

Appendix G - AIS and GIS Usage in the Bering Strait PARS

Incorporation of AIS Data

The Coast Guard has obtained and incorporated satellite based Automatic Identification System (SAIS) data into the Bering Strait PARS to develop an understanding of existing traffic patterns and usage of Bering Sea region by various types of vessels. This report displays AIS data through the use of Geographic Information System (GIS) tools because this represents the best available method to develop and display maritime traffic patterns.

After gathering AIS data and associated vessel details the Coast Guard was able to assemble Bering Sea region transit information for full calendar years 2014 and 2015. All totaled, the Coast Guard was able to identify approximately 5,200 different vessels which in turn generated over 117,000 transit segments in the area. Analysis of the transit data helped the Coast Guard determine traffic and use patterns for the area. The remainder of this section explains in greater detail how the Coast Guard processed the AIS information into the map products used in the Bering Strait PARS.

Limitations of AIS Data

The Coast Guard recognizes that AIS data comes with certain limitations. AIS requires line-of sight signal transmission, so Satellite AIS data is only captured when a satellite is overhead of a transmitting vessel, and the constellation of satellites is not sufficient to provide 100% coverage within the Bering Strait PARS study area at all times. Not all vessels are equipped with AIS, and regulatory requirements for certain vessels to carry AIS have changed over time. While many vessels operating in the study area were already voluntarily using AIS, it's use was not a requirement for towing vessels over 26 feet in length and all commercial vessels over 65 feet until March of 2016. Small commercial vessels and recreational vessels are not generally required to use AIS and are therefore not well represented in the AIS datasets. AIS data also represents a snapshot in time with defined start and stop times and may not accurately represent vessel transits for other time periods. For example, use of a dataset including both 2014 and 2015 AIS data ensured that maritime activity related to Outer Continental Shelf oil and gas exploratory drilling was captured, but the "first ever" 2016 transit of a large cruise ship bound for the Northwest Passage was not. Despite its limitations, the Coast Guard believes the volume and quality of AIS data is sufficient to accurately reflect existing traffic patterns.

Map Review and Reliability

The Coast Guard had current and former navigators with firsthand experience navigating in the Bering Sea region review the AIS based map products for inconsistencies between the map products and their firsthand observations. No inconsistencies were noted during this review. Additionally, a comparison between the Coast Guard created maps and similar maps created by other organizations and agencies revealed very similar traffic and use patterns. The Coast Guard believes the map products included in this report do adequately reflect current commercial maritime traffic patterns and will to a strong degree, reliably predict future traffic patterns except in circumstances where completely new commercial activity arises or there are significant migrations of commercially targeted fish species.

AIS Data Processing and Workflow

1. District 17 Waterways management office obtained Satellite based Automatic Identification System (SAIS) data from USCG Navigation Center (NAVCEN). NAVCEN is the central repository of all AIS data for the USCG.
 - a. Date range included: 01 Jan 2014 thru 31 Dec 2015
 - b. Geographic coverage of SAIS data in decimal degrees:
 - i. Upper right latitude: +71.000
 - ii. Upper right longitude: -157.000
 - iii. Lower left latitude: +49.000
 - iv. Lower left longitude: -179.999

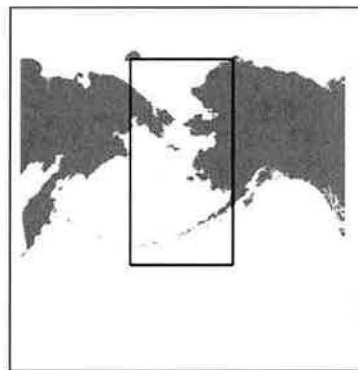
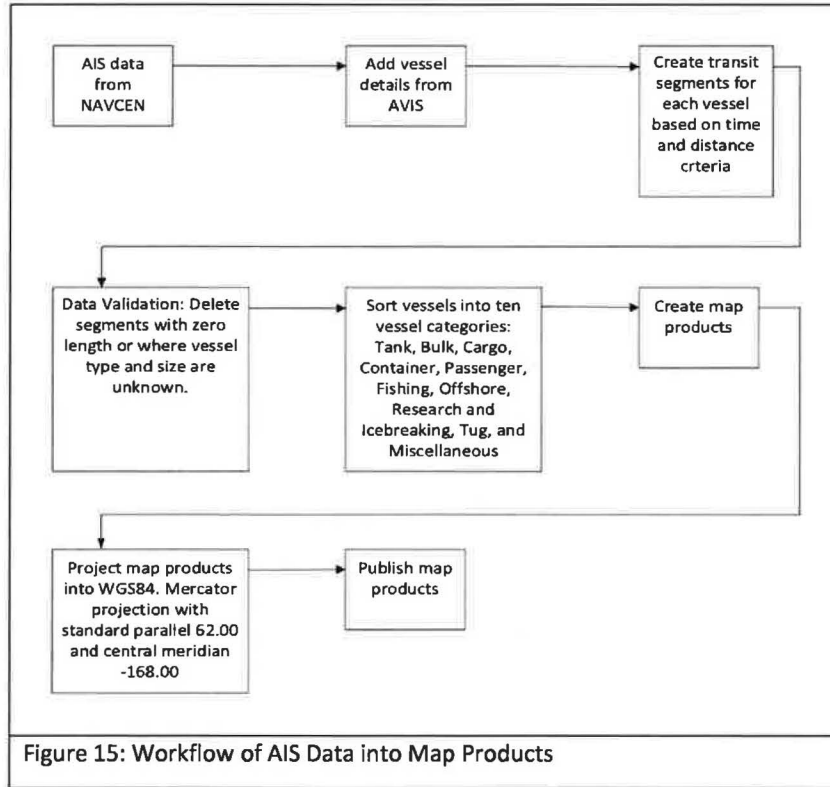


Figure 14: AIS Coverage Extent

- c. USCG NAVCEN provided AIS data as 5 minute aggregate point data in a CSV file format. Aggregation at 5 minute intervals occurred where more than one SAIS transmission was received for a specific vessel within a 5 minute time period. When only one SAIS transmission was received within a 5 minute period, it was not aggregated and has been provided as is without averaging. Aggregated data is not differentiable from non-aggregated data.
- d. The AIS data was augmented with information from the Authoritative Vessel Identification System (AVIS) maintained by USCG Operations Systems Center (OSC). The AVIS database is regularly updated from a number of reliable maritime information sources which results in an accurate and up to date database of vessel particulars for each vessel. Adding the AVIS data was useful to the Bering Strait PARS project because it offered additional vessel detail fields (such as a vessel's tonnage) for analysis that are not available within the AIS data, allowing for better qualitative analysis of vessels of particular concern, such as tank vessels carrying petroleum products or vessels with large numbers of passengers.

- e. Workflow used on AIS data and map production for the Bering Strait PARS.

Projection: Mercator
 Central Meridian: -168.0
 Standard Parallel: 62.0
 Geographic Coordinate System: WGS 1984



- f. Shown below are the individual vessel types that feed into each of the broader vessel categories, and the number of transit segments.

<u>Vessel Type</u>	<u>Transit Segments</u>	<u>Vessel Categories</u>
Chemical/Products Tanker	1,196	} Tank Vessel
Products Tanker	498	
Crude Oil Tanker	235	
Chemical Tanker	112	
LPG Tanker	70	
Crude/Oil Products Tanker	69	
LNG Tanker	57	
Asphalt/Bitumen Tanker	38	
Combination Gas Tanker (LNG/LPG)	2	
	2,277	
Bulk Carrier	20,120	} Bulk Carrier
Wood Chips Carrier	362	
Bulk Carrier, Self-discharging	21	
Bulk/Oil Carrier (OBO)	9	
Ore Carrier	2	
	20,514	

Vessel Type	Transit Segments	Vessel Categories
Vehicles Carrier	2,829	} Cargo Carrier
General Cargo Ship	1,927	
Open Hatch Cargo Ship	1,387	
Landing Craft	299	
General Cargo Ship (with Ro-Ro facility)	87	
Livestock Carrier	23	
Ro-Ro Cargo Ship	17	
General Cargo/Passenger Ship	6	
Heavy Load Carrier	4	
Heavy Load Carrier, semi submersible	4	
Palletised Cargo Ship	2	
	10,819	
Container Ship (Fully Cellular)	15,228	} Container Ship
Container Ship (Fully Cellular with Ro- Ro Facility)	6	
	15,234	
Passenger/Cruise	147	} Passenger Ship
Passenger/Ro-Ro Ship (Vehicles)	78	
Passenger Ship	9	
Air Cushion Vehicle Passenger/Ro-Ro Ship (Vehicles)	7	
	241	
Fishing Vessel	40,168	} Fishing Vessel
Stern Trawler	10,475	
Factory Stern Trawler	6,755	
Trawler	1,847	
Fish Factory Ship	1,174	
Fish Farm Support Vessel	227	
Fishery Research Vessel	193	
Fish Carrier	86	
	60,925	
Anchor Handling Tug Supply	159	} Offshore Vessel
Platform Supply Ship	116	
Standby Safety Vessel	40	
Drilling Ship	38	
Drilling Rig, semi submersible	23	
Crew/Supply Vessel	11	
Offshore Tug/Supply Ship	5	
FSO, Oil	3	
Diving Support Vessel	1	
	396	
Research Survey Vessel	428	} Research and Icebreaking Vessel
Icebreaker	116	
Icebreaker/Research	33	
	577	
Tug	5,651	} Tug Vessel
Pusher Tug	240	
Articulated Pusher Tug	58	
	5,949	
Salvage Ship	340	} Miscellaneous Vessels
Buoy Tender	130	
Pollution Control Vessel	48	
Yacht	36	
Search & Rescue Vessel	24	
Training Ship	16	
Grab Dredger	13	
Cable Layer	4	
Logistics Vessel (Naval Ro-Ro Cargo)	4	
	615	