86
Ghent	BEL	51.09	3.75	0.94
Grimbergen	BEL	50.93	4.37	0.88
Grobbendonk	BEL	51.20	4.75	0.88
Haren	BEL	50.90	4.38	0.88
Hemiksem	BEL	51.15	4.34	0.89
Hermalle sous Huy	BEL	50.55	5.37	0.83
Hingene	BEL	51.12	4.27	0.90
Hoboken	BEL	51.17	4.33	0.90
Humbeek	BEL	50.97	4.38	0.88
Kallo	BEL	51.25	4.28	0.92
Kapelle op den Bos	BEL	51.02	4.37	0.89
Kruibeke	BEL	51.17	4.32	0.90
Kwaadmechelen	BEL	51.10	5.15	0.87
Lanaken	BEL	50.88	5.65	0.86
Langerbrugge	BEL	51.12	3.75	0.94
Liefkenshoek	BEL	51.30	4.28	0.93
Liege	BEL	50.64	5.57	0.83
Lillo	BEL	51.30	4.30	0.93
Lixhe	BEL	50.73	5.70	0.84
Maasmechelen	BEL	50.97	5.70	0.86
Marly	BEL	50.88	4.38	0.88
Mechelen	BEL	51.03	4.47	0.89
Melle	BEL	51.00	3.80	0.91
Merksem	BEL	51.23	4.48	0.90
Nameche	BEL	50.47	4.98	0.84
Niel	BEL	51.12	4.33	0.90
Olen	BEL	51.15	4.87	0.87
Puurs	BEL	51.07	4.27	0.90

Rieme	BEL	51.17	3.77	0.94
Ruisbroek	BEL	50.78	4.28	0.90
Rumst	BEL	51.07	4.42	0.89
Rupelmonde	BEL	51.13	4.28	0.90
Schelle	BEL	51.13	4.32	0.90
Schoten	BEL	51.25	4.50	0.90
Seilles	BEL	50.50	5.08	0.84
Sint-Kruis-Winkel	BEL	51.15	3.80	0.94
Temse	BEL	51.13	4.22	0.90
Terdonk	BEL	51.15	3.78	0.94
Terhagen	BEL	51.08	4.38	0.89
Tessenderlo	BEL	51.07	5.08	0.87
Tielrode	BEL	51.12	4.22	0.90
Tisselt	BEL	51.03	4.37	0.89
Val St. Lambert	BEL	50.57	5.47	0.83
Verbrande Brug	BEL	50.95	4.38	0.88
Vilvoorde	BEL	50.95	4.42	0.88
Willebroek	BEL	51.05	4.35	0.89
Wintham	BEL	51.10	4.28	0.90
Wondelgem	BEL	51.08	3.72	0.94
Zelzate	BEL	51.20	3.80	0.95
Zutendaal	BEL	50.92	5.57	0.86
Zwyndrecht	BEL	51.22	4.33	0.92
Kozloduy	BGR	43.78	23.72	0.89
Lom	BGR	43.83	23.20	0.82
Rousse	BGR	43.83	25.97	0.81
Silistra	BGR	44.10	27.25	0.82
Amherstburg	CAN	42.10	-83.08	0.54
Baddeck	CAN	46.10	-60.73	0.87
Bath	CAN	44.17	-76.77	0.28
Batiscan	CAN	46.52	-72.23	0.26
Bayside	CAN	45.17	-67.13	0.89
Becancour	CAN	46.40	-72.38	0.18
Belleville	CAN	44.13	-77.37	0.24
Bowmanville	CAN	43.90	-78.67	0.31
Boylston	CAN	45.45	-61.52	1.00
Britt	CAN	45.77	-80.58	0.43
Brockville	CAN	44.60	-75.63	0.17
Bronte	CAN	43.40	-79.70	0.33
Bruce Mines	CAN	46.27	-83.72	0.65
Burlington	CAN	43.32	-79.75	0.31
Cardinal	CAN	44.78	-75.33	0.18
Chicoutimi	CAN	48.43	-71.08	0.40
Clarkson	CAN	43.50	-79.60	0.32
Cobourg	CAN	43.95	-78.17	0.26
Colborne	CAN	44.00	-77.88	0.25
Collingwood	CAN	44.50	-80.23	0.34
Contrecoeur	CAN	45.88	-73.20	0.03
Cornwall	CAN	45.02	-74.72	0.13
Corunna	CAN	42.88	-82.45	0.30

Cote Ste-Catherine	CAN	45.41	-73.58	0.13
Country Harbour	CAN	45.22	-61.73	1.04
Courtright	CAN	42.80	-82.45	0.32
Erieau	CAN	42.25	-81.93	0.47
Fort Erie	CAN	42.93	-78.95	0.44
Fredericton	CAN	45.95	-66.65	0.24
Gananoque	CAN	44.32	-76.15	0.31
Goderich	CAN	43.75	-81.75	0.39
Gold River	CAN	49.68	-126.12	1.05
Goose Bay	CAN	53.35	-60.42	1.06
Grondines	CAN	46.75	-72.03	0.38
Hamilton	CAN	43.23	-79.85	0.35
Hay River	CAN	60.85	-115.70	1.06
Humberstone	CAN	42.90	-79.25	0.41
Iona	CAN	45.97	-60.80	0.56
Killarney	CAN	45.97	-81.52	0.54
Kingston	CAN	44.20	-76.50	0.30
Kingsville	CAN	42.02	-82.72	0.56
Kitimat	CAN	54.00	-128.70	0.90
Lanoraie	CAN	45.97	-73.18	0.03
Lauzon	CAN	46.82	-71.15	0.29
Leamington	CAN	42.05	-82.62	0.57
Levis	CAN	46.82	-71.18	0.19
Little Current	CAN	45.97	-81.92	0.28
Little Narrows	CAN	45.98	-60.98	0.52
Long Sault	CAN	45.02	-74.90	0.07
Meldrum Bay	CAN	45.92	-83.10	0.61
Michipicoten Harbour	CAN	47.95	-84.92	0.86
Midland	CAN	44.75	-79.93	0.35
Montréal	CAN	45.50	-73.55	0.15
Mooretown	CAN	42.85	-82.47	0.30
Morrisburg	CAN	44.93	-75.18	0.08
Nanticoke	CAN	42.82	-80.07	0.37
Nelson	CAN	49.47	-117.30	1.03
Oakville	CAN	43.43	-79.67	0.34
Oshawa	CAN	43.87	-78.83	0.33
Ottawa	CAN	45.40	-75.70	0.04
Owen Sound	CAN	44.58	-80.95	0.37
Parry Sound	CAN	45.37	-80.05	0.35
Pelee Island	CAN	41.75	-82.67	0.60
Picton	CAN	44.00	-77.13	0.28
Pointe aux Trembles	CAN	45.63	-73.48	0.07
Port Alberni	CAN	49.23	-125.00	1.00
Port Burwell	CAN	42.63	-80.80	0.38
Port Colborne	CAN	42.87	-79.25	0.42
Port Credit	CAN	43.55	-79.60	0.36
Port Dalhousie	CAN	43.20	-79.27	0.33
Port Dover	CAN	42.78	-80.20	0.35
Port Hope	CAN	43.95	-78.28	0.26
Port Maitland	CAN	42.87	-79.58	0.40

Port McNicoll	CAN	44.75	-79.80	0.31
Port Stanley	CAN	42.67	-81.22	0.37
Port Weller	CAN	43.23	-79.22	0.33
Prescott	CAN	44.72	-75.52	0.14
Québec	CAN	46.82	-71.20	0.19
Sarnia	CAN	42.98	-82.42	0.30
Sault Ste. Marie	CAN	46.52	-84.33	0.57
Sombra	CAN	42.70	-82.47	0.32
Sonora	CAN	45.07	-61.92	1.07
Sorel	CAN	46.05	-73.12	0.00
Spragge	CAN	46.22	-82.67	0.42
St. Catharines	CAN	43.17	-79.27	0.32
St. Romuald	CAN	46.75	-71.23	0.19
St. Stephen	CAN	45.20	-67.28	0.49
Ste. Croix	CAN	46.63	-71.73	0.26
Thessalon	CAN	46.25	-83.55	0.63
Thorold	CAN	43.08	-79.17	0.39
Three Rivers	CAN	46.35	-72.55	0.16
Thunder Bay	CAN	48.42	-89.22	1.02
Tobermory	CAN	45.23	-81.65	0.59
Toronto	CAN	43.63	-79.38	0.35
Tracy	CAN	46.02	-73.17	0.05
Valleyfield	CAN	45.22	-74.08	0.11
Wallaceburg	CAN	42.60	-82.40	0.32
Welland	CAN	42.97	-79.22	0.36
Weymouth	CAN	44.45	-66.02	0.96
Wheatley	CAN	42.08	-82.43	0.48
Whitby	CAN	43.85	-78.92	0.36
Windsor	CAN	42.32	-83.05	0.34
Basle	CHE	47.55	7.57	0.69
Dandong	CHN	40.13	124.40	0.91
Fujin	CHN	47.25	132.02	0.35
Harbin	CHN	45.73	126.60	0.38
Heihe	CHN	50.23	127.47	0.52
Jiamusi	CHN	46.80	130.35	0.34
Panjin	CHN	41.12	122.07	0.77
Panshi	CHN	42.92	126.03	0.29
Tongjiang	CHN	47.63	132.50	0.38
Chvaletice	CZE	50.02	15.43	0.57
Usti nad Labem	CZE	50.67	14.03	0.58
Aken	DEU	51.85	12.03	0.67
Andernach	DEU	50.42	7.38	0.77
Anklam	DEU	53.87	13.68	0.87
Aschaffenburg	DEU	49.95	9.17	0.68
Barth	DEU	54.37	12.73	0.92
Bendorf	DEU	50.42	7.58	0.76
Berlin	DEU	52.53	13.42	0.63
Berne	DEU	53.18	10.50	0.78
Bingen	DEU	49.95	7.90	0.73
Bodenwerder	DEU	51.97	9.50	0.77

Boizenburg	DEU	53.38	10.73	0.78
Bonn	DEU	50.72	7.08	0.82
Brandenburg	DEU	52.40	12.52	0.66
Braunschweig	DEU	52.25	10.50	0.74
Brohl	DEU	50.42	7.30	0.77
Castrop Rauxel	DEU	51.55	7.30	0.85
Cologne	DEU	50.93	7.00	0.84
Deggendorf	DEU	48.83	12.97	0.57
Dormagen	DEU	51.10	6.95	0.85
Dortmund	DEU	51.53	7.45	0.84
Duisburg	DEU	51.43	6.75	0.87
Dusseldorf	DEU	51.25	6.77	0.86
Eisenhuttenstadt	DEU	52.15	14.62	0.54
Emmerich	DEU	51.85	6.25	0.89
Erftstadt	DEU	50.80	6.75	0.82
Essen	DEU	51.45	7.02	0.84
Frankfurt	DEU	50.12	8.67	0.69
Geesthacht	DEU	53.43	10.38	0.78
Gelsenkirchen	DEU	51.50	7.08	0.84
Germersheim	DEU	49.22	8.38	0.75
Gernsheim	DEU	49.75	8.47	0.72
Greifswald	DEU	54.10	13.38	0.94
Haren	DEU	52.80	7.25	0.93
Havelberg	DEU	52.83	12.07	0.69
Heringsdorf	DEU	53.97	14.17	0.83
Hohenhorn	DEU	53.47	10.37	0.78
Homberg	DEU	51.45	6.72	0.87
Hoya	DEU	52.80	9.13	0.79
Ibbenburen	DEU	52.28	7.73	0.83
Karlsruhe	DEU	49.05	8.33	0.76
Kehl	DEU	48.58	7.83	0.74
Koblenz	DEU	50.33	7.58	0.75
Krefeld	DEU	51.33	6.57	0.87
Kroslin	DEU	54.13	13.75	1.00
Ladebow	DEU	54.10	13.45	0.94
Lahnstein	DEU	50.30	7.62	0.75
Lauenburg	DEU	53.38	10.55	0.78
Lauterbach	DEU	54.33	13.52	1.03
Leer	DEU	53.22	7.45	0.94
Leeseringen	DEU	52.58	9.13	0.78
Leverkusen	DEU	51.02	7.03	0.83
Lubmin	DEU	54.12	13.60	0.91
Ludwigshafen am Rhein	DEU	49.47	8.45	0.74
Magdeburg	DEU	52.13	11.62	0.67
Mainz	DEU	50.00	8.28	0.71
Mannheim	DEU	49.48	8.47	0.74
Minden	DEU	52.30	8.90	0.78
Monheim	DEU	51.12	6.82	0.85
Moselkern	DEU	50.18	7.37	0.75
Mukran	DEU	54.48	13.58	1.06

Mulheim	DEU	50.95	7.05	0.82
Neckarsteinach	DEU	49.43	8.80	0.68
Neuss	DEU	51.20	6.70	0.86
Neuss/Dusseldorf	DEU	51.20	6.70	0.86
Neuwied	DEU	50.43	7.48	0.77
Nienburg	DEU	52.63	9.22	0.78
Nuremberg	DEU	49.45	11.05	0.61
Orsoy	DEU	51.53	6.68	0.87
Osnabruck	DEU	52.27	8.03	0.81
Papenburg	DEU	53.08	7.38	0.88
Passau	DEU	48.58	13.47	0.58
Peenemunde	DEU	54.12	13.77	1.00
Peine	DEU	52.32	10.22	0.75
Porz	DEU	50.88	7.05	0.82
Regensburg	DEU	49.02	12.12	0.58
Remagen	DEU	50.57	7.22	0.78
Rheinhausen	DEU	51.42	6.73	0.87
Rinteln	DEU	52.20	9.08	0.78
Rosslau	DEU	51.90	12.27	0.66
Rostock	DEU	54.15	12.10	0.94
Ruhrort	DEU	51.45	6.73	0.87
Salzgitter	DEU	52.22	10.33	0.75
Sassnitz	DEU	54.52	13.63	1.06
Speyer	DEU	49.30	8.43	0.75
Stralsund	DEU	54.32	13.10	0.94
Sturzelberg	DEU	51.12	6.80	0.85
Stuttgart	DEU	48.78	9.20	0.68
Tangermunde	DEU	52.57	11.97	0.69
Ueckermunde	DEU	53.73	14.28	0.97
Urdingen	DEU	51.35	6.67	0.87
Vallendar	DEU	50.40	7.62	0.76
Vierow	DEU	54.10	13.57	0.91
Walsum	DEU	51.53	6.68	0.87
Warnemunde	DEU	54.18	12.08	0.96
Weissenthurm	DEU	50.42	7.48	0.77
Wesel	DEU	51.65	6.60	0.87
Wesseling	DEU	50.83	7.00	0.82
Wolgast	DEU	54.05	13.78	1.00
Worms	DEU	49.63	8.35	0.73
Wurzburg	DEU	49.78	9.93	0.67
Gudhjem	DNK	55.22	14.97	0.98
Hvalpsund	DNK	56.68	9.20	0.89
Logstor	DNK	56.97	9.25	0.89
Nekso	DNK	55.07	15.15	1.04
Nykobing	DNK	56.80	8.87	1.09
Skarrehage	DNK	56.95	8.87	1.06
Skive	DNK	56.57	9.03	0.89
Stege	DNK	54.98	12.28	1.09
Stubbekobing	DNK	54.88	12.03	1.06
Svaneke	DNK	55.13	15.15	1.04

Thisted	DNK	56.95	8.70	0.96
Bekker	EST	59.45	24.67	0.78
Dirhami	EST	59.22	23.50	1.04
Forby	EST	59.00	23.17	1.00
Haapsalu	EST	58.95	23.53	0.78
Heltermaa	EST	58.87	23.07	0.88
Kuivastu	EST	58.58	23.40	0.86
Kunda	EST	59.52	26.55	1.00
Lehtma	EST	59.05	22.70	1.08
Loksa	EST	59.58	25.72	1.00
Meeruse	EST	59.45	24.68	0.77
Miiduranna	EST	59.50	24.82	1.07
Montu	EST	57.95	22.12	0.91
Muuga	EST	59.50	24.97	1.07
Narva Joesuu	EST	59.47	28.05	0.72
Paldiski	EST	59.35	24.05	1.07
Paljassaare	EST	59.45	24.70	0.77
Parnu	EST	58.38	24.48	0.70
Peetri	EST	59.45	24.73	0.77
Prangli Island	EST	59.63	25.00	1.01
Rohukula	EST	58.90	23.42	0.88
Roomassaare	EST	58.22	22.52	0.86
Saaremaa Harbour	EST	58.53	22.23	0.91
Sillamae	EST	59.40	27.78	0.72
Tallinn	EST	59.45	24.75	0.77
Veere	EST	58.45	22.05	0.85
Virtsu	EST	58.58	23.55	0.77
Dalsbruk	FIN	60.03	22.52	0.81
Hamina	FIN	60.57	27.18	0.69
Hanko	FIN	59.82	22.97	1.10
Helsinki	FIN	60.17	24.95	0.69
Imatra	FIN	61.17	28.83	0.60
Inkoo	FIN	60.05	24.02	0.87
Isnas	FIN	60.40	26.00	0.76
Joensuu	FIN	62.60	29.75	0.73
Joutseno	FIN	61.13	28.48	0.60
Kantvik	FIN	60.08	24.38	0.85
Kaukas	FIN	61.07	28.22	0.60
Kaukopaa	FIN	61.25	28.87	0.64
Kemi	FIN	65.73	24.57	1.04
Kokkila	FIN	60.33	22.87	0.82
Kotka	FIN	60.47	26.95	0.95
Koverhar	FIN	59.88	23.22	1.10
Kristiinankaupunki	FIN	62.27	21.32	0.84
Kronvik	FIN	63.05	21.52	0.89
Kuopio	FIN	62.85	27.50	0.68
Kustavi	FIN	60.57	21.33	0.86
Kuuslahti	FIN	63.12	27.75	0.66
Lapaluoto	FIN	64.67	24.42	0.98
Lappeenranta	FIN	61.07	28.25	0.60

Lappohja	FIN	59.90	23.27	1.10
Lappvik	FIN	59.90	23.27	1.10
Lauritsala	FIN	61.08	28.33	0.60
Loviisa	FIN	60.45	26.23	0.73
Luvia	FIN	61.33	21.57	0.85
Mantyluoto	FIN	61.58	21.50	0.84
Martinniemi	FIN	65.22	25.28	0.94
Maxmo	FIN	63.20	22.03	0.92
Merikarvia	FIN	61.85	21.47	0.88
Mjosund	FIN	60.22	22.47	0.78
Mustola	FIN	61.07	28.30	0.60
Naantali	FIN	60.47	22.02	0.79
Nyhamn	FIN	62.17	21.33	0.84
Olkiluoto	FIN	61.25	21.50	0.83
Oulu	FIN	65.00	25.47	0.91
Parainen	FIN	60.28	22.30	0.79
Pateniemi	FIN	65.08	25.40	0.93
Perno	FIN	60.45	26.05	0.75
Pori	FIN	61.48	21.80	0.87
Puhos	FIN	62.10	29.92	0.70
Raahe	FIN	64.68	24.48	1.01
Rahja	FIN	64.20	23.73	0.98
Rauma	FIN	61.13	21.50	0.85
Ristiina	FIN	61.53	27.42	0.67
Roytta	FIN	65.77	24.15	1.05
Salo	FIN	60.38	23.17	0.84
Savonlinna	FIN	61.90	28.92	0.65
Siilinjarvi	FIN	63.08	27.67	0.67
Sipoo	FIN	60.37	25.32	0.77
Skogby	FIN	59.92	23.32	1.10
Skoldvik	FIN	60.30	25.55	0.74
Skuru	FIN	60.10	23.55	0.85
Stromma	FIN	60.18	22.90	0.82
Summa	FIN	60.53	27.12	0.69
Svartback	FIN	60.28	25.53	0.74
Taalintehdas	FIN	60.02	22.52	0.81
Tammisaari	FIN	59.98	23.43	0.82
Teijo	FIN	60.25	22.95	0.82
Tolkkinen	FIN	60.33	25.58	0.74
Tornio	FIN	65.85	24.15	1.03
Tupavuori	FIN	60.45	22.07	0.79
Turku	FIN	60.43	22.22	0.78
Uusikaupunki	FIN	60.80	21.40	0.85
Vaasa	FIN	63.10	21.62	0.89
Valkom	FIN	60.42	26.27	0.73
Varkaus	FIN	62.33	27.83	0.64
Vartsala	FIN	60.33	23.02	0.84
Vastanfjard	FIN	60.05	22.65	0.81
Veitsiluoto	FIN	65.70	24.62	1.04
Annay sous Lens	FRA	50.47	2.87	0.95

Bethune	FRA	50.53	2.63	0.99
Bonnieres	FRA	49.03	1.58	0.97
Chalon-sur-Saone	FRA	46.78	4.83	0.82
Conflans	FRA	48.98	2.10	0.96
Duclair	FRA	49.45	0.87	1.04
Elbeuf	FRA	49.28	1.12	1.01
Gaillon	FRA	49.17	1.32	0.98
Grand Couronne	FRA	49.37	0.98	1.04
Grigny	FRA	45.62	4.78	0.87
Ingrandes	FRA	47.40	-0.92	1.09
La Mailleraye	FRA	49.48	0.77	1.04
Le Pouzin	FRA	44.75	4.75	1.07
Le Trait	FRA	49.47	0.80	1.04
Les Andelys	FRA	49.25	1.43	0.98
Lille	FRA	50.65	3.08	0.95
Lillebonne	FRA	49.52	0.53	1.08
Limay	FRA	48.97	1.78	0.95
Lyon	FRA	45.77	4.83	0.87
Mantes	FRA	48.98	1.72	0.95
Paris	FRA	48.87	2.33	0.99
Petit Couronne	FRA	49.37	1.00	1.04
Port Jerome	FRA	49.47	0.53	1.09
Rouen	FRA	49.48	1.08	1.02
St. Etienne du Rouvray	FRA	49.37	1.12	1.02
St. Wandrille	FRA	49.53	0.75	1.05
Strasbourg	FRA	48.57	7.70	0.74
Vernon	FRA	49.08	1.48	0.97
Villeneuve-la-Garenne	FRA	48.92	2.30	0.99
Villeneuve-le-Roi	FRA	48.73	2.40	0.99
Villequier	FRA	49.50	0.67	1.07
Althorpe Wharf	GBR	53.57	-0.73	1.08
Aylesford	GBR	51.27	0.47	1.10
Beckingham	GBR	53.40	-0.83	1.06
Burton upon Stather	GBR	53.65	-0.68	1.08
Drax	GBR	53.73	-0.98	1.07
Flixborough	GBR	53.62	-0.68	1.08
Gainsborough	GBR	53.40	-0.77	1.05
Gloucester	GBR	51.87	-2.22	1.06
Goole	GBR	53.70	-0.87	1.10
Grove Wharf	GBR	53.60	-0.68	1.08
Gunness	GBR	53.58	-0.72	1.08
Gunness Wharf	GBR	53.58	-0.68	1.08
Halling	GBR	51.37	0.01	1.05
Howdendyke	GBR	53.75	-0.87	1.10
Keadby	GBR	53.60	-0.67	1.08
Knottingley	GBR	53.72	-1.23	1.09
London	GBR	51.50	-0.07	1.05
Neap House	GBR	53.62	-0.67	1.08
Selby	GBR	53.78	-1.07	1.08
Thorne	GBR	53.62	-0.97	1.06

Budapest	HUN	47.50	19.03	0.76
Boretto	ITA	44.90	10.55	1.10
Cremona	ITA	45.13	10.02	1.04
Pavia	ITA	45.18	9.13	1.05
Klaipeda	LTU	55.72	21.13	0.80
Engure	LVA	57.17	23.23	0.93
Labrags	LVA	56.98	21.37	1.02
Liepaja	LVA	56.52	21.02	0.90
Mersrags	LVA	57.37	23.13	0.87
Pavilosta	LVA	56.90	21.18	0.90
Riga	LVA	56.97	24.10	0.71
Roja	LVA	57.50	22.82	0.85
Salacgriva	LVA	57.75	24.37	0.76
Skulte	LVA	57.32	24.40	0.73
Ventspils	LVA	57.40	21.55	0.92
Chisinau	MDA	47.02	28.83	0.58
Aalst	NLD	51.38	5.45	0.89
Alblasserdam	NLD	51.87	4.62	0.84
Ameide	NLD	51.95	4.95	0.82
Amsterdam	NLD	52.37	4.90	1.10
Arnhem	NLD	51.97	5.88	0.89
Assen	NLD	53.00	6.57	0.93
Axel Sassing	NLD	51.28	3.87	1.02
Bergambacht	NLD	51.93	4.78	0.82
Bergen-op-Zoom	NLD	51.50	4.27	1.06
Bolnes	NLD	51.90	4.57	0.84
Bruinisse	NLD	51.67	4.10	0.99
Capelle aan den Yssel	NLD	51.92	4.57	0.84
Culemborg	NLD	51.95	5.22	0.90
Deest	NLD	51.88	5.67	0.90
Den Bommel	NLD	51.72	4.28	0.99
Dintelmond	NLD	51.67	4.38	0.94
Dinteloord	NLD	51.63	4.37	0.95
Dodewaard	NLD	51.90	5.63	0.90
Dordrecht	NLD	51.80	4.65	0.84
Druten	NLD	51.88	5.62	0.90
Eindhoven	NLD	51.43	5.50	0.89
Fijnaart	NLD	51.63	4.48	0.93
Geertruidenberg	NLD	51.72	4.87	0.91
Gendt	NLD	51.87	5.98	0.89
Gorinchem	NLD	51.82	4.98	0.91
Grave	NLD	51.75	5.75	0.90
Groot-Ammers	NLD	51.92	4.83	0.82
Hardinxveld	NLD	51.82	4.85	0.82
Heerewaarden	NLD	51.82	5.38	0.90
Heerjansdam	NLD	51.83	4.57	0.84
Heijen	NLD	51.68	5.98	0.89
Hellevoetsluis	NLD	51.82	4.13	1.09
Hendrik Ido Ambacht	NLD	51.85	4.62	0.84
Heusden	NLD	51.73	5.15	0.91

Huissen	NLD	51.92	5.92	0.89
Kinderdijk	NLD	51.88	4.63	0.84
Krimpen aan den Yssel	NLD	51.90	4.58	0.84
Lekkerkerk	NLD	51.92	4.63	0.84
Lithoyen	NLD	51.82	5.43	0.90
Lobith	NLD	51.87	6.13	0.89
Maasbracht	NLD	51.13	5.87	0.86
Maashees	NLD	51.57	6.03	0.89
Maassluis	NLD	51.92	4.25	0.91
Maastricht	NLD	50.85	5.68	0.86
Made	NLD	51.68	4.80	0.92
Middelharnis	NLD	51.78	4.20	1.03
Millingen aan den Rijn	NLD	51.87	6.03	0.89
Moerdijk	NLD	51.70	4.62	0.95
Nieuw Lekkerland	NLD	51.88	4.63	0.84
Nieuwerkerk aan den Yssel	NLD	51.97	4.58	0.84
Nijmegen	NLD	51.83	5.83	0.90
Numansdorp	NLD	51.72	4.42	0.98
Ooltgensplaat	NLD	51.68	4.33	0.97
Oosterhout	NLD	51.62	4.87	0.91
Oss	NLD	51.77	5.52	0.90
Ouderkerk	NLD	51.93	4.60	0.84
Oudewater	NLD	52.03	4.88	1.10
Ouwerkerk	NLD	51.63	3.98	1.06
Overschie	NLD	51.93	4.42	0.87
Paal	NLD	51.35	4.12	1.06
Papendrecht	NLD	51.83	4.63	0.84
Raamsdonksveer	NLD	51.70	4.92	0.91
Renkum	NLD	51.97	5.73	0.89
Rhenen	NLD	51.95	5.57	0.90
Ridderkerk	NLD	51.87	4.58	0.84
Rijswijk	NLD	51.78	5.02	0.90
Roermond	NLD	51.20	5.98	0.88
Rotterdam	NLD	51.90	4.48	0.85
Sas van Ghent	NLD	51.23	3.80	0.97
Schiedam	NLD	51.90	4.40	0.88
‘sGravendeel	NLD	51.77	4.60	0.84
‘sHertogenbosch	NLD	51.70	5.30	0.92
Sliedrecht	NLD	51.83	4.75	0.82
Slikkerveer	NLD	51.88	4.60	0.84
Sluiskil	NLD	51.30	3.83	1.03
Spijk	NLD	51.87	5.05	0.91
St. Annaland	NLD	51.62	4.10	0.91
Stavenisse	NLD	51.58	4.00	1.06
Stein	NLD	50.97	5.77	0.86
Swalmen	NLD	51.22	6.02	0.87
Tegelen	NLD	51.35	6.13	0.88
Tiel	NLD	51.88	5.45	0.90
Tilburg	NLD	51.55	5.07	0.90
Venlo	NLD	51.37	6.17	0.88

Vlaardingen	NLD	51.90	4.35	0.88
Waalwijk	NLD	51.70	5.07	0.91
Wageningen	NLD	51.97	5.67	0.90
Wanssum	NLD	51.53	6.08	0.89
Wartena	NLD	53.15	5.90	1.05
Werkendam	NLD	51.80	4.90	0.82
Willemstad	NLD	51.68	4.40	0.96
Zaltbommel	NLD	51.80	5.20	0.91
Zuilichem	NLD	51.80	5.12	0.91
Zwijndrecht	NLD	51.82	4.65	0.84
Herre	NOR	59.10	9.53	0.98
Menstad	NOR	59.17	9.65	0.93
Porsgrunn	NOR	59.13	9.65	0.97
Skien	NOR	59.20	9.62	0.99
Darlowo	POL	54.43	16.38	0.79
Elblag	POL	54.17	19.40	0.79
Frombork	POL	54.35	19.67	0.85
Gdansk	POL	54.35	18.65	0.94
Gdynia	POL	54.53	18.55	1.02
Kolobrzeg	POL	54.18	15.57	0.77
Kozle	POL	50.32	18.13	0.58
Niechorze	POL	54.10	15.07	0.78
Nowa Sol	POL	51.80	15.72	0.55
Plock	POL	52.53	19.67	0.43
Police	POL	53.55	14.60	0.81
Puck	POL	54.72	18.35	0.89
Stepnica	POL	53.65	14.63	0.81
Swinoujscie	POL	53.93	14.28	0.97
Szczecin	POL	53.42	14.55	0.82
Tczew	POL	54.08	18.77	0.85
Ustka	POL	54.58	16.87	1.05
Wladyslawowo	POL	54.80	18.42	1.04
Wroclaw	POL	51.08	17.00	0.59
Pyongyang	PRK	39.00	125.75	0.81
Songnim	PRK	38.73	125.62	0.92
Bazias	ROM	44.80	21.40	0.78
Braila	ROM	45.25	27.98	0.77
Bucharest	ROM	44.42	26.12	0.77
Calarasi	ROM	44.18	27.32	0.84
Galatz	ROM	45.42	28.08	0.77
Giurgiu	ROM	43.90	25.97	0.84
Oltenitza	ROM	44.03	26.58	0.83
Orsova	ROM	44.70	22.37	0.64
Tulcea	ROM	45.17	28.82	0.72
Turnu Severin	ROM	44.63	22.67	0.79
Akhtubinsk	RUS	48.33	46.17	0.72
Annenskiy Most	RUS	60.72	37.08	0.71
Astrakhan	RUS	46.37	48.07	0.75
Azov	RUS	47.10	39.43	0.98
Bagaevskaya	RUS	47.32	40.38	0.70

Balakhna	RUS	56.48	43.62	0.31
Balakovo	RUS	52.07	47.77	0.26
Baltiysk	RUS	54.65	19.90	0.95
Belyy Ruchey	RUS	60.90	36.83	0.73
Berezniki	RUS	59.43	56.82	0.58
Brusnichnoye	RUS	60.78	28.73	0.66
Cheboksary	RUS	56.13	47.23	0.29
Cherepovets	RUS	59.15	37.83	0.55
Chkalovsk	RUS	56.75	43.23	0.33
Gorokhovets	RUS	56.18	42.70	0.30
Kalach-na-Donu	RUS	48.72	43.48	0.49
Kaliningrad	RUS	54.72	20.52	0.79
Kamyshin	RUS	50.08	45.40	0.43
Kanonerskiy Is.	RUS	59.90	30.22	0.56
Kazan	RUS	55.75	49.17	0.19
Khabarovsk	RUS	48.50	135.17	0.37
Kineshma	RUS	57.45	42.12	0.42
Kirovsk	RUS	59.87	30.98	0.61
Komsomolsk-na-Amure	RUS	50.53	136.98	0.64
Kondopoga	RUS	62.20	34.28	0.75
Konstantinovsk	RUS	47.55	41.10	0.63
Kostroma	RUS	57.77	40.93	0.38
Kotlas	RUS	61.25	46.65	0.66
Krasnoyarsk	RUS	56.08	92.77	0.54
Krasnyye Barrikady	RUS	46.20	47.85	0.78
Kronshtadt	RUS	60.00	29.77	0.62
Lomonosov	RUS	59.83	29.80	0.65
Mago	RUS	53.25	140.22	0.83
Medvezhyegorsk	RUS	62.93	34.47	0.85
Mondoma	RUS	59.93	37.47	0.67
Naberezhnyye Chelny	RUS	55.68	52.30	0.24
Nadvoitsy	RUS	63.93	34.33	0.94
Navashino	RUS	55.55	42.18	0.26
Nikolayevsk	RUS	53.13	140.72	0.86
Nikolayevskaya	RUS	47.60	41.48	0.65
Nizhnekamsk	RUS	55.42	51.88	0.24
Nizhnetambovskoye	RUS	50.93	138.17	0.71
Nizhniy Novgorod	RUS	56.33	44.00	0.31
Nizhnyaya Gavan	RUS	52.40	140.43	0.82
Novgorod	RUS	58.50	31.33	0.50
Novocheboksarsk	RUS	56.10	47.48	0.26
Olya	RUS	45.78	47.53	0.83
Otradnoye	RUS	59.77	30.80	0.59
Pechora	RUS	65.23	57.30	1.00
Perm	RUS	58.02	56.17	0.45
Petrodvorets	RUS	59.88	29.92	0.59
Petrozavodsk	RUS	61.77	34.32	0.77
Pionerskiy	RUS	54.93	20.20	0.80
Podporozhye	RUS	60.92	34.03	0.65
Primorsk	RUS	60.37	28.63	0.67

Priozersk	RUS	61.02	30.13	0.66
Pudozh	RUS	61.83	36.53	0.71
Rostov	RUS	47.17	39.70	0.98
Rybinsk	RUS	58.02	38.87	0.47
Samara	RUS	53.17	50.17	0.09
Saratov	RUS	51.50	45.92	0.33
Segezha	RUS	63.70	34.32	0.94
Semikarakorsk	RUS	47.55	41.10	0.63
Shlisselburg	RUS	59.93	31.13	0.61
Solikamsk	RUS	59.67	56.75	0.60
Sosnovka	RUS	56.23	51.28	0.26
St. Petersburg	RUS	59.93	30.30	0.56
Svetlyy	RUS	54.63	20.15	0.79
Syzran	RUS	53.17	48.48	0.10
Taganrog	RUS	47.20	38.95	0.96
Tatyanka	RUS	45.93	48.28	0.84
Tolyatti	RUS	53.53	49.40	0.08
Tomsk	RUS	56.50	85.08	0.50
Ust Donets	RUS	47.67	40.95	0.64
Ust-Luga	RUS	59.67	28.30	0.71
Volgodonsk	RUS	47.50	42.12	0.62
Volgograd	RUS	48.75	44.50	0.56
Volzhskiy	RUS	48.82	44.73	0.65
Voznesenye	RUS	61.02	35.47	0.66
Vyborg	RUS	60.72	28.73	0.66
Vysotsk	RUS	60.63	28.57	0.66
Vytegra	RUS	61.07	36.45	0.67
Yakutsk	RUS	62.02	129.73	1.00
Yaroslavl	RUS	57.57	39.87	0.38
Yeisk	RUS	46.73	38.27	1.06
Zelenodolsk	RUS	55.83	48.50	0.22
Apatin	SCG	45.67	19.00	0.75
Belgrade	SCG	44.80	20.47	0.89
Bezdam	SCG	45.83	18.93	0.75
Kladovo	SCG	44.60	22.55	0.79
Mitrovica	SCG	42.90	20.87	0.58
Novi Becej	SCG	45.58	20.13	0.78
Novi Sad	SCG	45.27	19.83	0.78
Pancevo	SCG	44.87	20.67	0.91
Zrenjanin	SCG	45.37	10.38	1.00
Bratislava	SVK	48.15	17.12	0.60
Komarno	SVK	47.77	18.08	0.65
Aelvenaes	SWE	59.37	13.18	0.74
Amal	SWE	59.05	12.72	0.74
Ar	SWE	57.92	18.95	1.05
Arvika	SWE	59.67	12.58	0.75
Balsta	SWE	59.55	17.55	0.78
Borgholm	SWE	56.88	16.65	1.08
Bungenas	SWE	57.82	19.08	1.05
Byxelkrok	SWE	57.30	17.03	1.05

Dalaro	SWE	59.13	18.42	1.06
Edsvalla	SWE	59.43	13.23	0.74
Elleholm	SWE	56.17	14.73	0.94
Enkoping	SWE	59.63	17.08	0.85
Farosund	SWE	57.87	19.07	1.05
Fiskeback	SWE	57.87	14.10	0.83
Fittja	SWE	59.23	17.85	0.73
Furillen	SWE	57.77	19.00	1.02
Furusund	SWE	59.65	18.90	1.08
Gamleby	SWE	57.90	16.42	0.90
Gefle	SWE	60.67	17.17	0.95
Gruvon	SWE	59.33	13.12	0.74
Hallekis	SWE	58.67	13.42	0.75
Haparanda	SWE	65.83	24.13	1.05
Haraholmen	SWE	65.23	21.63	1.01
Hasselby	SWE	59.37	17.82	0.74
Hernosand	SWE	62.63	17.93	0.95
Hoglunda	SWE	59.42	13.25	0.74
Hogmarso	SWE	59.65	18.85	1.08
Honsater	SWE	58.63	13.45	0.75
Hornefors	SWE	63.62	19.90	0.96
Kagehamn	SWE	64.83	21.03	1.02
Kallviken	SWE	64.33	21.37	0.98
Kalmarsand	SWE	59.53	17.52	0.78
Kappelshamn	SWE	57.85	18.78	1.05
Karlshamn	SWE	56.17	14.87	0.97
Karlskrona	SWE	56.17	15.60	0.96
Karlstad	SWE	59.38	13.52	0.74
Klintehamn	SWE	57.38	18.20	0.94
Koping	SWE	59.52	16.00	0.85
Kopmannebro	SWE	58.77	12.52	0.72
Kristinehamn	SWE	59.32	14.12	0.74
Krokstad	SWE	59.10	12.92	0.72
Kungsor	SWE	59.43	16.10	0.82
Kyrkebyn	SWE	59.27	13.07	0.74
Lidkoping	SWE	58.50	13.17	0.74
Liljeholmsviken	SWE	59.32	18.00	0.73
Ljustero	SWE	59.52	18.63	0.80
Loudden	SWE	59.33	18.13	0.72
Lulea	SWE	65.58	22.17	1.02
Mariestad	SWE	58.72	13.83	0.73
Marsviken	SWE	58.67	16.95	0.79
Mem	SWE	58.48	16.42	0.78
Monsteras	SWE	57.03	16.47	0.93
Motala	SWE	58.53	15.07	0.74
Munksund	SWE	65.28	21.48	1.02
Norrkoping	SWE	58.60	16.20	0.78
Norrsundet	SWE	60.95	17.17	0.93
Norrtalje	SWE	59.75	18.70	0.83
Norsbron	SWE	59.42	13.23	0.74

Nykoping	SWE	58.75	17.02	0.78
Oaxen	SWE	55.97	17.72	1.05
Orebro	SWE	59.28	15.18	0.76
Ornskoldsvik	SWE	63.27	18.72	0.95
Oskarshamn	SWE	57.27	16.45	0.92
Otterbacken	SWE	58.95	14.05	0.76
Oxelosund	SWE	58.67	17.12	1.10
Ronehamn	SWE	57.17	18.53	1.08
Ronneby	SWE	56.17	15.30	0.96
Rundvik	SWE	63.53	19.45	0.99
Saffle	SWE	59.13	12.93	0.72
Sandhamn	SWE	59.28	18.90	1.09
Sankt Anna	SWE	58.33	16.70	0.78
Sjotorp	SWE	58.83	14.00	0.74
Skattkar	SWE	59.42	13.70	0.74
Skelleftea	SWE	64.73	20.95	1.06
Skoghall	SWE	59.32	13.45	0.71
Skutskar	SWE	60.65	17.40	0.87
Slite	SWE	57.70	18.82	1.08
Slottsbron	SWE	59.33	13.10	0.74
Soderkoping	SWE	58.48	16.33	0.79
Sodertalje	SWE	59.20	17.63	1.06
Solvesborg	SWE	56.05	14.58	0.95
Soraker	SWE	62.50	17.50	0.95
Spesshult	SWE	59.07	12.92	0.72
Stavsnas	SWE	59.28	18.68	1.08
Stockholm	SWE	59.32	18.05	0.72
Stocksund	SWE	59.38	18.05	0.73
Storugns	SWE	57.83	18.80	1.05
Straa	SWE	57.90	19.03	1.05
Strangnas	SWE	59.38	17.03	0.84
Studsvik	SWE	58.75	17.28	0.78
Sturko	SWE	56.08	15.67	0.96
Sundsvall	SWE	62.42	17.33	1.02
Taxinge	SWE	59.22	17.37	0.78
Torko	SWE	56.15	15.40	0.96
Trelleborg	SWE	55.37	13.15	0.91
Uppsala	SWE	59.87	17.65	0.69
Valdemarsvik	SWE	58.20	16.60	0.79
Vaxholm	SWE	59.38	18.33	0.75
Vesteras	SWE	59.60	16.43	0.84
Visby	SWE	57.65	18.28	0.93
Ystad	SWE	55.43	13.83	0.91
Berdiansk	UKR	46.75	36.78	0.99
Cherkassy	UKR	49.43	32.05	0.33
Dneprodzerzhinsk	UKR	48.50	34.62	0.42
Dnepropetrovsk	UKR	48.48	35.00	0.45
Kiev	UKR	50.42	30.50	0.34
Kremenchug	UKR	49.05	33.42	0.35
Mariupol	UKR	47.05	37.50	0.92

Reni	UKR	45.43	28.30	0.76
Tyaginka	UKR	46.75	33.05	0.56
Zaporozhye	UKR	47.83	35.17	0.58
Albany	USA	42.65	-73.75	0.45
Allyns Point	USA	41.43	-72.07	0.72
Alpena	USA	45.05	-83.43	0.40
Alsen	USA	42.18	-73.92	0.41
Ashland	USA	46.58	-90.90	0.44
Ashtabula	USA	41.92	-80.82	0.47
Bangor	USA	44.80	-68.78	0.15
Bath	USA	43.90	-69.82	0.50
Bay City	USA	43.58	-83.88	0.34
Bayfield	USA	46.80	-90.80	0.54
Belfast	USA	44.42	-69.00	0.75
Benton Harbour	USA	42.12	-86.45	0.40
Beverly	USA	46.82	-119.92	0.76
Brevort	USA	46.00	-85.03	0.44
Buchanan	USA	41.20	-73.92	0.77
Bucksport	USA	44.57	-68.80	0.47
Buffalo	USA	42.88	-78.88	0.43
Buffington	USA	41.63	-87.42	0.37
Burlington (NJ)	USA	40.08	-74.85	1.01
Burns Harbour	USA	41.63	-87.18	0.38
Calcite	USA	45.40	-83.78	0.49
Camden (NJ	USA	39.93	-75.13	1.03
Catskill	USA	42.22	-73.88	0.41
Cedarville	USA	45.98	-84.35	0.59
Cementon	USA	42.13	-73.92	0.46
Charlevoix	USA	45.32	-85.22	0.32
Cheboygan	USA	45.67	-84.47	0.45
Chester (PA)	USA	39.83	-75.37	1.05
Chicago	USA	41.83	-87.63	0.35
Claymont	USA	39.80	-75.43	1.05
Clayton	USA	44.23	-76.08	0.32
Cleveland	USA	41.52	-81.72	0.53
Conneaut	USA	41.97	-80.57	0.46
Coxsackie	USA	42.33	-73.80	0.43
Delair	USA	40.00	-75.03	1.03
Delaware City	USA	39.57	-75.58	1.06
Detour	USA	45.97	-83.88	0.61
Detroit	USA	42.33	-83.03	0.37
Duluth	USA	46.73	-92.15	0.62
Eddystone	USA	39.83	-75.33	1.05
Erie	USA	42.17	-80.08	0.46
Escanaba	USA	45.78	-87.07	0.33
Essexville	USA	43.60	-83.83	0.34
Fairless Hills	USA	40.17	-74.88	1.01
Fairport	USA	41.77	-81.32	0.51
Ferrysburg	USA	43.08	-86.23	0.40
Gary Harbour	USA	41.60	-87.35	0.37

Gloucester (NJ)	USA	39.88	-75.13	1.03
Grand Haven	USA	43.07	-86.25	0.40
Grand River	USA	41.73	-81.28	0.50
Green Bay	USA	44.52	-88.00	0.23
Groton	USA	41.35	-72.08	1.02
Harbor Beach	USA	43.83	-82.65	0.37
Holland (MI)	USA	42.78	-86.22	0.41
Huron	USA	41.40	-82.58	0.56
Hyde Park	USA	41.78	-73.93	0.47
Indiana Harbour	USA	41.67	-87.50	0.37
Kalama	USA	46.02	-122.83	0.98
Kenosha	USA	42.58	-87.82	0.27
Kewaunee	USA	44.45	-87.52	0.49
Kingston	USA	41.87	-73.97	0.46
Lafayette	USA	40.40	-86.88	0.75
Lorain	USA	41.47	-82.17	0.55
Ludington	USA	43.97	-86.45	0.57
Mackinaw City	USA	45.75	-84.73	0.43
Manistee	USA	44.25	-86.33	0.59
Manitowoc	USA	44.10	-87.63	0.47
Marblehead	USA	41.53	-82.72	0.62
Marcus Hook	USA	39.82	-75.42	1.05
Marine City	USA	42.72	-82.48	0.32
Marinette	USA	45.12	-87.62	0.28
Marquette	USA	46.60	-87.38	0.69
Marysville	USA	42.92	-82.48	0.30
Menominee	USA	45.13	-87.62	0.29
Milton	USA	41.60	-73.95	0.59
Milwaukee	USA	43.05	-87.87	0.34
Monroe	USA	41.92	-83.33	0.58
Mossville	USA	40.80	-89.57	0.76
Muskegon	USA	43.18	-86.23	0.42
New London	USA	41.40	-72.10	0.83
Newburgh	USA	41.50	-74.08	0.60
Ogdensburg	USA	44.70	-75.50	0.14
Olympia	USA	47.05	-122.90	1.01
Ontonagon	USA	46.87	-89.30	0.58
Oswego	USA	43.47	-76.53	0.40
Pasco	USA	46.22	-119.08	1.00
Paulsboro	USA	39.83	-75.25	1.04
Peekskill	USA	41.25	-73.92	0.77
Pennsauken	USA	39.97	-75.03	1.03
Peoria	USA	40.68	-89.58	0.76
Philadelphia	USA	39.90	-75.13	1.03
Pittsburgh (PA)	USA	40.43	-80.00	0.67
Point Pleasant	USA	38.88	-82.12	0.91
Port Dolomite	USA	45.97	-84.27	0.53
Port Huron	USA	42.98	-82.43	0.29
Port Inland	USA	45.97	-85.87	0.47
Port Washington	USA	43.38	-87.87	0.40

Portland (OR)	USA	45.57	-122.73	0.96
Poughkeepsie	USA	41.68	-73.88	0.47
Providence	USA	41.80	-71.38	0.96
Racine	USA	42.73	-87.80	0.27
Ravena	USA	42.47	-73.80	0.43
Reedy Point	USA	39.57	-75.57	1.06
Rensselaer	USA	42.65	-73.73	0.45
Rochester (NY)	USA	43.28	-77.60	0.32
Rockport (MI)	USA	45.20	-83.38	0.48
Rogers City	USA	45.40	-83.83	0.49
Roseton	USA	41.57	-74.00	0.50
Saginaw	USA	43.45	-83.92	0.36
Salem (NJ)	USA	39.57	-75.47	1.06
Sandusky	USA	41.45	-82.73	0.60
Searsport	USA	44.45	-68.92	1.00
Sheboygan	USA	43.75	-87.70	0.51
Shippensburg	USA	40.03	-77.52	0.73
Silver Bay	USA	47.28	-91.27	1.09
Somerset (MA)	USA	41.78	-71.13	0.90
South Brewer	USA	44.78	-68.78	0.15
South Haven	USA	42.45	-86.25	0.40
St. Clair	USA	42.82	-82.47	0.31
St. Joseph	USA	42.08	-86.50	0.41
Stoneport	USA	45.28	-83.43	0.50
Stony Point	USA	41.23	-73.97	0.77
Superior	USA	46.72	-92.08	0.62
Taconite Harbour	USA	47.50	-90.92	1.06
The Dalles	USA	45.58	-121.18	0.66
Toledo	USA	41.70	-83.47	0.59
Tomkins Cove	USA	41.27	-73.98	0.77
Tonawanda	USA	43.02	-78.88	0.43
Trenton	USA	40.18	-74.75	0.96
Troutdale	USA	45.53	-122.38	0.97
Troy	USA	42.73	-73.68	0.43
Tullytown	USA	40.13	-74.82	0.96
Two Harbors	USA	47.02	-91.67	0.94
Umatilla	USA	45.92	-119.33	0.91
Vancouver	USA	45.63	-122.67	0.96
Waddington	USA	44.85	-75.20	0.08
Warren	USA	41.73	-71.30	1.10
Waukegan	USA	42.37	-87.83	0.27
Westville	USA	39.87	-75.13	1.03
Whitefish Point	USA	46.75	-84.95	0.71
Willbridge	USA	45.57	-122.75	0.96
Wilmington (DE)	USA	39.75	-75.50	1.00
Winterport	USA	44.63	-68.85	0.41
Wiscasset	USA	44.00	-69.67	0.50
Wyandotte	USA	42.18	-83.15	0.50
Yonkers	USA	40.95	-73.83	0.93
Zilwaukee	USA	43.47	-83.92	0.35

Appendix C. List of global ports that have highest environmental similarity to Montréal. NIS originating from these ports have the highest potential for survival if introduced at Montréal.

Name	Country	Latitude	Longitude	Environmental Distance
Eckero	ALD	60.22	19.60	0.99
Korneuburg	AUT	48.37	16.33	0.54
Linz	AUT	48.32	14.30	0.54
Vienna	AUT	48.22	16.37	0.57
Antwerp	BEL	51.24	4.41	0.89
Baasrode	BEL	51.05	4.17	0.90
Balen	BEL	51.17	5.17	0.85
Boom	BEL	51.08	4.37	0.87
Brussels	BEL	50.83	4.32	0.88
Buggenhout	BEL	51.02	4.20	0.88
Burcht	BEL	51.20	4.33	0.90
Chatelineau	BEL	50.42	4.52	0.84
Dendermonde	BEL	51.03	4.12	0.90
Doel	BEL	51.32	4.27	0.92
Engis	BEL	50.58	5.40	0.83
Ertvelde	BEL	51.20	3.78	0.94
Geel	BEL	51.15	4.97	0.85
Genk	BEL	50.94	5.50	0.85
Ghent	BEL	51.09	3.75	0.92
Grimbergen	BEL	50.93	4.37	0.86
Grobbendonk	BEL	51.20	4.75	0.87
Haren	BEL	50.90	4.38	0.86
Hemiksem	BEL	51.15	4.34	0.87
Hermalle sous Huy	BEL	50.55	5.37	0.83
Hingene	BEL	51.12	4.27	0.88
Hoboken	BEL	51.17	4.33	0.88
Humbeek	BEL	50.97	4.38	0.86
Kallo	BEL	51.25	4.28	0.91
Kapelle op den Bos	BEL	51.02	4.37	0.87
Kruibeke	BEL	51.17	4.32	0.88
Kwaadmechelen	BEL	51.10	5.15	0.85
Lanaken	BEL	50.88	5.65	0.85
Langerbrugge	BEL	51.12	3.75	0.92
Liefkenshoek	BEL	51.30	4.28	0.92
Liege	BEL	50.64	5.57	0.83
Lillo	BEL	51.30	4.30	0.92
Lixhe	BEL	50.73	5.70	0.84
Maasmechelen	BEL	50.97	5.70	0.85
Marly	BEL	50.88	4.38	0.86
Mechelen	BEL	51.03	4.47	0.87
Melle	BEL	51.00	3.80	0.90
Merksem	BEL	51.23	4.48	0.88
Nameche	BEL	50.47	4.98	0.84
Niel	BEL	51.12	4.33	0.88
Olen	BEL	51.15	4.87	0.85

Puurs	BEL	51.07	4.27	0.88
Rieme	BEL	51.17	3.77	0.92
Ruisbroek	BEL	50.78	4.28	0.88
Rumst	BEL	51.07	4.42	0.87
Rupelmonde	BEL	51.13	4.28	0.88
Schelle	BEL	51.13	4.32	0.88
Schoten	BEL	51.25	4.50	0.88
Seilles	BEL	50.50	5.08	0.85
Sint-Kruis-Winkel	BEL	51.15	3.80	0.92
Temse	BEL	51.13	4.22	0.88
Terdonk	BEL	51.15	3.78	0.92
Terhagen	BEL	51.08	4.38	0.87
Tessenderlo	BEL	51.07	5.08	0.85
Tielrode	BEL	51.12	4.22	0.88
Tisselt	BEL	51.03	4.37	0.87
Val St. Lambert	BEL	50.57	5.47	0.83
Verbrande Brug	BEL	50.95	4.38	0.86
Vilvoorde	BEL	50.95	4.42	0.86
Willebroek	BEL	51.05	4.35	0.87
Wintham	BEL	51.10	4.28	0.88
Wondelgem	BEL	51.08	3.72	0.92
Zelzate	BEL	51.20	3.80	0.94
Zutendaal	BEL	50.92	5.57	0.85
Zwyndrecht	BEL	51.22	4.33	0.90
Kozloduy	BGR	43.78	23.72	0.76
Lom	BGR	43.83	23.20	0.69
Rousse	BGR	43.83	25.97	0.68
Silistra	BGR	44.10	27.25	0.69
Amherstburg	CAN	42.10	-83.08	0.40
Baddeck	CAN	46.10	-60.73	0.92
Bath	CAN	44.17	-76.77	0.19
Batiscan	CAN	46.52	-72.23	0.40
Bayside	CAN	45.17	-67.13	0.94
Becancour	CAN	46.40	-72.38	0.32
Belleville	CAN	44.13	-77.37	0.21
Bowmanville	CAN	43.90	-78.67	0.35
Boylston	CAN	45.45	-61.52	1.05
Britt	CAN	45.77	-80.58	0.51
Brockville	CAN	44.60	-75.63	0.06
Bronte	CAN	43.40	-79.70	0.35
Bruce Mines	CAN	46.27	-83.72	0.73
Burlington	CAN	43.32	-79.75	0.30
Cardinal	CAN	44.78	-75.33	0.05
Chicoutimi	CAN	48.43	-71.08	0.54
Clarkson	CAN	43.50	-79.60	0.34
Cobourg	CAN	43.95	-78.17	0.25
Colborne	CAN	44.00	-77.88	0.23
Collingwood	CAN	44.50	-80.23	0.37
Contrecoeur	CAN	45.88	-73.20	0.17
Cornwall	CAN	45.02	-74.72	0.03

Corunna	CAN	42.88	-82.45	0.25
Cote Ste-Catherine	CAN	45.41	-73.58	0.03
Country Harbour	CAN	45.22	-61.73	1.08
Courtright	CAN	42.80	-82.45	0.27
Erieau	CAN	42.25	-81.93	0.33
Fort Erie	CAN	42.93	-78.95	0.30
Fredericton	CAN	45.95	-66.65	0.36
Gananoque	CAN	44.32	-76.15	0.19
Goderich	CAN	43.75	-81.75	0.41
Gold River	CAN	49.68	-126.12	1.10
Grondines	CAN	46.75	-72.03	0.52
Hamilton	CAN	43.23	-79.85	0.35
Humberstone	CAN	42.90	-79.25	0.28
Iona	CAN	45.97	-60.80	0.65
Killarney	CAN	45.97	-81.52	0.63
Kingston	CAN	44.20	-76.50	0.18
Kingsville	CAN	42.02	-82.72	0.42
Kitimat	CAN	54.00	-128.70	0.98
Lanoraie	CAN	45.97	-73.18	0.17
Lauzon	CAN	46.82	-71.15	0.43
Leamington	CAN	42.05	-82.62	0.42
Levis	CAN	46.82	-71.18	0.34
Little Current	CAN	45.97	-81.92	0.33
Little Narrows	CAN	45.98	-60.98	0.60
Long Sault	CAN	45.02	-74.90	0.10
Meldrum Bay	CAN	45.92	-83.10	0.70
Michipicoten Harbour	CAN	47.95	-84.92	0.97
Midland	CAN	44.75	-79.93	0.39
Montréal	CAN	45.50	-73.55	0.00
Mooretown	CAN	42.85	-82.47	0.25
Morrisburg	CAN	44.93	-75.18	0.11
Nanticoke	CAN	42.82	-80.07	0.25
Oakville	CAN	43.43	-79.67	0.36
Oshawa	CAN	43.87	-78.83	0.37
Ottawa	CAN	45.40	-75.70	0.12
Owen Sound	CAN	44.58	-80.95	0.43
Parry Sound	CAN	45.37	-80.05	0.40
Pelee Island	CAN	41.75	-82.67	0.46
Picton	CAN	44.00	-77.13	0.20
Pointe aux Trembles	CAN	45.63	-73.48	0.08
Port Alberni	CAN	49.23	-125.00	1.05
Port Burwell	CAN	42.63	-80.80	0.27
Port Colborne	CAN	42.87	-79.25	0.29
Port Credit	CAN	43.55	-79.60	0.41
Port Dalhousie	CAN	43.20	-79.27	0.29
Port Dover	CAN	42.78	-80.20	0.23
Port Hope	CAN	43.95	-78.28	0.27
Port Maitland	CAN	42.87	-79.58	0.27
Port McNicoll	CAN	44.75	-79.80	0.33
Port Stanley	CAN	42.67	-81.22	0.25

Port Weller	CAN	43.23	-79.22	0.27
Prescott	CAN	44.72	-75.52	0.06
Québec	CAN	46.82	-71.20	0.34
Sarnia	CAN	42.98	-82.42	0.26
Sault Ste. Marie	CAN	46.52	-84.33	0.66
Sombra	CAN	42.70	-82.47	0.27
Sorel	CAN	46.05	-73.12	0.15
Spragge	CAN	46.22	-82.67	0.50
St. Catharines	CAN	43.17	-79.27	0.28
St. Romuald	CAN	46.75	-71.23	0.34
St. Stephen	CAN	45.20	-67.28	0.55
Ste. Croix	CAN	46.63	-71.73	0.40
Thessalon	CAN	46.25	-83.55	0.71
Thorold	CAN	43.08	-79.17	0.26
Three Rivers	CAN	46.35	-72.55	0.30
Tobermory	CAN	45.23	-81.65	0.68
Toronto	CAN	43.63	-79.38	0.40
Tracy	CAN	46.02	-73.17	0.19
Valleyfield	CAN	45.22	-74.08	0.05
Wallaceburg	CAN	42.60	-82.40	0.27
Welland	CAN	42.97	-79.22	0.24
Weymouth	CAN	44.45	-66.02	1.01
Wheatley	CAN	42.08	-82.43	0.33
Whitby	CAN	43.85	-78.92	0.41
Windsor	CAN	42.32	-83.05	0.22
Basle	CHE	47.55	7.57	0.65
Dandong	CHN	40.13	124.40	0.82
Fujin	CHN	47.25	132.02	0.41
Harbin	CHN	45.73	126.60	0.38
Heihe	CHN	50.23	127.47	0.65
Jiamusi	CHN	46.80	130.35	0.39
Panjin	CHN	41.12	122.07	0.63
Panshi	CHN	42.92	126.03	0.28
Tongjiang	CHN	47.63	132.50	0.44
Chvaletice	CZE	50.02	15.43	0.56
Usti nad Labem	CZE	50.67	14.03	0.59
Aken	DEU	51.85	12.03	0.66
Andernach	DEU	50.42	7.38	0.75
Anklam	DEU	53.87	13.68	0.88
Aschaffenburg	DEU	49.95	9.17	0.66
Barth	DEU	54.37	12.73	0.95
Bendorf	DEU	50.42	7.58	0.75
Berlin	DEU	52.53	13.42	0.61
Berne	DEU	53.18	10.50	0.79
Bingen	DEU	49.95	7.90	0.70
Bodenwerder	DEU	51.97	9.50	0.80
Boizenburg	DEU	53.38	10.73	0.79
Bonn	DEU	50.72	7.08	0.79
Brandenburg	DEU	52.40	12.52	0.65
Braunschweig	DEU	52.25	10.50	0.75

Brohl	DEU	50.42	7.30	0.78
Castrop Rauxel	DEU	51.55	7.30	0.84
Cologne	DEU	50.93	7.00	0.81
Deggendorf	DEU	48.83	12.97	0.56
Dormagen	DEU	51.10	6.95	0.83
Dortmund	DEU	51.53	7.45	0.83
Duisburg	DEU	51.43	6.75	0.85
Dusseldorf	DEU	51.25	6.77	0.84
Eisenhuttenstadt	DEU	52.15	14.62	0.53
Emmerich	DEU	51.85	6.25	0.89
Erftstadt	DEU	50.80	6.75	0.80
Essen	DEU	51.45	7.02	0.83
Frankfurt	DEU	50.12	8.67	0.66
Geesthacht	DEU	53.43	10.38	0.80
Gelsenkirchen	DEU	51.50	7.08	0.83
Germersheim	DEU	49.22	8.38	0.69
Gernsheim	DEU	49.75	8.47	0.68
Greifswald	DEU	54.10	13.38	0.97
Haren	DEU	52.80	7.25	0.94
Havelberg	DEU	52.83	12.07	0.69
Heringsdorf	DEU	53.97	14.17	0.83
Hohenhorn	DEU	53.47	10.37	0.80
Homberg	DEU	51.45	6.72	0.85
Hoya	DEU	52.80	9.13	0.80
Ibbenburen	DEU	52.28	7.73	0.85
Karlsruhe	DEU	49.05	8.33	0.69
Kehl	DEU	48.58	7.83	0.69
Koblenz	DEU	50.33	7.58	0.75
Krefeld	DEU	51.33	6.57	0.85
Kroslin	DEU	54.13	13.75	1.06
Ladebow	DEU	54.10	13.45	0.97
Lahnstein	DEU	50.30	7.62	0.75
Lauenburg	DEU	53.38	10.55	0.79
Lauterbach	DEU	54.33	13.52	1.09
Leer	DEU	53.22	7.45	0.95
Leeseringen	DEU	52.58	9.13	0.79
Leverkusen	DEU	51.02	7.03	0.82
Lubmin	DEU	54.12	13.60	0.94
Ludwigshafen am Rhein	DEU	49.47	8.45	0.69
Magdeburg	DEU	52.13	11.62	0.67
Mainz	DEU	50.00	8.28	0.68
Mannheim	DEU	49.48	8.47	0.69
Minden	DEU	52.30	8.90	0.79
Monheim	DEU	51.12	6.82	0.83
Moselkern	DEU	50.18	7.37	0.75
Mulheim	DEU	50.95	7.05	0.80
Neckarsteinach	DEU	49.43	8.80	0.66
Neuss	DEU	51.20	6.70	0.84
Neuss/Dusseldorf	DEU	51.20	6.70	0.84
Neuwied	DEU	50.43	7.48	0.75

Nienburg	DEU	52.63	9.22	0.79
Nuremberg	DEU	49.45	11.05	0.62
Orsoy	DEU	51.53	6.68	0.86
Osnabruck	DEU	52.27	8.03	0.83
Papenburg	DEU	53.08	7.38	0.89
Passau	DEU	48.58	13.47	0.59
Peenemunde	DEU	54.12	13.77	1.06
Peine	DEU	52.32	10.22	0.76
Porz	DEU	50.88	7.05	0.80
Regensburg	DEU	49.02	12.12	0.59
Remagen	DEU	50.57	7.22	0.77
Rheinhausen	DEU	51.42	6.73	0.85
Rinteln	DEU	52.20	9.08	0.79
Rosslau	DEU	51.90	12.27	0.66
Rostock	DEU	54.15	12.10	0.96
Ruhrort	DEU	51.45	6.73	0.85
Salzgitter	DEU	52.22	10.33	0.76
Speyer	DEU	49.30	8.43	0.69
Stralsund	DEU	54.32	13.10	0.97
Sturzelberg	DEU	51.12	6.80	0.83
Stuttgart	DEU	48.78	9.20	0.66
Tangermunde	DEU	52.57	11.97	0.69
Ueckermunde	DEU	53.73	14.28	1.02
Urdingen	DEU	51.35	6.67	0.86
Vallendar	DEU	50.40	7.62	0.75
Vierow	DEU	54.10	13.57	0.94
Walsum	DEU	51.53	6.68	0.86
Warnemunde	DEU	54.18	12.08	0.97
Weissenthurm	DEU	50.42	7.48	0.75
Wesel	DEU	51.65	6.60	0.86
Wesseling	DEU	50.83	7.00	0.80
Wolgast	DEU	54.05	13.78	1.06
Worms	DEU	49.63	8.35	0.68
Wurzburg	DEU	49.78	9.93	0.68
Gudhjem	DNK	55.22	14.97	1.02
Hvalpsund	DNK	56.68	9.20	0.94
Logstor	DNK	56.97	9.25	0.94
Nekso	DNK	55.07	15.15	1.10
Skarrehage	DNK	56.95	8.87	1.10
Skive	DNK	56.57	9.03	0.95
Svaneke	DNK	55.13	15.15	1.10
Thisted	DNK	56.95	8.70	1.01
Bekker	EST	59.45	24.67	0.87
Forby	EST	59.00	23.17	1.09
Haapsalu	EST	58.95	23.53	0.86
Heltermaa	EST	58.87	23.07	0.96
Kuivastu	EST	58.58	23.40	0.94
Kunda	EST	59.52	26.55	1.10
Loksa	EST	59.58	25.72	1.10
Meeruse	EST	59.45	24.68	0.85

Montu	EST	57.95	22.12	0.99
Narva Joesuu	EST	59.47	28.05	0.82
Paljassaare	EST	59.45	24.70	0.85
Parnu	EST	58.38	24.48	0.77
Peetri	EST	59.45	24.73	0.85
Prangli Island	EST	59.63	25.00	1.10
Rohukula	EST	58.90	23.42	0.96
Roomassaare	EST	58.22	22.52	0.94
Saaremaa Harbour	EST	58.53	22.23	0.99
Sillamae	EST	59.40	27.78	0.82
Tallinn	EST	59.45	24.75	0.85
Veere	EST	58.45	22.05	0.92
Virtsu	EST	58.58	23.55	0.85
Dalsbruk	FIN	60.03	22.52	0.89
Hamina	FIN	60.57	27.18	0.79
Helsinki	FIN	60.17	24.95	0.78
Imatra	FIN	61.17	28.83	0.72
Inkoo	FIN	60.05	24.02	0.97
Isnas	FIN	60.40	26.00	0.86
Joensuu	FIN	62.60	29.75	0.86
Joutseno	FIN	61.13	28.48	0.72
Kantvik	FIN	60.08	24.38	0.95
Kaukas	FIN	61.07	28.22	0.72
Kaukopaa	FIN	61.25	28.87	0.77
Kokkila	FIN	60.33	22.87	0.91
Kotka	FIN	60.47	26.95	1.05
Kristiinankaupunki	FIN	62.27	21.32	0.94
Kronvik	FIN	63.05	21.52	1.00
Kuopio	FIN	62.85	27.50	0.81
Kustavi	FIN	60.57	21.33	0.95
Kuuslahti	FIN	63.12	27.75	0.79
Lapaluoto	FIN	64.67	24.42	1.10
Lappeenranta	FIN	61.07	28.25	0.72
Lauritsala	FIN	61.08	28.33	0.72
Loviisa	FIN	60.45	26.23	0.83
Luvia	FIN	61.33	21.57	0.95
Mantyluoto	FIN	61.58	21.50	0.95
Martinniemi	FIN	65.22	25.28	1.07
Maxmo	FIN	63.20	22.03	1.03
Merikarvia	FIN	61.85	21.47	0.99
Mjosund	FIN	60.22	22.47	0.87
Mustola	FIN	61.07	28.30	0.72
Naantali	FIN	60.47	22.02	0.88
Nyhamn	FIN	62.17	21.33	0.94
Olkiluoto	FIN	61.25	21.50	0.92
Oulu	FIN	65.00	25.47	1.03
Parainen	FIN	60.28	22.30	0.88
Pateniemi	FIN	65.08	25.40	1.05
Perno	FIN	60.45	26.05	0.85
Pori	FIN	61.48	21.80	0.97

Puhos	FIN	62.10	29.92	0.83
Rahja	FIN	64.20	23.73	1.10
Rauma	FIN	61.13	21.50	0.94
Ristiina	FIN	61.53	27.42	0.80
Salo	FIN	60.38	23.17	0.93
Savonlinna	FIN	61.90	28.92	0.78
Siilinjarvi	FIN	63.08	27.67	0.80
Sipoo	FIN	60.37	25.32	0.87
Skoldvik	FIN	60.30	25.55	0.84
Skuru	FIN	60.10	23.55	0.94
Stromma	FIN	60.18	22.90	0.91
Summa	FIN	60.53	27.12	0.79
Svartback	FIN	60.28	25.53	0.84
Taalintehdas	FIN	60.02	22.52	0.89
Tammisaari	FIN	59.98	23.43	0.91
Teijo	FIN	60.25	22.95	0.91
Tolkkinen	FIN	60.33	25.58	0.84
Tupavuori	FIN	60.45	22.07	0.88
Turku	FIN	60.43	22.22	0.87
Uusikaupunki	FIN	60.80	21.40	0.94
Vaasa	FIN	63.10	21.62	1.00
Valkom	FIN	60.42	26.27	0.83
Varkaus	FIN	62.33	27.83	0.77
Vartsala	FIN	60.33	23.02	0.93
Vastanfjard	FIN	60.05	22.65	0.89
Annay sous Lens	FRA	50.47	2.87	0.94
Bethune	FRA	50.53	2.63	0.99
Bonnieres	FRA	49.03	1.58	0.94
Chalon-sur-Saone	FRA	46.78	4.83	0.75
Conflans	FRA	48.98	2.10	0.92
Duclair	FRA	49.45	0.87	1.02
Elbeuf	FRA	49.28	1.12	0.99
Gaillon	FRA	49.17	1.32	0.96
Grand Couronne	FRA	49.37	0.98	1.02
Grigny	FRA	45.62	4.78	0.79
Ingrandes	FRA	47.40	-0.92	1.04
La Mailleraye	FRA	49.48	0.77	1.03
Le Pouzin	FRA	44.75	4.75	0.97
Le Trait	FRA	49.47	0.80	1.03
Les Andelys	FRA	49.25	1.43	0.97
Lille	FRA	50.65	3.08	0.94
Lillebonne	FRA	49.52	0.53	1.08
Limay	FRA	48.97	1.78	0.92
Lyon	FRA	45.77	4.83	0.79
Mantes	FRA	48.98	1.72	0.92
Nantes	FRA	47.23	-1.57	1.08
Nort-sur-Erdre	FRA	47.43	-1.50	1.07
Paris	FRA	48.87	2.33	0.94
Petit Couronne	FRA	49.37	1.00	1.02
Port Jerome	FRA	49.47	0.53	1.08

Radicatel	FRA	49.42	0.48	1.09
Rouen	FRA	49.48	1.08	1.01
St. Etienne du Rouvray	FRA	49.37	1.12	1.01
St. Wandrille	FRA	49.53	0.75	1.04
Strasbourg	FRA	48.57	7.70	0.69
Vernon	FRA	49.08	1.48	0.95
Villeneuve-la-Garenne	FRA	48.92	2.30	0.94
Villeneuve-le-Roi	FRA	48.73	2.40	0.94
Villequier	FRA	49.50	0.67	1.05
Althorpe Wharf	GBR	53.57	-0.73	1.09
Aylesford	GBR	51.27	0.47	1.10
Beckingham	GBR	53.40	-0.83	1.08
Burton upon Stather	GBR	53.65	-0.68	1.10
Drax	GBR	53.73	-0.98	1.09
Flixborough	GBR	53.62	-0.68	1.09
Gainsborough	GBR	53.40	-0.77	1.07
Gloucester	GBR	51.87	-2.22	1.06
Grove Wharf	GBR	53.60	-0.68	1.09
Gunness	GBR	53.58	-0.72	1.09
Gunness Wharf	GBR	53.58	-0.68	1.09
Halling	GBR	51.37	0.01	1.04
Keadby	GBR	53.60	-0.67	1.09
London	GBR	51.50	-0.07	1.04
Neap House	GBR	53.62	-0.67	1.09
Selby	GBR	53.78	-1.07	1.10
Thorne	GBR	53.62	-0.97	1.07
Budapest	HUN	47.50	19.03	0.64
Adria	ITA	45.05	12.07	1.02
Boretto	ITA	44.90	10.55	0.97
Cremona	ITA	45.13	10.02	0.92
Donada	ITA	45.05	12.22	1.03
Pavia	ITA	45.18	9.13	0.93
Klaipeda	LTU	55.72	21.13	0.85
Engure	LVA	57.17	23.23	1.02
Labrags	LVA	56.98	21.37	1.08
Liepaja	LVA	56.52	21.02	0.96
Mersrags	LVA	57.37	23.13	0.96
Pavilosta	LVA	56.90	21.18	0.95
Riga	LVA	56.97	24.10	0.78
Roja	LVA	57.50	22.82	0.94
Salacgriva	LVA	57.75	24.37	0.84
Skulte	LVA	57.32	24.40	0.81
Ventspils	LVA	57.40	21.55	0.98
Chisinau	MDA	47.02	28.83	0.46
Aalst	NLD	51.38	5.45	0.88
Alblasserdam	NLD	51.87	4.62	0.84
Ameide	NLD	51.95	4.95	0.82
Amsterdam	NLD	52.37	4.90	1.10
Arnhem	NLD	51.97	5.88	0.90
Assen	NLD	53.00	6.57	0.96

Axel Sassing	NLD	51.28	3.87	1.01
Bergambacht	NLD	51.93	4.78	0.82
Bergen-op-Zoom	NLD	51.50	4.27	1.05
Bolnes	NLD	51.90	4.57	0.84
Bruinisse	NLD	51.67	4.10	0.99
Capelle aan den Yssel	NLD	51.92	4.57	0.84
Culemborg	NLD	51.95	5.22	0.90
Deest	NLD	51.88	5.67	0.90
Den Bommel	NLD	51.72	4.28	0.99
Dintelmond	NLD	51.67	4.38	0.94
Dinteloord	NLD	51.63	4.37	0.94
Dodewaard	NLD	51.90	5.63	0.90
Dordrecht	NLD	51.80	4.65	0.84
Druten	NLD	51.88	5.62	0.90
Eindhoven	NLD	51.43	5.50	0.88
Fijnaart	NLD	51.63	4.48	0.93
Geertruidenberg	NLD	51.72	4.87	0.91
Gendt	NLD	51.87	5.98	0.90
Gorinchem	NLD	51.82	4.98	0.91
Grave	NLD	51.75	5.75	0.90
Groot-Ammers	NLD	51.92	4.83	0.82
Hardinxveld	NLD	51.82	4.85	0.82
Heerewaarden	NLD	51.82	5.38	0.90
Heerjansdam	NLD	51.83	4.57	0.84
Heijen	NLD	51.68	5.98	0.89
Hellevoetsluis	NLD	51.82	4.13	1.09
Hendrik Ido Ambacht	NLD	51.85	4.62	0.84
Heusden	NLD	51.73	5.15	0.91
Huissen	NLD	51.92	5.92	0.90
Kinderdijk	NLD	51.88	4.63	0.84
Krimpen aan den Yssel	NLD	51.90	4.58	0.84
Lekkerkerk	NLD	51.92	4.63	0.84
Lithoyen	NLD	51.82	5.43	0.90
Lobith	NLD	51.87	6.13	0.89
Maasbracht	NLD	51.13	5.87	0.85
Maashees	NLD	51.57	6.03	0.89
Maassluis	NLD	51.92	4.25	0.91
Maastricht	NLD	50.85	5.68	0.85
Made	NLD	51.68	4.80	0.92
Middelharnis	NLD	51.78	4.20	1.03
Millingen aan den Rijn	NLD	51.87	6.03	0.89
Moerdijk	NLD	51.70	4.62	0.95
Nieuw Lekkerland	NLD	51.88	4.63	0.84
Nieuwerkerk aan den Yssel	NLD	51.97	4.58	0.84
Nijmegen	NLD	51.83	5.83	0.90
Numansdorp	NLD	51.72	4.42	0.98
Ooltgensplaat	NLD	51.68	4.33	0.96
Oosterhout	NLD	51.62	4.87	0.90
Oss	NLD	51.77	5.52	0.90
Ouderkerk	NLD	51.93	4.60	0.84

Oudewater	NLD	52.03	4.88	1.09
Ouwerkerk	NLD	51.63	3.98	1.06
Overschie	NLD	51.93	4.42	0.87
Paal	NLD	51.35	4.12	1.05
Papendrecht	NLD	51.83	4.63	0.84
Raamsdonksveer	NLD	51.70	4.92	0.91
Renkum	NLD	51.97	5.73	0.90
Rhenen	NLD	51.95	5.57	0.90
Ridderkerk	NLD	51.87	4.58	0.84
Rijswijk	NLD	51.78	5.02	0.91
Roermond	NLD	51.20	5.98	0.86
Rotterdam	NLD	51.90	4.48	0.85
Sas van Ghent	NLD	51.23	3.80	0.96
Schiedam	NLD	51.90	4.40	0.88
‘sGravendeel	NLD	51.77	4.60	0.84
‘sHertogenbosch	NLD	51.70	5.30	0.92
Sliedrecht	NLD	51.83	4.75	0.82
Slikkerveer	NLD	51.88	4.60	0.84
Sluiskil	NLD	51.30	3.83	1.01
Spijk	NLD	51.87	5.05	0.92
St. Annaland	NLD	51.62	4.10	0.91
Stavenisse	NLD	51.58	4.00	1.06
Stein	NLD	50.97	5.77	0.85
Swalmen	NLD	51.22	6.02	0.86
Tegelen	NLD	51.35	6.13	0.87
Tiel	NLD	51.88	5.45	0.90
Tilburg	NLD	51.55	5.07	0.90
Venlo	NLD	51.37	6.17	0.87
Vlaardingen	NLD	51.90	4.35	0.88
Waalwijk	NLD	51.70	5.07	0.91
Wageningen	NLD	51.97	5.67	0.90
Wanssum	NLD	51.53	6.08	0.89
Wartena	NLD	53.15	5.90	1.07
Werkendam	NLD	51.80	4.90	0.82
Willemstad	NLD	51.68	4.40	0.96
Zaltbommel	NLD	51.80	5.20	0.91
Zuilichem	NLD	51.80	5.12	0.91
Zwijndrecht	NLD	51.82	4.65	0.84
Herre	NOR	59.10	9.53	1.05
Menstad	NOR	59.17	9.65	1.00
Porsgrunn	NOR	59.13	9.65	1.05
Skien	NOR	59.20	9.62	1.08
Darlowo	POL	54.43	16.38	0.80
Elblag	POL	54.17	19.40	0.82
Frombork	POL	54.35	19.67	0.88
Gdansk	POL	54.35	18.65	1.01
Gdynia	POL	54.53	18.55	1.08
Kolobrzeg	POL	54.18	15.57	0.74
Kozle	POL	50.32	18.13	0.59
Niechorze	POL	54.10	15.07	0.78

Nowa Sol	POL	51.80	15.72	0.51
Plock	POL	52.53	19.67	0.44
Police	POL	53.55	14.60	0.80
Puck	POL	54.72	18.35	0.94
Stepnica	POL	53.65	14.63	0.80
Swinoujscie	POL	53.93	14.28	1.02
Szczecin	POL	53.42	14.55	0.82
Tczew	POL	54.08	18.77	0.90
Wladyslawowo	POL	54.80	18.42	1.10
Wroclaw	POL	51.08	17.00	0.60
Pyongyang	PRK	39.00	125.75	0.67
Songnim	PRK	38.73	125.62	0.80
Bazias	ROM	44.80	21.40	0.67
Braila	ROM	45.25	27.98	0.64
Bucharest	ROM	44.42	26.12	0.64
Calarasi	ROM	44.18	27.32	0.71
Galatz	ROM	45.42	28.08	0.64
Giurgiu	ROM	43.90	25.97	0.71
Oltenitza	ROM	44.03	26.58	0.70
Orsova	ROM	44.70	22.37	0.55
Tulcea	ROM	45.17	28.82	0.60
Turnu Severin	ROM	44.63	22.67	0.67
Akhtubinsk	RUS	48.33	46.17	0.59
Annenskiy Most	RUS	60.72	37.08	0.84
Astrakhan	RUS	46.37	48.07	0.67
Azov	RUS	47.10	39.43	0.87
Bagaevskaya	RUS	47.32	40.38	0.56
Balakhna	RUS	56.48	43.62	0.44
Balakovo	RUS	52.07	47.77	0.16
Baltiysk	RUS	54.65	19.90	1.01
Belyy Ruchey	RUS	60.90	36.83	0.86
Berezniki	RUS	59.43	56.82	0.72
Brusnichnoye	RUS	60.78	28.73	0.77
Cheboksary	RUS	56.13	47.23	0.43
Cherepovets	RUS	59.15	37.83	0.68
Chkalovsk	RUS	56.75	43.23	0.46
Gorokhovets	RUS	56.18	42.70	0.44
Kalach-na-Donu	RUS	48.72	43.48	0.35
Kaliningrad	RUS	54.72	20.52	0.82
Kamyshin	RUS	50.08	45.40	0.30
Kanonerskiy Is.	RUS	59.90	30.22	0.65
Kazan	RUS	55.75	49.17	0.33
Khabarovsk	RUS	48.50	135.17	0.48
Kineshma	RUS	57.45	42.12	0.55
Kirovsk	RUS	59.87	30.98	0.71
Komsomolsk-na-Amure	RUS	50.53	136.98	0.79
Kondopoga	RUS	62.20	34.28	0.88
Konstantinovsk	RUS	47.55	41.10	0.48
Kostroma	RUS	57.77	40.93	0.51
Kotlas	RUS	61.25	46.65	0.80

Krasnoyarsk	RUS	56.08	92.77	0.68
Krasnyye Barrikady	RUS	46.20	47.85	0.69
Kronshtadt	RUS	60.00	29.77	0.71
Lomonosov	RUS	59.83	29.80	0.75
Mago	RUS	53.25	140.22	0.97
Medvezhyegorsk	RUS	62.93	34.47	0.98
Mondoma	RUS	59.93	37.47	0.80
Naberezhnyye Chelny	RUS	55.68	52.30	0.38
Nadvoitsy	RUS	63.93	34.33	1.07
Navashino	RUS	55.55	42.18	0.39
Nikolayevsk	RUS	53.13	140.72	1.00
Nikolayevskaya	RUS	47.60	41.48	0.50
Nizhnekamsk	RUS	55.42	51.88	0.38
Nizhnetambovskoye	RUS	50.93	138.17	0.86
Nizhniy Novgorod	RUS	56.33	44.00	0.45
Nizhnyaya Gavan	RUS	52.40	140.43	0.97
Novgorod	RUS	58.50	31.33	0.62
Novocheboksarsk	RUS	56.10	47.48	0.40
Olya	RUS	45.78	47.53	0.74
Otradnoye	RUS	59.77	30.80	0.69
Perm	RUS	58.02	56.17	0.60
Petrodvorets	RUS	59.88	29.92	0.68
Petrozavodsk	RUS	61.77	34.32	0.90
Pionerskiy	RUS	54.93	20.20	0.84
Podporozhye	RUS	60.92	34.03	0.78
Primorsk	RUS	60.37	28.63	0.78
Priozersk	RUS	61.02	30.13	0.76
Pudozh	RUS	61.83	36.53	0.84
Rostov	RUS	47.17	39.70	0.88
Rybinsk	RUS	58.02	38.87	0.60
Samara	RUS	53.17	50.17	0.16
Saratov	RUS	51.50	45.92	0.20
Segezha	RUS	63.70	34.32	1.07
Semikarakorsk	RUS	47.55	41.10	0.48
Shlisselburg	RUS	59.93	31.13	0.71
Solikamsk	RUS	59.67	56.75	0.75
Sosnovka	RUS	56.23	51.28	0.41
St. Petersburg	RUS	59.93	30.30	0.65
Svetlyy	RUS	54.63	20.15	0.82
Syzran	RUS	53.17	48.48	0.13
Taganrog	RUS	47.20	38.95	0.86
Tatyanka	RUS	45.93	48.28	0.74
Tolyatti	RUS	53.53	49.40	0.20
Tomsk	RUS	56.50	85.08	0.64
Ust Donets	RUS	47.67	40.95	0.49
Ust-Luga	RUS	59.67	28.30	0.81
Volgodonsk	RUS	47.50	42.12	0.48
Volgograd	RUS	48.75	44.50	0.42
Volzhskiy	RUS	48.82	44.73	0.51
Voznesenye	RUS	61.02	35.47	0.79

Vyborg	RUS	60.72	28.73	0.77
Vysotsk	RUS	60.63	28.57	0.76
Vytegra	RUS	61.07	36.45	0.80
Yaroslavl	RUS	57.57	39.87	0.52
Yeisk	RUS	46.73	38.27	0.95
Zelenodolsk	RUS	55.83	48.50	0.36
Apatin	SCG	45.67	19.00	0.64
Belgrade	SCG	44.80	20.47	0.78
Bezdam	SCG	45.83	18.93	0.63
Kladovo	SCG	44.60	22.55	0.67
Mitrovica	SCG	42.90	20.87	0.57
Novi Becej	SCG	45.58	20.13	0.67
Novi Sad	SCG	45.27	19.83	0.67
Pancevo	SCG	44.87	20.67	0.79
Zrenjanin	SCG	45.37	10.38	0.87
Bratislava	SVK	48.15	17.12	0.52
Komarno	SVK	47.77	18.08	0.56
Aelvenaes	SWE	59.37	13.18	0.84
Amal	SWE	59.05	12.72	0.83
Arvika	SWE	59.67	12.58	0.86
Balsta	SWE	59.55	17.55	0.85
Edsvalla	SWE	59.43	13.23	0.84
Elleholm	SWE	56.17	14.73	0.98
Enkoping	SWE	59.63	17.08	0.93
Fiskeback	SWE	57.87	14.10	0.92
Fittja	SWE	59.23	17.85	0.78
Furillen	SWE	57.77	19.00	1.10
Gamleby	SWE	57.90	16.42	0.95
Gefle	SWE	60.67	17.17	1.05
Gruvon	SWE	59.33	13.12	0.83
Hallekis	SWE	58.67	13.42	0.83
Hasselby	SWE	59.37	17.82	0.80
Hernosand	SWE	62.63	17.93	1.06
Hoglunda	SWE	59.42	13.25	0.84
Honsater	SWE	58.63	13.45	0.83
Hornefors	SWE	63.62	19.90	1.07
Kallviken	SWE	64.33	21.37	1.10
Kalmarsand	SWE	59.53	17.52	0.85
Karlshamn	SWE	56.17	14.87	1.02
Karlskrona	SWE	56.17	15.60	1.01
Karlstad	SWE	59.38	13.52	0.84
Klintehamn	SWE	57.38	18.20	0.98
Koping	SWE	59.52	16.00	0.95
Kopmannebro	SWE	58.77	12.52	0.80
Kristinehamn	SWE	59.32	14.12	0.83
Krokstad	SWE	59.10	12.92	0.82
Kungsor	SWE	59.43	16.10	0.92
Kyrkebyn	SWE	59.27	13.07	0.83
Lidkoping	SWE	58.50	13.17	0.82
Liljeholmsviken	SWE	59.32	18.00	0.78

Ljustero	SWE	59.52	18.63	0.87
Loudden	SWE	59.33	18.13	0.77
Mariestad	SWE	58.72	13.83	0.82
Marsviken	SWE	58.67	16.95	0.85
Mem	SWE	58.48	16.42	0.85
Monsteras	SWE	57.03	16.47	0.98
Motala	SWE	58.53	15.07	0.83
Norrkoping	SWE	58.60	16.20	0.84
Norrsundet	SWE	60.95	17.17	1.03
Norrtalje	SWE	59.75	18.70	0.90
Norsbron	SWE	59.42	13.23	0.84
Nykoping	SWE	58.75	17.02	0.85
Orebro	SWE	59.28	15.18	0.85
Ornskoldsvik	SWE	63.27	18.72	1.07
Oskarshamn	SWE	57.27	16.45	0.98
Otterbacken	SWE	58.95	14.05	0.85
Ronneby	SWE	56.17	15.30	1.01
Rundvik	SWE	63.53	19.45	1.10
Saffle	SWE	59.13	12.93	0.82
Sankt Anna	SWE	58.33	16.70	0.84
Sjotorp	SWE	58.83	14.00	0.83
Skattkar	SWE	59.42	13.70	0.84
Skoghall	SWE	59.32	13.45	0.80
Skutskar	SWE	60.65	17.40	0.97
Slottsbron	SWE	59.33	13.10	0.83
Soderkoping	SWE	58.48	16.33	0.86
Solvesborg	SWE	56.05	14.58	1.00
Soraker	SWE	62.50	17.50	1.06
Spesshult	SWE	59.07	12.92	0.82
Stockholm	SWE	59.32	18.05	0.77
Stocksund	SWE	59.38	18.05	0.78
Strangnas	SWE	59.38	17.03	0.91
Studsvik	SWE	58.75	17.28	0.84
Sturko	SWE	56.08	15.67	1.01
Taxinge	SWE	59.22	17.37	0.85
Torko	SWE	56.15	15.40	1.01
Trelleborg	SWE	55.37	13.15	0.94
Uppsala	SWE	59.87	17.65	0.78
Valdemarsvik	SWE	58.20	16.60	0.85
Vaxholm	SWE	59.38	18.33	0.80
Vesteras	SWE	59.60	16.43	0.94
Visby	SWE	57.65	18.28	0.98
Ystad	SWE	55.43	13.83	0.95
Berdiansk	UKR	46.75	36.78	0.91
Cherkassy	UKR	49.43	32.05	0.26
Dneprodzerzhinsk	UKR	48.50	34.62	0.29
Dnepropetrovsk	UKR	48.48	35.00	0.32
Kiev	UKR	50.42	30.50	0.31
Kremenchug	UKR	49.05	33.42	0.25
Mariupol	UKR	47.05	37.50	0.84

Reni	UKR	45.43	28.30	0.63
Tyaginka	UKR	46.75	33.05	0.43
Zaporozhye	UKR	47.83	35.17	0.44
Albany	USA	42.65	-73.75	0.31
Allyns Point	USA	41.43	-72.07	0.63
Alpena	USA	45.05	-83.43	0.46
Alsen	USA	42.18	-73.92	0.28
Ashland	USA	46.58	-90.90	0.54
Ashtabula	USA	41.92	-80.82	0.34
Bangor	USA	44.80	-68.78	0.15
Bath	USA	43.90	-69.82	0.45
Bay City	USA	43.58	-83.88	0.21
Bayfield	USA	46.80	-90.80	0.65
Belfast	USA	44.42	-69.00	0.75
Benton Harbour	USA	42.12	-86.45	0.33
Beverly	USA	46.82	-119.92	0.63
Brevort	USA	46.00	-85.03	0.52
Buchanan	USA	41.20	-73.92	0.63
Bucksport	USA	44.57	-68.80	0.46
Buffalo	USA	42.88	-78.88	0.29
Buffington	USA	41.63	-87.42	0.26
Burlington (NJ)	USA	40.08	-74.85	0.87
Burns Harbour	USA	41.63	-87.18	0.28
Calcite	USA	45.40	-83.78	0.57
Camden (NJ)	USA	39.93	-75.13	0.89
Castine	USA	44.38	-68.83	1.10
Catskill	USA	42.22	-73.88	0.28
Cedarville	USA	45.98	-84.35	0.69
Cementon	USA	42.13	-73.92	0.32
Charlevoix	USA	45.32	-85.22	0.37
Cheboygan	USA	45.67	-84.47	0.53
Chester (PA)	USA	39.83	-75.37	0.91
Chicago	USA	41.83	-87.63	0.26
Claymont	USA	39.80	-75.43	0.91
Clayton	USA	44.23	-76.08	0.19
Cleveland	USA	41.52	-81.72	0.39
Conneaut	USA	41.97	-80.57	0.33
Coxsackie	USA	42.33	-73.80	0.29
Delair	USA	40.00	-75.03	0.89
Delaware City	USA	39.57	-75.58	0.92
Detour	USA	45.97	-83.88	0.70
Detroit	USA	42.33	-83.03	0.24
Duluth	USA	46.73	-92.15	0.72
East St. Louis	USA	38.62	-90.18	1.08
Eddystone	USA	39.83	-75.33	0.91
Erie	USA	42.17	-80.08	0.32
Escanaba	USA	45.78	-87.07	0.39
Essexville	USA	43.60	-83.83	0.21
Fairless Hills	USA	40.17	-74.88	0.87
Fairport	USA	41.77	-81.32	0.37

Ferrysburg	USA	43.08	-86.23	0.40
Gary Harbour	USA	41.60	-87.35	0.26
Gloucester (NJ)	USA	39.88	-75.13	0.89
Grand Haven	USA	43.07	-86.25	0.39
Grand River	USA	41.73	-81.28	0.36
Green Bay	USA	44.52	-88.00	0.14
Groton	USA	41.35	-72.08	0.96
Harbor Beach	USA	43.83	-82.65	0.41
Holland (MI)	USA	42.78	-86.22	0.40
Huron	USA	41.40	-82.58	0.41
Hyde Park	USA	41.78	-73.93	0.33
Indiana Harbour	USA	41.67	-87.50	0.26
Jeffersonville	USA	38.27	-85.75	1.05
Kalama	USA	46.02	-122.83	0.96
Kenosha	USA	42.58	-87.82	0.28
Kewaunee	USA	44.45	-87.52	0.58
Kingston	USA	41.87	-73.97	0.33
Lafayette	USA	40.40	-86.88	0.60
Lorain	USA	41.47	-82.17	0.41
Louisville	USA	38.23	-85.77	1.05
Ludington	USA	43.97	-86.45	0.63
Mackinaw City	USA	45.75	-84.73	0.52
Manistee	USA	44.25	-86.33	0.65
Manitowoc	USA	44.10	-87.63	0.55
Marblehead	USA	41.53	-82.72	0.47
Marcus Hook	USA	39.82	-75.42	0.91
Marine City	USA	42.72	-82.48	0.27
Marinette	USA	45.12	-87.62	0.31
Marquette	USA	46.60	-87.38	0.79
Marysville	USA	42.92	-82.48	0.26
Menominee	USA	45.13	-87.62	0.33
Milton	USA	41.60	-73.95	0.45
Milwaukee	USA	43.05	-87.87	0.37
Monroe	USA	41.92	-83.33	0.43
Mossville	USA	40.80	-89.57	0.62
Mount Vernon	USA	37.92	-87.88	1.05
Muskegon	USA	43.18	-86.23	0.43
New London	USA	41.40	-72.10	0.75
Newburgh	USA	41.50	-74.08	0.46
Ogdensburg	USA	44.70	-75.50	0.06
Olympia	USA	47.05	-122.90	1.00
Ontonagon	USA	46.87	-89.30	0.69
Oswego	USA	43.47	-76.53	0.29
Pasco	USA	46.22	-119.08	0.88
Paulsboro	USA	39.83	-75.25	0.90
Peekskill	USA	41.25	-73.92	0.63
Pennsauken	USA	39.97	-75.03	0.89
Peoria	USA	40.68	-89.58	0.62
Philadelphia	USA	39.90	-75.13	0.89
Pittsburgh (PA)	USA	40.43	-80.00	0.54

Point Pleasant	USA	38.88	-82.12	0.77
Port Dolomite	USA	45.97	-84.27	0.62
Port Huron	USA	42.98	-82.43	0.25
Port Inland	USA	45.97	-85.87	0.55
Port Jefferson	USA	40.95	-73.07	1.06
Port Washington	USA	43.38	-87.87	0.46
Portland (OR)	USA	45.57	-122.73	0.92
Poughkeepsie	USA	41.68	-73.88	0.33
Providence	USA	41.80	-71.38	0.88
Racine	USA	42.73	-87.80	0.27
Ravena	USA	42.47	-73.80	0.29
Reedy Point	USA	39.57	-75.57	0.92
Rensselaer	USA	42.65	-73.73	0.31
Rochester (NY)	USA	43.28	-77.60	0.24
Rockport (MI)	USA	45.20	-83.38	0.57
Rogers City	USA	45.40	-83.83	0.58
Roseton	USA	41.57	-74.00	0.36
Saginaw	USA	43.45	-83.92	0.22
Salem (NJ)	USA	39.57	-75.47	0.92
Sandusky	USA	41.45	-82.73	0.45
Searsport	USA	44.45	-68.92	0.99
Sheboygan	USA	43.75	-87.70	0.60
Shippensburg	USA	40.03	-77.52	0.59
Somerset (MA)	USA	41.78	-71.13	0.81
South Brewer	USA	44.78	-68.78	0.15
South Haven	USA	42.45	-86.25	0.37
St. Clair	USA	42.82	-82.47	0.26
St. Joseph	USA	42.08	-86.50	0.33
St. Louis (MO)	USA	38.67	-90.25	1.08
Stoneport	USA	45.28	-83.43	0.58
Stony Point	USA	41.23	-73.97	0.63
Superior	USA	46.72	-92.08	0.72
Tell City	USA	37.95	-86.77	1.03
The Dalles	USA	45.58	-121.18	0.61
Toledo(USA)	USA	41.70	-83.47	0.45
Tomkins Cove	USA	41.27	-73.98	0.63
Tonawanda	USA	43.02	-78.88	0.29
Trenton	USA	40.18	-74.75	0.83
Troutdale	USA	45.53	-122.38	0.93
Troy	USA	42.73	-73.68	0.29
Tullytown	USA	40.13	-74.82	0.83
Two Harbors	USA	47.02	-91.67	1.06
Umatilla	USA	45.92	-119.33	0.79
Vancouver	USA	45.63	-122.67	0.92
Waddington	USA	44.85	-75.20	0.11
Warren	USA	41.73	-71.30	1.03
Waukegan	USA	42.37	-87.83	0.22
Westville	USA	39.87	-75.13	0.89
Whitefish Point	USA	46.75	-84.95	0.81
Willbridge	USA	45.57	-122.75	0.92

Wilmington (DE)	USA	39.75	-75.50	0.86
Winterport	USA	44.63	-68.85	0.40
Wiscasset	USA	44.00	-69.67	0.46
Wyandotte	USA	42.18	-83.15	0.35
Yonkers	USA	40.95	-73.83	0.79
Zilwaukee	USA	43.47	-83.92	0.22

Appendix D. List of global ports that have highest environmental similarity to Toronto. NIS originating from these ports have the highest potential for survival if introduced at Toronto.

Name	Country	Latitude	Longitude	Environmental Distance
Eckero	ALD	60.22	19.60	0.69
Farjsundet	ALD	60.23	20.02	0.96
Finstrom	ALD	60.25	19.92	0.96
Langnasudd	ALD	60.12	20.30	0.98
Mariehamn	ALD	60.10	19.93	1.03
Launceston	AUS	-41.44	147.14	1.09
Korneuburg	AUT	48.37	16.33	0.42
Linz	AUT	48.32	14.30	0.26
Vienna	AUT	48.22	16.37	0.51
Antwerp	BEL	51.24	4.41	0.60
Baasrode	BEL	51.05	4.17	0.62
Balen	BEL	51.17	5.17	0.57
Boom	BEL	51.08	4.37	0.59
Brussels	BEL	50.83	4.32	0.59
Buggenhout	BEL	51.02	4.20	0.61
Burcht	BEL	51.20	4.33	0.62
Chatelineau	BEL	50.42	4.52	0.52
Dendermonde	BEL	51.03	4.12	0.62
Doel	BEL	51.32	4.27	0.64
Engis	BEL	50.58	5.40	0.51
Ertvelde	BEL	51.20	3.78	0.66
Geel	BEL	51.15	4.97	0.57
Genk	BEL	50.94	5.50	0.55
Ghent	BEL	51.09	3.75	0.64
Grimbergen	BEL	50.93	4.37	0.58
Grobbendonk	BEL	51.20	4.75	0.58
Haren	BEL	50.90	4.38	0.58
Hemiksem	BEL	51.15	4.34	0.59
Hermalle sous Huy	BEL	50.55	5.37	0.51
Hingene	BEL	51.12	4.27	0.61
Hoboken	BEL	51.17	4.33	0.61
Humbeek	BEL	50.97	4.38	0.58
Kallo	BEL	51.25	4.28	0.62
Kapelle op den Bos	BEL	51.02	4.37	0.59
Kruibeke	BEL	51.17	4.32	0.61

Kwaadmechelen	BEL	51.10	5.15	0.57
Lanaken	BEL	50.88	5.65	0.55
Langerbrugge	BEL	51.12	3.75	0.64
Liefkenshoek	BEL	51.30	4.28	0.64
Liege	BEL	50.64	5.57	0.51
Lillo	BEL	51.30	4.30	0.64
Lixhe	BEL	50.73	5.70	0.53
Maasmechelen	BEL	50.97	5.70	0.55
Marly	BEL	50.88	4.38	0.58
Mechelen	BEL	51.03	4.47	0.59
Melle	BEL	51.00	3.80	0.61
Merksem	BEL	51.23	4.48	0.60
Nameche	BEL	50.47	4.98	0.52
Niel	BEL	51.12	4.33	0.61
Olen	BEL	51.15	4.87	0.57
Puurs	BEL	51.07	4.27	0.61
Rieme	BEL	51.17	3.77	0.65
Ruisbroek	BEL	50.78	4.28	0.59
Rumst	BEL	51.07	4.42	0.59
Rupelmonde	BEL	51.13	4.28	0.61
Schelle	BEL	51.13	4.32	0.61
Schoten	BEL	51.25	4.50	0.60
Seilles	BEL	50.50	5.08	0.50
Sint-Kruis-Winkel	BEL	51.15	3.80	0.65
Temse	BEL	51.13	4.22	0.61
Terdonk	BEL	51.15	3.78	0.65
Terhagen	BEL	51.08	4.38	0.59
Tessenderlo	BEL	51.07	5.08	0.57
Tielrode	BEL	51.12	4.22	0.61
Tisselt	BEL	51.03	4.37	0.59
Val St. Lambert	BEL	50.57	5.47	0.51
Verbrande Brug	BEL	50.95	4.38	0.58
Vilvoorde	BEL	50.95	4.42	0.58
Willebroek	BEL	51.05	4.35	0.59
Wintham	BEL	51.10	4.28	0.61
Wondelgem	BEL	51.08	3.72	0.64
Zelzate	BEL	51.20	3.80	0.66
Zutendaal	BEL	50.92	5.57	0.55
Zwyndrecht	BEL	51.22	4.33	0.62
Kozloduy	BGR	43.78	23.72	0.89
Lom	BGR	43.83	23.20	0.80
Rousse	BGR	43.83	25.97	0.80
Silistra	BGR	44.10	27.25	0.79
Amherstburg	CAN	42.10	-83.08	0.65
Baddeck	CAN	46.10	-60.73	0.78

Bath	CAN	44.17	-76.77	0.31
Batiscan	CAN	46.52	-72.23	0.34
Bayside	CAN	45.17	-67.13	0.80
Becancour	CAN	46.40	-72.38	0.31
Bella Coola	CAN	52.38	-126.77	0.99
Belleville	CAN	44.13	-77.37	0.23
Bowmanville	CAN	43.90	-78.67	0.05
Boylston	CAN	45.45	-61.52	0.93
Britt	CAN	45.77	-80.58	0.20
Brockville	CAN	44.60	-75.63	0.35
Bronte	CAN	43.40	-79.70	0.08
Bruce Mines	CAN	46.27	-83.72	0.39
Burlington	CAN	43.32	-79.75	0.16
Cardinal	CAN	44.78	-75.33	0.38
Chicoutimi	CAN	48.43	-71.08	0.45
Clarkson	CAN	43.50	-79.60	0.10
Cobourg	CAN	43.95	-78.17	0.17
Colborne	CAN	44.00	-77.88	0.18
Collingwood	CAN	44.50	-80.23	0.10
Contrecoeur	CAN	45.88	-73.20	0.32
Cornwall	CAN	45.02	-74.72	0.37
Corunna	CAN	42.88	-82.45	0.25
Cote Ste-Catherine	CAN	45.41	-73.58	0.37
Country Harbour	CAN	45.22	-61.73	0.96
Courtright	CAN	42.80	-82.45	0.25
Erieau	CAN	42.25	-81.93	0.55
Fort Erie	CAN	42.93	-78.95	0.53
Fredericton	CAN	45.95	-66.65	0.23
Gananoque	CAN	44.32	-76.15	0.39
Goderich	CAN	43.75	-81.75	0.14
Gold River	CAN	49.68	-126.12	0.78
Goose Bay	CAN	53.35	-60.42	0.96
Grondines	CAN	46.75	-72.03	0.39
Hamilton	CAN	43.23	-79.85	0.10
Hay River	CAN	60.85	-115.70	1.03
Houston	CAN	54.40	-126.65	0.98
Humberstone	CAN	42.90	-79.25	0.49
Iona	CAN	45.97	-60.80	0.37
Isaac’s Harbour	CAN	45.17	-61.65	1.05
Killarney	CAN	45.97	-81.52	0.30
Kingston	CAN	44.20	-76.50	0.37
Kingsville	CAN	42.02	-82.72	0.68
Kitimat	CAN	54.00	-128.70	0.61
Lanoraie	CAN	45.97	-73.18	0.32
Lauzon	CAN	46.82	-71.15	0.34

Leamington	CAN	42.05	-82.62	0.69
Levis	CAN	46.82	-71.18	0.31
Little Current	CAN	45.97	-81.92	0.12
Little Narrows	CAN	45.98	-60.98	0.31
Long Sault	CAN	45.02	-74.90	0.33
Marathon	CAN	48.75	-86.38	0.93
Meldrum Bay	CAN	45.92	-83.10	0.36
Michipicoten Harbour	CAN	47.95	-84.92	0.63
Midland	CAN	44.75	-79.93	0.11
Montréal	CAN	45.50	-73.55	0.40
Mooretown	CAN	42.85	-82.47	0.25
Morrisburg	CAN	44.93	-75.18	0.31
Nanticoke	CAN	42.82	-80.07	0.42
Nelson	CAN	49.47	-117.30	0.83
Oakville	CAN	43.43	-79.67	0.07
Ocean Falls	CAN	52.35	-127.70	0.87
Oshawa	CAN	43.87	-78.83	0.05
Ottawa	CAN	45.40	-75.70	0.34
Owen Sound	CAN	44.58	-80.95	0.08
Parry Sound	CAN	45.37	-80.05	0.12
Pelee Island	CAN	41.75	-82.67	0.73
Picton	CAN	44.00	-77.13	0.30
Pointe aux Trembles	CAN	45.63	-73.48	0.35
Port Alberni	CAN	49.23	-125.00	0.71
Port Alice	CAN	50.38	-127.45	1.01
Port Burwell	CAN	42.63	-80.80	0.41
Port Colborne	CAN	42.87	-79.25	0.50
Port Credit	CAN	43.55	-79.60	0.03
Port Dalhousie	CAN	43.20	-79.27	0.22
Port Dover	CAN	42.78	-80.20	0.38
Port Hope	CAN	43.95	-78.28	0.15
Port Maitland	CAN	42.87	-79.58	0.46
Port McNicoll	CAN	44.75	-79.80	0.12
Port Stanley	CAN	42.67	-81.22	0.42
Port Weller	CAN	43.23	-79.22	0.26
Prescott	CAN	44.72	-75.52	0.34
Québec	CAN	46.82	-71.20	0.31
Sarnia	CAN	42.98	-82.42	0.24
Sault Ste. Marie	CAN	46.52	-84.33	0.33
Sombra	CAN	42.70	-82.47	0.25
Sonora	CAN	45.07	-61.92	0.98
Sorel	CAN	46.05	-73.12	0.35
Spragge	CAN	46.22	-82.67	0.19
St. Catharines	CAN	43.17	-79.27	0.20
St. Romuald	CAN	46.75	-71.23	0.31

St. Stephen	CAN	45.20	-67.28	0.45
Ste. Croix	CAN	46.63	-71.73	0.32
Tahsis	CAN	49.92	-126.67	1.02
Thessalon	CAN	46.25	-83.55	0.38
Thorold	CAN	43.08	-79.17	0.46
Three Rivers	CAN	46.35	-72.55	0.31
Thunder Bay	CAN	48.42	-89.22	0.79
Tobermory	CAN	45.23	-81.65	0.34
Toronto	CAN	43.63	-79.38	0.00
Tracy	CAN	46.02	-73.17	0.33
Valleyfield	CAN	45.22	-74.08	0.36
Wallaceburg	CAN	42.60	-82.40	0.25
Welland	CAN	42.97	-79.22	0.42
Weymouth	CAN	44.45	-66.02	0.78
Wheatley	CAN	42.08	-82.43	0.57
Whitby	CAN	43.85	-78.92	0.02
Windsor	CAN	42.32	-83.05	0.41
Basle	CHE	47.55	7.57	0.42
Dandong	CHN	40.13	124.40	1.04
Fujin	CHN	47.25	132.02	0.68
Harbin	CHN	45.73	126.60	0.71
Heihe	CHN	50.23	127.47	0.74
Jiamusi	CHN	46.80	130.35	0.67
Panjin	CHN	41.12	122.07	0.96
Panshi	CHN	42.92	126.03	0.62
Tongjiang	CHN	47.63	132.50	0.69
Chvaletice	CZE	50.02	15.43	0.26
Usti nad Labem	CZE	50.67	14.03	0.24
Aken	DEU	51.85	12.03	0.35
Andernach	DEU	50.42	7.38	0.47
Anklam	DEU	53.87	13.68	0.65
Aschaffenburg	DEU	49.95	9.17	0.38
Barth	DEU	54.37	12.73	0.65
Bendorf	DEU	50.42	7.58	0.45
Berlin	DEU	52.53	13.42	0.33
Berne	DEU	53.18	10.50	0.43
Bingen	DEU	49.95	7.90	0.45
Bodenwerder	DEU	51.97	9.50	0.43
Boizenburg	DEU	53.38	10.73	0.43
Bonn	DEU	50.72	7.08	0.53
Brandenburg	DEU	52.40	12.52	0.35
Braunschweig	DEU	52.25	10.50	0.41
Brohl	DEU	50.42	7.30	0.44
Castrop Rauxel	DEU	51.55	7.30	0.53
Cologne	DEU	50.93	7.00	0.56

Deggendorf	DEU	48.83	12.97	0.27
Dormagen	DEU	51.10	6.95	0.57
Dortmund	DEU	51.53	7.45	0.53
Duisburg	DEU	51.43	6.75	0.57
Dusseldorf	DEU	51.25	6.77	0.57
Eisenhuttenstadt	DEU	52.15	14.62	0.25
Emmerich	DEU	51.85	6.25	0.56
Erftstadt	DEU	50.80	6.75	0.51
Essen	DEU	51.45	7.02	0.53
Frankfurt	DEU	50.12	8.67	0.41
Geesthacht	DEU	53.43	10.38	0.44
Gelsenkirchen	DEU	51.50	7.08	0.53
Germersheim	DEU	49.22	8.38	0.55
Gernsheim	DEU	49.75	8.47	0.48
Greifswald	DEU	54.10	13.38	0.69
Haren	DEU	52.80	7.25	0.62
Havelberg	DEU	52.83	12.07	0.36
Heringsdorf	DEU	53.97	14.17	0.64
Hohenhorn	DEU	53.47	10.37	0.44
Homberg	DEU	51.45	6.72	0.57
Hoya	DEU	52.80	9.13	0.45
Ibbenburen	DEU	52.28	7.73	0.50
Karlsruhe	DEU	49.05	8.33	0.56
Kehl	DEU	48.58	7.83	0.51
Koblenz	DEU	50.33	7.58	0.42
Krefeld	DEU	51.33	6.57	0.57
Kroslin	DEU	54.13	13.75	0.76
Ladebow	DEU	54.10	13.45	0.69
Lahnstein	DEU	50.30	7.62	0.42
Lauenburg	DEU	53.38	10.55	0.43
Lauterbach	DEU	54.33	13.52	0.79
Leer	DEU	53.22	7.45	0.65
Leeseringen	DEU	52.58	9.13	0.45
Leverkusen	DEU	51.02	7.03	0.52
Lubeck	DEU	53.87	10.67	1.10
Lubmin	DEU	54.12	13.60	0.67
Ludwigshafen am Rhein	DEU	49.47	8.45	0.53
Magdeburg	DEU	52.13	11.62	0.34
Mainz	DEU	50.00	8.28	0.43
Mannheim	DEU	49.48	8.47	0.53
Minden	DEU	52.30	8.90	0.45
Monheim	DEU	51.12	6.82	0.56
Moselkern	DEU	50.18	7.37	0.43
Mukran	DEU	54.48	13.58	0.81
Mulheim	DEU	50.95	7.05	0.54

Neckarsteinach	DEU	49.43	8.80	0.37
Neuss	DEU	51.20	6.70	0.57
Neuss/Dusseldorf	DEU	51.20	6.70	0.57
Neustadt	DEU	54.10	10.82	1.10
Neuwied	DEU	50.43	7.48	0.47
Nienburg	DEU	52.63	9.22	0.44
Nuremberg	DEU	49.45	11.05	0.29
Oldersum	DEU	53.32	7.33	0.98
Orsoy	DEU	51.53	6.68	0.57
Osnabruck	DEU	52.27	8.03	0.47
Papenburg	DEU	53.08	7.38	0.56
Passau	DEU	48.58	13.47	0.25
Peenemunde	DEU	54.12	13.77	0.76
Peine	DEU	52.32	10.22	0.42
Porz	DEU	50.88	7.05	0.54
Regensburg	DEU	49.02	12.12	0.24
Remagen	DEU	50.57	7.22	0.47
Rheinhausen	DEU	51.42	6.73	0.57
Rinteln	DEU	52.20	9.08	0.44
Rosslau	DEU	51.90	12.27	0.35
Rostock	DEU	54.15	12.10	0.70
Ruhrort	DEU	51.45	6.73	0.57
Salzgitter	DEU	52.22	10.33	0.42
Sassnitz	DEU	54.52	13.63	0.81
Schlutup	DEU	53.88	10.78	1.10
Speyer	DEU	49.30	8.43	0.55
Stralsund	DEU	54.32	13.10	0.70
Sturzelberg	DEU	51.12	6.80	0.56
Stuttgart	DEU	48.78	9.20	0.38
Tangermunde	DEU	52.57	11.97	0.36
Travemunde	DEU	53.97	10.90	1.10
Ueckermunde	DEU	53.73	14.28	0.73
Urdingen	DEU	51.35	6.67	0.57
Vallendar	DEU	50.40	7.62	0.45
Vierow	DEU	54.10	13.57	0.67
Walsum	DEU	51.53	6.68	0.57
Warnemunde	DEU	54.18	12.08	0.71
Weissenthurm	DEU	50.42	7.48	0.47
Wesel	DEU	51.65	6.60	0.57
Wesseling	DEU	50.83	7.00	0.51
Westerende-Kirchloog	DEU	53.43	7.42	0.96
Wolgast	DEU	54.05	13.78	0.76
Worms	DEU	49.63	8.35	0.50
Wurzburg	DEU	49.78	9.93	0.33
Aggersund	DNK	57.02	9.28	0.80

Allinge	DNK	55.28	14.80	0.88
Fur	DNK	56.83	9.00	0.80
Gudhjem	DNK	55.22	14.97	0.73
Hammeren	DNK	55.28	14.75	0.88
Hammerhavn	DNK	55.27	14.75	0.88
Hasle	DNK	55.18	14.70	0.88
Hvalpsund	DNK	56.68	9.20	0.55
Logstor	DNK	56.97	9.25	0.55
Nekso	DNK	55.07	15.15	0.78
Nykobing	DNK	56.80	8.87	0.76
Ronne	DNK	55.10	14.70	0.88
Skarrehage	DNK	56.95	8.87	0.72
Skive	DNK	56.57	9.03	0.55
Stege	DNK	54.98	12.28	0.84
Struer	DNK	56.50	8.60	1.09
Stubbekobing	DNK	54.88	12.03	0.79
Svaneke	DNK	55.13	15.15	0.78
Tejn	DNK	55.23	14.83	0.88
Thisted	DNK	56.95	8.70	0.64
Vang	DNK	55.27	14.75	0.88
Bekker	EST	59.45	24.67	0.60
Dirhami	EST	59.22	23.50	0.82
Forby	EST	59.00	23.17	0.77
Haapsalu	EST	58.95	23.53	0.59
Heltermaa	EST	58.87	23.07	0.66
Kuivastu	EST	58.58	23.40	0.64
Kunda	EST	59.52	26.55	0.80
Lehtma	EST	59.05	22.70	0.85
Loksa	EST	59.58	25.72	0.79
Meeruse	EST	59.45	24.68	0.59
Miiduranna	EST	59.50	24.82	0.84
Montu	EST	57.95	22.12	0.70
Muuga	EST	59.50	24.97	0.84
Narva Joesuu	EST	59.47	28.05	0.57
Paldiski	EST	59.35	24.05	0.84
Paljassaare	EST	59.45	24.70	0.59
Parnu	EST	58.38	24.48	0.52
Peetri	EST	59.45	24.73	0.59
Prangli Island	EST	59.63	25.00	0.78
Rohukula	EST	58.90	23.42	0.65
Roomassaare	EST	58.22	22.52	0.65
Saaremaa Harbour	EST	58.53	22.23	0.69
Sillamae	EST	59.40	27.78	0.57
Tallinn	EST	59.45	24.75	0.59
Veere	EST	58.45	22.05	0.62

Virtsu	EST	58.58	23.55	0.57
Dalsbruk	FIN	60.03	22.52	0.62
Frojdbole	FIN	60.15	19.92	1.03
Galtby	FIN	60.18	21.58	0.89
Hamina	FIN	60.57	27.18	0.55
Hanko	FIN	59.82	22.97	0.88
Helsinki	FIN	60.17	24.95	0.54
Houtskar	FIN	60.22	21.37	0.91
Imatra	FIN	61.17	28.83	0.47
Inkoo	FIN	60.05	24.02	0.70
Isnas	FIN	60.40	26.00	0.61
Joensuu	FIN	62.60	29.75	0.62
Joutseno	FIN	61.13	28.48	0.46
Kantvik	FIN	60.08	24.38	0.68
Kaskinen	FIN	62.38	21.22	1.06
Kaukas	FIN	61.07	28.22	0.46
Kaukopaa	FIN	61.25	28.87	0.51
Kemi	FIN	65.73	24.57	0.93
Kokkila	FIN	60.33	22.87	0.64
Korpo	FIN	60.15	21.55	0.89
Kotka	FIN	60.47	26.95	0.76
Koverhar	FIN	59.88	23.22	0.87
Kristiinankaupunki	FIN	62.27	21.32	0.67
Kronvik	FIN	63.05	21.52	0.73
Kuopio	FIN	62.85	27.50	0.57
Kustavi	FIN	60.57	21.33	0.67
Kuuslahti	FIN	63.12	27.75	0.56
Lapaluoto	FIN	64.67	24.42	0.85
Lappeenranta	FIN	61.07	28.25	0.46
Lappohja	FIN	59.90	23.27	0.88
Lappvik	FIN	59.90	23.27	0.88
Lauritsala	FIN	61.08	28.33	0.46
Loviisa	FIN	60.45	26.23	0.58
Luvia	FIN	61.33	21.57	0.67
Mantyluoto	FIN	61.58	21.50	0.68
Martinniemi	FIN	65.22	25.28	0.83
Maxmo	FIN	63.20	22.03	0.76
Merikarvia	FIN	61.85	21.47	0.71
Mjosund	FIN	60.22	22.47	0.61
Mustola	FIN	61.07	28.30	0.46
Naantali	FIN	60.47	22.02	0.62
Nyhamn	FIN	62.17	21.33	0.67
Olkiluoto	FIN	61.25	21.50	0.64
Oulu	FIN	65.00	25.47	0.80
Parainen	FIN	60.28	22.30	0.61

Pateniemi	FIN	65.08	25.40	0.82
Perno	FIN	60.45	26.05	0.60
Pori	FIN	61.48	21.80	0.70
Puhos	FIN	62.10	29.92	0.58
Raahe	FIN	64.68	24.48	0.87
Rahja	FIN	64.20	23.73	0.84
Rauma	FIN	61.13	21.50	0.66
Ristiina	FIN	61.53	27.42	0.53
Roytta	FIN	65.77	24.15	0.93
Salo	FIN	60.38	23.17	0.67
Savonlinna	FIN	61.90	28.92	0.54
Siilinjarvi	FIN	63.08	27.67	0.56
Sipoo	FIN	60.37	25.32	0.62
Skogby	FIN	59.92	23.32	0.88
Skoldvik	FIN	60.30	25.55	0.58
Skuru	FIN	60.10	23.55	0.68
Stromma	FIN	60.18	22.90	0.64
Summa	FIN	60.53	27.12	0.55
Svartback	FIN	60.28	25.53	0.58
Taalintehdas	FIN	60.02	22.52	0.62
Tammisaari	FIN	59.98	23.43	0.64
Teijo	FIN	60.25	22.95	0.64
Tolkkinen	FIN	60.33	25.58	0.58
Tornio	FIN	65.85	24.15	0.92
Tupavuori	FIN	60.45	22.07	0.62
Turku	FIN	60.43	22.22	0.61
Uusikaupunki	FIN	60.80	21.40	0.66
Vaasa	FIN	63.10	21.62	0.73
Valkom	FIN	60.42	26.27	0.58
Varkaus	FIN	62.33	27.83	0.52
Vartsala	FIN	60.33	23.02	0.66
Vastanfjard	FIN	60.05	22.65	0.62
Veitsiluoto	FIN	65.70	24.62	0.93
Abbeville	FRA	50.10	1.85	0.91
Ambes	FRA	45.03	-0.60	1.06
Annay sous Lens	FRA	50.47	2.87	0.64
Bassens	FRA	44.90	-0.53	1.09
Bethune	FRA	50.53	2.63	0.68
Blaye	FRA	45.12	-0.67	1.08
Bonnieres	FRA	49.03	1.58	0.68
Bordeaux	FRA	44.83	-0.57	1.09
Chalon-sur-Saone	FRA	46.78	4.83	0.63
Conflans	FRA	48.98	2.10	0.70
Cordemais	FRA	47.27	-1.88	0.98
Duclair	FRA	49.45	0.87	0.74

Elbeuf	FRA	49.28	1.12	0.71
Fontenay le Comte	FRA	46.47	-0.78	1.07
Gaillon	FRA	49.17	1.32	0.68
Grand Couronne	FRA	49.37	0.98	0.74
Grigny	FRA	45.62	4.78	0.71
Ingrandes	FRA	47.40	-0.92	0.86
Izon	FRA	44.95	-0.37	1.06
La Mailleraye	FRA	49.48	0.77	0.74
Le Pouzin	FRA	44.75	4.75	0.96
Le Trait	FRA	49.47	0.80	0.74
Les Andelys	FRA	49.25	1.43	0.68
Libourne	FRA	44.92	-0.23	1.07
Lille	FRA	50.65	3.08	0.64
Lillebonne	FRA	49.52	0.53	0.78
Limay	FRA	48.97	1.78	0.66
Lyon	FRA	45.77	4.83	0.71
Mantes	FRA	48.98	1.72	0.66
Nantes	FRA	47.23	-1.57	0.91
Nort-sur-Erdre	FRA	47.43	-1.50	0.90
Noyelles	FRA	50.18	1.72	1.09
Paimboeuf	FRA	47.28	-2.03	1.07
Paris	FRA	48.87	2.33	0.75
Pauillac	FRA	45.20	-0.75	1.09
Petit Couronne	FRA	49.37	1.00	0.74
Port Jerome	FRA	49.47	0.53	0.80
Radicatel	FRA	49.42	0.48	0.82
Redon	FRA	47.65	-2.07	0.98
Rouen	FRA	49.48	1.08	0.72
St. Etienne du Rouvray	FRA	49.37	1.12	0.72
St. Wandrille	FRA	49.53	0.75	0.74
Strasbourg	FRA	48.57	7.70	0.51
Vernon	FRA	49.08	1.48	0.68
Villeneuve-la-Garenne	FRA	48.92	2.30	0.75
Villeneuve-le-Roi	FRA	48.73	2.40	0.77
Villequier	FRA	49.50	0.67	0.77
Acton Grange	GBR	53.37	-2.63	0.91
Alloa	GBR	56.10	-3.80	0.94
Althorpe Wharf	GBR	53.57	-0.73	0.75
Anderton	GBR	53.27	-2.52	0.82
Aylesford	GBR	51.27	0.47	0.80
Barton	GBR	53.47	-2.37	0.80
Beckingham	GBR	53.40	-0.83	0.72
Beverley	GBR	53.85	-0.43	0.83
Bowling	GBR	55.93	-4.50	0.91
Burton upon Stather	GBR	53.65	-0.68	0.76

Dalmuir	GBR	55.90	-4.43	0.86
Drax	GBR	53.73	-0.98	0.74
Dumbarton	GBR	55.93	-4.57	0.96
Dunglass	GBR	55.93	-4.52	0.91
Faslane Dock	GBR	56.07	-4.82	1.04
Finnart	GBR	56.12	-4.83	1.04
Flixborough	GBR	53.62	-0.68	0.75
Frodsham	GBR	53.30	-2.73	1.00
Gainsborough	GBR	53.40	-0.77	0.72
Garelochhead	GBR	56.08	-4.83	1.06
Glasgow	GBR	55.87	-4.28	0.84
Glenmallan	GBR	56.12	-4.82	1.02
Gloucester	GBR	51.87	-2.22	0.76
Goole	GBR	53.70	-0.87	0.77
Grove Wharf	GBR	53.60	-0.68	0.75
Gunness	GBR	53.58	-0.72	0.75
Gunness Wharf	GBR	53.58	-0.68	0.75
Halling	GBR	51.37	0.01	0.75
Howdendyke	GBR	53.75	-0.87	0.77
Irlam	GBR	53.43	-2.42	0.82
Irwell	GBR	53.47	-2.35	0.80
Keadby	GBR	53.60	-0.67	0.75
Knottingley	GBR	53.72	-1.23	0.75
Latchford	GBR	53.38	-2.57	0.88
London	GBR	51.50	-0.07	0.76
Manchester	GBR	53.47	-2.28	0.79
Neap House	GBR	53.62	-0.67	0.75
Northwich	GBR	53.27	-2.53	0.82
Old Kilpatrick	GBR	55.92	-4.45	0.86
Paisley	GBR	55.85	-4.43	0.86
Partington	GBR	53.43	-2.43	0.82
Perth	GBR	56.40	-3.43	0.90
Renfrew	GBR	55.87	-4.40	0.86
Rochester	GBR	51.40	0.50	0.93
Selby	GBR	53.78	-1.07	0.74
Shandon	GBR	56.05	-4.82	1.04
Snodland	GBR	51.33	0.45	0.85
Thorne	GBR	53.62	-0.97	0.73
Tilbury	GBR	51.45	0.33	1.08
Warrington	GBR	53.40	-2.60	0.88
Winnington	GBR	53.28	-2.52	0.82
Wisbech	GBR	52.65	0.15	0.99
Budapest	HUN	47.50	19.03	0.69
Aughinish Island	IRL	52.63	-9.05	1.09
Dernish Island	IRL	52.68	-8.92	0.98

Limerick	IRL	52.67	-8.63	0.92
Adria	ITA	45.05	12.07	1.09
Boretto	ITA	44.90	10.55	1.08
Cremona	ITA	45.13	10.02	1.02
Donada	ITA	45.05	12.22	1.09
Pavia	ITA	45.18	9.13	1.00
Klaipeda	LTU	55.72	21.13	0.57
Engure	LVA	57.17	23.23	0.70
Labrags	LVA	56.98	21.37	0.79
Liepaja	LVA	56.52	21.02	0.70
Mersrags	LVA	57.37	23.13	0.66
Pavilosta	LVA	56.90	21.18	0.68
Riga	LVA	56.97	24.10	0.50
Roja	LVA	57.50	22.82	0.65
Salacgriva	LVA	57.75	24.37	0.56
Skulte	LVA	57.32	24.40	0.53
Ventspils	LVA	57.40	21.55	0.70
Chisinau	MDA	47.02	28.83	0.55
Aalst	NLD	51.38	5.45	0.58
Alblasserdam	NLD	51.87	4.62	0.52
Ameide	NLD	51.95	4.95	0.50
Amsterdam	NLD	52.37	4.90	0.88
Arnhem	NLD	51.97	5.88	0.56
Assen	NLD	53.00	6.57	0.64
Axel Sassing	NLD	51.28	3.87	0.76
Bergambacht	NLD	51.93	4.78	0.50
Bergen-op-Zoom	NLD	51.50	4.27	0.80
Bergum	NLD	53.20	5.98	0.94
Bolnes	NLD	51.90	4.57	0.52
Bruinisse	NLD	51.67	4.10	0.73
Buitenhuizen	NLD	52.43	4.72	1.06
Capelle aan den Yssel	NLD	51.92	4.57	0.52
Culemborg	NLD	51.95	5.22	0.58
Deest	NLD	51.88	5.67	0.57
Den Bommel	NLD	51.72	4.28	0.69
Dintelmond	NLD	51.67	4.38	0.63
Dinteloord	NLD	51.63	4.37	0.64
Dodewaard	NLD	51.90	5.63	0.57
Dordrecht	NLD	51.80	4.65	0.52
Drachten	NLD	53.12	6.10	0.95
Druten	NLD	51.88	5.62	0.57
Eindhoven	NLD	51.43	5.50	0.58
Fijnaart	NLD	51.63	4.48	0.62
Geertruidenberg	NLD	51.72	4.87	0.59
Gendt	NLD	51.87	5.98	0.56

Gorinchem	NLD	51.82	4.98	0.59
Grave	NLD	51.75	5.75	0.58
Groot-Ammers	NLD	51.92	4.83	0.50
Grouw	NLD	53.10	5.85	0.97
Hansweert	NLD	51.45	4.00	0.97
Hardinxveld	NLD	51.82	4.85	0.50
Heerenveen	NLD	52.95	5.92	0.96
Heerewaarden	NLD	51.82	5.38	0.58
Heerjansdam	NLD	51.83	4.57	0.52
Heijen	NLD	51.68	5.98	0.57
Hellevoetsluis	NLD	51.82	4.13	0.83
Hendrik Ido Ambacht	NLD	51.85	4.62	0.52
Heusden	NLD	51.73	5.15	0.58
Huissen	NLD	51.92	5.92	0.56
Kinderdijk	NLD	51.88	4.63	0.52
Krimpen aan den Yssel	NLD	51.90	4.58	0.52
Lekkerkerk	NLD	51.92	4.63	0.52
Lithoyen	NLD	51.82	5.43	0.58
Lobith	NLD	51.87	6.13	0.56
Maasbracht	NLD	51.13	5.87	0.56
Maashees	NLD	51.57	6.03	0.58
Maassluis	NLD	51.92	4.25	0.61
Maastricht	NLD	50.85	5.68	0.55
Made	NLD	51.68	4.80	0.60
Middelharnis	NLD	51.78	4.20	0.76
Millingen aan den Rijn	NLD	51.87	6.03	0.56
Moerdijk	NLD	51.70	4.62	0.63
Nieuw Lekkerland	NLD	51.88	4.63	0.52
Nieuwerkerk aan den Yssel	NLD	51.97	4.58	0.52
Nijmegen	NLD	51.83	5.83	0.58
Numansdorp	NLD	51.72	4.42	0.67
Odijk	NLD	52.03	5.22	1.02
Ooltgensplaat	NLD	51.68	4.33	0.66
Oosterhout	NLD	51.62	4.87	0.59
Oss	NLD	51.77	5.52	0.58
Ouderkerk	NLD	51.93	4.60	0.52
Oudewater	NLD	52.03	4.88	0.90
Ouwerkerk	NLD	51.63	3.98	0.83
Overschie	NLD	51.93	4.42	0.54
Paal	NLD	51.35	4.12	0.80
Papendrecht	NLD	51.83	4.63	0.52
Raamsdonksveer	NLD	51.70	4.92	0.59
Renkum	NLD	51.97	5.73	0.56
Rhenen	NLD	51.95	5.57	0.57
Ridderkerk	NLD	51.87	4.58	0.52

Rijswijk	NLD	51.78	5.02	0.58
Roermond	NLD	51.20	5.98	0.57
Rotterdam	NLD	51.90	4.48	0.54
Sas van Ghent	NLD	51.23	3.80	0.69
Schiedam	NLD	51.90	4.40	0.56
‘sGravendeel	NLD	51.77	4.60	0.52
‘sHertogenbosch	NLD	51.70	5.30	0.60
Sliedrecht	NLD	51.83	4.75	0.50
Slikkerveer	NLD	51.88	4.60	0.52
Sluiskil	NLD	51.30	3.83	0.76
Spijk	NLD	51.87	5.05	0.58
St. Annaland	NLD	51.62	4.10	0.62
Stavenisse	NLD	51.58	4.00	0.83
Stein	NLD	50.97	5.77	0.55
Stellendam	NLD	51.80	4.02	1.02
Swalmen	NLD	51.22	6.02	0.56
Tegelen	NLD	51.35	6.13	0.57
Tiel	NLD	51.88	5.45	0.57
Tilburg	NLD	51.55	5.07	0.58
Venlo	NLD	51.37	6.17	0.57
Vlaardingen	NLD	51.90	4.35	0.56
Waalwijk	NLD	51.70	5.07	0.58
Wageningen	NLD	51.97	5.67	0.57
Walsoorden	NLD	51.45	4.03	0.96
Wanssum	NLD	51.53	6.08	0.58
Wartena	NLD	53.15	5.90	0.79
Wemeldinge	NLD	51.52	4.00	1.01
Werkendam	NLD	51.80	4.90	0.50
Willemstad	NLD	51.68	4.40	0.65
Wolphaartsdijk	NLD	51.53	3.82	0.87
Wormerveer	NLD	52.47	4.78	1.04
Yerseke	NLD	51.50	4.05	1.01
Zaltbommel	NLD	51.80	5.20	0.59
Zeist	NLD	52.08	5.23	1.02
Zierikzee	NLD	51.63	3.88	0.88
Zuilichem	NLD	51.80	5.12	0.59
Zwijndrecht	NLD	51.82	4.65	0.52
Aakra	NOR	59.78	6.10	1.08
Askoy	NOR	60.40	5.17	1.07
Bergen	NOR	60.40	5.32	1.05
Dolvik	NOR	60.32	5.25	1.06
Etne	NOR	59.67	5.95	1.04
Fiborgtangen	NOR	63.72	11.17	0.93
Florvaag	NOR	60.45	5.22	1.00
Follafoss	NOR	63.98	11.10	1.05

Fusa	NOR	60.20	5.62	1.06
Garnes	NOR	60.43	5.48	1.01
Heroysund	NOR	59.92	5.78	1.02
Herre	NOR	59.10	9.53	0.79
Hommelvik	NOR	63.42	10.80	1.04
Hoylandsbygdi	NOR	59.77	5.78	0.91
Hoylandssundet	NOR	59.78	5.80	0.90
Husnes	NOR	59.87	5.77	1.02
Knarrevik	NOR	60.37	5.17	1.07
Kvinesdal	NOR	58.30	7.00	1.04
Laksevaag	NOR	60.38	5.30	1.05
Langangen	NOR	59.08	9.80	0.99
Levanger	NOR	63.75	11.30	0.95
Lofallstrand	NOR	60.02	6.00	0.82
Malm	NOR	64.07	11.22	1.02
Malvik	NOR	63.42	10.63	1.02
Menstad	NOR	59.17	9.65	0.73
Muruvik	NOR	63.43	10.85	1.03
Nordveitgrend	NOR	60.10	5.73	0.98
Nystrand	NOR	59.10	9.72	1.05
Olen	NOR	59.60	5.83	0.98
Omastrand	NOR	60.22	5.97	1.08
Onarheim	NOR	59.95	5.65	1.03
Porsgrunn	NOR	59.13	9.65	0.79
Rubbestadneset	NOR	59.82	5.28	1.09
Skaalevik	NOR	60.37	5.22	1.08
Skaanevik	NOR	59.75	5.93	1.03
Skien	NOR	59.20	9.62	0.81
Steinkjer	NOR	64.02	11.50	1.01
Stjordal	NOR	63.45	10.88	1.03
Trondheim	NOR	63.43	10.40	1.01
Tyssebotn	NOR	60.62	5.58	1.02
Vaksdal	NOR	60.48	5.75	1.06
Verdal	NOR	63.78	11.43	0.98
Darlowo	POL	54.43	16.38	0.60
Elblag	POL	54.17	19.40	0.59
Frombork	POL	54.35	19.67	0.62
Gdansk	POL	54.35	18.65	0.72
Gdynia	POL	54.53	18.55	0.77
Kolobrzeg	POL	54.18	15.57	0.63
Kozle	POL	50.32	18.13	0.24
Niechorze	POL	54.10	15.07	0.61
Nowa Sol	POL	51.80	15.72	0.30
Plock	POL	52.53	19.67	0.14
Police	POL	53.55	14.60	0.63

Puck	POL	54.72	18.35	0.66
Stepnica	POL	53.65	14.63	0.63
Swinoujscie	POL	53.93	14.28	0.73
Szczecin	POL	53.42	14.55	0.63
Tczew	POL	54.08	18.77	0.63
Ustka	POL	54.58	16.87	0.80
Wladyslawowo	POL	54.80	18.42	0.79
Wroclaw	POL	51.08	17.00	0.26
Pyongyang	PRK	39.00	125.75	0.97
Songnim	PRK	38.73	125.62	1.06
Bazias	ROM	44.80	21.40	0.68
Braila	ROM	45.25	27.98	0.76
Bucharest	ROM	44.42	26.12	0.77
Calarasi	ROM	44.18	27.32	0.83
Galatz	ROM	45.42	28.08	0.76
Giurgiu	ROM	43.90	25.97	0.84
Oltenitza	ROM	44.03	26.58	0.83
Orsova	ROM	44.70	22.37	0.49
Tulcea	ROM	45.17	28.82	0.68
Turnu Severin	ROM	44.63	22.67	0.73
Akhtubinsk	RUS	48.33	46.17	0.92
Annenskiy Most	RUS	60.72	37.08	0.60
Astrakhan	RUS	46.37	48.07	0.88
Azov	RUS	47.10	39.43	1.04
Bagaevskaya	RUS	47.32	40.38	0.80
Balakhna	RUS	56.48	43.62	0.32
Balakovo	RUS	52.07	47.77	0.55
Baltiysk	RUS	54.65	19.90	0.71
Belyy Ruchey	RUS	60.90	36.83	0.62
Berezniki	RUS	59.43	56.82	0.60
Brusnichnoye	RUS	60.78	28.73	0.55
Cheboksary	RUS	56.13	47.23	0.38
Cherepovets	RUS	59.15	37.83	0.46
Chkalovsk	RUS	56.75	43.23	0.34
Gorokhovets	RUS	56.18	42.70	0.32
Kalach-na-Donu	RUS	48.72	43.48	0.69
Kaliningrad	RUS	54.72	20.52	0.59
Kamyshin	RUS	50.08	45.40	0.67
Kanonerskiy Island	RUS	59.90	30.22	0.46
Kazan	RUS	55.75	49.17	0.38
Khabarovsk	RUS	48.50	135.17	0.66
Kineshma	RUS	57.45	42.12	0.39
Kirovsk	RUS	59.87	30.98	0.50
Komsomolsk-na-Amure	RUS	50.53	136.98	0.73
Kondopoga	RUS	62.20	34.28	0.63

Konstantinovsk	RUS	47.55	41.10	0.75
Kostroma	RUS	57.77	40.93	0.36
Kotlas	RUS	61.25	46.65	0.62
Krasnoyarsk	RUS	56.08	92.77	0.61
Krasnyye Barrikady	RUS	46.20	47.85	0.91
Kronshtadt	RUS	60.00	29.77	0.50
Lomonosov	RUS	59.83	29.80	0.53
Mago	RUS	53.25	140.22	0.84
Medvezhyegorsk	RUS	62.93	34.47	0.72
Mondoma	RUS	59.93	37.47	0.57
Naberezhnyye Chelny	RUS	55.68	52.30	0.41
Nadvoitsy	RUS	63.93	34.33	0.81
Navashino	RUS	55.55	42.18	0.29
Nikolayevsk	RUS	53.13	140.72	0.88
Nikolayevskaya	RUS	47.60	41.48	0.77
Nizhnekamsk	RUS	55.42	51.88	0.42
Nizhnetambovskoye	RUS	50.93	138.17	0.75
Nizhniy Novgorod	RUS	56.33	44.00	0.33
Nizhnyaya Gavan	RUS	52.40	140.43	0.82
Novgorod	RUS	58.50	31.33	0.36
Novocheboksarsk	RUS	56.10	47.48	0.38
Olya	RUS	45.78	47.53	0.97
Otradnoye	RUS	59.77	30.80	0.49
Pechora	RUS	65.23	57.30	0.97
Perm	RUS	58.02	56.17	0.50
Petrodvorets	RUS	59.88	29.92	0.48
Petrozavodsk	RUS	61.77	34.32	0.64
Pionerskiy	RUS	54.93	20.20	0.59
Podporozhye	RUS	60.92	34.03	0.52
Primorsk	RUS	60.37	28.63	0.55
Priozersk	RUS	61.02	30.13	0.56
Pudozh	RUS	61.83	36.53	0.60
Rostov	RUS	47.17	39.70	1.05
Rybinsk	RUS	58.02	38.87	0.39
Samara	RUS	53.17	50.17	0.43
Saratov	RUS	51.50	45.92	0.58
Segezha	RUS	63.70	34.32	0.81
Semikarakorsk	RUS	47.55	41.10	0.75
Shlisselburg	RUS	59.93	31.13	0.50
Solikamsk	RUS	59.67	56.75	0.62
Sosnovka	RUS	56.23	51.28	0.41
St. Petersburg	RUS	59.93	30.30	0.46
Svetlyy	RUS	54.63	20.15	0.59
Syzran	RUS	53.17	48.48	0.44
Taganrog	RUS	47.20	38.95	1.06

Tatyanka	RUS	45.93	48.28	0.97
Tolyatti	RUS	53.53	49.40	0.41
Tomsk	RUS	56.50	85.08	0.63
Ust Donets	RUS	47.67	40.95	0.75
Ust-Luga	RUS	59.67	28.30	0.56
Volgodonsk	RUS	47.50	42.12	0.76
Volgograd	RUS	48.75	44.50	0.77
Volzhskiy	RUS	48.82	44.73	0.85
Voznesenye	RUS	61.02	35.47	0.54
Vyborg	RUS	60.72	28.73	0.55
Vysotsk	RUS	60.63	28.57	0.54
Vytegra	RUS	61.07	36.45	0.56
Yaroslavl	RUS	57.57	39.87	0.35
Zelenodolsk	RUS	55.83	48.50	0.38
Apatin	SCG	45.67	19.00	0.66
Belgrade	SCG	44.80	20.47	0.80
Bezdam	SCG	45.83	18.93	0.66
Kladovo	SCG	44.60	22.55	0.73
Mitrovica	SCG	42.90	20.87	0.28
Novi Becej	SCG	45.58	20.13	0.70
Novi Sad	SCG	45.27	19.83	0.67
Pancevo	SCG	44.87	20.67	0.83
Zrenjanin	SCG	45.37	10.38	0.97
Bratislava	SVK	48.15	17.12	0.44
Komarno	SVK	47.77	18.08	0.52
Aelvenaes	SWE	59.37	13.18	0.49
Ahus	SWE	55.93	14.32	0.96
Amal	SWE	59.05	12.72	0.47
Ar	SWE	57.92	18.95	0.82
Arvika	SWE	59.67	12.58	0.51
Balsta	SWE	59.55	17.55	0.58
Bergkvara	SWE	56.38	16.08	0.88
Borgholm	SWE	56.88	16.65	0.82
Bungenas	SWE	57.82	19.08	0.81
Byxelkrok	SWE	57.30	17.03	0.81
Dalaro	SWE	59.13	18.42	0.83
Degerhamn	SWE	56.35	16.42	0.86
Edsvalla	SWE	59.43	13.23	0.49
Elleholm	SWE	56.17	14.73	0.69
Enkoping	SWE	59.63	17.08	0.64
Farjestaden	SWE	56.65	16.47	0.86
Farosund	SWE	57.87	19.07	0.81
Fiskeback	SWE	57.87	14.10	0.54
Fittja	SWE	59.23	17.85	0.52
Forsmark	SWE	60.42	18.20	0.91

Furillen	SWE	57.77	19.00	0.77
Furusund	SWE	59.65	18.90	0.84
Gamleby	SWE	57.90	16.42	0.70
Gefle	SWE	60.67	17.17	0.74
Grisslehamn	SWE	60.10	18.82	0.92
Gruvon	SWE	59.33	13.12	0.48
Hallekis	SWE	58.67	13.42	0.46
Hallstavik	SWE	60.05	18.60	0.91
Haparanda	SWE	65.83	24.13	0.93
Haraholmen	SWE	65.23	21.63	0.87
Hargshamn	SWE	60.17	18.48	0.91
Hasselby	SWE	59.37	17.82	0.54
Hernosand	SWE	62.63	17.93	0.78
Hoglunda	SWE	59.42	13.25	0.49
Hogmarso	SWE	59.65	18.85	0.84
Honsater	SWE	58.63	13.45	0.46
Hornefors	SWE	63.62	19.90	0.80
Hudiksvall	SWE	61.72	17.12	0.97
Iggesund	SWE	61.65	17.10	0.97
Kagehamn	SWE	64.83	21.03	0.87
Kalix	SWE	65.85	23.13	0.99
Kallvik	SWE	57.88	16.72	0.92
Kallviken	SWE	64.33	21.37	0.82
Kalmar	SWE	56.67	16.37	0.86
Kalmarsand	SWE	59.53	17.52	0.58
Kapellskar	SWE	59.72	19.00	0.90
Kappelshamn	SWE	57.85	18.78	0.82
Karlshamn	SWE	56.17	14.87	0.73
Karlskrona	SWE	56.17	15.60	0.71
Karlstad	SWE	59.38	13.52	0.48
Klintehamn	SWE	57.38	18.20	0.71
Koping	SWE	59.52	16.00	0.60
Kopmannebro	SWE	58.77	12.52	0.42
Kristinehamn	SWE	59.32	14.12	0.48
Krokstad	SWE	59.10	12.92	0.45
Kungsor	SWE	59.43	16.10	0.56
Kyrkebyn	SWE	59.27	13.07	0.48
Landsort	SWE	58.73	17.87	0.88
Lidkoping	SWE	58.50	13.17	0.44
Liljeholmsviken	SWE	59.32	18.00	0.52
Ljustero	SWE	59.52	18.63	0.58
Loudden	SWE	59.33	18.13	0.52
Lulea	SWE	65.58	22.17	0.90
Mariestad	SWE	58.72	13.83	0.44
Marsviken	SWE	58.67	16.95	0.56

Mem	SWE	58.48	16.42	0.55
Monsteras	SWE	57.03	16.47	0.71
Morbylanga	SWE	56.53	16.37	0.86
Motala	SWE	58.53	15.07	0.47
Munksund	SWE	65.28	21.48	0.89
Norrkoping	SWE	58.60	16.20	0.55
Norrsundet	SWE	60.95	17.17	0.72
Norrtalje	SWE	59.75	18.70	0.61
Norsbron	SWE	59.42	13.23	0.49
Nykoping	SWE	58.75	17.02	0.56
Nynashamn	SWE	58.90	17.95	0.89
Oaxen	SWE	55.97	17.72	0.81
Orebro	SWE	59.28	15.18	0.49
Oregrund	SWE	60.33	18.45	0.90
Ornskoldsvik	SWE	63.27	18.72	0.80
Oskarshamn	SWE	57.27	16.45	0.71
Otterbacken	SWE	58.95	14.05	0.48
Oxelosund	SWE	58.67	17.12	0.88
Pataholm	SWE	56.92	16.43	0.85
Ronehamn	SWE	57.17	18.53	0.85
Ronneby	SWE	56.17	15.30	0.71
Rundvik	SWE	63.53	19.45	0.84
Saffle	SWE	59.13	12.93	0.45
Sandhamn	SWE	59.28	18.90	0.85
Sankt Anna	SWE	58.33	16.70	0.55
Simpevarp	SWE	57.42	16.67	0.95
Simrishamn	SWE	55.55	14.37	0.93
Sjotorp	SWE	58.83	14.00	0.46
Skattkar	SWE	59.42	13.70	0.48
Skelleftea	SWE	64.73	20.95	0.91
Skoghall	SWE	59.32	13.45	0.44
Skutskar	SWE	60.65	17.40	0.66
Slite	SWE	57.70	18.82	0.86
Slottsbron	SWE	59.33	13.10	0.48
Soderhamn	SWE	61.32	17.10	0.99
Soderkoping	SWE	58.48	16.33	0.56
Sodertalje	SWE	59.20	17.63	0.82
Solvesborg	SWE	56.05	14.58	0.71
Soraker	SWE	62.50	17.50	0.79
Spesshult	SWE	59.07	12.92	0.45
Stavsnas	SWE	59.28	18.68	0.84
Stockholm	SWE	59.32	18.05	0.52
Stocksund	SWE	59.38	18.05	0.52
Stora Vika	SWE	58.93	17.78	0.89
Storugns	SWE	57.83	18.80	0.82

Straa	SWE	57.90	19.03	0.81
Strangnas	SWE	59.38	17.03	0.63
Studsvik	SWE	58.75	17.28	0.55
Sturko	SWE	56.08	15.67	0.71
Sundsvall	SWE	62.42	17.33	0.86
Taxinge	SWE	59.22	17.37	0.57
Torko	SWE	56.15	15.40	0.71
Trelleborg	SWE	55.37	13.15	0.64
Umea	SWE	63.70	20.35	1.04
Uppsala	SWE	59.87	17.65	0.43
Valdemarsvik	SWE	58.20	16.60	0.55
Vaxholm	SWE	59.38	18.33	0.54
Vesteras	SWE	59.60	16.43	0.58
Vestervik	SWE	57.75	16.65	0.92
Visby	SWE	57.65	18.28	0.71
Ystad	SWE	55.43	13.83	0.65
Berdiansk	UKR	46.75	36.78	1.02
Cherkassy	UKR	49.43	32.05	0.27
Dneprodzerzhinsk	UKR	48.50	34.62	0.46
Dnepropetrovsk	UKR	48.48	35.00	0.51
Kiev	UKR	50.42	30.50	0.20
Kremenchug	UKR	49.05	33.42	0.34
Mariupol	UKR	47.05	37.50	0.96
Reni	UKR	45.43	28.30	0.75
Tyaginka	UKR	46.75	33.05	0.58
Zaporozhye	UKR	47.83	35.17	0.63
Albany	USA	42.65	-73.75	0.56
Allyns Point	USA	41.43	-72.07	0.73
Alpena	USA	45.05	-83.43	0.15
Alsen	USA	42.18	-73.92	0.50
Ashland	USA	46.58	-90.90	0.23
Ashtabula	USA	41.92	-80.82	0.53
Bangor	USA	44.80	-68.78	0.25
Bath	USA	43.90	-69.82	0.53
Bay City	USA	43.58	-83.88	0.44
Bayfield	USA	46.80	-90.80	0.34
Belfast	USA	44.42	-69.00	0.77
Benton Harbour	USA	42.12	-86.45	0.30
Beverly	USA	46.82	-119.92	0.77
Brevort	USA	46.00	-85.03	0.20
Buchanan	USA	41.20	-73.92	0.84
Bucksport	USA	44.57	-68.80	0.51
Buffalo	USA	42.88	-78.88	0.51
Buffington	USA	41.63	-87.42	0.39
Burlington (NJ)	USA	40.08	-74.85	1.05

Burns Harbour	USA	41.63	-87.18	0.38
Calcite	USA	45.40	-83.78	0.24
Camden (NJ)	USA	39.93	-75.13	1.08
Catskill	USA	42.22	-73.88	0.50
Cedarville	USA	45.98	-84.35	0.36
Cementon	USA	42.13	-73.92	0.54
Charlevoix	USA	45.32	-85.22	0.10
Cheboygan	USA	45.67	-84.47	0.21
Chester (PA)	USA	39.83	-75.37	1.09
Chicago	USA	41.83	-87.63	0.34
Claymont	USA	39.80	-75.43	1.09
Clayton	USA	44.23	-76.08	0.40
Cleveland	USA	41.52	-81.72	0.60
Conneaut	USA	41.97	-80.57	0.52
Coxsackie	USA	42.33	-73.80	0.51
Delair	USA	40.00	-75.03	1.08
Delaware City	USA	39.57	-75.58	1.10
Detour	USA	45.97	-83.88	0.37
Detroit	USA	42.33	-83.03	0.44
Duluth	USA	46.73	-92.15	0.41
Eddystone	USA	39.83	-75.33	1.09
Erie	USA	42.17	-80.08	0.51
Escanaba	USA	45.78	-87.07	0.13
Essexville	USA	43.60	-83.83	0.44
Fairless Hills	USA	40.17	-74.88	1.05
Fairport	USA	41.77	-81.32	0.58
Ferrysburg	USA	43.08	-86.23	0.15
Gary Harbour	USA	41.60	-87.35	0.37
Gloucester (NJ)	USA	39.88	-75.13	1.08
Grand Haven	USA	43.07	-86.25	0.16
Grand River	USA	41.73	-81.28	0.57
Green Bay	USA	44.52	-88.00	0.32
Groton	USA	41.35	-72.08	1.03
Harbor Beach	USA	43.83	-82.65	0.12
Holland (MI)	USA	42.78	-86.22	0.19
Huron	USA	41.40	-82.58	0.66
Hyde Park	USA	41.78	-73.93	0.54
Indiana Harbour	USA	41.67	-87.50	0.39
Kalama	USA	46.02	-122.83	0.69
Kenosha	USA	42.58	-87.82	0.16
Kewaunee	USA	44.45	-87.52	0.23
Kingston	USA	41.87	-73.97	0.54
Lafayette	USA	40.40	-86.88	0.83
Lorain	USA	41.47	-82.17	0.64
Ludington	USA	43.97	-86.45	0.24

Mackinaw City	USA	45.75	-84.73	0.19
Manistee	USA	44.25	-86.33	0.26
Manitowoc	USA	44.10	-87.63	0.20
Marblehead	USA	41.53	-82.72	0.74
Marcus Hook	USA	39.82	-75.42	1.09
Marine City	USA	42.72	-82.48	0.25
Marinette	USA	45.12	-87.62	0.15
Marquette	USA	46.60	-87.38	0.45
Marysville	USA	42.92	-82.48	0.24
Menominee	USA	45.13	-87.62	0.14
Milton	USA	41.60	-73.95	0.66
Milwaukee	USA	43.05	-87.87	0.09
Monroe	USA	41.92	-83.33	0.69
Mossville	USA	40.80	-89.57	0.89
Muskegon	USA	43.18	-86.23	0.13
New London	USA	41.40	-72.10	0.84
Newburgh	USA	41.50	-74.08	0.66
Ogdensburg	USA	44.70	-75.50	0.34
Olympia	USA	47.05	-122.90	0.73
Ontonagon	USA	46.87	-89.30	0.37
Oswego	USA	43.47	-76.53	0.39
Pasco	USA	46.22	-119.08	1.00
Paulsboro	USA	39.83	-75.25	1.09
Peekskill	USA	41.25	-73.92	0.83
Pennsauken	USA	39.97	-75.03	1.08
Peoria	USA	40.68	-89.58	0.89
Philadelphia	USA	39.90	-75.13	1.08
Pittsburgh (PA)	USA	40.43	-80.00	0.70
Point Pleasant	USA	38.88	-82.12	0.93
Port Dolomite	USA	45.97	-84.27	0.30
Port Huron	USA	42.98	-82.43	0.24
Port Inland	USA	45.97	-85.87	0.23
Port Washington	USA	43.38	-87.87	0.10
Portland (OR)	USA	45.57	-122.73	0.72
Poughkeepsie	USA	41.68	-73.88	0.54
Providence	USA	41.80	-71.38	0.99
Racine	USA	42.73	-87.80	0.16
Ravena	USA	42.47	-73.80	0.53
Reedy Point	USA	39.57	-75.57	1.10
Rensselaer	USA	42.65	-73.73	0.56
Rochester (NY)	USA	43.28	-77.60	0.29
Rockport (MI)	USA	45.20	-83.38	0.24
Rogers City	USA	45.40	-83.83	0.25
Roseton	USA	41.57	-74.00	0.56
Saginaw	USA	43.45	-83.92	0.47

Salem (NJ)	USA	39.57	-75.47	1.10
Sandusky	USA	41.45	-82.73	0.71
Searsport	USA	44.45	-68.92	1.02
Sheboygan	USA	43.75	-87.70	0.25
Shippensburg	USA	40.03	-77.52	0.77
Silver Bay	USA	47.28	-91.27	0.87
Somerset (MA)	USA	41.78	-71.13	0.92
South Brewer	USA	44.78	-68.78	0.25
South Haven	USA	42.45	-86.25	0.23
St. Clair	USA	42.82	-82.47	0.25
St. Joseph	USA	42.08	-86.50	0.33
Stoneport	USA	45.28	-83.43	0.25
Stony Point	USA	41.23	-73.97	0.83
Superior	USA	46.72	-92.08	0.41
Taconite Harbour	USA	47.50	-90.92	0.84
The Dalles	USA	45.58	-121.18	0.46
Toledo	USA	41.70	-83.47	0.72
Tomkins Cove	USA	41.27	-73.98	0.83
Tonawanda	USA	43.02	-78.88	0.51
Trenton	USA	40.18	-74.75	1.01
Troutdale	USA	45.53	-122.38	0.73
Troy	USA	42.73	-73.68	0.55
Tullytown	USA	40.13	-74.82	1.00
Two Harbors	USA	47.02	-91.67	0.73
Umatilla	USA	45.92	-119.33	0.87
Vancouver	USA	45.63	-122.67	0.72
Waddington	USA	44.85	-75.20	0.31
Waukegan	USA	42.37	-87.83	0.26
Westville	USA	39.87	-75.13	1.08
Whitefish Point	USA	46.75	-84.95	0.48
Willbridge	USA	45.57	-122.75	0.72
Wilmington (DE)	USA	39.75	-75.50	1.04
Winterport	USA	44.63	-68.85	0.45
Wiscasset	USA	44.00	-69.67	0.54
Wyandotte	USA	42.18	-83.15	0.59
Yonkers	USA	40.95	-73.83	0.98
Zilwaukee	USA	43.47	-83.92	0.46

Appendix E. List of global ports that have highest environmental similarity to Duluth-Superior. NIS originating from these ports have the highest potential for survival if introduced at Duluth-Superior.

Name	Country	Latitude	Longitude	Environmental Distance
Eckero	ALD	60.22	19.60	0.47
Farjsundet	ALD	60.23	20.02	0.65
Finstrom	ALD	60.25	19.92	0.64
Lsngnssudd	ALD	60.12	20.30	0.67
Mariehamn	ALD	60.10	19.93	0.70
Korneuburg	AUT	48.37	16.33	0.79
Linz	AUT	48.32	14.30	0.57
Vienna	AUT	48.22	16.37	0.88
Antwerp	BEL	51.24	4.41	0.82
Baasrode	BEL	51.05	4.17	0.85
Balen	BEL	51.17	5.17	0.80
Boom	BEL	51.08	4.37	0.82
Brussels	BEL	50.83	4.32	0.81
Buggenhout	BEL	51.02	4.20	0.84
Burcht	BEL	51.20	4.33	0.83
Chatelineau	BEL	50.42	4.52	0.72
Dendermonde	BEL	51.03	4.12	0.85
Doel	BEL	51.32	4.27	0.85
Engis	BEL	50.58	5.40	0.69
Ertvelde	BEL	51.20	3.78	0.87
Geel	BEL	51.15	4.97	0.80
Genk	BEL	50.94	5.50	0.77
Ghent	BEL	51.09	3.75	0.86
Grimbergen	BEL	50.93	4.37	0.81
Grobbendonk	BEL	51.20	4.75	0.79
Haren	BEL	50.90	4.38	0.81
Hemiksem	BEL	51.15	4.34	0.82
Hermalle sous Huy	BEL	50.55	5.37	0.69
Hingene	BEL	51.12	4.27	0.84
Hoboken	BEL	51.17	4.33	0.84
Humbeek	BEL	50.97	4.38	0.81
Kallo	BEL	51.25	4.28	0.83
Kapelle op den Bos	BEL	51.02	4.37	0.82
Kruibeke	BEL	51.17	4.32	0.84
Kwaadmechelen	BEL	51.10	5.15	0.80
Lanaken	BEL	50.88	5.65	0.77
Langerbrugge	BEL	51.12	3.75	0.86
Liefkenshoek	BEL	51.30	4.28	0.85
Liege	BEL	50.64	5.57	0.71
Lillo	BEL	51.30	4.30	0.85
Lixhe	BEL	50.73	5.70	0.73

Maasmechelen	BEL	50.97	5.70	0.76
Marly	BEL	50.88	4.38	0.81
Mechelen	BEL	51.03	4.47	0.82
Melle	BEL	51.00	3.80	0.83
Merksem	BEL	51.23	4.48	0.82
Nameche	BEL	50.47	4.98	0.70
Niel	BEL	51.12	4.33	0.84
Olen	BEL	51.15	4.87	0.80
Puurs	BEL	51.07	4.27	0.84
Rieme	BEL	51.17	3.77	0.87
Ruisbroek	BEL	50.78	4.28	0.81
Rumst	BEL	51.07	4.42	0.82
Rupelmonde	BEL	51.13	4.28	0.84
Schelle	BEL	51.13	4.32	0.84
Schoten	BEL	51.25	4.50	0.82
Seilles	BEL	50.50	5.08	0.63
Sint-Kruis-Winkel	BEL	51.15	3.80	0.87
Temse	BEL	51.13	4.22	0.84
Terdonk	BEL	51.15	3.78	0.87
Terhagen	BEL	51.08	4.38	0.82
Tessenderlo	BEL	51.07	5.08	0.80
Tielrode	BEL	51.12	4.22	0.84
Tisselt	BEL	51.03	4.37	0.82
Val St. Lambert	BEL	50.57	5.47	0.69
Verbrande Brug	BEL	50.95	4.38	0.81
Vilvoorde	BEL	50.95	4.42	0.81
Willebroek	BEL	51.05	4.35	0.82
Wintham	BEL	51.10	4.28	0.84
Wondelgem	BEL	51.08	3.72	0.86
Zelzate	BEL	51.20	3.80	0.87
Zutendaal	BEL	50.92	5.57	0.77
Zwyndrecht	BEL	51.22	4.33	0.83
Amherstburg	CAN	42.10	-83.08	1.03
Baddeck	CAN	46.10	-60.73	0.76
Bath	CAN	44.17	-76.77	0.68
Batiscan	CAN	46.52	-72.23	0.42
Bayside	CAN	45.17	-67.13	0.80
Becancour	CAN	46.40	-72.38	0.47
Bella Coola	CAN	52.38	-126.77	0.64
Belleville	CAN	44.13	-77.37	0.59
Bowmanville	CAN	43.90	-78.67	0.45
Boylston	CAN	45.45	-61.52	0.93
Britt	CAN	45.77	-80.58	0.23
Brockville	CAN	44.60	-75.63	0.69
Bronte	CAN	43.40	-79.70	0.49

Bruce Mines	CAN	46.27	-83.72	0.10
Burlington	CAN	43.32	-79.75	0.56
Cardinal	CAN	44.78	-75.33	0.72
Chicoutimi	CAN	48.43	-71.08	0.41
Clarenville	CAN	48.17	-53.95	1.05
Clarkson	CAN	43.50	-79.60	0.51
Cobourg	CAN	43.95	-78.17	0.56
Colborne	CAN	44.00	-77.88	0.56
Collingwood	CAN	44.50	-80.23	0.44
Contrecoeur	CAN	45.88	-73.20	0.59
Corner Brook	CAN	48.95	-57.93	1.01
Cornwall	CAN	45.02	-74.72	0.70
Corunna	CAN	42.88	-82.45	0.61
Cote Ste-Catherine	CAN	45.41	-73.58	0.69
Country Harbour	CAN	45.22	-61.73	0.94
Courtright	CAN	42.80	-82.45	0.61
Erieau	CAN	42.25	-81.93	0.94
Fort Erie	CAN	42.93	-78.95	0.91
Fredericton	CAN	45.95	-66.65	0.38
Gananoque	CAN	44.32	-76.15	0.76
Goderich	CAN	43.75	-81.75	0.43
Gold River	CAN	49.68	-126.12	0.74
Goose Bay	CAN	53.35	-60.42	0.61
Grondines	CAN	46.75	-72.03	0.34
Hamilton	CAN	43.23	-79.85	0.50
Hay River	CAN	60.85	-115.70	0.74
Houston	CAN	54.40	-126.65	0.59
Humberstone	CAN	42.90	-79.25	0.87
Iona	CAN	45.97	-60.80	0.30
Isaac’s Harbour	CAN	45.17	-61.65	1.06
Killarney	CAN	45.97	-81.52	0.13
Kingston	CAN	44.20	-76.50	0.74
Kingsville	CAN	42.02	-82.72	1.06
Kitimat	CAN	54.00	-128.70	0.33
Lanoraie	CAN	45.97	-73.18	0.59
Lauzon	CAN	46.82	-71.15	0.39
Leamington	CAN	42.05	-82.62	1.07
Levis	CAN	46.82	-71.18	0.46
Little Current	CAN	45.97	-81.92	0.43
Little Narrows	CAN	45.98	-60.98	0.25
Long Sault	CAN	45.02	-74.90	0.63
Marathon	CAN	48.75	-86.38	0.55
Meldrum Bay	CAN	45.92	-83.10	0.09
Michipicoten Harbour	CAN	47.95	-84.92	0.25
Midland	CAN	44.75	-79.93	0.39

Montréal	CAN	45.50	-73.55	0.72
Mooretown	CAN	42.85	-82.47	0.61
Morrisburg	CAN	44.93	-75.18	0.61
Nanticoke	CAN	42.82	-80.07	0.80
Nelson	CAN	49.47	-117.30	0.43
Oakville	CAN	43.43	-79.67	0.47
Ocean Falls	CAN	52.35	-127.70	0.67
Oshawa	CAN	43.87	-78.83	0.46
Ottawa	CAN	45.40	-75.70	0.62
Owen Sound	CAN	44.58	-80.95	0.35
Parry Sound	CAN	45.37	-80.05	0.36
Picton	CAN	44.00	-77.13	0.68
Pointe aux Trembles	CAN	45.63	-73.48	0.66
Port Alberni	CAN	49.23	-125.00	0.68
Port Alice	CAN	50.38	-127.45	0.90
Port Burwell	CAN	42.63	-80.80	0.79
Port Colborne	CAN	42.87	-79.25	0.88
Port Credit	CAN	43.55	-79.60	0.39
Port Dalhousie	CAN	43.20	-79.27	0.62
Port Dover	CAN	42.78	-80.20	0.76
Port Hope	CAN	43.95	-78.28	0.54
Port Maitland	CAN	42.87	-79.58	0.84
Port McNicoll	CAN	44.75	-79.80	0.46
Port Stanley	CAN	42.67	-81.22	0.79
Port Weller	CAN	43.23	-79.22	0.67
Prescott	CAN	44.72	-75.52	0.67
Québec	CAN	46.82	-71.20	0.46
Sarnia	CAN	42.98	-82.42	0.59
Sault Ste. Marie	CAN	46.52	-84.33	0.10
Sombra	CAN	42.70	-82.47	0.61
Sonora	CAN	45.07	-61.92	0.97
Sorel	CAN	46.05	-73.12	0.62
Spragge	CAN	46.22	-82.67	0.24
St. Albans	CAN	47.87	-55.85	1.08
St. Catharines	CAN	43.17	-79.27	0.59
St. Romuald	CAN	46.75	-71.23	0.46
St. Stephen	CAN	45.20	-67.28	0.53
Ste. Croix	CAN	46.63	-71.73	0.40
Stewart	CAN	55.92	-130.00	0.75
Tahsis	CAN	49.92	-126.67	0.92
Thessalon	CAN	46.25	-83.55	0.10
Thorold	CAN	43.08	-79.17	0.85
Three Rivers	CAN	46.35	-72.55	0.49
Thunder Bay	CAN	48.42	-89.22	0.41
Tobermory	CAN	45.23	-81.65	0.10

Toronto	CAN	43.63	-79.38	0.41
Tracy	CAN	46.02	-73.17	0.57
Valleyfield	CAN	45.22	-74.08	0.68
Wallaceburg	CAN	42.60	-82.40	0.61
Welland	CAN	42.97	-79.22	0.81
Weymouth	CAN	44.45	-66.02	0.73
Wheatley	CAN	42.08	-82.43	0.95
Whitby	CAN	43.85	-78.92	0.39
Windsor	CAN	42.32	-83.05	0.78
Zeballos	CAN	49.98	-126.85	1.07
Basle	CHE	47.55	7.57	0.73
Fujin	CHN	47.25	132.02	0.88
Harbin	CHN	45.73	126.60	0.97
Heihe	CHN	50.23	127.47	0.77
Jiamusi	CHN	46.80	130.35	0.87
Panshi	CHN	42.92	126.03	0.89
Tongjiang	CHN	47.63	132.50	0.88
Chvaletice	CZE	50.02	15.43	0.55
Usti nad Labem	CZE	50.67	14.03	0.48
Aken	DEU	51.85	12.03	0.60
Andernach	DEU	50.42	7.38	0.72
Anklam	DEU	53.87	13.68	0.76
Aschaffenburg	DEU	49.95	9.17	0.66
Barth	DEU	54.37	12.73	0.70
Bendorf	DEU	50.42	7.58	0.70
Berlin	DEU	52.53	13.42	0.63
Berne	DEU	53.18	10.50	0.57
Bingen	DEU	49.95	7.90	0.74
Bodenwerder	DEU	51.97	9.50	0.53
Boizenburg	DEU	53.38	10.73	0.57
Bonn	DEU	50.72	7.08	0.80
Brandenburg	DEU	52.40	12.52	0.61
Braunschweig	DEU	52.25	10.50	0.60
Brohl	DEU	50.42	7.30	0.61
Burgstaaken	DEU	54.42	11.20	1.09
Castrop Rauxel	DEU	51.55	7.30	0.74
Cologne	DEU	50.93	7.00	0.82
Deggendorf	DEU	48.83	12.97	0.57
Dormagen	DEU	51.10	6.95	0.82
Dortmund	DEU	51.53	7.45	0.73
Duisburg	DEU	51.43	6.75	0.80
Dusseldorf	DEU	51.25	6.77	0.82
Eisenhuttenstadt	DEU	52.15	14.62	0.56
Emmerich	DEU	51.85	6.25	0.73
Erftstadt	DEU	50.80	6.75	0.74

Essen	DEU	51.45	7.02	0.75
Frankfurt	DEU	50.12	8.67	0.70
Geesthacht	DEU	53.43	10.38	0.56
Gelsenkirchen	DEU	51.50	7.08	0.75
Germersheim	DEU	49.22	8.38	0.90
Gernsheim	DEU	49.75	8.47	0.80
Greifswald	DEU	54.10	13.38	0.73
Gromitz	DEU	54.15	10.98	1.06
Haren	DEU	52.80	7.25	0.73
Havelberg	DEU	52.83	12.07	0.58
Heiligenhafen	DEU	54.37	10.98	1.09
Heringsdorf	DEU	53.97	14.17	0.81
Hohenhorn	DEU	53.47	10.37	0.56
Homberg	DEU	51.45	6.72	0.80
Hoya	DEU	52.80	9.13	0.60
Ibbenburen	DEU	52.28	7.73	0.63
Karlsruhe	DEU	49.05	8.33	0.91
Kehl	DEU	48.58	7.83	0.84
Koblenz	DEU	50.33	7.58	0.63
Krefeld	DEU	51.33	6.57	0.80
Kroslin	DEU	54.13	13.75	0.67
Ladebow	DEU	54.10	13.45	0.73
Lahnstein	DEU	50.30	7.62	0.63
Lauenburg	DEU	53.38	10.55	0.57
Lauterbach	DEU	54.33	13.52	0.66
Leer	DEU	53.22	7.45	0.76
Leeseringen	DEU	52.58	9.13	0.61
Leverkusen	DEU	51.02	7.03	0.73
Lubmin	DEU	54.12	13.60	0.73
Ludwigshafen am Rhein	DEU	49.47	8.45	0.87
Magdeburg	DEU	52.13	11.62	0.57
Mainz	DEU	50.00	8.28	0.72
Mannheim	DEU	49.48	8.47	0.87
Minden	DEU	52.30	8.90	0.61
Monheim	DEU	51.12	6.82	0.81
Moselkern	DEU	50.18	7.37	0.66
Mukran	DEU	54.48	13.58	0.67
Mulheim	DEU	50.95	7.05	0.80
Neckarsteinach	DEU	49.43	8.80	0.65
Neuss	DEU	51.20	6.70	0.82
Neuss/Dusseldorf	DEU	51.20	6.70	0.82
Neuwied	DEU	50.43	7.48	0.72
Nienburg	DEU	52.63	9.22	0.61
Nuremberg	DEU	49.45	11.05	0.54
Oldersum	DEU	53.32	7.33	1.06

Orsoy	DEU	51.53	6.68	0.78
Orth	DEU	54.45	11.05	1.09
Osnabruck	DEU	52.27	8.03	0.60
Papenburg	DEU	53.08	7.38	0.69
Passau	DEU	48.58	13.47	0.51
Peenemunde	DEU	54.12	13.77	0.67
Peine	DEU	52.32	10.22	0.59
Porz	DEU	50.88	7.05	0.80
Regensburg	DEU	49.02	12.12	0.48
Remagen	DEU	50.57	7.22	0.70
Rheinhausen	DEU	51.42	6.73	0.80
Rinteln	DEU	52.20	9.08	0.59
Rosslau	DEU	51.90	12.27	0.60
Rostock	DEU	54.15	12.10	0.77
Ruhrort	DEU	51.45	6.73	0.80
Salzgitter	DEU	52.22	10.33	0.59
Sassnitz	DEU	54.52	13.63	0.67
Speyer	DEU	49.30	8.43	0.90
Stralsund	DEU	54.32	13.10	0.74
Sturzelberg	DEU	51.12	6.80	0.81
Stuttgart	DEU	48.78	9.20	0.67
Tangermunde	DEU	52.57	11.97	0.58
Ueckermunde	DEU	53.73	14.28	0.64
Urdingen	DEU	51.35	6.67	0.79
Vallendar	DEU	50.40	7.62	0.70
Vierow	DEU	54.10	13.57	0.73
Walsum	DEU	51.53	6.68	0.78
Warnemunde	DEU	54.18	12.08	0.80
Weissenthurm	DEU	50.42	7.48	0.72
Wesel	DEU	51.65	6.60	0.78
Wesseling	DEU	50.83	7.00	0.75
Westerende-Kirchloog	DEU	53.43	7.42	1.03
Wolgast	DEU	54.05	13.78	0.67
Worms	DEU	49.63	8.35	0.84
Wurzburg	DEU	49.78	9.93	0.51
Aggersund	DNK	57.02	9.28	0.65
Allinge	DNK	55.28	14.80	0.70
Fur	DNK	56.83	9.00	0.64
Gudhjem	DNK	55.22	14.97	0.70
Hammeren	DNK	55.28	14.75	0.70
Hammerhavn	DNK	55.27	14.75	0.70
Hasle	DNK	55.18	14.70	0.70
Hvalpsund	DNK	56.68	9.20	0.47
Logstor	DNK	56.97	9.25	0.47
Nekso	DNK	55.07	15.15	0.66

Nykobing	DNK	56.80	8.87	0.69
Ronne	DNK	55.10	14.70	0.70
Skarrehage	DNK	56.95	8.87	0.64
Skive	DNK	56.57	9.03	0.48
Stege	DNK	54.98	12.28	0.70
Struer	DNK	56.50	8.60	1.06
Stubbekobing	DNK	54.88	12.03	0.55
Svaneke	DNK	55.13	15.15	0.66
Tejn	DNK	55.23	14.83	0.70
Thisted	DNK	56.95	8.70	0.58
Vang	DNK	55.27	14.75	0.70
Bekker	EST	59.45	24.67	0.43
Dirhami	EST	59.22	23.50	0.55
Forby	EST	59.00	23.17	0.52
Haapsalu	EST	58.95	23.53	0.46
Heltermaa	EST	58.87	23.07	0.47
Kuivastu	EST	58.58	23.40	0.47
Kunda	EST	59.52	26.55	0.48
Lehtma	EST	59.05	22.70	0.58
Loksa	EST	59.58	25.72	0.49
Meeruse	EST	59.45	24.68	0.42
Miiduranna	EST	59.50	24.82	0.55
Montu	EST	57.95	22.12	0.48
Muuga	EST	59.50	24.97	0.55
Narva Joesuu	EST	59.47	28.05	0.37
Paldiski	EST	59.35	24.05	0.57
Paljassaare	EST	59.45	24.70	0.42
Parnu	EST	58.38	24.48	0.43
Peetri	EST	59.45	24.73	0.42
Prangli Island	EST	59.63	25.00	0.50
Rohukula	EST	58.90	23.42	0.47
Roomassaare	EST	58.22	22.52	0.44
Saaremaa Harbour	EST	58.53	22.23	0.48
Sillamae	EST	59.40	27.78	0.37
Tallinn	EST	59.45	24.75	0.42
Veere	EST	58.45	22.05	0.50
Virtsu	EST	58.58	23.55	0.44
Dalsbruk	FIN	60.03	22.52	0.46
Frojdbole	FIN	60.15	19.92	0.70
Galtby	FIN	60.18	21.58	0.60
Hamina	FIN	60.57	27.18	0.37
Hanko	FIN	59.82	22.97	0.59
Helsinki	FIN	60.17	24.95	0.41
Houtskar	FIN	60.22	21.37	0.62
Imatra	FIN	61.17	28.83	0.15

Inkoo	FIN	60.05	24.02	0.46
Isnas	FIN	60.40	26.00	0.38
Joensuu	FIN	62.60	29.75	0.28
Joutseno	FIN	61.13	28.48	0.15
Kalajoki	FIN	64.25	23.93	0.92
Kantvik	FIN	60.08	24.38	0.45
Kaskinen	FIN	62.38	21.22	0.71
Kaukas	FIN	61.07	28.22	0.15
Kaukopaa	FIN	61.25	28.87	0.18
Kemi	FIN	65.73	24.57	0.61
Kokkila	FIN	60.33	22.87	0.46
Kokkola	FIN	63.83	23.13	0.82
Korpo	FIN	60.15	21.55	0.60
Kotka	FIN	60.47	26.95	0.45
Koverhar	FIN	59.88	23.22	0.59
Kristiinankaupunki	FIN	62.27	21.32	0.43
Kronvik	FIN	63.05	21.52	0.44
Kuopio	FIN	62.85	27.50	0.25
Kustavi	FIN	60.57	21.33	0.47
Kuuslahti	FIN	63.12	27.75	0.26
Lapaluoto	FIN	64.67	24.42	0.53
Lappeenranta	FIN	61.07	28.25	0.15
Lappohja	FIN	59.90	23.27	0.59
Lappvik	FIN	59.90	23.27	0.59
Lauritsala	FIN	61.08	28.33	0.15
Loviisa	FIN	60.45	26.23	0.37
Luvia	FIN	61.33	21.57	0.44
Mantyluoto	FIN	61.58	21.50	0.45
Martinniemi	FIN	65.22	25.28	0.53
Maxmo	FIN	63.20	22.03	0.46
Merikarvia	FIN	61.85	21.47	0.46
Mjosund	FIN	60.22	22.47	0.45
Mustola	FIN	61.07	28.30	0.15
Naantali	FIN	60.47	22.02	0.45
Nyhamn	FIN	62.17	21.33	0.43
Olkiluoto	FIN	61.25	21.50	0.43
Oulu	FIN	65.00	25.47	0.50
Parainen	FIN	60.28	22.30	0.45
Pateniemi	FIN	65.08	25.40	0.52
Perno	FIN	60.45	26.05	0.38
Pietarsaari	FIN	63.68	22.70	0.79
Pori	FIN	61.48	21.80	0.45
Puhos	FIN	62.10	29.92	0.25
Raahe	FIN	64.68	24.48	0.54
Rahja	FIN	64.20	23.73	0.52

Rauma	FIN	61.13	21.50	0.44
Ristiina	FIN	61.53	27.42	0.18
Roytta	FIN	65.77	24.15	0.60
Salo	FIN	60.38	23.17	0.46
Savonlinna	FIN	61.90	28.92	0.22
Siilinjarvi	FIN	63.08	27.67	0.25
Sipoo	FIN	60.37	25.32	0.41
Skogby	FIN	59.92	23.32	0.59
Skoldvik	FIN	60.30	25.55	0.39
Skuru	FIN	60.10	23.55	0.45
Stromma	FIN	60.18	22.90	0.46
Summa	FIN	60.53	27.12	0.37
Svartback	FIN	60.28	25.53	0.39
Taalintehdas	FIN	60.02	22.52	0.46
Tammisaari	FIN	59.98	23.43	0.45
Teijo	FIN	60.25	22.95	0.46
Tolkkinen	FIN	60.33	25.58	0.39
Tornio	FIN	65.85	24.15	0.60
Tupavuori	FIN	60.45	22.07	0.45
Turku	FIN	60.43	22.22	0.45
Uusikaupunki	FIN	60.80	21.40	0.46
Vaasa	FIN	63.10	21.62	0.44
Valkom	FIN	60.42	26.27	0.37
Varkaus	FIN	62.33	27.83	0.21
Vartsala	FIN	60.33	23.02	0.46
Vastanfjard	FIN	60.05	22.65	0.46
Veitsiluoto	FIN	65.70	24.62	0.61
Abbeville	FRA	50.10	1.85	1.05
Annay sous Lens	FRA	50.47	2.87	0.83
Bethune	FRA	50.53	2.63	0.85
Bonnieres	FRA	49.03	1.58	0.92
Chalon-sur-Saone	FRA	46.78	4.83	0.97
Conflans	FRA	48.98	2.10	0.97
Duclair	FRA	49.45	0.87	0.95
Elbeuf	FRA	49.28	1.12	0.92
Gaillon	FRA	49.17	1.32	0.90
Grand Couronne	FRA	49.37	0.98	0.95
Grigny	FRA	45.62	4.78	1.07
La Mailleraye	FRA	49.48	0.77	0.93
Le Trait	FRA	49.47	0.80	0.93
Les Andelys	FRA	49.25	1.43	0.89
Lille	FRA	50.65	3.08	0.83
Lillebonne	FRA	49.52	0.53	0.93
Limay	FRA	48.97	1.78	0.91
Lyon	FRA	45.77	4.83	1.07

Mantes	FRA	48.98	1.72	0.91
Paris	FRA	48.87	2.33	1.04
Petit Couronne	FRA	49.37	1.00	0.95
Port Jerome	FRA	49.47	0.53	0.98
Radicatel	FRA	49.42	0.48	1.01
Rouen	FRA	49.48	1.08	0.92
St. Etienne du Rouvray	FRA	49.37	1.12	0.92
St. Wandrille	FRA	49.53	0.75	0.90
Strasbourg	FRA	48.57	7.70	0.84
Vernon	FRA	49.08	1.48	0.90
Villeneuve-la-Garenne	FRA	48.92	2.30	1.04
Villeneuve-le-Roi	FRA	48.73	2.40	1.07
Villequier	FRA	49.50	0.67	0.95
Acton Grange	GBR	53.37	-2.63	0.97
Alloa	GBR	56.10	-3.80	0.91
Althorpe Wharf	GBR	53.57	-0.73	0.82
Anderton	GBR	53.27	-2.52	0.89
Aylesford	GBR	51.27	0.47	0.92
Barton	GBR	53.47	-2.37	0.88
Beckingham	GBR	53.40	-0.83	0.80
Beverley	GBR	53.85	-0.43	0.87
Bowling	GBR	55.93	-4.50	0.84
Burton upon Stather	GBR	53.65	-0.68	0.84
Coulport	GBR	56.07	-4.88	0.96
Dalmuir	GBR	55.90	-4.43	0.78
Dingwall	GBR	57.60	-4.42	1.09
Drax	GBR	53.73	-0.98	0.79
Dumbarton	GBR	55.93	-4.57	0.89
Dunglass	GBR	55.93	-4.52	0.84
Faslane Dock	GBR	56.07	-4.82	0.87
Finnart	GBR	56.12	-4.83	0.87
Flixborough	GBR	53.62	-0.68	0.82
Frodsham	GBR	53.30	-2.73	1.06
Gainsborough	GBR	53.40	-0.77	0.79
Garelochhead	GBR	56.08	-4.83	0.89
Glasgow	GBR	55.87	-4.28	0.77
Glenmallan	GBR	56.12	-4.82	0.85
Gloucester	GBR	51.87	-2.22	0.92
Goole	GBR	53.70	-0.87	0.83
Grove Wharf	GBR	53.60	-0.68	0.82
Gunness	GBR	53.58	-0.72	0.82
Gunness Wharf	GBR	53.58	-0.68	0.82
Halling	GBR	51.37	0.01	0.92
Howdendyke	GBR	53.75	-0.87	0.83
Irlam	GBR	53.43	-2.42	0.90

Irwell	GBR	53.47	-2.35	0.88
Keadby	GBR	53.60	-0.67	0.82
Knottingley	GBR	53.72	-1.23	0.79
Latchford	GBR	53.38	-2.57	0.94
London	GBR	51.50	-0.07	0.95
Manchester	GBR	53.47	-2.28	0.88
Neap House	GBR	53.62	-0.67	0.82
Northwich	GBR	53.27	-2.53	0.89
Old Kilpatrick	GBR	55.92	-4.45	0.78
Paisley	GBR	55.85	-4.43	0.77
Partington	GBR	53.43	-2.43	0.90
Perth	GBR	56.40	-3.43	0.83
Port Glasgow	GBR	55.93	-4.68	1.05
Renfrew	GBR	55.87	-4.40	0.77
Rochester	GBR	51.40	0.50	1.06
Rosneath	GBR	56.02	-4.80	0.97
Selby	GBR	53.78	-1.07	0.79
Shandon	GBR	56.05	-4.82	0.87
Snodland	GBR	51.33	0.45	0.97
Thorne	GBR	53.62	-0.97	0.82
Warrington	GBR	53.40	-2.60	0.94
Winnington	GBR	53.28	-2.52	0.89
Wisbech	GBR	52.65	0.15	1.08
Budapest	HUN	47.50	19.03	1.08
Dernish Island	IRL	52.68	-8.92	1.06
Limerick	IRL	52.67	-8.63	0.97
Klaipeda	LTU	55.72	21.13	0.56
Engure	LVA	57.17	23.23	0.45
Labrags	LVA	56.98	21.37	0.64
Liepaja	LVA	56.52	21.02	0.65
Mersrags	LVA	57.37	23.13	0.41
Pavilosta	LVA	56.90	21.18	0.62
Riga	LVA	56.97	24.10	0.43
Roja	LVA	57.50	22.82	0.42
Salacgriva	LVA	57.75	24.37	0.42
Skulte	LVA	57.32	24.40	0.43
Ventspils	LVA	57.40	21.55	0.62
Chisinau	MDA	47.02	28.83	0.94
Aalst	NLD	51.38	5.45	0.77
Alblasserdam	NLD	51.87	4.62	0.71
Ameide	NLD	51.95	4.95	0.70
Amsterdam	NLD	52.37	4.90	0.99
Arnhem	NLD	51.97	5.88	0.72
Assen	NLD	53.00	6.57	0.67
Axel Sassing	NLD	51.28	3.87	0.94

Bergambacht	NLD	51.93	4.78	0.70
Bergen-op-Zoom	NLD	51.50	4.27	0.96
Bergum	NLD	53.20	5.98	0.98
Bolnes	NLD	51.90	4.57	0.71
Bruinisse	NLD	51.67	4.10	0.87
Capelle aan den Yssel	NLD	51.92	4.57	0.71
Culemborg	NLD	51.95	5.22	0.73
Deest	NLD	51.88	5.67	0.73
Den Bommel	NLD	51.72	4.28	0.85
Dintelmond	NLD	51.67	4.38	0.81
Dinteloord	NLD	51.63	4.37	0.82
Dodewaard	NLD	51.90	5.63	0.73
Dordrecht	NLD	51.80	4.65	0.71
Drachten	NLD	53.12	6.10	0.98
Druten	NLD	51.88	5.62	0.73
Eindhoven	NLD	51.43	5.50	0.77
Fijnaart	NLD	51.63	4.48	0.80
Geertruidenberg	NLD	51.72	4.87	0.76
Gendt	NLD	51.87	5.98	0.72
Gorinchem	NLD	51.82	4.98	0.76
Grave	NLD	51.75	5.75	0.74
Groot-Ammers	NLD	51.92	4.83	0.70
Grouw	NLD	53.10	5.85	1.00
Hardinxveld	NLD	51.82	4.85	0.70
Heerenveen	NLD	52.95	5.92	1.01
Heerewaarden	NLD	51.82	5.38	0.74
Heerjansdam	NLD	51.83	4.57	0.71
Heijen	NLD	51.68	5.98	0.74
Hellevoetsluis	NLD	51.82	4.13	0.94
Hendrik Ido Ambacht	NLD	51.85	4.62	0.71
Heusden	NLD	51.73	5.15	0.75
Huissen	NLD	51.92	5.92	0.72
Kinderdijk	NLD	51.88	4.63	0.71
Krimpen aan den Yssel	NLD	51.90	4.58	0.71
Lekkerkerk	NLD	51.92	4.63	0.71
Lithoyen	NLD	51.82	5.43	0.74
Lobith	NLD	51.87	6.13	0.73
Maasbracht	NLD	51.13	5.87	0.78
Maashees	NLD	51.57	6.03	0.76
Maassluis	NLD	51.92	4.25	0.76
Maastricht	NLD	50.85	5.68	0.76
Made	NLD	51.68	4.80	0.77
Middelharnis	NLD	51.78	4.20	0.88
Millingen aan den Rijn	NLD	51.87	6.03	0.73
Moerdijk	NLD	51.70	4.62	0.79

Nieuw Lekkerland	NLD	51.88	4.63	0.71
Nieuwerkerk aan den Yssel	NLD	51.97	4.58	0.71
Nijmegen	NLD	51.83	5.83	0.74
Numansdorp	NLD	51.72	4.42	0.83
Ooltgensplaat	NLD	51.68	4.33	0.82
Oosterhout	NLD	51.62	4.87	0.76
Oss	NLD	51.77	5.52	0.74
Ouderkerk	NLD	51.93	4.60	0.71
Oudewater	NLD	52.03	4.88	1.04
Ouwerkerk	NLD	51.63	3.98	0.96
Overschie	NLD	51.93	4.42	0.72
Paal	NLD	51.35	4.12	0.97
Papendrecht	NLD	51.83	4.63	0.71
Raamsdonksveer	NLD	51.70	4.92	0.76
Renkum	NLD	51.97	5.73	0.72
Rhenen	NLD	51.95	5.57	0.73
Ridderkerk	NLD	51.87	4.58	0.71
Rijswijk	NLD	51.78	5.02	0.75
Roermond	NLD	51.20	5.98	0.78
Rotterdam	NLD	51.90	4.48	0.72
Sas van Ghent	NLD	51.23	3.80	0.89
Schiedam	NLD	51.90	4.40	0.73
‘sGravendeel	NLD	51.77	4.60	0.71
‘sHertogenbosch	NLD	51.70	5.30	0.77
Sliedrecht	NLD	51.83	4.75	0.70
Slikkerveer	NLD	51.88	4.60	0.71
Sluiskil	NLD	51.30	3.83	0.95
Spijk	NLD	51.87	5.05	0.73
St. Annaland	NLD	51.62	4.10	0.78
Stavenisse	NLD	51.58	4.00	0.96
Stein	NLD	50.97	5.77	0.76
Swalmen	NLD	51.22	6.02	0.78
Tegelen	NLD	51.35	6.13	0.78
Tiel	NLD	51.88	5.45	0.73
Tilburg	NLD	51.55	5.07	0.76
Venlo	NLD	51.37	6.17	0.78
Vlaardingen	NLD	51.90	4.35	0.73
Waalwijk	NLD	51.70	5.07	0.75
Wageningen	NLD	51.97	5.67	0.73
Wanssum	NLD	51.53	6.08	0.76
Wartena	NLD	53.15	5.90	0.84
Werkendam	NLD	51.80	4.90	0.70
Willemstad	NLD	51.68	4.40	0.81
Wolphaartsdijk	NLD	51.53	3.82	1.02
Zaltbommel	NLD	51.80	5.20	0.75

Zierikzee	NLD	51.63	3.88	1.03
Zuilichem	NLD	51.80	5.12	0.75
Zwijndrecht	NLD	51.82	4.65	0.71
Aagotnes	NOR	60.40	5.02	1.08
Aakra	NOR	59.78	6.10	0.74
Aalvik	NOR	60.43	6.40	0.92
Aandalsnes	NOR	62.57	7.68	1.03
Alta	NOR	69.97	23.25	0.91
Anfiskaa	NOR	66.28	14.10	1.04
Askoy	NOR	60.40	5.17	0.94
Balholm	NOR	61.22	6.53	0.76
Bergen	NOR	60.40	5.32	0.89
Buvika	NOR	63.32	10.18	1.01
Bygstad	NOR	61.38	5.67	0.93
Dirdal	NOR	58.78	6.23	0.90
Dolvik	NOR	60.32	5.25	0.93
Eide	NOR	60.52	6.72	0.94
Eidfjord	NOR	60.47	7.07	1.09
Eikefet	NOR	60.70	5.55	0.84
Eikefjord	NOR	61.60	5.47	1.07
Eitrheimsneset	NOR	60.10	6.53	1.06
Elvebakken	NOR	69.92	23.42	0.95
Etne	NOR	59.67	5.95	0.74
Fiborgtangen	NOR	63.72	11.17	0.60
Finneid	NOR	67.25	15.40	0.89
Finnsnes	NOR	69.23	17.97	1.10
Flekkefjord	NOR	58.30	6.67	1.01
Florvaag	NOR	60.45	5.22	0.84
Follafoss	NOR	63.98	11.10	0.71
Forde (Fordefjord)	NOR	61.45	5.85	0.89
Forde (Fuglesetfjord)	NOR	61.03	5.82	0.85
Fusa	NOR	60.20	5.62	0.82
Garnes	NOR	60.43	5.48	0.74
Gaupne	NOR	61.42	7.30	0.82
Glaerem	NOR	63.02	8.52	0.89
Gullsmedvik	NOR	66.33	14.15	1.04
Haugsvik	NOR	61.83	5.00	1.09
Hellesylt	NOR	62.08	6.88	1.10
Heroysund	NOR	59.92	5.78	0.74
Herre	NOR	59.10	9.53	0.66
Hjelmaas	NOR	60.58	5.35	1.10
Hommelvik	NOR	63.42	10.80	0.69
Hoyanger	NOR	61.22	6.07	1.07
Hoylandsbygdi	NOR	59.77	5.78	0.71
Hoylandssundet	NOR	59.78	5.80	0.69

Husnes	NOR	59.87	5.77	0.74
Kaupanger	NOR	61.18	7.23	0.73
Knarrevik	NOR	60.37	5.17	0.94
Kongsmoen	NOR	64.88	12.43	0.92
Kvinesdal	NOR	58.30	7.00	0.82
Laksevaag	NOR	60.38	5.30	0.89
Langangen	NOR	59.08	9.80	0.88
Langstein	NOR	63.55	10.92	0.93
Levanger	NOR	63.75	11.30	0.61
Lofallstrand	NOR	60.02	6.00	0.54
Malm	NOR	64.07	11.22	0.68
Malvik	NOR	63.42	10.63	0.68
Menstad	NOR	59.17	9.65	0.58
Mo i Rana	NOR	66.32	14.13	1.04
Mosjoen	NOR	65.83	13.18	1.04
Muruvik	NOR	63.43	10.85	0.67
Namsos	NOR	64.47	11.50	1.10
Narvik	NOR	68.43	17.43	1.01
Naustdal	NOR	61.52	5.72	1.04
Nordfjordeid	NOR	61.90	6.02	0.97
Nordveitgrend	NOR	60.10	5.73	0.76
Norheimsund	NOR	60.37	6.15	0.96
Nystrand	NOR	59.10	9.72	0.96
Odda	NOR	60.07	6.55	1.06
Olen	NOR	59.60	5.83	0.69
Omastrand	NOR	60.22	5.97	0.73
Onarheim	NOR	59.95	5.65	0.81
Orkanger	NOR	63.32	9.85	0.86
Oystese	NOR	60.38	6.22	0.84
Porsgrunn	NOR	59.13	9.65	0.65
Raudsand	NOR	62.83	8.10	0.98
Rognan	NOR	67.08	15.37	0.96
Ronningen	NOR	63.70	10.58	0.81
Rosendal	NOR	59.98	6.02	0.99
Rubbestadneset	NOR	59.82	5.28	0.94
Sagvaag	NOR	59.77	5.38	1.07
Salsbruket	NOR	64.80	11.88	0.96
Sandane	NOR	61.77	6.22	1.06
Sandnes	NOR	58.85	5.75	1.06
Sauda	NOR	59.65	6.35	0.90
Skaalevik	NOR	60.37	5.22	0.93
Skaanevik	NOR	59.75	5.93	0.73
Skien	NOR	59.20	9.62	0.62
Sogndal	NOR	61.23	7.10	0.74
Steinkjer	NOR	64.02	11.50	0.65

Stjordal	NOR	63.45	10.88	0.67
Stryn	NOR	61.92	6.73	1.01
Sunndalsora	NOR	62.68	8.60	1.10
Thamshavn	NOR	63.33	9.87	0.86
Trondheim	NOR	63.43	10.40	0.68
Trosvik	NOR	59.05	9.70	1.07
Tyssebotn	NOR	60.62	5.58	0.73
Tyssedal	NOR	60.12	6.57	1.06
Ulvik	NOR	60.57	6.92	0.91
Uskedal	NOR	59.93	5.88	0.82
Vadheim	NOR	61.20	5.82	0.89
Vaksdal	NOR	60.48	5.75	0.73
Verdal	NOR	63.78	11.43	0.62
Vik (Sognefjord)	NOR	61.08	6.58	0.85
Darlowo	POL	54.43	16.38	0.72
Elblag	POL	54.17	19.40	0.66
Frombork	POL	54.35	19.67	0.66
Gdansk	POL	54.35	18.65	0.59
Gdynia	POL	54.53	18.55	0.64
Kolobrzeg	POL	54.18	15.57	0.84
Kozle	POL	50.32	18.13	0.48
Niechorze	POL	54.10	15.07	0.78
Nowa Sol	POL	51.80	15.72	0.64
Plock	POL	52.53	19.67	0.46
Police	POL	53.55	14.60	0.80
Puck	POL	54.72	18.35	0.62
Stepnica	POL	53.65	14.63	0.80
Swinoujscie	POL	53.93	14.28	0.64
Szczecin	POL	53.42	14.55	0.78
Tczew	POL	54.08	18.77	0.61
Ustka	POL	54.58	16.87	0.68
Wladyslawowo	POL	54.80	18.42	0.65
Wroclaw	POL	51.08	17.00	0.50
Bazias	ROM	44.80	21.40	1.06
Orsova	ROM	44.70	22.37	0.87
Tulcea	ROM	45.17	28.82	1.07
Annenskiy Most	RUS	60.72	37.08	0.27
Balakhna	RUS	56.48	43.62	0.36
Balakovo	RUS	52.07	47.77	0.87
Baltiysk	RUS	54.65	19.90	0.62
Belyy Ruchey	RUS	60.90	36.83	0.28
Berezniki	RUS	59.43	56.82	0.44
Brusnichnoye	RUS	60.78	28.73	0.38
Cheboksary	RUS	56.13	47.23	0.44
Cherepovets	RUS	59.15	37.83	0.21

Chkalovsk	RUS	56.75	43.23	0.35
Dudinka	RUS	69.40	86.17	1.02
Gorokhovets	RUS	56.18	42.70	0.36
Igarka	RUS	67.50	86.67	0.91
Kalach-na-Donu	RUS	48.72	43.48	1.06
Kaliningrad	RUS	54.72	20.52	0.63
Kamyshin	RUS	50.08	45.40	1.02
Kanonerskiy Island	RUS	59.90	30.22	0.41
Kazan	RUS	55.75	49.17	0.53
Khabarovsk	RUS	48.50	135.17	0.79
Khatanga	RUS	71.97	102.42	1.10
Kineshma	RUS	57.45	42.12	0.30
Kirovsk	RUS	59.87	30.98	0.39
Komsomolsk-na-Amure	RUS	50.53	136.98	0.61
Kondopoga	RUS	62.20	34.28	0.28
Kostroma	RUS	57.77	40.93	0.31
Kotlas	RUS	61.25	46.65	0.38
Krasnoyarsk	RUS	56.08	92.77	0.51
Kronshtadt	RUS	60.00	29.77	0.39
Lomonosov	RUS	59.83	29.80	0.38
Mago	RUS	53.25	140.22	0.61
Medvezhyegorsk	RUS	62.93	34.47	0.36
Mondoma	RUS	59.93	37.47	0.25
Murmansk	RUS	68.97	33.08	0.91
Naberezhnyye Chelny	RUS	55.68	52.30	0.52
Nadvoitsy	RUS	63.93	34.33	0.44
Naryan Mar	RUS	67.65	53.02	0.88
Navashino	RUS	55.55	42.18	0.38
Nikolayevsk	RUS	53.13	140.72	0.65
Nizhnekamsk	RUS	55.42	51.88	0.52
Nizhnetambovskoye	RUS	50.93	138.17	0.56
Nizhniy Novgorod	RUS	56.33	44.00	0.36
Nizhnyaya Gavan	RUS	52.40	140.43	0.58
Novgorod	RUS	58.50	31.33	0.14
Novocheboksarsk	RUS	56.10	47.48	0.46
Oleniy	RUS	49.45	143.28	1.00
Otradnoye	RUS	59.77	30.80	0.40
Pechora	RUS	65.23	57.30	0.68
Perm	RUS	58.02	56.17	0.43
Petrodvorets	RUS	59.88	29.92	0.40
Petrozavodsk	RUS	61.77	34.32	0.29
Pionerskiy	RUS	54.93	20.20	0.61
Podporozhye	RUS	60.92	34.03	0.20
Primorsk	RUS	60.37	28.63	0.38
Priozersk	RUS	61.02	30.13	0.40

Pudozh	RUS	61.83	36.53	0.28
Rybinsk	RUS	58.02	38.87	0.24
Samara	RUS	53.17	50.17	0.69
Saratov	RUS	51.50	45.92	0.93
Segezha	RUS	63.70	34.32	0.43
Shlisselburg	RUS	59.93	31.13	0.40
Solikamsk	RUS	59.67	56.75	0.45
Sosnovka	RUS	56.23	51.28	0.50
St. Petersburg	RUS	59.93	30.30	0.41
Svetlyy	RUS	54.63	20.15	0.64
Syzran	RUS	53.17	48.48	0.72
Tolyatti	RUS	53.53	49.40	0.65
Tomsk	RUS	56.50	85.08	0.59
Ust-Luga	RUS	59.67	28.30	0.37
Voznesenye	RUS	61.02	35.47	0.22
Vyborg	RUS	60.72	28.73	0.38
Vysotsk	RUS	60.63	28.57	0.38
Vytegra	RUS	61.07	36.45	0.24
Yakutsk	RUS	62.02	129.73	0.96
Yaroslavl	RUS	57.57	39.87	0.29
Zelenodolsk	RUS	55.83	48.50	0.50
Apatin	SCG	45.67	19.00	1.04
Bezdam	SCG	45.83	18.93	1.05
Mitrovica	SCG	42.90	20.87	0.57
Novi Becej	SCG	45.58	20.13	1.08
Novi Sad	SCG	45.27	19.83	1.05
Bratislava	SVK	48.15	17.12	0.82
Komarno	SVK	47.77	18.08	0.90
Aelvenaes	SWE	59.37	13.18	0.14
Ahus	SWE	55.93	14.32	0.74
Amal	SWE	59.05	12.72	0.16
Ar	SWE	57.92	18.95	0.62
Arvika	SWE	59.67	12.58	0.14
Backfors	SWE	64.50	21.42	0.85
Balsta	SWE	59.55	17.55	0.49
Bergkvara	SWE	56.38	16.08	0.68
Borgholm	SWE	56.88	16.65	0.64
Bungenas	SWE	57.82	19.08	0.61
Burea	SWE	64.62	21.25	0.85
Byxelkrok	SWE	57.30	17.03	0.55
Dalaro	SWE	59.13	18.42	0.59
Degerhamn	SWE	56.35	16.42	0.67
Edsvalla	SWE	59.43	13.23	0.14
Elleholm	SWE	56.17	14.73	0.68
Enkoping	SWE	59.63	17.08	0.49

Farjestaden	SWE	56.65	16.47	0.66
Farosund	SWE	57.87	19.07	0.61
Fiskeback	SWE	57.87	14.10	0.25
Fittja	SWE	59.23	17.85	0.54
Forsmark	SWE	60.42	18.20	0.61
Furillen	SWE	57.77	19.00	0.55
Furusund	SWE	59.65	18.90	0.60
Gamleby	SWE	57.90	16.42	0.65
Gefle	SWE	60.67	17.17	0.46
Grisslehamn	SWE	60.10	18.82	0.61
Gruvon	SWE	59.33	13.12	0.15
Hallekis	SWE	58.67	13.42	0.20
Hallstavik	SWE	60.05	18.60	0.60
Haparanda	SWE	65.83	24.13	0.60
Haraholmen	SWE	65.23	21.63	0.55
Hargshamn	SWE	60.17	18.48	0.60
Hasselby	SWE	59.37	17.82	0.52
Hernosand	SWE	62.63	17.93	0.47
Hoglunda	SWE	59.42	13.25	0.14
Hogmarso	SWE	59.65	18.85	0.60
Honsater	SWE	58.63	13.45	0.20
Hornefors	SWE	63.62	19.90	0.49
Hudiksvall	SWE	61.72	17.12	0.63
Iggesund	SWE	61.65	17.10	0.63
Kagehamn	SWE	64.83	21.03	0.54
Kalix	SWE	65.85	23.13	0.65
Kallvik	SWE	57.88	16.72	0.71
Kallviken	SWE	64.33	21.37	0.49
Kalmar	SWE	56.67	16.37	0.66
Kalmarsand	SWE	59.53	17.52	0.49
Kapellskar	SWE	59.72	19.00	0.62
Kappelshamn	SWE	57.85	18.78	0.62
Karlshamn	SWE	56.17	14.87	0.67
Karlskrona	SWE	56.17	15.60	0.66
Karlstad	SWE	59.38	13.52	0.14
Klintehamn	SWE	57.38	18.20	0.70
Koping	SWE	59.52	16.00	0.24
Kopmannebro	SWE	58.77	12.52	0.19
Kristinehamn	SWE	59.32	14.12	0.15
Krokstad	SWE	59.10	12.92	0.15
Kungsor	SWE	59.43	16.10	0.22
Kyrkebyn	SWE	59.27	13.07	0.15
Landsort	SWE	58.73	17.87	0.60
Lidkoping	SWE	58.50	13.17	0.22
Liljeholmsviken	SWE	59.32	18.00	0.54

Ljustero	SWE	59.52	18.63	0.51
Loudden	SWE	59.33	18.13	0.55
Lulea	SWE	65.58	22.17	0.58
Mariestad	SWE	58.72	13.83	0.19
Marsviken	SWE	58.67	16.95	0.51
Mem	SWE	58.48	16.42	0.48
Monsteras	SWE	57.03	16.47	0.67
Morbylanga	SWE	56.53	16.37	0.66
Motala	SWE	58.53	15.07	0.18
Munksund	SWE	65.28	21.48	0.56
Norrkoping	SWE	58.60	16.20	0.48
Norrsundet	SWE	60.95	17.17	0.45
Norrtalje	SWE	59.75	18.70	0.50
Norsbron	SWE	59.42	13.23	0.14
Nykoping	SWE	58.75	17.02	0.51
Nynashamn	SWE	58.90	17.95	0.60
Oaxen	SWE	55.97	17.72	0.64
Orebro	SWE	59.28	15.18	0.17
Oregrund	SWE	60.33	18.45	0.60
Ornskoldsvik	SWE	63.27	18.72	0.49
Oskarshamn	SWE	57.27	16.45	0.66
Otterbacken	SWE	58.95	14.05	0.18
Oxelosund	SWE	58.67	17.12	0.60
Pataholm	SWE	56.92	16.43	0.66
Ronehamn	SWE	57.17	18.53	0.68
Ronneby	SWE	56.17	15.30	0.66
Ronnskar	SWE	64.67	21.28	0.85
Rundvik	SWE	63.53	19.45	0.52
Saffle	SWE	59.13	12.93	0.15
Sandhamn	SWE	59.28	18.90	0.60
Sankt Anna	SWE	58.33	16.70	0.51
Seskaro Island	SWE	65.72	23.75	0.88
Sikea	SWE	64.13	20.98	0.85
Simpevarp	SWE	57.42	16.67	0.72
Simrishamn	SWE	55.55	14.37	0.72
Sjotorp	SWE	58.83	14.00	0.19
Skattkar	SWE	59.42	13.70	0.14
Skelleftea	SWE	64.73	20.95	0.57
Skoghall	SWE	59.32	13.45	0.13
Skutskar	SWE	60.65	17.40	0.42
Slite	SWE	57.70	18.82	0.69
Slottsbron	SWE	59.33	13.10	0.15
Soderhamn	SWE	61.32	17.10	0.65
Soderkoping	SWE	58.48	16.33	0.48
Sodertalje	SWE	59.20	17.63	0.58

Solvesborg	SWE	56.05	14.58	0.68
Soraker	SWE	62.50	17.50	0.49
Spesshult	SWE	59.07	12.92	0.15
Stavsnas	SWE	59.28	18.68	0.59
Stockholm	SWE	59.32	18.05	0.55
Stocksund	SWE	59.38	18.05	0.54
Stora Vika	SWE	58.93	17.78	0.60
Storugns	SWE	57.83	18.80	0.62
Straa	SWE	57.90	19.03	0.61
Strangnas	SWE	59.38	17.03	0.50
Studsvik	SWE	58.75	17.28	0.52
Sturko	SWE	56.08	15.67	0.66
Sundsvall	SWE	62.42	17.33	0.53
Taxinge	SWE	59.22	17.37	0.51
Torko	SWE	56.15	15.40	0.66
Trelleborg	SWE	55.37	13.15	0.67
Umea	SWE	63.70	20.35	0.68
Uppsala	SWE	59.87	17.65	0.12
Valdemarsvik	SWE	58.20	16.60	0.49
Vaxholm	SWE	59.38	18.33	0.53
Vesteras	SWE	59.60	16.43	0.23
Vestervik	SWE	57.75	16.65	0.70
Visby	SWE	57.65	18.28	0.69
Ystad	SWE	55.43	13.83	0.65
Cherkassy	UKR	49.43	32.05	0.65
Dneprodzerzhinsk	UKR	48.50	34.62	0.85
Dnepropetrovsk	UKR	48.48	35.00	0.89
Kiev	UKR	50.42	30.50	0.58
Kremenchug	UKR	49.05	33.42	0.73
Tyaginka	UKR	46.75	33.05	0.97
Zaporozhye	UKR	47.83	35.17	1.02
Albany	USA	42.65	-73.75	0.94
Allyns Point	USA	41.43	-72.07	1.08
Alpena	USA	45.05	-83.43	0.32
Alsen	USA	42.18	-73.92	0.88
Ashland	USA	46.58	-90.90	0.19
Ashtabula	USA	41.92	-80.82	0.91
Bangor	USA	44.80	-68.78	0.58
Bath	USA	43.90	-69.82	0.82
Bay City	USA	43.58	-83.88	0.81
Bayfield	USA	46.80	-90.80	0.08
Belfast	USA	44.42	-69.00	0.94
Benton Harbour	USA	42.12	-86.45	0.67
Brevort	USA	46.00	-85.03	0.23
Bucksport	USA	44.57	-68.80	0.75

Buffalo	USA	42.88	-78.88	0.90
Buffington	USA	41.63	-87.42	0.76
Burns Harbour	USA	41.63	-87.18	0.76
Calcite	USA	45.40	-83.78	0.18
Catskill	USA	42.22	-73.88	0.88
Cedarville	USA	45.98	-84.35	0.06
Cementon	USA	42.13	-73.92	0.93
Charlevoix	USA	45.32	-85.22	0.40
Cheboygan	USA	45.67	-84.47	0.21
Chicago	USA	41.83	-87.63	0.71
Clayton	USA	44.23	-76.08	0.77
Cleveland	USA	41.52	-81.72	0.98
Conneaut	USA	41.97	-80.57	0.91
Coxsackie	USA	42.33	-73.80	0.90
Detour	USA	45.97	-83.88	0.07
Detroit	USA	42.33	-83.03	0.81
Duluth	USA	46.73	-92.15	0.00
Erie	USA	42.17	-80.08	0.90
Escanaba	USA	45.78	-87.07	0.36
Essexville	USA	43.60	-83.83	0.80
Fairport	USA	41.77	-81.32	0.96
Ferrysburg	USA	43.08	-86.23	0.50
Gary Harbour	USA	41.60	-87.35	0.74
Grand Haven	USA	43.07	-86.25	0.52
Grand River	USA	41.73	-81.28	0.95
Green Bay	USA	44.52	-88.00	0.68
Harbor Beach	USA	43.83	-82.65	0.38
Holland (MI)	USA	42.78	-86.22	0.54
Huron	USA	41.40	-82.58	1.04
Hyde Park	USA	41.78	-73.93	0.93
Indiana Harbour	USA	41.67	-87.50	0.76
Kalama	USA	46.02	-122.83	0.90
Kenosha	USA	42.58	-87.82	0.51
Kewaunee	USA	44.45	-87.52	0.18
Kingston	USA	41.87	-73.97	0.93
Lorain	USA	41.47	-82.17	1.02
Ludington	USA	43.97	-86.45	0.29
Mackinaw City	USA	45.75	-84.73	0.23
Manistee	USA	44.25	-86.33	0.27
Manitowoc	USA	44.10	-87.63	0.22
Marine City	USA	42.72	-82.48	0.61
Marinette	USA	45.12	-87.62	0.46
Marquette	USA	46.60	-87.38	0.07
Marysville	USA	42.92	-82.48	0.60
Menominee	USA	45.13	-87.62	0.44

Milton	USA	41.60	-73.95	1.05
Milwaukee	USA	43.05	-87.87	0.41
Monroe	USA	41.92	-83.33	1.07
Muskegon	USA	43.18	-86.23	0.46
Newburgh	USA	41.50	-74.08	1.06
Ogdensburg	USA	44.70	-75.50	0.67
Olympia	USA	47.05	-122.90	0.93
Ontonagon	USA	46.87	-89.30	0.04
Oswego	USA	43.47	-76.53	0.79
Pittsburgh (PA)	USA	40.43	-80.00	1.09
Port Dolomite	USA	45.97	-84.27	0.11
Port Huron	USA	42.98	-82.43	0.60
Port Inland	USA	45.97	-85.87	0.20
Port Washington	USA	43.38	-87.87	0.31
Portland (OR)	USA	45.57	-122.73	1.01
Poughkeepsie	USA	41.68	-73.88	0.93
Racine	USA	42.73	-87.80	0.51
Ravena	USA	42.47	-73.80	0.91
Rensselaer	USA	42.65	-73.73	0.94
Rochester (NY)	USA	43.28	-77.60	0.69
Rockport (MI)	USA	45.20	-83.38	0.18
Rogers City	USA	45.40	-83.83	0.17
Roseton	USA	41.57	-74.00	0.96
Saginaw	USA	43.45	-83.92	0.83
Sandusky	USA	41.45	-82.73	1.09
Sheboygan	USA	43.75	-87.70	0.17
Silver Bay	USA	47.28	-91.27	0.48
South Brewer	USA	44.78	-68.78	0.58
South Haven	USA	42.45	-86.25	0.59
St. Clair	USA	42.82	-82.47	0.61
St. Joseph	USA	42.08	-86.50	0.70
Stoneport	USA	45.28	-83.43	0.17
Superior	USA	46.72	-92.08	0.00
Taconite Harbour	USA	47.50	-90.92	0.46
The Dalles	USA	45.58	-121.18	0.82
Toledo	USA	41.70	-83.47	1.10
Tonawanda	USA	43.02	-78.88	0.90
Troutdale	USA	45.53	-122.38	1.02
Troy	USA	42.73	-73.68	0.93
Two Harbors	USA	47.02	-91.67	0.34
Vancouver	USA	45.63	-122.67	1.01
Waddington	USA	44.85	-75.20	0.61
Waukegan	USA	42.37	-87.83	0.63
Whitefish Point	USA	46.75	-84.95	0.09
Willbridge	USA	45.57	-122.75	1.01

Winterport	USA	44.63	-68.85	0.70
Wiscasset	USA	44.00	-69.67	0.82
Wyandotte	USA	42.18	-83.15	0.97
Zilwaukee	USA	43.47	-83.92	0.83

Appendix F. List of global ports that have highest environmental similarity to Two Harbours. NIS originating from these ports have the highest potential for survival if introduced at Two Harbours.

Name	Country	Latitude	Longitude	Environmental Distance
Eckero	ALD	60.22	19.60	0.47
Farjsundet	ALD	60.23	20.02	0.47
Finstrom	ALD	60.25	19.92	0.45
Langnasudd	ALD	60.12	20.30	0.48
Mariehamn	ALD	60.10	19.93	0.48
Korneuburg	AUT	48.37	16.33	1.08
Linz	AUT	48.32	14.30	0.85
Antwerp	BEL	51.24	4.41	1.01
Baasrode	BEL	51.05	4.17	1.04
Balen	BEL	51.17	5.17	1.00
Boom	BEL	51.08	4.37	1.02
Brussels	BEL	50.83	4.32	0.99
Buggenhout	BEL	51.02	4.20	1.03
Burcht	BEL	51.20	4.33	1.01
Chatelineau	BEL	50.42	4.52	0.91
Dendermonde	BEL	51.03	4.12	1.04
Doel	BEL	51.32	4.27	1.03
Engis	BEL	50.58	5.40	0.87
Ertvelde	BEL	51.20	3.78	1.05
Geel	BEL	51.15	4.97	1.00
Genk	BEL	50.94	5.50	0.96
Ghent	BEL	51.09	3.75	1.05
Grimbergen	BEL	50.93	4.37	1.01
Grobbendonk	BEL	51.20	4.75	0.98
Haren	BEL	50.90	4.38	1.01
Hemiksem	BEL	51.15	4.34	1.02
Hermalle sous Huy	BEL	50.55	5.37	0.87
Hingene	BEL	51.12	4.27	1.03
Hoboken	BEL	51.17	4.33	1.03
Humbeek	BEL	50.97	4.38	1.01
Kallo	BEL	51.25	4.28	1.02
Kapelle op den Bos	BEL	51.02	4.37	1.02
Kruibeke	BEL	51.17	4.32	1.03
Kwaadmechelen	BEL	51.10	5.15	1.00
Lanaken	BEL	50.88	5.65	0.96
Langerbrugge	BEL	51.12	3.75	1.05
Liefkenshoek	BEL	51.30	4.28	1.03
Liege	BEL	50.64	5.57	0.89
Lillo	BEL	51.30	4.30	1.03
Lixhe	BEL	50.73	5.70	0.92
Maasmechelen	BEL	50.97	5.70	0.95

Marly	BEL	50.88	4.38	1.01
Mechelen	BEL	51.03	4.47	1.02
Melle	BEL	51.00	3.80	1.01
Merksem	BEL	51.23	4.48	1.01
Nameche	BEL	50.47	4.98	0.88
Niel	BEL	51.12	4.33	1.03
Olen	BEL	51.15	4.87	1.00
Puurs	BEL	51.07	4.27	1.03
Rieme	BEL	51.17	3.77	1.05
Ruisbroek	BEL	50.78	4.28	0.99
Rumst	BEL	51.07	4.42	1.02
Rupelmonde	BEL	51.13	4.28	1.03
Schelle	BEL	51.13	4.32	1.03
Schoten	BEL	51.25	4.50	1.01
Seilles	BEL	50.50	5.08	0.80
Sint-Kruis-Winkel	BEL	51.15	3.80	1.05
Temse	BEL	51.13	4.22	1.03
Terdonk	BEL	51.15	3.78	1.05
Terhagen	BEL	51.08	4.38	1.02
Tessenderlo	BEL	51.07	5.08	1.00
Tielrode	BEL	51.12	4.22	1.03
Tisselt	BEL	51.03	4.37	1.02
Val St. Lambert	BEL	50.57	5.47	0.87
Verbrande Brug	BEL	50.95	4.38	1.01
Vilvoorde	BEL	50.95	4.42	1.01
Willebroek	BEL	51.05	4.35	1.02
Wintham	BEL	51.10	4.28	1.03
Wondelgem	BEL	51.08	3.72	1.05
Zelzate	BEL	51.20	3.80	1.05
Zutendaal	BEL	50.92	5.57	0.96
Zwyndrecht	BEL	51.22	4.33	1.01
Baddeck	CAN	46.10	-60.73	0.89
Bath	CAN	44.17	-76.77	1.01
Batiscan	CAN	46.52	-72.23	0.72
Bayside	CAN	45.17	-67.13	0.94
Becancour	CAN	46.40	-72.38	0.78
Bella Coola	CAN	52.38	-126.77	0.33
Belleville	CAN	44.13	-77.37	0.93
Bowmanville	CAN	43.90	-78.67	0.77
Boylston	CAN	45.45	-61.52	1.05
Britt	CAN	45.77	-80.58	0.56
Brockville	CAN	44.60	-75.63	1.03
Bronte	CAN	43.40	-79.70	0.81
Bruce Mines	CAN	46.27	-83.72	0.36
Burlington	CAN	43.32	-79.75	0.88

Cardinal	CAN	44.78	-75.33	1.06
Chicoutimi	CAN	48.43	-71.08	0.65
Clarenville	CAN	48.17	-53.95	1.04
Clarkson	CAN	43.50	-79.60	0.82
Cobourg	CAN	43.95	-78.17	0.89
Colborne	CAN	44.00	-77.88	0.89
Collingwood	CAN	44.50	-80.23	0.76
Contrecoeur	CAN	45.88	-73.20	0.91
Corner Brook	CAN	48.95	-57.93	1.01
Cornwall	CAN	45.02	-74.72	1.03
Corunna	CAN	42.88	-82.45	0.94
Cote Ste-Catherine	CAN	45.41	-73.58	1.03
Country Harbour	CAN	45.22	-61.73	1.06
Courtright	CAN	42.80	-82.45	0.94
Fredericton	CAN	45.95	-66.65	0.70
Gananoque	CAN	44.32	-76.15	1.09
Goderich	CAN	43.75	-81.75	0.75
Gold River	CAN	49.68	-126.12	0.79
Goose Bay	CAN	53.35	-60.42	0.42
Grondines	CAN	46.75	-72.03	0.61
Hamilton	CAN	43.23	-79.85	0.82
Hay River	CAN	60.85	-115.70	0.63
Houston	CAN	54.40	-126.65	0.26
Iona	CAN	45.97	-60.80	0.54
Killarney	CAN	45.97	-81.52	0.45
Kingston	CAN	44.20	-76.50	1.07
Kitimat	CAN	54.00	-128.70	0.28
Lanoraie	CAN	45.97	-73.18	0.91
Lauzon	CAN	46.82	-71.15	0.69
Levis	CAN	46.82	-71.18	0.77
Little Current	CAN	45.97	-81.92	0.76
Little Narrows	CAN	45.98	-60.98	0.53
Long Sault	CAN	45.02	-74.90	0.96
Marathon	CAN	48.75	-86.38	0.23
Meldrum Bay	CAN	45.92	-83.10	0.39
Michipicoten Harbour	CAN	47.95	-84.92	0.11
Midland	CAN	44.75	-79.93	0.72
Montréal	CAN	45.50	-73.55	1.06
Mooretown	CAN	42.85	-82.47	0.94
Morrisburg	CAN	44.93	-75.18	0.94
Nelson	CAN	49.47	-117.30	0.10
Oakville	CAN	43.43	-79.67	0.79
Ocean Falls	CAN	52.35	-127.70	0.57
Oshawa	CAN	43.87	-78.83	0.78
Ottawa	CAN	45.40	-75.70	0.95

Owen Sound	CAN	44.58	-80.95	0.67
Parry Sound	CAN	45.37	-80.05	0.69
Picton	CAN	44.00	-77.13	1.01
Pointe aux Trembles	CAN	45.63	-73.48	0.99
Pointe de la Prairie	CAN	47.42	-70.41	1.05
Port Alberni	CAN	49.23	-125.00	0.73
Port Alice	CAN	50.38	-127.45	0.83
Port Credit	CAN	43.55	-79.60	0.71
Port Dalhousie	CAN	43.20	-79.27	0.94
Port Dover	CAN	42.78	-80.20	1.09
Port Hope	CAN	43.95	-78.28	0.87
Port McNicoll	CAN	44.75	-79.80	0.79
Port Weller	CAN	43.23	-79.22	0.99
Prescott	CAN	44.72	-75.52	1.00
Québec	CAN	46.82	-71.20	0.77
Sarnia	CAN	42.98	-82.42	0.93
Sault Ste. Marie	CAN	46.52	-84.33	0.42
Sombra	CAN	42.70	-82.47	0.94
Sonora	CAN	45.07	-61.92	1.08
Sorel	CAN	46.05	-73.12	0.94
Spragge	CAN	46.22	-82.67	0.58
St. Albans	CAN	47.87	-55.85	1.06
St. Catharines	CAN	43.17	-79.27	0.92
St. Romuald	CAN	46.75	-71.23	0.77
St. Stephen	CAN	45.20	-67.28	0.79
Ste. Croix	CAN	46.63	-71.73	0.70
Stewart	CAN	55.92	-130.00	0.42
Tahsis	CAN	49.92	-126.67	0.87
Thessalon	CAN	46.25	-83.55	0.38
Three Rivers	CAN	46.35	-72.55	0.80
Thunder Bay	CAN	48.42	-89.22	0.11
Tobermory	CAN	45.23	-81.65	0.41
Toronto	CAN	43.63	-79.38	0.73
Tracy	CAN	46.02	-73.17	0.89
Valleyfield	CAN	45.22	-74.08	1.01
Wallaceburg	CAN	42.60	-82.40	0.94
Weymouth	CAN	44.45	-66.02	0.82
Whitby	CAN	43.85	-78.92	0.71
Zeballos	CAN	49.98	-126.85	1.05
Basle	CHE	47.55	7.57	0.99
Heihe	CHN	50.23	127.47	0.98
Chvaletice	CZE	50.02	15.43	0.83
Usti nad Labem	CZE	50.67	14.03	0.74
Aken	DEU	51.85	12.03	0.85
Andernach	DEU	50.42	7.38	0.94

Anklam	DEU	53.87	13.68	0.93
Aschaffenburg	DEU	49.95	9.17	0.91
Barth	DEU	54.37	12.73	0.82
Bendorf	DEU	50.42	7.58	0.92
Berlin	DEU	52.53	13.42	0.89
Berne	DEU	53.18	10.50	0.75
Bingen	DEU	49.95	7.90	0.99
Bodenwerder	DEU	51.97	9.50	0.70
Boizenburg	DEU	53.38	10.73	0.75
Bonn	DEU	50.72	7.08	1.02
Brandenburg	DEU	52.40	12.52	0.86
Braunschweig	DEU	52.25	10.50	0.80
Brohl	DEU	50.42	7.30	0.81
Castrop Rauxel	DEU	51.55	7.30	0.93
Cologne	DEU	50.93	7.00	1.04
Deggendorf	DEU	48.83	12.97	0.84
Dormagen	DEU	51.10	6.95	1.03
Dortmund	DEU	51.53	7.45	0.92
Duisburg	DEU	51.43	6.75	1.00
Dusseldorf	DEU	51.25	6.77	1.02
Eisenhuttenstadt	DEU	52.15	14.62	0.84
Emmerich	DEU	51.85	6.25	0.89
Erftstadt	DEU	50.80	6.75	0.95
Essen	DEU	51.45	7.02	0.94
Frankfurt	DEU	50.12	8.67	0.95
Geesthacht	DEU	53.43	10.38	0.74
Gelsenkirchen	DEU	51.50	7.08	0.94
Gernsheim	DEU	49.75	8.47	1.06
Greifswald	DEU	54.10	13.38	0.86
Gromitz	DEU	54.15	10.98	1.09
Haren	DEU	52.80	7.25	0.86
Havelberg	DEU	52.83	12.07	0.81
Heringsdorf	DEU	53.97	14.17	1.01
Hohenhorn	DEU	53.47	10.37	0.74
Homberg	DEU	51.45	6.72	1.00
Hoya	DEU	52.80	9.13	0.79
Ibbenburen	DEU	52.28	7.73	0.80
Kehl	DEU	48.58	7.83	1.10
Koblenz	DEU	50.33	7.58	0.84
Krefeld	DEU	51.33	6.57	1.00
Kroslin	DEU	54.13	13.75	0.71
Ladebow	DEU	54.10	13.45	0.86
Lahnstein	DEU	50.30	7.62	0.84
Lauenburg	DEU	53.38	10.55	0.75
Lauterbach	DEU	54.33	13.52	0.69

Leer	DEU	53.22	7.45	0.91
Leeseringen	DEU	52.58	9.13	0.81
Leverkusen	DEU	51.02	7.03	0.93
Lubmin	DEU	54.12	13.60	0.87
Magdeburg	DEU	52.13	11.62	0.81
Mainz	DEU	50.00	8.28	0.97
Minden	DEU	52.30	8.90	0.80
Monheim	DEU	51.12	6.82	1.02
Moselkern	DEU	50.18	7.37	0.87
Mukran	DEU	54.48	13.58	0.67
Mulheim	DEU	50.95	7.05	1.02
Neckarsteinach	DEU	49.43	8.80	0.89
Neuss	DEU	51.20	6.70	1.02
Neuss/Dusseldorf	DEU	51.20	6.70	1.02
Neuwied	DEU	50.43	7.48	0.94
Nienburg	DEU	52.63	9.22	0.80
Nuremberg	DEU	49.45	11.05	0.80
Orsoy	DEU	51.53	6.68	0.97
Osnabruck	DEU	52.27	8.03	0.78
Papenburg	DEU	53.08	7.38	0.85
Passau	DEU	48.58	13.47	0.77
Peenemunde	DEU	54.12	13.77	0.71
Peine	DEU	52.32	10.22	0.79
Porz	DEU	50.88	7.05	1.02
Regensburg	DEU	49.02	12.12	0.75
Remagen	DEU	50.57	7.22	0.91
Rheinhausen	DEU	51.42	6.73	1.00
Rinteln	DEU	52.20	9.08	0.78
Rosslau	DEU	51.90	12.27	0.84
Rostock	DEU	54.15	12.10	0.90
Ruhrort	DEU	51.45	6.73	1.00
Salzgitter	DEU	52.22	10.33	0.79
Sassnitz	DEU	54.52	13.63	0.67
Stralsund	DEU	54.32	13.10	0.86
Sturzelberg	DEU	51.12	6.80	1.02
Stuttgart	DEU	48.78	9.20	0.91
Tangermunde	DEU	52.57	11.97	0.81
Ueckermunde	DEU	53.73	14.28	0.71
Urdingen	DEU	51.35	6.67	0.99
Vallendar	DEU	50.40	7.62	0.92
Vierow	DEU	54.10	13.57	0.87
Walsum	DEU	51.53	6.68	0.97
Warnemunde	DEU	54.18	12.08	0.95
Weissenthurm	DEU	50.42	7.48	0.94
Wesel	DEU	51.65	6.60	0.97

Wesseling	DEU	50.83	7.00	0.96
Wolgast	DEU	54.05	13.78	0.71
Worms	DEU	49.63	8.35	1.09
Wurzburg	DEU	49.78	9.93	0.74
Aggersund	DNK	57.02	9.28	0.59
Allinge	DNK	55.28	14.80	0.65
Fur	DNK	56.83	9.00	0.57
Gudhjem	DNK	55.22	14.97	0.78
Hammeren	DNK	55.28	14.75	0.65
Hammerhavn	DNK	55.27	14.75	0.65
Hasle	DNK	55.18	14.70	0.66
Hvalpsund	DNK	56.68	9.20	0.54
Logstor	DNK	56.97	9.25	0.54
Nekso	DNK	55.07	15.15	0.68
Nykobing	DNK	56.80	8.87	0.70
Ronne	DNK	55.10	14.70	0.66
Skarrehage	DNK	56.95	8.87	0.65
Skive	DNK	56.57	9.03	0.55
Stege	DNK	54.98	12.28	0.70
Struer	DNK	56.50	8.60	1.10
Stubbekobing	DNK	54.88	12.03	0.47
Svaneke	DNK	55.13	15.15	0.68
Tejn	DNK	55.23	14.83	0.65
Thisted	DNK	56.95	8.70	0.63
Vang	DNK	55.27	14.75	0.65
Bekker	EST	59.45	24.67	0.52
Dirhami	EST	59.22	23.50	0.46
Forby	EST	59.00	23.17	0.46
Haapsalu	EST	58.95	23.53	0.57
Heltermaa	EST	58.87	23.07	0.51
Kuivastu	EST	58.58	23.40	0.52
Kunda	EST	59.52	26.55	0.37
Lehtma	EST	59.05	22.70	0.49
Loksa	EST	59.58	25.72	0.40
Meeruse	EST	59.45	24.68	0.53
Miiduranna	EST	59.50	24.82	0.43
Montu	EST	57.95	22.12	0.50
Muuga	EST	59.50	24.97	0.43
Narva Joesuu	EST	59.47	28.05	0.48
Paldiski	EST	59.35	24.05	0.45
Paljassaare	EST	59.45	24.70	0.53
Parnu	EST	58.38	24.48	0.59
Peetri	EST	59.45	24.73	0.53
Prangli Island	EST	59.63	25.00	0.42
Rohukula	EST	58.90	23.42	0.51

Roomassaare	EST	58.22	22.52	0.49
Saaremaa Harbour	EST	58.53	22.23	0.50
Sillamae	EST	59.40	27.78	0.48
Tallinn	EST	59.45	24.75	0.53
Veere	EST	58.45	22.05	0.58
Virtsu	EST	58.58	23.55	0.56
Dalsbruk	FIN	60.03	22.52	0.54
Frojdbole	FIN	60.15	19.92	0.48
Galtby	FIN	60.18	21.58	0.47
Hamina	FIN	60.57	27.18	0.51
Hanko	FIN	59.82	22.97	0.47
Helsinki	FIN	60.17	24.95	0.56
Houtskar	FIN	60.22	21.37	0.48
Imatra	FIN	61.17	28.83	0.36
Inkoo	FIN	60.05	24.02	0.47
Isnas	FIN	60.40	26.00	0.46
Joensuu	FIN	62.60	29.75	0.32
Joutseno	FIN	61.13	28.48	0.36
Kalajoki	FIN	64.25	23.93	0.63
Kantvik	FIN	60.08	24.38	0.47
Kaskinen	FIN	62.38	21.22	0.47
Kaukas	FIN	61.07	28.22	0.36
Kaukopaa	FIN	61.25	28.87	0.33
Kemi	FIN	65.73	24.57	0.47
Kokkila	FIN	60.33	22.87	0.52
Kokkola	FIN	63.83	23.13	0.55
Korpo	FIN	60.15	21.55	0.47
Kotka	FIN	60.47	26.95	0.38
Koverhar	FIN	59.88	23.22	0.46
Kristiinankaupunki	FIN	62.27	21.32	0.46
Kronvik	FIN	63.05	21.52	0.40
Kuopio	FIN	62.85	27.50	0.33
Kustavi	FIN	60.57	21.33	0.51
Kuuslahti	FIN	63.12	27.75	0.36
Lapaluoto	FIN	64.67	24.42	0.43
Lappeenranta	FIN	61.07	28.25	0.36
Lappohja	FIN	59.90	23.27	0.46
Lappvik	FIN	59.90	23.27	0.46
Lauritsala	FIN	61.08	28.33	0.36
Loviisa	FIN	60.45	26.23	0.48
Luvia	FIN	61.33	21.57	0.47
Mantyluoto	FIN	61.58	21.50	0.47
Martinniemi	FIN	65.22	25.28	0.45
Maxmo	FIN	63.20	22.03	0.39
Merikarvia	FIN	61.85	21.47	0.45

Mjosund	FIN	60.22	22.47	0.55
Mustola	FIN	61.07	28.30	0.36
Naantali	FIN	60.47	22.02	0.54
Nyhamn	FIN	62.17	21.33	0.46
Olkiluoto	FIN	61.25	21.50	0.49
Oulu	FIN	65.00	25.47	0.45
Parainen	FIN	60.28	22.30	0.54
Pateniemi	FIN	65.08	25.40	0.45
Perno	FIN	60.45	26.05	0.47
Pietarsaari	FIN	63.68	22.70	0.52
Pori	FIN	61.48	21.80	0.46
Puhos	FIN	62.10	29.92	0.32
Raahe	FIN	64.68	24.48	0.41
Rahja	FIN	64.20	23.73	0.41
Rauma	FIN	61.13	21.50	0.47
Ristiina	FIN	61.53	27.42	0.30
Roytta	FIN	65.77	24.15	0.46
Salo	FIN	60.38	23.17	0.51
Savonlinna	FIN	61.90	28.92	0.34
Siilinjarvi	FIN	63.08	27.67	0.35
Sipoo	FIN	60.37	25.32	0.48
Skogby	FIN	59.92	23.32	0.46
Skoldvik	FIN	60.30	25.55	0.50
Skuru	FIN	60.10	23.55	0.49
Stromma	FIN	60.18	22.90	0.52
Summa	FIN	60.53	27.12	0.51
Svartback	FIN	60.28	25.53	0.50
Taalintehdas	FIN	60.02	22.52	0.54
Tammisaari	FIN	59.98	23.43	0.51
Teijo	FIN	60.25	22.95	0.52
Tolkkinen	FIN	60.33	25.58	0.50
Tornio	FIN	65.85	24.15	0.47
Tupavuori	FIN	60.45	22.07	0.54
Turku	FIN	60.43	22.22	0.55
Uusikaupunki	FIN	60.80	21.40	0.51
Vaasa	FIN	63.10	21.62	0.40
Valkom	FIN	60.42	26.27	0.48
Varkaus	FIN	62.33	27.83	0.35
Vartsala	FIN	60.33	23.02	0.51
Vastanfjard	FIN	60.05	22.65	0.54
Veitsiluoto	FIN	65.70	24.62	0.47
Annay sous Lens	FRA	50.47	2.87	0.99
Bethune	FRA	50.53	2.63	1.01
Duclair	FRA	49.45	0.87	1.10
Elbeuf	FRA	49.28	1.12	1.09

Gaillon	FRA	49.17	1.32	1.07
Grand Couronne	FRA	49.37	0.98	1.10
La Mailleraye	FRA	49.48	0.77	1.08
Le Trait	FRA	49.47	0.80	1.08
Les Andelys	FRA	49.25	1.43	1.06
Lille	FRA	50.65	3.08	1.00
Lillebonne	FRA	49.52	0.53	1.05
Limay	FRA	48.97	1.78	1.10
Mantes	FRA	48.98	1.72	1.10
Petit Couronne	FRA	49.37	1.00	1.10
Rouen	FRA	49.48	1.08	1.08
St. Etienne du Rouvray	FRA	49.37	1.12	1.08
St. Wandrille	FRA	49.53	0.75	1.04
Strasbourg	FRA	48.57	7.70	1.10
Vernon	FRA	49.08	1.48	1.08
Villequier	FRA	49.50	0.67	1.10
Acton Grange	GBR	53.37	-2.63	1.04
Alloa	GBR	56.10	-3.80	0.92
Althorpe Wharf	GBR	53.57	-0.73	0.91
Anderton	GBR	53.27	-2.52	0.96
Aylesford	GBR	51.27	0.47	1.04
Barton	GBR	53.47	-2.37	0.96
Beckingham	GBR	53.40	-0.83	0.89
Beverley	GBR	53.85	-0.43	0.92
Bowling	GBR	55.93	-4.50	0.81
Burton upon Stather	GBR	53.65	-0.68	0.92
Coulport	GBR	56.07	-4.88	0.85
Dalmuir	GBR	55.90	-4.43	0.74
Dingwall	GBR	57.60	-4.42	1.03
Drax	GBR	53.73	-0.98	0.87
Dumbarton	GBR	55.93	-4.57	0.87
Dunglass	GBR	55.93	-4.52	0.81
Faslane Dock	GBR	56.07	-4.82	0.75
Finnart	GBR	56.12	-4.83	0.74
Flixborough	GBR	53.62	-0.68	0.91
Gainsborough	GBR	53.40	-0.77	0.89
Garelochhead	GBR	56.08	-4.83	0.77
Glasgow	GBR	55.87	-4.28	0.74
Glenmallan	GBR	56.12	-4.82	0.72
Gloucester	GBR	51.87	-2.22	1.05
Goole	GBR	53.70	-0.87	0.90
Gourock	GBR	55.95	-4.80	1.06
Greenock	GBR	55.95	-4.73	1.09
Grove Wharf	GBR	53.60	-0.68	0.91
Gunness	GBR	53.58	-0.72	0.91

Gunness Wharf	GBR	53.58	-0.68	0.91
Halling	GBR	51.37	0.01	1.06
Helensburgh	GBR	56.02	-4.73	1.03
Howdendyke	GBR	53.75	-0.87	0.90
Irlam	GBR	53.43	-2.42	0.98
Irwell	GBR	53.47	-2.35	0.96
Keadby	GBR	53.60	-0.67	0.91
Kilcreggan	GBR	55.98	-4.82	1.06
Kinlochleven	GBR	56.72	-4.98	0.91
Knottingley	GBR	53.72	-1.23	0.86
Latchford	GBR	53.38	-2.57	1.01
London	GBR	51.50	-0.07	1.10
Manchester	GBR	53.47	-2.28	0.97
Neap House	GBR	53.62	-0.67	0.91
Northwich	GBR	53.27	-2.53	0.96
Old Kilpatrick	GBR	55.92	-4.45	0.74
Paisley	GBR	55.85	-4.43	0.74
Partington	GBR	53.43	-2.43	0.98
Perth	GBR	56.40	-3.43	0.81
Port Glasgow	GBR	55.93	-4.68	0.97
Renfrew	GBR	55.87	-4.40	0.74
Rosneath	GBR	56.02	-4.80	0.86
Selby	GBR	53.78	-1.07	0.86
Shandon	GBR	56.05	-4.82	0.75
Snodland	GBR	51.33	0.45	1.08
Thorne	GBR	53.62	-0.97	0.91
Warrington	GBR	53.40	-2.60	1.01
Winnington	GBR	53.28	-2.52	0.96
Kangerlussuaq	GRL	66.97	-50.95	1.08
Donegal	IRL	54.65	-8.10	1.05
Limerick	IRL	52.67	-8.63	1.02
Klaipeda	LTU	55.72	21.13	0.71
Engure	LVA	57.17	23.23	0.42
Labrags	LVA	56.98	21.37	0.65
Liepaja	LVA	56.52	21.02	0.75
Mersrags	LVA	57.37	23.13	0.43
Pavilosta	LVA	56.90	21.18	0.72
Riga	LVA	56.97	24.10	0.60
Roja	LVA	57.50	22.82	0.46
Salacgriva	LVA	57.75	24.37	0.54
Skulte	LVA	57.32	24.40	0.57
Ventspils	LVA	57.40	21.55	0.71
Aalst	NLD	51.38	5.45	0.95
Alblasserdam	NLD	51.87	4.62	0.89
Ameide	NLD	51.95	4.95	0.89

Arnhem	NLD	51.97	5.88	0.88
Assen	NLD	53.00	6.57	0.79
Bergambacht	NLD	51.93	4.78	0.89
Bergum	NLD	53.20	5.98	1.07
Bolnes	NLD	51.90	4.57	0.89
Bruinisse	NLD	51.67	4.10	1.03
Capelle aan den Yssel	NLD	51.92	4.57	0.89
Culemborg	NLD	51.95	5.22	0.89
Deest	NLD	51.88	5.67	0.89
Den Bommel	NLD	51.72	4.28	1.00
Dintelmond	NLD	51.67	4.38	0.97
Dinteloord	NLD	51.63	4.37	0.98
Dodewaard	NLD	51.90	5.63	0.89
Dordrecht	NLD	51.80	4.65	0.89
Drachten	NLD	53.12	6.10	1.08
Druten	NLD	51.88	5.62	0.89
Eindhoven	NLD	51.43	5.50	0.95
Fijnaart	NLD	51.63	4.48	0.96
Geertruidenberg	NLD	51.72	4.87	0.92
Gendt	NLD	51.87	5.98	0.88
Gorinchem	NLD	51.82	4.98	0.92
Grave	NLD	51.75	5.75	0.91
Groot-Ammers	NLD	51.92	4.83	0.89
Grouw	NLD	53.10	5.85	1.09
Hardinxveld	NLD	51.82	4.85	0.89
Heerenveen	NLD	52.95	5.92	1.10
Heerewaarden	NLD	51.82	5.38	0.91
Heerjansdam	NLD	51.83	4.57	0.89
Heijen	NLD	51.68	5.98	0.90
Hellevoetsluis	NLD	51.82	4.13	1.07
Hendrik Ido Ambacht	NLD	51.85	4.62	0.89
Heusden	NLD	51.73	5.15	0.91
Huissen	NLD	51.92	5.92	0.88
Kinderdijk	NLD	51.88	4.63	0.89
Krimpen aan den Yssel	NLD	51.90	4.58	0.89
Lekkerkerk	NLD	51.92	4.63	0.89
Lithoyen	NLD	51.82	5.43	0.91
Lobith	NLD	51.87	6.13	0.89
Maasbracht	NLD	51.13	5.87	0.98
Maashees	NLD	51.57	6.03	0.94
Maassluis	NLD	51.92	4.25	0.93
Maastricht	NLD	50.85	5.68	0.95
Made	NLD	51.68	4.80	0.93
Middelharnis	NLD	51.78	4.20	1.01
Millingen aan den Rijn	NLD	51.87	6.03	0.89

Moerdijk	NLD	51.70	4.62	0.94
Nieuw Lekkerland	NLD	51.88	4.63	0.89
Nieuwerkerk aan den Yssel	NLD	51.97	4.58	0.89
Nijmegen	NLD	51.83	5.83	0.91
Numansdorp	NLD	51.72	4.42	0.98
Ooltgensplaat	NLD	51.68	4.33	0.98
Oosterhout	NLD	51.62	4.87	0.93
Oss	NLD	51.77	5.52	0.91
Ouderkerk	NLD	51.93	4.60	0.89
Ouwerkerk	NLD	51.63	3.98	1.10
Overschie	NLD	51.93	4.42	0.89
Papendrecht	NLD	51.83	4.63	0.89
Raamsdonksveer	NLD	51.70	4.92	0.92
Renkum	NLD	51.97	5.73	0.88
Rhenen	NLD	51.95	5.57	0.89
Ridderkerk	NLD	51.87	4.58	0.89
Rijswijk	NLD	51.78	5.02	0.91
Roermond	NLD	51.20	5.98	0.97
Rotterdam	NLD	51.90	4.48	0.90
Sas van Ghent	NLD	51.23	3.80	1.06
Schiedam	NLD	51.90	4.40	0.90
‘sGravendeel	NLD	51.77	4.60	0.89
‘sHertogenbosch	NLD	51.70	5.30	0.93
Sliedrecht	NLD	51.83	4.75	0.89
Slikkerveer	NLD	51.88	4.60	0.89
Spijk	NLD	51.87	5.05	0.89
St. Annaland	NLD	51.62	4.10	0.95
Stavenisse	NLD	51.58	4.00	1.10
Stein	NLD	50.97	5.77	0.95
Swalmen	NLD	51.22	6.02	0.97
Tegelen	NLD	51.35	6.13	0.96
Tiel	NLD	51.88	5.45	0.89
Tilburg	NLD	51.55	5.07	0.93
Venlo	NLD	51.37	6.17	0.96
Vlaardingen	NLD	51.90	4.35	0.90
Waalwijk	NLD	51.70	5.07	0.91
Wageningen	NLD	51.97	5.67	0.89
Wanssum	NLD	51.53	6.08	0.94
Wartena	NLD	53.15	5.90	0.94
Werkendam	NLD	51.80	4.90	0.89
Willemstad	NLD	51.68	4.40	0.96
Zaltbommel	NLD	51.80	5.20	0.92
Zuilichem	NLD	51.80	5.12	0.92
Zwijndrecht	NLD	51.82	4.65	0.89
Aagotnes	NOR	60.40	5.02	1.02

Aakra	NOR	59.78	6.10	0.44
Aalvik	NOR	60.43	6.40	0.58
Aandalsnes	NOR	62.57	7.68	0.75
Aardal	NOR	61.23	7.68	0.78
Aardalstangen	NOR	61.23	7.70	0.78
Alta	NOR	69.97	23.25	0.61
Anfiskaa	NOR	66.28	14.10	0.71
Askoy	NOR	60.40	5.17	0.88
Balholm	NOR	61.22	6.53	0.44
Balsfjord	NOR	69.32	19.35	0.78
Bergen	NOR	60.40	5.32	0.81
Bogen	NOR	68.52	17.00	1.05
Bryggja	NOR	61.93	5.42	1.00
Buvika	NOR	63.32	10.18	0.80
Bygstad	NOR	61.38	5.67	0.68
Dirdal	NOR	58.78	6.23	0.64
Dolvik	NOR	60.32	5.25	0.87
Eide	NOR	60.52	6.72	0.61
Eidfjord	NOR	60.47	7.07	0.76
Eikefet	NOR	60.70	5.55	0.57
Eikefjord	NOR	61.60	5.47	0.87
Eitrheimsneset	NOR	60.10	6.53	0.73
Elvebakken	NOR	69.92	23.42	0.64
Etne	NOR	59.67	5.95	0.50
Fiborgtangen	NOR	63.72	11.17	0.33
Finneid	NOR	67.25	15.40	0.60
Finnsnes	NOR	69.23	17.97	0.89
Fitjar	NOR	59.92	5.28	1.05
Flaam	NOR	60.83	7.13	1.06
Flekkefjord	NOR	58.30	6.67	0.94
Flora	NOR	62.30	7.35	0.86
Florvaag	NOR	60.45	5.22	0.75
Follafoss	NOR	63.98	11.10	0.41
Forde (Fordefjord)	NOR	61.45	5.85	0.61
Forde (Fuglesetfjord)	NOR	61.03	5.82	0.54
Fusa	NOR	60.20	5.62	0.67
Garnes	NOR	60.43	5.48	0.54
Gaupne	NOR	61.42	7.30	0.48
Glaerem	NOR	63.02	8.52	0.61
Gudvangen	NOR	60.87	6.83	0.91
Gullsmedvik	NOR	66.33	14.15	0.71
Hammerfall	NOR	67.42	15.53	0.91
Haugsvik	NOR	61.83	5.00	0.95
Hellesylt	NOR	62.08	6.88	0.77
Heroysund	NOR	59.92	5.78	0.55

Herre	NOR	59.10	9.53	0.69
Hjelmaas	NOR	60.58	5.35	0.97
Hjelset	NOR	62.77	7.50	0.99
Holla	NOR	63.28	9.12	1.00
Hommelvik	NOR	63.42	10.80	0.38
Hoyanger	NOR	61.22	6.07	0.74
Hoylandsbygdi	NOR	59.77	5.78	0.61
Hoylandssundet	NOR	59.78	5.80	0.59
Husnes	NOR	59.87	5.77	0.55
Innhavet	NOR	67.97	15.93	1.08
Kaupanger	NOR	61.18	7.23	0.39
Knarrevik	NOR	60.37	5.17	0.88
Kongsmoen	NOR	64.88	12.43	0.61
Kvinesdal	NOR	58.30	7.00	0.70
Kyrksaetrora	NOR	63.28	9.08	1.00
Laerdalsoyri	NOR	61.10	7.48	0.80
Laksevaag	NOR	60.38	5.30	0.81
Langangen	NOR	59.08	9.80	0.91
Langstein	NOR	63.55	10.92	0.71
Leirvik	NOR	59.77	5.52	1.05
Levanger	NOR	63.75	11.30	0.31
Lofallstrand	NOR	60.02	6.00	0.37
Malm	NOR	64.07	11.22	0.38
Malvik	NOR	63.42	10.63	0.38
Menstad	NOR	59.17	9.65	0.62
Mo i Rana	NOR	66.32	14.13	0.71
Mosjoen	NOR	65.83	13.18	0.80
Muruvik	NOR	63.43	10.85	0.36
Namsos	NOR	64.47	11.50	0.96
Narvik	NOR	68.43	17.43	0.70
Naustdal	NOR	61.52	5.72	0.81
Norddal	NOR	62.25	7.25	0.81
Nordfjordeid	NOR	61.90	6.02	0.68
Nordveitgrend	NOR	60.10	5.73	0.64
Norheimsund	NOR	60.37	6.15	0.63
Nystrand	NOR	59.10	9.72	0.98
Odda	NOR	60.07	6.55	0.73
Olden	NOR	61.83	6.82	0.95
Olen	NOR	59.60	5.83	0.48
Omastrand	NOR	60.22	5.97	0.42
Onarheim	NOR	59.95	5.65	0.65
Orkanger	NOR	63.32	9.85	0.57
Orsta	NOR	62.20	6.15	0.88
Oystese	NOR	60.38	6.22	0.52
Porsgrunn	NOR	59.13	9.65	0.69

Raudsand	NOR	62.83	8.10	0.74
Revsnes	NOR	61.15	7.27	0.95
Rognan	NOR	67.08	15.37	0.63
Ronningen	NOR	63.70	10.58	0.50
Rosendal	NOR	59.98	6.02	0.66
Rubbestadneset	NOR	59.82	5.28	0.87
Sagvaag	NOR	59.77	5.38	0.99
Salsbruket	NOR	64.80	11.88	0.72
Sandane	NOR	61.77	6.22	0.74
Sandnes	NOR	58.85	5.75	0.99
Sauda	NOR	59.65	6.35	0.60
Skaalevik	NOR	60.37	5.22	0.85
Skaanevik	NOR	59.75	5.93	0.50
Skien	NOR	59.20	9.62	0.61
Sogndal	NOR	61.23	7.10	0.40
Sorreisa	NOR	69.13	18.13	0.83
Steinkjer	NOR	64.02	11.50	0.35
Stjordal	NOR	63.45	10.88	0.36
Stord	NOR	59.78	5.52	1.05
Stryn	NOR	61.92	6.73	0.68
Sunndalsora	NOR	62.68	8.60	0.77
Svelgen	NOR	61.77	5.30	0.88
Sykkylven	NOR	62.38	6.58	1.00
Thamshavn	NOR	63.33	9.87	0.57
Torjul	NOR	62.97	8.25	1.03
Trondheim	NOR	63.43	10.40	0.42
Trosvik	NOR	59.05	9.70	1.09
Tyssebotn	NOR	60.62	5.58	0.51
Tyssedal	NOR	60.12	6.57	0.73
Ulvik	NOR	60.57	6.92	0.58
Uskedal	NOR	59.93	5.88	0.52
Vaagland	NOR	63.12	8.32	1.00
Vadheim	NOR	61.20	5.82	0.59
Vaksdal	NOR	60.48	5.75	0.45
Verdal	NOR	63.78	11.43	0.31
Vettas	NOR	60.60	5.15	1.06
Vik (Sognefjord)	NOR	61.08	6.58	0.52
Volda	NOR	62.15	6.07	0.88
Darlowo	POL	54.43	16.38	0.92
Elblag	POL	54.17	19.40	0.85
Frombork	POL	54.35	19.67	0.82
Gdansk	POL	54.35	18.65	0.65
Gdynia	POL	54.53	18.55	0.67
Kolobrzeg	POL	54.18	15.57	1.08
Kozle	POL	50.32	18.13	0.75

Niechorze	POL	54.10	15.07	0.99
Nowa Sol	POL	51.80	15.72	0.93
Plock	POL	52.53	19.67	0.78
Police	POL	53.55	14.60	1.01
Puck	POL	54.72	18.35	0.72
Stepnica	POL	53.65	14.63	1.01
Swinoujscie	POL	53.93	14.28	0.71
Szczecin	POL	53.42	14.55	0.98
Tczew	POL	54.08	18.77	0.74
Ustka	POL	54.58	16.87	0.69
Wladyslawowo	POL	54.80	18.42	0.66
Wroclaw	POL	51.08	17.00	0.76
Annenskiy Most	RUS	60.72	37.08	0.33
Balakhna	RUS	56.48	43.62	0.66
Baltiysk	RUS	54.65	19.90	0.68
Belyy Ruchey	RUS	60.90	36.83	0.32
Berezniki	RUS	59.43	56.82	0.59
Brusnichnoye	RUS	60.78	28.73	0.53
Cheboksary	RUS	56.13	47.23	0.72
Cherepovets	RUS	59.15	37.83	0.42
Chkalovsk	RUS	56.75	43.23	0.64
Dudinka	RUS	69.40	86.17	0.80
Gorokhovets	RUS	56.18	42.70	0.66
Igarka	RUS	67.50	86.67	0.77
Kaliningrad	RUS	54.72	20.52	0.79
Kanonerskiy Island	RUS	59.90	30.22	0.63
Kazan	RUS	55.75	49.17	0.82
Khabarovsk	RUS	48.50	135.17	1.05
Khatanga	RUS	71.97	102.42	0.84
Kineshma	RUS	57.45	42.12	0.56
Kirovsk	RUS	59.87	30.98	0.58
Komsomolsk-na-Amure	RUS	50.53	136.98	0.74
Kondopoga	RUS	62.20	34.28	0.29
Kostroma	RUS	57.77	40.93	0.59
Kotlas	RUS	61.25	46.65	0.47
Krasnoyarsk	RUS	56.08	92.77	0.68
Kronshtadt	RUS	60.00	29.77	0.57
Lomonosov	RUS	59.83	29.80	0.55
Mago	RUS	53.25	140.22	0.62
Medvezhyegorsk	RUS	62.93	34.47	0.26
Mondoma	RUS	59.93	37.47	0.35
Murmansk	RUS	68.97	33.08	0.66
Naberezhnyye Chelny	RUS	55.68	52.30	0.81
Nadvoitsy	RUS	63.93	34.33	0.26
Naryan Mar	RUS	67.65	53.02	0.63

Navashino	RUS	55.55	42.18	0.69
Nikolayevsk	RUS	53.13	140.72	0.66
Nizhnekamsk	RUS	55.42	51.88	0.81
Nizhnetambovskoye	RUS	50.93	138.17	0.64
Nizhniy Novgorod	RUS	56.33	44.00	0.66
Nizhnyaya Gavan	RUS	52.40	140.43	0.59
Novgorod	RUS	58.50	31.33	0.44
Novocheboksarsk	RUS	56.10	47.48	0.75
Oleniy	RUS	49.45	143.28	0.94
Otradnoye	RUS	59.77	30.80	0.60
Pechora	RUS	65.23	57.30	0.59
Perm	RUS	58.02	56.17	0.64
Petrodvorets	RUS	59.88	29.92	0.60
Petrozavodsk	RUS	61.77	34.32	0.28
Pionerskiy	RUS	54.93	20.20	0.77
Podporozhye	RUS	60.92	34.03	0.33
Primorsk	RUS	60.37	28.63	0.52
Priozersk	RUS	61.02	30.13	0.54
Pudozh	RUS	61.83	36.53	0.33
Rybinsk	RUS	58.02	38.87	0.50
Samara	RUS	53.17	50.17	1.01
Segezha	RUS	63.70	34.32	0.26
Shlisselburg	RUS	59.93	31.13	0.58
Solikamsk	RUS	59.67	56.75	0.58
Sosnovka	RUS	56.23	51.28	0.78
St. Petersburg	RUS	59.93	30.30	0.63
Svetlyy	RUS	54.63	20.15	0.82
Syzran	RUS	53.17	48.48	1.04
Tolyatti	RUS	53.53	49.40	0.96
Tomsk	RUS	56.50	85.08	0.79
Ust-Luga	RUS	59.67	28.30	0.49
Voznesenye	RUS	61.02	35.47	0.34
Vyborg	RUS	60.72	28.73	0.53
Vysotsk	RUS	60.63	28.57	0.53
Vytegra	RUS	61.07	36.45	0.35
Yakutsk	RUS	62.02	129.73	0.99
Yaroslavl	RUS	57.57	39.87	0.58
Zelenodolsk	RUS	55.83	48.50	0.79
Mitrovica	SCG	42.90	20.87	0.84
Aelvenaes	SWE	59.37	13.18	0.24
Ahus	SWE	55.93	14.32	0.64
Amal	SWE	59.05	12.72	0.28
Ar	SWE	57.92	18.95	0.58
Arvika	SWE	59.67	12.58	0.22
Backfors	SWE	64.50	21.42	0.57

Balsta	SWE	59.55	17.55	0.62
Bergkvara	SWE	56.38	16.08	0.62
Borgholm	SWE	56.88	16.65	0.60
Bungenas	SWE	57.82	19.08	0.57
Burea	SWE	64.62	21.25	0.57
Byxelkrok	SWE	57.30	17.03	0.46
Dalaro	SWE	59.13	18.42	0.52
Degerhamn	SWE	56.35	16.42	0.61
Edsvalla	SWE	59.43	13.23	0.24
Elleholm	SWE	56.17	14.73	0.78
Enkoping	SWE	59.63	17.08	0.56
Farjestaden	SWE	56.65	16.47	0.60
Farosund	SWE	57.87	19.07	0.57
Fiskeback	SWE	57.87	14.10	0.25
Fittja	SWE	59.23	17.85	0.71
Forsmark	SWE	60.42	18.20	0.45
Furillen	SWE	57.77	19.00	0.51
Furusund	SWE	59.65	18.90	0.51
Gamleby	SWE	57.90	16.42	0.76
Gefle	SWE	60.67	17.17	0.40
Grisslehamn	SWE	60.10	18.82	0.44
Gruvon	SWE	59.33	13.12	0.26
Hallekis	SWE	58.67	13.42	0.31
Hallstavik	SWE	60.05	18.60	0.45
Haparanda	SWE	65.83	24.13	0.46
Haraholmen	SWE	65.23	21.63	0.42
Hargshamn	SWE	60.17	18.48	0.45
Hasselby	SWE	59.37	17.82	0.68
Hernosand	SWE	62.63	17.93	0.39
Hoglunda	SWE	59.42	13.25	0.24
Hogmarso	SWE	59.65	18.85	0.51
Honsater	SWE	58.63	13.45	0.31
Hornefors	SWE	63.62	19.90	0.40
Hudiksvall	SWE	61.72	17.12	0.43
Iggesund	SWE	61.65	17.10	0.43
Kagehamn	SWE	64.83	21.03	0.40
Kalix	SWE	65.85	23.13	0.47
Kallvik	SWE	57.88	16.72	0.64
Kallviken	SWE	64.33	21.37	0.38
Kalmar	SWE	56.67	16.37	0.60
Kalmarsand	SWE	59.53	17.52	0.62
Kapellskar	SWE	59.72	19.00	0.48
Kappelshamn	SWE	57.85	18.78	0.58
Karlshamn	SWE	56.17	14.87	0.74
Karlskrona	SWE	56.17	15.60	0.73

Karlstad	SWE	59.38	13.52	0.25
Klintehamn	SWE	57.38	18.20	0.80
Koping	SWE	59.52	16.00	0.15
Kopmannebro	SWE	58.77	12.52	0.35
Kristinehamn	SWE	59.32	14.12	0.27
Krokstad	SWE	59.10	12.92	0.29
Kungsor	SWE	59.43	16.10	0.20
Kyrkebyn	SWE	59.27	13.07	0.26
Landsort	SWE	58.73	17.87	0.48
Lidkoping	SWE	58.50	13.17	0.35
Liljeholmsviken	SWE	59.32	18.00	0.71
Ljustero	SWE	59.52	18.63	0.63
Loudden	SWE	59.33	18.13	0.73
Lulea	SWE	65.58	22.17	0.45
Mariestad	SWE	58.72	13.83	0.32
Marsviken	SWE	58.67	16.95	0.65
Mem	SWE	58.48	16.42	0.61
Monsteras	SWE	57.03	16.47	0.76
Morbylanga	SWE	56.53	16.37	0.60
Motala	SWE	58.53	15.07	0.29
Munksund	SWE	65.28	21.48	0.43
Norrkoping	SWE	58.60	16.20	0.61
Norrsundet	SWE	60.95	17.17	0.40
Norrtalje	SWE	59.75	18.70	0.60
Norsbron	SWE	59.42	13.23	0.24
Nykoping	SWE	58.75	17.02	0.64
Nynashamn	SWE	58.90	17.95	0.48
Oaxen	SWE	55.97	17.72	0.62
Orebro	SWE	59.28	15.18	0.26
Oregrund	SWE	60.33	18.45	0.45
Ornskoldsvik	SWE	63.27	18.72	0.41
Oskarshamn	SWE	57.27	16.45	0.76
Otterbacken	SWE	58.95	14.05	0.27
Oxelosund	SWE	58.67	17.12	0.48
Pataholm	SWE	56.92	16.43	0.60
Ronehamn	SWE	57.17	18.53	0.65
Ronneby	SWE	56.17	15.30	0.73
Ronnskar	SWE	64.67	21.28	0.57
Rundvik	SWE	63.53	19.45	0.41
Saffle	SWE	59.13	12.93	0.29
Sandhamn	SWE	59.28	18.90	0.50
Sankt Anna	SWE	58.33	16.70	0.65
Seskaro Island	SWE	65.72	23.75	0.59
Sikea	SWE	64.13	20.98	0.57
Simpevarp	SWE	57.42	16.67	0.63

Simrishamn	SWE	55.55	14.37	0.64
Sjotorp	SWE	58.83	14.00	0.31
Skattkar	SWE	59.42	13.70	0.25
Skelleftea	SWE	64.73	20.95	0.41
Skoghall	SWE	59.32	13.45	0.30
Skutskar	SWE	60.65	17.40	0.43
Slite	SWE	57.70	18.82	0.66
Slottsbron	SWE	59.33	13.10	0.26
Soderhamn	SWE	61.32	17.10	0.44
Soderkoping	SWE	58.48	16.33	0.60
Sodertalje	SWE	59.20	17.63	0.50
Solvesborg	SWE	56.05	14.58	0.76
Soraker	SWE	62.50	17.50	0.41
Spesshult	SWE	59.07	12.92	0.29
Stavsnas	SWE	59.28	18.68	0.51
Stockholm	SWE	59.32	18.05	0.73
Stocksund	SWE	59.38	18.05	0.71
Stora Vika	SWE	58.93	17.78	0.48
Storugns	SWE	57.83	18.80	0.58
Straa	SWE	57.90	19.03	0.57
Strangnas	SWE	59.38	17.03	0.58
Studsvik	SWE	58.75	17.28	0.66
Sturko	SWE	56.08	15.67	0.73
Sundsvall	SWE	62.42	17.33	0.40
Taxinge	SWE	59.22	17.37	0.63
Torko	SWE	56.15	15.40	0.73
Trelleborg	SWE	55.37	13.15	0.80
Umea	SWE	63.70	20.35	0.44
Uppsala	SWE	59.87	17.65	0.31
Valdemarsvik	SWE	58.20	16.60	0.62
Vaxholm	SWE	59.38	18.33	0.69
Vesteras	SWE	59.60	16.43	0.18
Vestervik	SWE	57.75	16.65	0.63
Visby	SWE	57.65	18.28	0.79
Ystad	SWE	55.43	13.83	0.76
Cherkassy	UKR	49.43	32.05	0.98
Kiev	UKR	50.42	30.50	0.91
Kremenchug	UKR	49.05	33.42	1.06
Alpena	USA	45.05	-83.43	0.64
Ashland	USA	46.58	-90.90	0.53
Bangor	USA	44.80	-68.78	0.92
Bayfield	USA	46.80	-90.80	0.41
Benton Harbour	USA	42.12	-86.45	0.99
Brevort	USA	46.00	-85.03	0.56
Bucksport	USA	44.57	-68.80	1.04

Buffington	USA	41.63	-87.42	1.09
Burns Harbour	USA	41.63	-87.18	1.09
Calcite	USA	45.40	-83.78	0.51
Cedarville	USA	45.98	-84.35	0.38
Charlevoix	USA	45.32	-85.22	0.73
Cheboygan	USA	45.67	-84.47	0.54
Chicago	USA	41.83	-87.63	1.04
Detour	USA	45.97	-83.88	0.37
Duluth	USA	46.73	-92.15	0.34
Escanaba	USA	45.78	-87.07	0.69
Ferrysburg	USA	43.08	-86.23	0.82
Gary Harbour	USA	41.60	-87.35	1.07
Grand Haven	USA	43.07	-86.25	0.84
Green Bay	USA	44.52	-88.00	1.01
Harbor Beach	USA	43.83	-82.65	0.71
Holland (MI)	USA	42.78	-86.22	0.85
Indiana Harbour	USA	41.67	-87.50	1.09
Kalama	USA	46.02	-122.83	1.07
Kenosha	USA	42.58	-87.82	0.84
Kewaunee	USA	44.45	-87.52	0.50
Ludington	USA	43.97	-86.45	0.56
Mackinaw City	USA	45.75	-84.73	0.56
Manistee	USA	44.25	-86.33	0.54
Manitowoc	USA	44.10	-87.63	0.54
Marine City	USA	42.72	-82.48	0.94
Marinette	USA	45.12	-87.62	0.79
Marquette	USA	46.60	-87.38	0.28
Marysville	USA	42.92	-82.48	0.93
Menominee	USA	45.13	-87.62	0.77
Milwaukee	USA	43.05	-87.87	0.74
Muskegon	USA	43.18	-86.23	0.77
Ogdensburg	USA	44.70	-75.50	1.00
Olympia	USA	47.05	-122.90	1.10
Ontonagon	USA	46.87	-89.30	0.37
Port Dolomite	USA	45.97	-84.27	0.44
Port Huron	USA	42.98	-82.43	0.93
Port Inland	USA	45.97	-85.87	0.53
Port Washington	USA	43.38	-87.87	0.64
Racine	USA	42.73	-87.80	0.84
Rochester (NY)	USA	43.28	-77.60	1.01
Rockport (MI)	USA	45.20	-83.38	0.51
Rogers City	USA	45.40	-83.83	0.50
Sheboygan	USA	43.75	-87.70	0.49
Silver Bay	USA	47.28	-91.27	0.15
South Brewer	USA	44.78	-68.78	0.92

South Haven	USA	42.45	-86.25	0.91
St. Clair	USA	42.82	-82.47	0.94
St. Joseph	USA	42.08	-86.50	1.02
Stoneport	USA	45.28	-83.43	0.50
Superior	USA	46.72	-92.08	0.33
Taconite Harbour	USA	47.50	-90.92	0.12
The Dalles	USA	45.58	-121.18	1.09
Two Harbors	USA	47.02	-91.67	0.00
Waddington	USA	44.85	-75.20	0.94
Waukegan	USA	42.37	-87.83	0.96
Whitefish Point	USA	46.75	-84.95	0.26
Winterport	USA	44.63	-68.85	1.00

Appendix G. List of global ports that have highest environmental similarity to Presque Isle-Marquette. NIS originating from these ports have the highest potential for survival if introduced at Presque Isle-Marquette.

Name	Country	Latitude	Longitude	Environmental Distance
Eckero	ALD	60.22	19.60	0.44
Farjsundet	ALD	60.23	20.02	0.60
Finstrom	ALD	60.25	19.92	0.59
Langnasudd	ALD	60.12	20.30	0.62
Mariehamn	ALD	60.10	19.93	0.65
Korneuburg	AUT	48.37	16.33	0.81
Linz	AUT	48.32	14.30	0.59
Vienna	AUT	48.22	16.37	0.91
Antwerp	BEL	51.24	4.41	0.81
Baasrode	BEL	51.05	4.17	0.84
Balen	BEL	51.17	5.17	0.79
Boom	BEL	51.08	4.37	0.81
Brussels	BEL	50.83	4.32	0.79
Buggenhout	BEL	51.02	4.20	0.83
Burcht	BEL	51.20	4.33	0.82
Chatelineau	BEL	50.42	4.52	0.71
Dendermonde	BEL	51.03	4.12	0.84
Doel	BEL	51.32	4.27	0.83
Engis	BEL	50.58	5.40	0.67
Ertvelde	BEL	51.20	3.78	0.86
Geel	BEL	51.15	4.97	0.79
Genk	BEL	50.94	5.50	0.75
Ghent	BEL	51.09	3.75	0.85
Grimbergen	BEL	50.93	4.37	0.80
Grobbendonk	BEL	51.20	4.75	0.78
Haren	BEL	50.90	4.38	0.80
Hemiksem	BEL	51.15	4.34	0.81
Hermalle sous Huy	BEL	50.55	5.37	0.67
Hingene	BEL	51.12	4.27	0.83
Hoboken	BEL	51.17	4.33	0.83
Humbeek	BEL	50.97	4.38	0.80
Kallo	BEL	51.25	4.28	0.82
Kapelle op den Bos	BEL	51.02	4.37	0.81
Kruibeke	BEL	51.17	4.32	0.83
Kwaadmechelen	BEL	51.10	5.15	0.79
Lanaken	BEL	50.88	5.65	0.75
Langerbrugge	BEL	51.12	3.75	0.85
Liefkenshoek	BEL	51.30	4.28	0.83
Liege	BEL	50.64	5.57	0.69
Lillo	BEL	51.30	4.30	0.83
Lixhe	BEL	50.73	5.70	0.72
Maasmechelen	BEL	50.97	5.70	0.75
Marly	BEL	50.88	4.38	0.80
Mechelen	BEL	51.03	4.47	0.81
Melle	BEL	51.00	3.80	0.81

Merksem	BEL	51.23	4.48	0.81
Nameche	BEL	50.47	4.98	0.68
Niel	BEL	51.12	4.33	0.83
Olen	BEL	51.15	4.87	0.79
Puurs	BEL	51.07	4.27	0.83
Rieme	BEL	51.17	3.77	0.86
Ruisbroek	BEL	50.78	4.28	0.79
Rumst	BEL	51.07	4.42	0.81
Rupelmonde	BEL	51.13	4.28	0.83
Schelle	BEL	51.13	4.32	0.83
Schoten	BEL	51.25	4.50	0.81
Seilles	BEL	50.50	5.08	0.61
Sint-Kruis-Winkel	BEL	51.15	3.80	0.86
Temse	BEL	51.13	4.22	0.83
Terdonk	BEL	51.15	3.78	0.86
Terhagen	BEL	51.08	4.38	0.81
Tessenderlo	BEL	51.07	5.08	0.79
Tielrode	BEL	51.12	4.22	0.83
Tisselt	BEL	51.03	4.37	0.81
Val St. Lambert	BEL	50.57	5.47	0.67
Verbrande Brug	BEL	50.95	4.38	0.80
Vilvoorde	BEL	50.95	4.42	0.80
Willebroek	BEL	51.05	4.35	0.81
Wintham	BEL	51.10	4.28	0.83
Wondelgem	BEL	51.08	3.72	0.85
Zelzate	BEL	51.20	3.80	0.86
Zutendaal	BEL	50.92	5.57	0.75
Zwyndrecht	BEL	51.22	4.33	0.82
Amherstburg	CAN	42.10	-83.08	1.08
Baddeck	CAN	46.10	-60.73	0.77
Bath	CAN	44.17	-76.77	0.73
Batiscan	CAN	46.52	-72.23	0.49
Bayside	CAN	45.17	-67.13	0.81
Becancour	CAN	46.40	-72.38	0.54
Bella Coola	CAN	52.38	-126.77	0.57
Belleville	CAN	44.13	-77.37	0.65
Bowmanville	CAN	43.90	-78.67	0.50
Boylston	CAN	45.45	-61.52	0.94
Britt	CAN	45.77	-80.58	0.29
Brockville	CAN	44.60	-75.63	0.75
Bronte	CAN	43.40	-79.70	0.53
Bruce Mines	CAN	46.27	-83.72	0.10
Burlington	CAN	43.32	-79.75	0.61
Cardinal	CAN	44.78	-75.33	0.78
Chicoutimi	CAN	48.43	-71.08	0.47
Clarenville	CAN	48.17	-53.95	1.04
Clarkson	CAN	43.50	-79.60	0.55
Cobourg	CAN	43.95	-78.17	0.61
Colborne	CAN	44.00	-77.88	0.61
Collingwood	CAN	44.50	-80.23	0.48

Contrecoeur	CAN	45.88	-73.20	0.65
Corner Brook	CAN	48.95	-57.93	1.01
Cornwall	CAN	45.02	-74.72	0.76
Corunna	CAN	42.88	-82.45	0.66
Cote Ste-Catherine	CAN	45.41	-73.58	0.76
Country Harbour	CAN	45.22	-61.73	0.96
Courtright	CAN	42.80	-82.45	0.66
Erieau	CAN	42.25	-81.93	0.99
Fort Erie	CAN	42.93	-78.95	0.96
Fredericton	CAN	45.95	-66.65	0.44
Gananoque	CAN	44.32	-76.15	0.81
Goderich	CAN	43.75	-81.75	0.47
Gold River	CAN	49.68	-126.12	0.71
Goose Bay	CAN	53.35	-60.42	0.59
Grondines	CAN	46.75	-72.03	0.41
Hamilton	CAN	43.23	-79.85	0.54
Hay River	CAN	60.85	-115.70	0.74
Houston	CAN	54.40	-126.65	0.54
Humberstone	CAN	42.90	-79.25	0.92
Iona	CAN	45.97	-60.80	0.33
Isaac’s Harbour	CAN	45.17	-61.65	1.08
Killarney	CAN	45.97	-81.52	0.18
Kingston	CAN	44.20	-76.50	0.79
Kitimat	CAN	54.00	-128.70	0.26
Lanoraie	CAN	45.97	-73.18	0.65
Lauzon	CAN	46.82	-71.15	0.46
Levis	CAN	46.82	-71.18	0.52
Little Current	CAN	45.97	-81.92	0.48
Little Narrows	CAN	45.98	-60.98	0.29
Long Sault	CAN	45.02	-74.90	0.69
Marathon	CAN	48.75	-86.38	0.49
Meldrum Bay	CAN	45.92	-83.10	0.12
Michipicoten Harbour	CAN	47.95	-84.92	0.19
Midland	CAN	44.75	-79.93	0.44
Montréal	CAN	45.50	-73.55	0.79
Mooretown	CAN	42.85	-82.47	0.66
Morrisburg	CAN	44.93	-75.18	0.68
Nanticoke	CAN	42.82	-80.07	0.85
Nelson	CAN	49.47	-117.30	0.38
Oakville	CAN	43.43	-79.67	0.52
Ocean Falls	CAN	52.35	-127.70	0.61
Oshawa	CAN	43.87	-78.83	0.50
Ottawa	CAN	45.40	-75.70	0.69
Owen Sound	CAN	44.58	-80.95	0.39
Parry Sound	CAN	45.37	-80.05	0.41
Picton	CAN	44.00	-77.13	0.73
Pointe aux Trembles	CAN	45.63	-73.48	0.72
Port Alberni	CAN	49.23	-125.00	0.64
Port Alice	CAN	50.38	-127.45	0.84
Port Burwell	CAN	42.63	-80.80	0.84

Port Colborne	CAN	42.87	-79.25	0.94
Port Credit	CAN	43.55	-79.60	0.43
Port Dalhousie	CAN	43.20	-79.27	0.67
Port Dover	CAN	42.78	-80.20	0.81
Port Hope	CAN	43.95	-78.28	0.59
Port Maitland	CAN	42.87	-79.58	0.89
Port McNicoll	CAN	44.75	-79.80	0.51
Port Stanley	CAN	42.67	-81.22	0.84
Port Weller	CAN	43.23	-79.22	0.71
Prescott	CAN	44.72	-75.52	0.73
Québec	CAN	46.82	-71.20	0.52
Rupert Inlet	CAN	50.55	-127.57	1.08
Sarnia	CAN	42.98	-82.42	0.65
Sault Ste. Marie	CAN	46.52	-84.33	0.14
Sombra	CAN	42.70	-82.47	0.66
Sonora	CAN	45.07	-61.92	0.98
Sorel	CAN	46.05	-73.12	0.69
Spragge	CAN	46.22	-82.67	0.30
St. Albans	CAN	47.87	-55.85	1.07
St. Catharines	CAN	43.17	-79.27	0.64
St. Romuald	CAN	46.75	-71.23	0.52
St. Stephen	CAN	45.20	-67.28	0.58
Ste. Croix	CAN	46.63	-71.73	0.47
Stewart	CAN	55.92	-130.00	0.69
Tahsis	CAN	49.92	-126.67	0.87
Thessalon	CAN	46.25	-83.55	0.11
Thorold	CAN	43.08	-79.17	0.90
Three Rivers	CAN	46.35	-72.55	0.55
Thunder Bay	CAN	48.42	-89.22	0.35
Tobermory	CAN	45.23	-81.65	0.13
Toronto	CAN	43.63	-79.38	0.45
Tracy	CAN	46.02	-73.17	0.64
Valleyfield	CAN	45.22	-74.08	0.74
Wallaceburg	CAN	42.60	-82.40	0.66
Welland	CAN	42.97	-79.22	0.86
Weymouth	CAN	44.45	-66.02	0.72
Wheatley	CAN	42.08	-82.43	1.00
Whitby	CAN	43.85	-78.92	0.43
Windsor	CAN	42.32	-83.05	0.83
Zeballos	CAN	49.98	-126.85	1.02
Basle	CHE	47.55	7.57	0.74
Fujin	CHN	47.25	132.02	0.94
Harbin	CHN	45.73	126.60	1.03
Heihe	CHN	50.23	127.47	0.83
Jiamusi	CHN	46.80	130.35	0.94
Panshi	CHN	42.92	126.03	0.96
Tongjiang	CHN	47.63	132.50	0.94
Chvaletice	CZE	50.02	15.43	0.57
Usti nad Labem	CZE	50.67	14.03	0.49
Aken	DEU	51.85	12.03	0.61

Andernach	DEU	50.42	7.38	0.72
Anklam	DEU	53.87	13.68	0.75
Aschaffenburg	DEU	49.95	9.17	0.67
Barth	DEU	54.37	12.73	0.68
Bendorf	DEU	50.42	7.58	0.69
Berlin	DEU	52.53	13.42	0.64
Berne	DEU	53.18	10.50	0.55
Bingen	DEU	49.95	7.90	0.75
Bodenwerder	DEU	51.97	9.50	0.51
Boizenburg	DEU	53.38	10.73	0.55
Bonn	DEU	50.72	7.08	0.79
Brandenburg	DEU	52.40	12.52	0.61
Braunschweig	DEU	52.25	10.50	0.59
Brohl	DEU	50.42	7.30	0.60
Burgstaaken	DEU	54.42	11.20	1.08
Castrop Rauxel	DEU	51.55	7.30	0.73
Cologne	DEU	50.93	7.00	0.82
Deggendorf	DEU	48.83	12.97	0.58
Dormagen	DEU	51.10	6.95	0.81
Dortmund	DEU	51.53	7.45	0.72
Duisburg	DEU	51.43	6.75	0.79
Dusseldorf	DEU	51.25	6.77	0.81
Eisenhuttenstadt	DEU	52.15	14.62	0.58
Emmerich	DEU	51.85	6.25	0.71
Erftstadt	DEU	50.80	6.75	0.74
Essen	DEU	51.45	7.02	0.74
Frankfurt	DEU	50.12	8.67	0.71
Geesthacht	DEU	53.43	10.38	0.54
Gelsenkirchen	DEU	51.50	7.08	0.74
Germersheim	DEU	49.22	8.38	0.91
Gernsheim	DEU	49.75	8.47	0.81
Greifswald	DEU	54.10	13.38	0.72
Gromitz	DEU	54.15	10.98	1.04
Haren	DEU	52.80	7.25	0.70
Havelberg	DEU	52.83	12.07	0.58
Heiligenhafen	DEU	54.37	10.98	1.08
Heringsdorf	DEU	53.97	14.17	0.81
Hohenhorn	DEU	53.47	10.37	0.54
Homberg	DEU	51.45	6.72	0.79
Hoya	DEU	52.80	9.13	0.58
Ibbenburen	DEU	52.28	7.73	0.61
Karlsruhe	DEU	49.05	8.33	0.93
Kehl	DEU	48.58	7.83	0.85
Koblenz	DEU	50.33	7.58	0.62
Krefeld	DEU	51.33	6.57	0.79
Kroslin	DEU	54.13	13.75	0.64
Ladebow	DEU	54.10	13.45	0.72
Lahnstein	DEU	50.30	7.62	0.62
Lauenburg	DEU	53.38	10.55	0.55
Lauterbach	DEU	54.33	13.52	0.64

Leer	DEU	53.22	7.45	0.74
Leeseringen	DEU	52.58	9.13	0.60
Leverkusen	DEU	51.02	7.03	0.72
Lubmin	DEU	54.12	13.60	0.72
Ludwigshafen am Rhein	DEU	49.47	8.45	0.88
Magdeburg	DEU	52.13	11.62	0.57
Mainz	DEU	50.00	8.28	0.73
Mannheim	DEU	49.48	8.47	0.88
Minden	DEU	52.30	8.90	0.60
Monheim	DEU	51.12	6.82	0.80
Moselkern	DEU	50.18	7.37	0.65
Mukran	DEU	54.48	13.58	0.64
Mulheim	DEU	50.95	7.05	0.80
Neckarsteinach	DEU	49.43	8.80	0.65
Neuss	DEU	51.20	6.70	0.81
Neuss/Dusseldorf	DEU	51.20	6.70	0.81
Neuwied	DEU	50.43	7.48	0.72
Nienburg	DEU	52.63	9.22	0.59
Nuremberg	DEU	49.45	11.05	0.55
Oldersum	DEU	53.32	7.33	1.05
Orsoy	DEU	51.53	6.68	0.77
Orth	DEU	54.45	11.05	1.08
Osnabruck	DEU	52.27	8.03	0.58
Papenburg	DEU	53.08	7.38	0.67
Passau	DEU	48.58	13.47	0.52
Peenemunde	DEU	54.12	13.77	0.64
Peine	DEU	52.32	10.22	0.58
Porz	DEU	50.88	7.05	0.80
Regensburg	DEU	49.02	12.12	0.49
Remagen	DEU	50.57	7.22	0.69
Rheinhausen	DEU	51.42	6.73	0.79
Rinteln	DEU	52.20	9.08	0.57
Rosslau	DEU	51.90	12.27	0.60
Rostock	DEU	54.15	12.10	0.76
Ruhrort	DEU	51.45	6.73	0.79
Salzgitter	DEU	52.22	10.33	0.58
Sassnitz	DEU	54.52	13.63	0.64
Speyer	DEU	49.30	8.43	0.91
Stralsund	DEU	54.32	13.10	0.73
Sturzelberg	DEU	51.12	6.80	0.80
Stuttgart	DEU	48.78	9.20	0.67
Tangermunde	DEU	52.57	11.97	0.58
Ueckermunde	DEU	53.73	14.28	0.62
Urdingen	DEU	51.35	6.67	0.78
Vallendar	DEU	50.40	7.62	0.69
Vierow	DEU	54.10	13.57	0.72
Walsum	DEU	51.53	6.68	0.77
Warnemunde	DEU	54.18	12.08	0.79
Weissenthurm	DEU	50.42	7.48	0.72
Wesel	DEU	51.65	6.60	0.77

Wesseling	DEU	50.83	7.00	0.75
Westerende-Kirchloog	DEU	53.43	7.42	1.02
Wolgast	DEU	54.05	13.78	0.64
Worms	DEU	49.63	8.35	0.85
Wurzburg	DEU	49.78	9.93	0.51
Aggersund	DNK	57.02	9.28	0.59
Allinge	DNK	55.28	14.80	0.66
Fur	DNK	56.83	9.00	0.57
Gudhjem	DNK	55.22	14.97	0.68
Hammeren	DNK	55.28	14.75	0.66
Hammerhavn	DNK	55.27	14.75	0.66
Hasle	DNK	55.18	14.70	0.66
Hvalpsund	DNK	56.68	9.20	0.42
Logstor	DNK	56.97	9.25	0.42
Nekso	DNK	55.07	15.15	0.63
Nykobing	DNK	56.80	8.87	0.64
Ronne	DNK	55.10	14.70	0.66
Skarrehage	DNK	56.95	8.87	0.59
Skive	DNK	56.57	9.03	0.43
Stege	DNK	54.98	12.28	0.67
Struer	DNK	56.50	8.60	1.04
Stubbekobing	DNK	54.88	12.03	0.50
Svaneke	DNK	55.13	15.15	0.63
Tejn	DNK	55.23	14.83	0.66
Thisted	DNK	56.95	8.70	0.53
Vang	DNK	55.27	14.75	0.66
Bekker	EST	59.45	24.67	0.42
Dirhami	EST	59.22	23.50	0.51
Forby	EST	59.00	23.17	0.49
Haapsalu	EST	58.95	23.53	0.45
Heltermaa	EST	58.87	23.07	0.45
Kuivastu	EST	58.58	23.40	0.45
Kunda	EST	59.52	26.55	0.45
Lehtma	EST	59.05	22.70	0.55
Loksa	EST	59.58	25.72	0.46
Meeruse	EST	59.45	24.68	0.42
Miiduranna	EST	59.50	24.82	0.51
Montu	EST	57.95	22.12	0.46
Muuga	EST	59.50	24.97	0.51
Narva Joesuu	EST	59.47	28.05	0.38
Paldiski	EST	59.35	24.05	0.52
Paljassaare	EST	59.45	24.70	0.42
Parnu	EST	58.38	24.48	0.44
Peetri	EST	59.45	24.73	0.42
Prangli Island	EST	59.63	25.00	0.46
Rohukula	EST	58.90	23.42	0.45
Roomassaare	EST	58.22	22.52	0.43
Saaremaa Harbour	EST	58.53	22.23	0.46
Sillamae	EST	59.40	27.78	0.38
Tallinn	EST	59.45	24.75	0.42

Veere	EST	58.45	22.05	0.49
Virtsu	EST	58.58	23.55	0.44
Dalsbruk	FIN	60.03	22.52	0.45
Frojdbole	FIN	60.15	19.92	0.65
Galtby	FIN	60.18	21.58	0.56
Hamina	FIN	60.57	27.18	0.39
Hanko	FIN	59.82	22.97	0.55
Helsinki	FIN	60.17	24.95	0.42
Houtskar	FIN	60.22	21.37	0.57
Imatra	FIN	61.17	28.83	0.20
Inkoo	FIN	60.05	24.02	0.45
Isnas	FIN	60.40	26.00	0.39
Joensuu	FIN	62.60	29.75	0.30
Joutseno	FIN	61.13	28.48	0.20
Kalajoki	FIN	64.25	23.93	0.87
Kantvik	FIN	60.08	24.38	0.44
Kaskinen	FIN	62.38	21.22	0.66
Kaukas	FIN	61.07	28.22	0.19
Kaukopaa	FIN	61.25	28.87	0.21
Kemi	FIN	65.73	24.57	0.59
Kokkila	FIN	60.33	22.87	0.45
Kokkola	FIN	63.83	23.13	0.78
Korpo	FIN	60.15	21.55	0.56
Kotka	FIN	60.47	26.95	0.42
Koverhar	FIN	59.88	23.22	0.54
Kristiinankaupunki	FIN	62.27	21.32	0.42
Kronvik	FIN	63.05	21.52	0.42
Kuopio	FIN	62.85	27.50	0.27
Kustavi	FIN	60.57	21.33	0.45
Kuuslahti	FIN	63.12	27.75	0.28
Lapaluoto	FIN	64.67	24.42	0.52
Lappeenranta	FIN	61.07	28.25	0.19
Lappohja	FIN	59.90	23.27	0.54
Lappvik	FIN	59.90	23.27	0.54
Lauritsala	FIN	61.08	28.33	0.19
Loviisa	FIN	60.45	26.23	0.38
Luvia	FIN	61.33	21.57	0.43
Mantyluoto	FIN	61.58	21.50	0.44
Martinniemi	FIN	65.22	25.28	0.52
Maxmo	FIN	63.20	22.03	0.44
Merikarvia	FIN	61.85	21.47	0.44
Mjosund	FIN	60.22	22.47	0.45
Mustola	FIN	61.07	28.30	0.19
Naantali	FIN	60.47	22.02	0.45
Nyhamn	FIN	62.17	21.33	0.42
Olkiluoto	FIN	61.25	21.50	0.42
Oulu	FIN	65.00	25.47	0.50
Parainen	FIN	60.28	22.30	0.45
Pateniemi	FIN	65.08	25.40	0.51
Perno	FIN	60.45	26.05	0.39

Pietarsaari	FIN	63.68	22.70	0.75
Pori	FIN	61.48	21.80	0.44
Puhos	FIN	62.10	29.92	0.27
Raahe	FIN	64.68	24.48	0.52
Rahja	FIN	64.20	23.73	0.51
Rauma	FIN	61.13	21.50	0.43
Ristiina	FIN	61.53	27.42	0.20
Roytta	FIN	65.77	24.15	0.58
Salo	FIN	60.38	23.17	0.45
Savonlinna	FIN	61.90	28.92	0.24
Siilinjarvi	FIN	63.08	27.67	0.27
Sipoo	FIN	60.37	25.32	0.41
Skogby	FIN	59.92	23.32	0.54
Skoldvik	FIN	60.30	25.55	0.40
Skuru	FIN	60.10	23.55	0.45
Stromma	FIN	60.18	22.90	0.45
Summa	FIN	60.53	27.12	0.39
Svartback	FIN	60.28	25.53	0.40
Taalintehdas	FIN	60.02	22.52	0.45
Tammisaari	FIN	59.98	23.43	0.44
Teijo	FIN	60.25	22.95	0.45
Tolkkinen	FIN	60.33	25.58	0.40
Tornio	FIN	65.85	24.15	0.58
Tupavuori	FIN	60.45	22.07	0.45
Turku	FIN	60.43	22.22	0.45
Uusikaupunki	FIN	60.80	21.40	0.45
Vaasa	FIN	63.10	21.62	0.42
Valkom	FIN	60.42	26.27	0.38
Varkaus	FIN	62.33	27.83	0.24
Vartsala	FIN	60.33	23.02	0.45
Vastanfjard	FIN	60.05	22.65	0.45
Veitsiluoto	FIN	65.70	24.62	0.59
Abbeville	FRA	50.10	1.85	1.03
Annay sous Lens	FRA	50.47	2.87	0.81
Bethune	FRA	50.53	2.63	0.83
Bonnieres	FRA	49.03	1.58	0.91
Chalon-sur-Saone	FRA	46.78	4.83	0.98
Conflans	FRA	48.98	2.10	0.97
Duclair	FRA	49.45	0.87	0.93
Elbeuf	FRA	49.28	1.12	0.90
Gaillon	FRA	49.17	1.32	0.88
Grand Couronne	FRA	49.37	0.98	0.93
Grigny	FRA	45.62	4.78	1.08
La Mailleraye	FRA	49.48	0.77	0.91
Le Trait	FRA	49.47	0.80	0.91
Les Andelys	FRA	49.25	1.43	0.87
Lille	FRA	50.65	3.08	0.81
Lillebonne	FRA	49.52	0.53	0.90
Limay	FRA	48.97	1.78	0.90
Lyon	FRA	45.77	4.83	1.09

Mantes	FRA	48.98	1.72	0.90
Paris	FRA	48.87	2.33	1.04
Petit Couronne	FRA	49.37	1.00	0.93
Port Jerome	FRA	49.47	0.53	0.96
Radicatel	FRA	49.42	0.48	0.99
Rouen	FRA	49.48	1.08	0.91
St. Etienne du Rouvray	FRA	49.37	1.12	0.91
St. Wandrille	FRA	49.53	0.75	0.88
Strasbourg	FRA	48.57	7.70	0.85
Vernon	FRA	49.08	1.48	0.89
Villeneuve-la-Garenne	FRA	48.92	2.30	1.04
Villeneuve-le-Roi	FRA	48.73	2.40	1.07
Villequier	FRA	49.50	0.67	0.93
Acton Grange	GBR	53.37	-2.63	0.93
Alloa	GBR	56.10	-3.80	0.87
Althorpe Wharf	GBR	53.57	-0.73	0.79
Anderton	GBR	53.27	-2.52	0.85
Aylesford	GBR	51.27	0.47	0.90
Barton	GBR	53.47	-2.37	0.84
Beckingham	GBR	53.40	-0.83	0.77
Beverley	GBR	53.85	-0.43	0.83
Bowling	GBR	55.93	-4.50	0.79
Burton upon Stather	GBR	53.65	-0.68	0.80
Coulport	GBR	56.07	-4.88	0.90
Dalmuir	GBR	55.90	-4.43	0.72
Dingwall	GBR	57.60	-4.42	1.05
Drax	GBR	53.73	-0.98	0.75
Dumbarton	GBR	55.93	-4.57	0.84
Dunglass	GBR	55.93	-4.52	0.79
Faslane Dock	GBR	56.07	-4.82	0.81
Finnart	GBR	56.12	-4.83	0.80
Flixborough	GBR	53.62	-0.68	0.79
Frodsham	GBR	53.30	-2.73	1.03
Gainsborough	GBR	53.40	-0.77	0.76
Garelochhead	GBR	56.08	-4.83	0.83
Glasgow	GBR	55.87	-4.28	0.71
Glenmallan	GBR	56.12	-4.82	0.78
Gloucester	GBR	51.87	-2.22	0.89
Goole	GBR	53.70	-0.87	0.79
Gourock	GBR	55.95	-4.80	1.08
Grove Wharf	GBR	53.60	-0.68	0.79
Gunness	GBR	53.58	-0.72	0.79
Gunness Wharf	GBR	53.58	-0.68	0.79
Halling	GBR	51.37	0.01	0.90
Helensburgh	GBR	56.02	-4.73	1.07
Howdendyke	GBR	53.75	-0.87	0.79
Irlam	GBR	53.43	-2.42	0.86
Irwell	GBR	53.47	-2.35	0.84
Keadby	GBR	53.60	-0.67	0.79
Kilcreggan	GBR	55.98	-4.82	1.08

Kinlochleven	GBR	56.72	-4.98	1.07
Knottingley	GBR	53.72	-1.23	0.75
Latchford	GBR	53.38	-2.57	0.90
London	GBR	51.50	-0.07	0.93
Manchester	GBR	53.47	-2.28	0.84
Neap House	GBR	53.62	-0.67	0.79
Northwich	GBR	53.27	-2.53	0.85
Old Kilpatrick	GBR	55.92	-4.45	0.72
Paisley	GBR	55.85	-4.43	0.72
Partington	GBR	53.43	-2.43	0.86
Perth	GBR	56.40	-3.43	0.78
Port Glasgow	GBR	55.93	-4.68	1.00
Renfrew	GBR	55.87	-4.40	0.72
Rochester	GBR	51.40	0.50	1.04
Rosneath	GBR	56.02	-4.80	0.92
Selby	GBR	53.78	-1.07	0.75
Shandon	GBR	56.05	-4.82	0.81
Snodland	GBR	51.33	0.45	0.94
Thorne	GBR	53.62	-0.97	0.78
Warrington	GBR	53.40	-2.60	0.90
Winnington	GBR	53.28	-2.52	0.85
Wisbech	GBR	52.65	0.15	1.05
Aughinish Island	IRL	52.63	-9.05	1.09
Dernish Island	IRL	52.68	-8.92	1.02
Donegal	IRL	54.65	-8.10	1.06
Limerick	IRL	52.67	-8.63	0.93
Klaipeda	LTU	55.72	21.13	0.56
Engure	LVA	57.17	23.23	0.42
Labrags	LVA	56.98	21.37	0.61
Liepaja	LVA	56.52	21.02	0.64
Mersrags	LVA	57.37	23.13	0.39
Pavilosta	LVA	56.90	21.18	0.61
Riga	LVA	56.97	24.10	0.44
Roja	LVA	57.50	22.82	0.40
Salacgriva	LVA	57.75	24.37	0.42
Skulte	LVA	57.32	24.40	0.43
Ventspils	LVA	57.40	21.55	0.61
Chisinau	MDA	47.02	28.83	0.98
Aalst	NLD	51.38	5.45	0.76
Alblasserdam	NLD	51.87	4.62	0.69
Ameide	NLD	51.95	4.95	0.69
Amsterdam	NLD	52.37	4.90	0.98
Arnhem	NLD	51.97	5.88	0.70
Assen	NLD	53.00	6.57	0.65
Axel Sassing	NLD	51.28	3.87	0.93
Bergambacht	NLD	51.93	4.78	0.69
Bergen-op-Zoom	NLD	51.50	4.27	0.95
Bergum	NLD	53.20	5.98	0.97
Bolnes	NLD	51.90	4.57	0.69
Bruinisse	NLD	51.67	4.10	0.86

Capelle aan den Yssel	NLD	51.92	4.57	0.69
Culemborg	NLD	51.95	5.22	0.71
Deest	NLD	51.88	5.67	0.71
Den Bommel	NLD	51.72	4.28	0.83
Dintelmond	NLD	51.67	4.38	0.79
Dinteloord	NLD	51.63	4.37	0.80
Dodewaard	NLD	51.90	5.63	0.71
Dordrecht	NLD	51.80	4.65	0.69
Drachten	NLD	53.12	6.10	0.97
Druten	NLD	51.88	5.62	0.71
Eindhoven	NLD	51.43	5.50	0.76
Fijnaart	NLD	51.63	4.48	0.78
Geertruidenberg	NLD	51.72	4.87	0.74
Gendt	NLD	51.87	5.98	0.70
Gorinchem	NLD	51.82	4.98	0.74
Grave	NLD	51.75	5.75	0.72
Groot-Ammers	NLD	51.92	4.83	0.69
Grouw	NLD	53.10	5.85	0.99
Hardinxveld	NLD	51.82	4.85	0.69
Heerenveen	NLD	52.95	5.92	0.99
Heerewaarden	NLD	51.82	5.38	0.72
Heerjansdam	NLD	51.83	4.57	0.69
Heijen	NLD	51.68	5.98	0.72
Hellevoetsluis	NLD	51.82	4.13	0.92
Hendrik Ido Ambacht	NLD	51.85	4.62	0.69
Heusden	NLD	51.73	5.15	0.73
Huissen	NLD	51.92	5.92	0.70
Kinderdijk	NLD	51.88	4.63	0.69
Krimpen aan den Yssel	NLD	51.90	4.58	0.69
Lekkerkerk	NLD	51.92	4.63	0.69
Lithoyen	NLD	51.82	5.43	0.72
Lobith	NLD	51.87	6.13	0.71
Maasbracht	NLD	51.13	5.87	0.77
Maashees	NLD	51.57	6.03	0.75
Maassluis	NLD	51.92	4.25	0.75
Maastricht	NLD	50.85	5.68	0.75
Made	NLD	51.68	4.80	0.75
Middelharnis	NLD	51.78	4.20	0.86
Millingen aan den Rijn	NLD	51.87	6.03	0.71
Moerdijk	NLD	51.70	4.62	0.77
Nieuw Lekkerland	NLD	51.88	4.63	0.69
Nieuwerkerk aan den Yssel	NLD	51.97	4.58	0.69
Nijmegen	NLD	51.83	5.83	0.72
Numansdorp	NLD	51.72	4.42	0.81
Odijk	NLD	52.03	5.22	1.09
Ooltgensplaat	NLD	51.68	4.33	0.80
Oosterhout	NLD	51.62	4.87	0.75
Oss	NLD	51.77	5.52	0.72
Ouderkerk	NLD	51.93	4.60	0.69
Oudewater	NLD	52.03	4.88	1.03

Ouwerkerk	NLD	51.63	3.98	0.95
Overschie	NLD	51.93	4.42	0.70
Paal	NLD	51.35	4.12	0.96
Papendrecht	NLD	51.83	4.63	0.69
Raamsdonksveer	NLD	51.70	4.92	0.74
Renkum	NLD	51.97	5.73	0.70
Rhenen	NLD	51.95	5.57	0.71
Ridderkerk	NLD	51.87	4.58	0.69
Rijswijk	NLD	51.78	5.02	0.73
Roermond	NLD	51.20	5.98	0.77
Rotterdam	NLD	51.90	4.48	0.70
Sas van Ghent	NLD	51.23	3.80	0.88
Schiedam	NLD	51.90	4.40	0.72
‘sGravendeel	NLD	51.77	4.60	0.69
‘sHertogenbosch	NLD	51.70	5.30	0.75
Sliedrecht	NLD	51.83	4.75	0.69
Slikkerveer	NLD	51.88	4.60	0.69
Sluiskil	NLD	51.30	3.83	0.94
Spijk	NLD	51.87	5.05	0.71
St. Annaland	NLD	51.62	4.10	0.77
Stavenisse	NLD	51.58	4.00	0.95
Stein	NLD	50.97	5.77	0.75
Stellendam	NLD	51.80	4.02	1.10
Swalmen	NLD	51.22	6.02	0.77
Tegelen	NLD	51.35	6.13	0.76
Tiel	NLD	51.88	5.45	0.71
Tilburg	NLD	51.55	5.07	0.74
Venlo	NLD	51.37	6.17	0.76
Vlaardingen	NLD	51.90	4.35	0.72
Waalwijk	NLD	51.70	5.07	0.73
Wageningen	NLD	51.97	5.67	0.71
Walsoorden	NLD	51.45	4.03	1.10
Wanssum	NLD	51.53	6.08	0.75
Wartena	NLD	53.15	5.90	0.82
Werkendam	NLD	51.80	4.90	0.69
Willemstad	NLD	51.68	4.40	0.79
Wolphaartsdijk	NLD	51.53	3.82	1.00
Zaltbommel	NLD	51.80	5.20	0.74
Zeist	NLD	52.08	5.23	1.09
Zierikzee	NLD	51.63	3.88	1.01
Zuilichem	NLD	51.80	5.12	0.73
Zwijndrecht	NLD	51.82	4.65	0.69
Aagotnes	NOR	60.40	5.02	1.04
Aakra	NOR	59.78	6.10	0.67
Aalvik	NOR	60.43	6.40	0.85
Aandalsnes	NOR	62.57	7.68	0.97
Aardal	NOR	61.23	7.68	1.06
Aardalstangen	NOR	61.23	7.70	1.06
Alta	NOR	69.97	23.25	0.86
Anfiskaa	NOR	66.28	14.10	0.98

Askoy	NOR	60.40	5.17	0.90
Balholm	NOR	61.22	6.53	0.69
Balsfjord	NOR	69.32	19.35	1.06
Bergen	NOR	60.40	5.32	0.84
Buvika	NOR	63.32	10.18	0.94
Bygstad	NOR	61.38	5.67	0.86
Dirdal	NOR	58.78	6.23	0.83
Dolvik	NOR	60.32	5.25	0.88
Eide	NOR	60.52	6.72	0.88
Eidfjord	NOR	60.47	7.07	1.04
Eikefet	NOR	60.70	5.55	0.78
Eikefjord	NOR	61.60	5.47	1.02
Eitrheimsneset	NOR	60.10	6.53	1.00
Elvebakken	NOR	69.92	23.42	0.90
Etne	NOR	59.67	5.95	0.67
Fiborgtangen	NOR	63.72	11.17	0.53
Finneid	NOR	67.25	15.40	0.84
Finnsnes	NOR	69.23	17.97	1.06
Fitjar	NOR	59.92	5.28	1.07
Flekkefjord	NOR	58.30	6.67	0.97
Florvaag	NOR	60.45	5.22	0.78
Follafoss	NOR	63.98	11.10	0.64
Forde (Fordefjord)	NOR	61.45	5.85	0.83
Forde (Fuglesetfjord)	NOR	61.03	5.82	0.78
Fusa	NOR	60.20	5.62	0.77
Garnes	NOR	60.43	5.48	0.67
Gaupne	NOR	61.42	7.30	0.76
Glaerem	NOR	63.02	8.52	0.83
Gullsmedvik	NOR	66.33	14.15	0.98
Hammerfall	NOR	67.42	15.53	1.10
Haugsvik	NOR	61.83	5.00	1.04
Hellesylt	NOR	62.08	6.88	1.04
Heroysund	NOR	59.92	5.78	0.68
Herre	NOR	59.10	9.53	0.64
Hjelmaas	NOR	60.58	5.35	1.05
Hommelvik	NOR	63.42	10.80	0.62
Hoyanger	NOR	61.22	6.07	1.00
Hoylandsbygdi	NOR	59.77	5.78	0.66
Hoylandssundet	NOR	59.78	5.80	0.64
Husnes	NOR	59.87	5.77	0.68
Kaupanger	NOR	61.18	7.23	0.67
Knarrevik	NOR	60.37	5.17	0.90
Kongsmoen	NOR	64.88	12.43	0.86
Kvinesdal	NOR	58.30	7.00	0.78
Laerdalsoyri	NOR	61.10	7.48	1.08
Laksevaag	NOR	60.38	5.30	0.84
Langangen	NOR	59.08	9.80	0.87
Langstein	NOR	63.55	10.92	0.86
Levanger	NOR	63.75	11.30	0.54
Lofallstrand	NOR	60.02	6.00	0.47

Malm	NOR	64.07	11.22	0.61
Malvik	NOR	63.42	10.63	0.61
Menstad	NOR	59.17	9.65	0.57
Mo i Rana	NOR	66.32	14.13	0.98
Mosjoen	NOR	65.83	13.18	0.99
Muruvik	NOR	63.43	10.85	0.60
Namsos	NOR	64.47	11.50	1.06
Narvik	NOR	68.43	17.43	0.96
Naustdal	NOR	61.52	5.72	0.99
Norddal	NOR	62.25	7.25	1.08
Nordfjordeid	NOR	61.90	6.02	0.90
Nordveitgrend	NOR	60.10	5.73	0.71
Norheimsund	NOR	60.37	6.15	0.90
Nystrand	NOR	59.10	9.72	0.95
Odda	NOR	60.07	6.55	1.00
Olen	NOR	59.60	5.83	0.62
Omastrand	NOR	60.22	5.97	0.66
Onarheim	NOR	59.95	5.65	0.75
Orkanger	NOR	63.32	9.85	0.80
Orsta	NOR	62.20	6.15	1.05
Oystese	NOR	60.38	6.22	0.78
Porsgrunn	NOR	59.13	9.65	0.64
Raudsand	NOR	62.83	8.10	0.93
Rognan	NOR	67.08	15.37	0.91
Ronningen	NOR	63.70	10.58	0.74
Rosendal	NOR	59.98	6.02	0.92
Rubbestadneset	NOR	59.82	5.28	0.89
Sagvaag	NOR	59.77	5.38	1.03
Salsbruket	NOR	64.80	11.88	0.90
Sandane	NOR	61.77	6.22	1.00
Sandnes	NOR	58.85	5.75	1.02
Sauda	NOR	59.65	6.35	0.84
Skaalevik	NOR	60.37	5.22	0.88
Skaanevik	NOR	59.75	5.93	0.67
Skien	NOR	59.20	9.62	0.60
Sogndal	NOR	61.23	7.10	0.68
Sorreisa	NOR	69.13	18.13	1.10
Steinkjer	NOR	64.02	11.50	0.59
Stjordal	NOR	63.45	10.88	0.60
Stryn	NOR	61.92	6.73	0.95
Sunndalsora	NOR	62.68	8.60	1.04
Svelgen	NOR	61.77	5.30	1.07
Thamshavn	NOR	63.33	9.87	0.80
Trondheim	NOR	63.43	10.40	0.61
Trosvik	NOR	59.05	9.70	1.06
Tyssebotn	NOR	60.62	5.58	0.66
Tyssedal	NOR	60.12	6.57	1.00
Ulvik	NOR	60.57	6.92	0.85
Uskedal	NOR	59.93	5.88	0.76
Vaagland	NOR	63.12	8.32	1.10

Vadheim	NOR	61.20	5.82	0.82
Vaksdal	NOR	60.48	5.75	0.66
Verdal	NOR	63.78	11.43	0.55
Vik (Sognefjord)	NOR	61.08	6.58	0.78
Volda	NOR	62.15	6.07	1.05
Darlowo	POL	54.43	16.38	0.73
Elblag	POL	54.17	19.40	0.67
Frombork	POL	54.35	19.67	0.66
Gdansk	POL	54.35	18.65	0.57
Gdynia	POL	54.53	18.55	0.61
Kolobrzeg	POL	54.18	15.57	0.86
Kozle	POL	50.32	18.13	0.49
Niechorze	POL	54.10	15.07	0.79
Nowa Sol	POL	51.80	15.72	0.67
Plock	POL	52.53	19.67	0.50
Police	POL	53.55	14.60	0.81
Puck	POL	54.72	18.35	0.61
Stepnica	POL	53.65	14.63	0.81
Swinoujscie	POL	53.93	14.28	0.62
Szczecin	POL	53.42	14.55	0.79
Tczew	POL	54.08	18.77	0.61
Ustka	POL	54.58	16.87	0.64
Wladyslawowo	POL	54.80	18.42	0.62
Wroclaw	POL	51.08	17.00	0.51
Bazias	ROM	44.80	21.40	1.08
Orsova	ROM	44.70	22.37	0.90
Annenskiy Most	RUS	60.72	37.08	0.29
Balakhna	RUS	56.48	43.62	0.43
Balakovo	RUS	52.07	47.77	0.94
Baltiysk	RUS	54.65	19.90	0.59
Belyy Ruchey	RUS	60.90	36.83	0.30
Berezniki	RUS	59.43	56.82	0.49
Brusnichnoye	RUS	60.78	28.73	0.41
Cheboksary	RUS	56.13	47.23	0.50
Cherepovets	RUS	59.15	37.83	0.26
Chkalovsk	RUS	56.75	43.23	0.42
Dudinka	RUS	69.40	86.17	1.01
Gorokhovets	RUS	56.18	42.70	0.43
Igarka	RUS	67.50	86.67	0.91
Kaliningrad	RUS	54.72	20.52	0.63
Kamyshin	RUS	50.08	45.40	1.08
Kanonerskiy Island	RUS	59.90	30.22	0.45
Kazan	RUS	55.75	49.17	0.59
Khabarovsk	RUS	48.50	135.17	0.85
Khatanga	RUS	71.97	102.42	1.07
Kineshma	RUS	57.45	42.12	0.36
Kirovsk	RUS	59.87	30.98	0.43
Komsomolsk-na-Amure	RUS	50.53	136.98	0.66
Kondopoga	RUS	62.20	34.28	0.29
Kostroma	RUS	57.77	40.93	0.38

Kotlas	RUS	61.25	46.65	0.41
Krasnoyarsk	RUS	56.08	92.77	0.56
Kronshtadt	RUS	60.00	29.77	0.42
Lomonosov	RUS	59.83	29.80	0.41
Mago	RUS	53.25	140.22	0.63
Medvezhyegorsk	RUS	62.93	34.47	0.35
Mondoma	RUS	59.93	37.47	0.28
Murmansk	RUS	68.97	33.08	0.87
Naberezhnyye Chelny	RUS	55.68	52.30	0.59
Nadvoitsy	RUS	63.93	34.33	0.42
Naryan Mar	RUS	67.65	53.02	0.85
Navashino	RUS	55.55	42.18	0.45
Nikolayevsk	RUS	53.13	140.72	0.67
Nizhnekamsk	RUS	55.42	51.88	0.59
Nizhnetambovskoye	RUS	50.93	138.17	0.59
Nizhniy Novgorod	RUS	56.33	44.00	0.43
Nizhnyaya Gavan	RUS	52.40	140.43	0.61
Novgorod	RUS	58.50	31.33	0.21
Novocheboksarsk	RUS	56.10	47.48	0.53
Oleniy	RUS	49.45	143.28	1.00
Otradnoye	RUS	59.77	30.80	0.43
Pechora	RUS	65.23	57.30	0.68
Perm	RUS	58.02	56.17	0.49
Petrodvorets	RUS	59.88	29.92	0.43
Petrozavodsk	RUS	61.77	34.32	0.29
Pionerskiy	RUS	54.93	20.20	0.61
Podporozhye	RUS	60.92	34.03	0.23
Primorsk	RUS	60.37	28.63	0.40
Priozersk	RUS	61.02	30.13	0.42
Pudozh	RUS	61.83	36.53	0.30
Rybinsk	RUS	58.02	38.87	0.30
Samara	RUS	53.17	50.17	0.76
Saratov	RUS	51.50	45.92	0.99
Segezha	RUS	63.70	34.32	0.41
Shlisselburg	RUS	59.93	31.13	0.43
Solikamsk	RUS	59.67	56.75	0.49
Sosnovka	RUS	56.23	51.28	0.56
St. Petersburg	RUS	59.93	30.30	0.45
Svetlyy	RUS	54.63	20.15	0.65
Syzran	RUS	53.17	48.48	0.79
Tolyatti	RUS	53.53	49.40	0.72
Tomsk	RUS	56.50	85.08	0.65
Ust-Luga	RUS	59.67	28.30	0.38
Voznesenye	RUS	61.02	35.47	0.25
Vyborg	RUS	60.72	28.73	0.41
Vysotsk	RUS	60.63	28.57	0.40
Vytegra	RUS	61.07	36.45	0.27
Yakutsk	RUS	62.02	129.73	0.99
Yaroslavl	RUS	57.57	39.87	0.36
Zelenodolsk	RUS	55.83	48.50	0.57

Apatin	SCG	45.67	19.00	1.07
Bezdam	SCG	45.83	18.93	1.08
Mitrovica	SCG	42.90	20.87	0.58
Novi Sad	SCG	45.27	19.83	1.08
Bratislava	SVK	48.15	17.12	0.84
Komarno	SVK	47.77	18.08	0.93
Aelvenaes	SWE	59.37	13.18	0.06
Ahus	SWE	55.93	14.32	0.69
Amal	SWE	59.05	12.72	0.09
Ar	SWE	57.92	18.95	0.58
Arvika	SWE	59.67	12.58	0.07
Backfors	SWE	64.50	21.42	0.81
Balsta	SWE	59.55	17.55	0.49
Bergkvara	SWE	56.38	16.08	0.64
Borgholm	SWE	56.88	16.65	0.60
Bungenas	SWE	57.82	19.08	0.58
Burea	SWE	64.62	21.25	0.81
Byxelkrok	SWE	57.30	17.03	0.51
Dalaro	SWE	59.13	18.42	0.55
Degerhamn	SWE	56.35	16.42	0.63
Edsvalla	SWE	59.43	13.23	0.06
Elleholm	SWE	56.17	14.73	0.67
Enkoping	SWE	59.63	17.08	0.48
Farjestaden	SWE	56.65	16.47	0.62
Farosund	SWE	57.87	19.07	0.58
Fiskeback	SWE	57.87	14.10	0.18
Fittja	SWE	59.23	17.85	0.54
Forsmark	SWE	60.42	18.20	0.57
Furillen	SWE	57.77	19.00	0.51
Furusund	SWE	59.65	18.90	0.55
Gamleby	SWE	57.90	16.42	0.65
Gefle	SWE	60.67	17.17	0.43
Grisslehamn	SWE	60.10	18.82	0.57
Gruvon	SWE	59.33	13.12	0.08
Hallekis	SWE	58.67	13.42	0.14
Hallstavik	SWE	60.05	18.60	0.56
Haparanda	SWE	65.83	24.13	0.58
Haraholmen	SWE	65.23	21.63	0.53
Hargshamn	SWE	60.17	18.48	0.56
Hasselby	SWE	59.37	17.82	0.52
Hernosand	SWE	62.63	17.93	0.45
Hoglunda	SWE	59.42	13.25	0.06
Hogmarso	SWE	59.65	18.85	0.55
Honsater	SWE	58.63	13.45	0.14
Hornefors	SWE	63.62	19.90	0.47
Hudiksvall	SWE	61.72	17.12	0.59
Iggesund	SWE	61.65	17.10	0.59
Kagehamn	SWE	64.83	21.03	0.52
Kalix	SWE	65.85	23.13	0.63
Kallvik	SWE	57.88	16.72	0.68

Kallviken	SWE	64.33	21.37	0.47
Kalmar	SWE	56.67	16.37	0.62
Kalmarsand	SWE	59.53	17.52	0.49
Kapellskar	SWE	59.72	19.00	0.57
Kappelshamn	SWE	57.85	18.78	0.58
Karlshamn	SWE	56.17	14.87	0.65
Karlskrona	SWE	56.17	15.60	0.63
Karlstad	SWE	59.38	13.52	0.07
Klintehamn	SWE	57.38	18.20	0.69
Koping	SWE	59.52	16.00	0.17
Kopmannebro	SWE	58.77	12.52	0.15
Kristinehamn	SWE	59.32	14.12	0.08
Krokstad	SWE	59.10	12.92	0.09
Kungsor	SWE	59.43	16.10	0.15
Kyrkebyn	SWE	59.27	13.07	0.08
Landsort	SWE	58.73	17.87	0.56
Lidkoping	SWE	58.50	13.17	0.17
Liljeholmsviken	SWE	59.32	18.00	0.54
Ljustero	SWE	59.52	18.63	0.50
Loudden	SWE	59.33	18.13	0.56
Lulea	SWE	65.58	22.17	0.56
Mariestad	SWE	58.72	13.83	0.13
Marsviken	SWE	58.67	16.95	0.51
Mem	SWE	58.48	16.42	0.47
Monsteras	SWE	57.03	16.47	0.65
Morbylanga	SWE	56.53	16.37	0.62
Motala	SWE	58.53	15.07	0.11
Munksund	SWE	65.28	21.48	0.54
Norrkoping	SWE	58.60	16.20	0.47
Norrsundet	SWE	60.95	17.17	0.42
Norrtalje	SWE	59.75	18.70	0.49
Norsbron	SWE	59.42	13.23	0.06
Nykoping	SWE	58.75	17.02	0.50
Nynashamn	SWE	58.90	17.95	0.56
Oaxen	SWE	55.97	17.72	0.60
Orebro	SWE	59.28	15.18	0.10
Oregrund	SWE	60.33	18.45	0.56
Ornskoldsvik	SWE	63.27	18.72	0.48
Oskarshamn	SWE	57.27	16.45	0.65
Otterbacken	SWE	58.95	14.05	0.11
Oxelosund	SWE	58.67	17.12	0.56
Pataholm	SWE	56.92	16.43	0.61
Ronehamn	SWE	57.17	18.53	0.65
Ronneby	SWE	56.17	15.30	0.63
Ronnskar	SWE	64.67	21.28	0.81
Rundvik	SWE	63.53	19.45	0.50
Saffle	SWE	59.13	12.93	0.09
Sandhamn	SWE	59.28	18.90	0.56
Sankt Anna	SWE	58.33	16.70	0.50
Seskaro Island	SWE	65.72	23.75	0.83

Sikea	SWE	64.13	20.98	0.80
Simpevarp	SWE	57.42	16.67	0.68
Simrishamn	SWE	55.55	14.37	0.68
Sjotorp	SWE	58.83	14.00	0.13
Skattkar	SWE	59.42	13.70	0.07
Skelleftea	SWE	64.73	20.95	0.55
Skoghall	SWE	59.32	13.45	0.07
Skutskar	SWE	60.65	17.40	0.40
Slite	SWE	57.70	18.82	0.66
Slottsbron	SWE	59.33	13.10	0.08
Soderhamn	SWE	61.32	17.10	0.60
Soderkoping	SWE	58.48	16.33	0.47
Sodertalje	SWE	59.20	17.63	0.54
Solvesborg	SWE	56.05	14.58	0.66
Soraker	SWE	62.50	17.50	0.47
Spesshult	SWE	59.07	12.92	0.09
Stavsnas	SWE	59.28	18.68	0.55
Stockholm	SWE	59.32	18.05	0.56
Stocksund	SWE	59.38	18.05	0.55
Stora Vika	SWE	58.93	17.78	0.56
Storugns	SWE	57.83	18.80	0.58
Straa	SWE	57.90	19.03	0.58
Strangnas	SWE	59.38	17.03	0.48
Studsvik	SWE	58.75	17.28	0.51
Sturko	SWE	56.08	15.67	0.63
Sundsvall	SWE	62.42	17.33	0.51
Taxinge	SWE	59.22	17.37	0.50
Torko	SWE	56.15	15.40	0.63
Trelleborg	SWE	55.37	13.15	0.66
Umea	SWE	63.70	20.35	0.64
Uppsala	SWE	59.87	17.65	0.07
Valdemarsvik	SWE	58.20	16.60	0.48
Vaxholm	SWE	59.38	18.33	0.53
Vesteras	SWE	59.60	16.43	0.16
Vestervik	SWE	57.75	16.65	0.67
Visby	SWE	57.65	18.28	0.68
Ystad	SWE	55.43	13.83	0.63
Cherkassy	UKR	49.43	32.05	0.70
Dneprodzerzhinsk	UKR	48.50	34.62	0.89
Dnepropetrovsk	UKR	48.48	35.00	0.94
Kiev	UKR	50.42	30.50	0.62
Kremenchug	UKR	49.05	33.42	0.78
Tyaginka	UKR	46.75	33.05	1.02
Zaporozhye	UKR	47.83	35.17	1.07
Albany	USA	42.65	-73.75	0.99
Alpena	USA	45.05	-83.43	0.37
Alsen	USA	42.18	-73.92	0.94
Ashland	USA	46.58	-90.90	0.25
Ashtabula	USA	41.92	-80.82	0.96
Bangor	USA	44.80	-68.78	0.65

Bath	USA	43.90	-69.82	0.87
Bay City	USA	43.58	-83.88	0.86
Bayfield	USA	46.80	-90.80	0.15
Belfast	USA	44.42	-69.00	0.98
Benton Harbour	USA	42.12	-86.45	0.72
Brevort	USA	46.00	-85.03	0.29
Bucksport	USA	44.57	-68.80	0.80
Buffalo	USA	42.88	-78.88	0.95
Buffington	USA	41.63	-87.42	0.81
Burns Harbour	USA	41.63	-87.18	0.81
Calcite	USA	45.40	-83.78	0.23
Catskill	USA	42.22	-73.88	0.94
Cedarville	USA	45.98	-84.35	0.10
Cementon	USA	42.13	-73.92	0.98
Charlevoix	USA	45.32	-85.22	0.45
Cheboygan	USA	45.67	-84.47	0.26
Chicago	USA	41.83	-87.63	0.76
Clayton	USA	44.23	-76.08	0.83
Cleveland	USA	41.52	-81.72	1.03
Conneaut	USA	41.97	-80.57	0.95
Coxsackie	USA	42.33	-73.80	0.95
Detour	USA	45.97	-83.88	0.09
Detroit	USA	42.33	-83.03	0.86
Duluth	USA	46.73	-92.15	0.07
Erie	USA	42.17	-80.08	0.95
Escanaba	USA	45.78	-87.07	0.41
Essexville	USA	43.60	-83.83	0.86
Fairport	USA	41.77	-81.32	1.01
Ferrysburg	USA	43.08	-86.23	0.54
Gary Harbour	USA	41.60	-87.35	0.79
Grand Haven	USA	43.07	-86.25	0.56
Grand River	USA	41.73	-81.28	1.00
Green Bay	USA	44.52	-88.00	0.73
Harbor Beach	USA	43.83	-82.65	0.43
Holland (MI)	USA	42.78	-86.22	0.57
Huron	USA	41.40	-82.58	1.09
Hyde Park	USA	41.78	-73.93	0.98
Indiana Harbour	USA	41.67	-87.50	0.81
Kalama	USA	46.02	-122.83	0.89
Kenosha	USA	42.58	-87.82	0.56
Kewaunee	USA	44.45	-87.52	0.22
Kingston	USA	41.87	-73.97	0.98
Lorain	USA	41.47	-82.17	1.07
Ludington	USA	43.97	-86.45	0.30
Mackinaw City	USA	45.75	-84.73	0.28
Manistee	USA	44.25	-86.33	0.28
Manitowoc	USA	44.10	-87.63	0.26
Marine City	USA	42.72	-82.48	0.66
Marinette	USA	45.12	-87.62	0.51
Marquette	USA	46.60	-87.38	0.00

Marysville	USA	42.92	-82.48	0.65
Menominee	USA	45.13	-87.62	0.49
Milton	USA	41.60	-73.95	1.10
Milwaukee	USA	43.05	-87.87	0.46
Muskegon	USA	43.18	-86.23	0.49
Newburgh	USA	41.50	-74.08	1.10
Ogdensburg	USA	44.70	-75.50	0.73
Olympia	USA	47.05	-122.90	0.92
Ontonagon	USA	46.87	-89.30	0.11
Oswego	USA	43.47	-76.53	0.84
Port Dolomite	USA	45.97	-84.27	0.17
Port Huron	USA	42.98	-82.43	0.65
Port Inland	USA	45.97	-85.87	0.25
Port Washington	USA	43.38	-87.87	0.36
Portland (OR)	USA	45.57	-122.73	1.01
Poughkeepsie	USA	41.68	-73.88	0.98
Racine	USA	42.73	-87.80	0.56
Ravena	USA	42.47	-73.80	0.97
Rensselaer	USA	42.65	-73.73	0.99
Rochester (NY)	USA	43.28	-77.60	0.73
Rockport (MI)	USA	45.20	-83.38	0.23
Rogers City	USA	45.40	-83.83	0.22
Roseton	USA	41.57	-74.00	1.01
Saginaw	USA	43.45	-83.92	0.89
Sheboygan	USA	43.75	-87.70	0.21
Silver Bay	USA	47.28	-91.27	0.42
South Brewer	USA	44.78	-68.78	0.65
South Haven	USA	42.45	-86.25	0.63
St. Clair	USA	42.82	-82.47	0.66
St. Joseph	USA	42.08	-86.50	0.74
Stoneport	USA	45.28	-83.43	0.22
Superior	USA	46.72	-92.08	0.07
Taconite Harbour	USA	47.50	-90.92	0.40
The Dalles	USA	45.58	-121.18	0.84
Tonawanda	USA	43.02	-78.88	0.95
Troutdale	USA	45.53	-122.38	1.02
Troy	USA	42.73	-73.68	0.99
Two Harbors	USA	47.02	-91.67	0.28
Vancouver	USA	45.63	-122.67	1.01
Waddington	USA	44.85	-75.20	0.68
Waukegan	USA	42.37	-87.83	0.68
Whitefish Point	USA	46.75	-84.95	0.04
Willbridge	USA	45.57	-122.75	1.01
Winterport	USA	44.63	-68.85	0.75
Wiscasset	USA	44.00	-69.67	0.87
Wyandotte	USA	42.18	-83.15	1.02
Zilwaukee	USA	43.47	-83.92	0.88

Appendix H. Potential fouling NIS with high impact globally found at ports connected to GLSLR top ports.

Species	Higher taxa	Ports					
		CL[1]	DE[2]	DS[3]	MO[4]	QC[5]	ST[6]
Acar plicata	Mollusc						X
Acartia tonsa	Crustacean				X	X	X
Acrothamnion preissii	Plant				X	X	
Aglaothamnion halliae	Algae				X	X	X
Alitta succinea	Annelid				X	X	X
Amathia distans	Bryozoan						X
Anadara inaequivalvis	Mollusc				X	X	X
Anomia nobilis	Mollusc						X
Antithamnionella ternifolia	Algae				X	X	X
Asparagopsis armata	Plant				X	X	X
Balanus improvisus	Crustacean				X	X	X
Balanus trigonus	Crustacean				X	X	X
Botryllus schlosseri	Tunicate				X	X	X
Botryllus violaceus	Tunicate				X	X	X
Brachidontes pharaonis	Mollusc				X	X	
Bugula neritina	Bryozoan				X		
Carcinus maenas	Crustacean					X	
Carijoa riisei	Cnidarian				X	X	X
Caulerpa racemosa var. cylindracea	Plant				X	X	X
Cellana rota	Mollusc				X	X	X
Cerithium scabridum	Mollusc				X	X	
Ciona intestinalis	Tunicate				X	X	X
Cladophora sericea	Algae	X	X	X	X	X	X
Cliona thoosina	Porifera				X		X
Codium fragile ssp tomentosoides	Algae	X	X	X	X	X	X
Codium webbiana	Algae				X	X	X
Corbula gibba	Mollusc				X	X	X
Cordylophora caspia	Cnidarian				X	X	X
Crassostrea gigas	Mollusc				X	X	X
Crepidula fornicata	Mollusc				X	X	X
Didemnum cf. lahillei	Ascidian				X	X	X
Didemnum vexillum	Ascidian				X	X	X
Dreissena polymorpha	Mollusc	X	X	X	X	X	X
Dreissena polymorpha bugensis	Mollusc	X	X	X	X	X	X
Drymonema dalmatinum	Cnidarian				X	X	X
Elminius modestus	Crustacean				X	X	X
Eriocheir sinensis	Crustacean				X	X	X
Ficopomatus enigmaticus	Annelid				X	X	X
Fucus evanescens	Algae				X	X	X
Garveia Franciscana	Cnidarian				X	X	X
Geukensia demissa	Mollusc				X	X	X
Hemigrapsus sanguineus	Crustacean					X	X
Hemimysis anomala	Crustacean				X	X	X
Hydroides elegans	Echinoderms				X	X	X
Hydroides ezoensis	Annelid				X	X	X
Hydroides operculatus	Annelid				X	X	X

Hypnea musciformis	Algae				X	X	X
Jassa marmorata	Crustacean					X	X
Lophocladia lallemandii	Algae				X	X	X
Lyrodus medilobatus	Mollusc				X	X	X
Maeotias marginata	Cnidarian				X	X	X
Membranipora membranacea	Bryozoan				X	X	X
Molgula manhattensis	Ascidian						X
Morone saxatilis	Fish				X		
Mya arenaria	Mollusc				X	X	X
Myriophyllum spicatum L.	Plant						X
Mytella charruana	Mollusc					X	X
Mytilicola orientalis	Annelid				X	X	X
Mytilopsis sallei	Mollusc				X		X
Mytilus galloprovincialis	Mollusc				X		X
Orchestia cavimana	Crustacean						X
Perna viridis	Mollusc				X	X	X
Phyllorhiza punctata	Cnidarian				X	X	X
Pinctada margaritifera	Mollusc						X
Polyandrocarpa zorritensis	Tunicate				X	X	
Polydora ciliata	Annelid				X	X	X
Polydora cornuta	Annelid				X	X	X
Polysiphonia brodiei	Algae					X	
Pontogammarus robustoides	Crustacean				X	X	X
Pseudopolydora paucibranchiata	Annelid				X	X	X
Rapana venosa	Mollusc				X	X	X
Rhithropanopeus harrisii	Crustacean				X	X	X
Sabella spallanzanii	Annelid				X	X	X
Sargassum muticum	Algae				X	X	X
Sphaeroma quoianum	Crustacean					X	X
Sphaeroma terebrans	Crustacean				X	X	X
Spirorbis marioni	Annelid				X	X	X
Styela clava	Tunicate	X	X	X	X	X	X
Stypopodium schimperi	Algae				X	X	X
Synidotea laevidorsalis	Crustacean				X	X	X
Teredo bartschi	Mollusc				X	X	X
Teredo navalis	Mollusc					X	
Tricellaria inopinata	Bryozoan				X	X	X
Tridentiger trigonocephalus	Fish					X	
Ulva fasciata	Algae				X		
Undaria pinnatifida	Plant				X	X	X
Victorella pavida	Bryozoan				X	X	X
Xenostrobus securis	Mollusc				X	X	X

Abbreviations: Cleveland, Ohio[1]; Detroit-Ecorse, Michigan[2]; Duluth-Superior, Minnesota[3] ;Montréal, Québec[4] ;Québec City, Québec[5]; Sorel-Tracy, Québec[6].

Appendix I. Potential ballast-mediated NIS with high impact globally found at ports connected to GLSLR top ports.

Species	Higher taxa	Ports						
		DS[1]	MO[2]	PM[3]	QC[4]	ST[5]	TH[6]	TO[7]
Acartia tonsa	Crustacean		X		X	X		
Acrothamnion preissii	Plant		X		X			
Aglaothamnion halliae	Algae		X		X	X		
Alepes djedaba	Fish		X		X	X		
Alexandrium catenella	Algae		X		X			
Alexandrium minutum	Algae		X		X	X		
Alexandrium ostenfeldii	Algae	X	X		X	X		X
Alexandrium peruvianum	Algae		X		X			
Alexandrium taylori	Algae		X		X	X		
Anadara inaequivalvis	Mollusc		X		X	X		
Apollonia melanostoma	Fish	X	X	X	X	X	X	
Asparagopsis armata	Plant		X		X	X		
Balanus improvisus	Crustacean		X		X	X		
Botryllus schlosseri	Tunicate		X		X	X		
Botryllus violaceus	Tunicate		X		X	X		
Brachidontes pharaonis	Mollusc		X		X			
Bythotrephes longimanus	Crustacean	X	X	X	X	X	X	
Callinectes sapidus	Crustacean		X		X	X		
Carcinus maenas	Crustacean		X		X	X		
Caulerpa racemosa var. cylindracea	Plant		X		X	X		
Caulerpa taxifolia	Plant		X		X			
Cercopagis pengoi	Crustacean	X	X	X	X	X	X	
Chara connivens	Algae		X		X	X		
Charybdis hellerii	Crustacean		X		X	X		
Chattonella aff verruculosa	Algae		X		X	X		
Cliona thoosina	Porifera					X		
Codium webbiana	Algae		X		X	X		
Corbula gibba	Mollusc		X		X	X		
Cordylophora caspia	Cnidarian		X		X	X		
Coscinodiscus wailesii	Diatom		X		X	X		
Crepidula fornicata	Mollusc		X		X	X		
Dasya baillouviana	Algae		X		X	X		
Didemnum cf. lahillei	Ascidian		X		X	X		
Dreissena polymorpha	Mollusc	X	X	X	X	X	X	X
Dreissena polymorpha bugensis	Mollusc	X	X	X	X	X	X	
Elminius modestus	Crustacean		X		X	X		
Eriocheir sinensis	Crustacean		X		X	X		
Ficopomatus enigmaticus	Annelid		X		X	X		
Gammarus tigrinus	Crustacean	X	X	X	X	X	X	
Garveia franciscana	Cnidarian		X		X	X		
Gymnocwphalus cernuus	Fish	X	X	X	X	X	X	
Hemigrapsus penicillatus	Crustacean		X		X	X		
Hemigrapsus sanguineus	Crustacean		X		X	X		
Hemimysis anomala	Crustacean	X	X	X	X	X	X	
Heterosiphonia japonica	Algae		X		X	X		
Hydroides ezoensis	Annelid		X		X	X		

Lithoglyphus naticoides	Mollusc		X		X		
Littorina littorea	Mollusc		X		X	X	
Lophocladia lallemandii	Algae		X		X	X	
Maeotias marginata	Cnidarian		X		X	X	
Marenzelleria neglecta	Annelid		X		X	X	
Marenzelleria viridis	Annelid		X		X	X	
Membranipora membranacea	Bryozoan		X		X	X	
Microspongium globosum	Algae		X			X	
Mnemiopsis leidyi	Ctenophore		X			X	
Moerisia lyonsi	Cnidarian		X		X	X	
Musculista senhousia	Mollusc		X		X		
Mya arenaria	Mollusc		X		X	X	
Mytella charruana	Mollusc				X		
Mytilopsis leucophaeata	Mollusc		X		X	X	
Neogobius melanostomus	Fish		X		X		
Ostreopsis ovata	Algae		X		X	X	
Percnon gibbesi	Crustacean		X		X	X	
Perna perna	Mollusc		X		X	X	
Perna viridis	Mollusc		X		X	X	
Phyllorhiza punctata	Cnidarian		X		X	X	
Polydora ciliata	Annelid		X		X	X	
Polydora cornuta	Annelid				X		
Pontogammarus robustoides	Crustacean		X		X		
Potamopyrgus antipodarum	Mollusc	X	X	X	X	X	X
Prorocentrum minimum	Diatom		X		X	X	
Pseudobacciger harengulae	Annelid		X		X	X	
Pseudopolydora paucibranchiata	Annelid		X		X		
Rapana venosa	Mollusc		X		X	X	
Rhithropanopeus harrisii	Crustacean		X		X	X	
Sabella spallanzanii	Annelid				X		
Sargassum muticum	Algae		X		X	X	
Spartina anglica	Plant		X		X	X	
Strombus persicus	Mollusc					X	
Styela clava	Tunicate	X	X		X	X	X
Theora lubrica	Mollusc		X		X		
Undaria pinnatifida	Plant		X		X	X	
Xenostrobus securis	Mollusc		X		X		

Abbreviations: Duluth-Superior, Minnesota[1]; Montréal, Québec[2]; Presque Isle-Marquette, Michigan[3]; Québec City, Québec[4]; Sorel-Tracy, Québec[5]; Two Harbours, Minnesota[6]; Toronto, Ontario[7].