United States Government Accountability Office

Report to Congressional Requesters

March 2014

MARITIME INFRASTRUCTURE

Key Issues Related to Commercial Activity in the U.S. Arctic over the Next Decade

GAO-14-299

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GAO Highlights

Highlights of GAO-14-299, a report to congressional requesters

Why GAO Did This Study

Decreasing seasonal sea ice has opened up Arctic waters for longer periods with resulting potential economic opportunities in commercial shipping, cruises, commercial fishing, oil, and mining. In light of the importance of U.S. efforts to effectively manage Arctic issues, GAO was asked to examine U.S. actions related to developing and investing in Arctic maritime infrastructure.

This report discusses (1) current commercial maritime activity in the U.S. Arctic and anticipated activity in the next 10 years, (2) actions taken by government entities in support of planning and developing U.S. Arctic maritime infrastructure, and (3) federal interagency efforts to identify and prioritize Arctic maritime-infrastructure investments. GAO interviewed representatives from the commercial-shipping, cruise, commercial-fishing, oil, and mining industries and government entities involved in the U.S. Arctic. Site visits were conducted to Nome, Barrow, and Anchorage, Alaska. These sites were selected based on factors such as geographic location and infrastructure activity.

What GAO Recommends

GAO is not making recommendations in this report. USCG, NOAA, the Department of Transportation, and the Department of the Interior sent GAO technical comments on this report, which were incorporated as appropriate. USACE did not have any comments on this report.

View a video of GAO's review of U.S. Arctic maritime infrastructure.

View GAO-14-299. For more information, contact Lorelei St. James at (202) 512-2834 or stjamesl@gao.gov.

What GAO Found

Commercial U.S. Arctic maritime activities are expected to be limited for the next 10 years, according to industry representatives, due to a variety of factors. Interviews with industry representatives highlighted a variety of general challenges related to operating in the Arctic, such as geography, extreme weather, and hard-to-predict ice floes. Industry-specific factors were also cited as contributing to limited commercial activity. For example, shipping companies noted higher costs with Arctic transit; cruise industry groups noted a lack of demand for Arctic cruises from the mainstream cruise-consumer base, and oil companies last drilled offshore exploratory wells in the U.S. Arctic in 2012.

Although the activity will likely be limited, federal, state, and local stakeholders have taken some actions to plan for future maritime-infrastructure investments. Some of these actions address factors that, as identified by industry representatives, contribute to the current and expected limited maritime activity in the U.S. Arctic. For example, the U.S. Army Corps of Engineers (USACE), in collaboration with the State of Alaska, has taken steps to study the development of an Arctic deepwater port; the lack of which is a factor identified by mining representatives as contributing to the expected limited mining activity in the U.S. Arctic. The U.S. Coast Guard (USCG) is in the preliminary phase of seeking to acquire a new polar icebreaker, which could be used for emergency response, research assistance, or patrols. The National Oceanic and Atmospheric Administration (NOAA) and the Alaska government are working to improve mapping, charting, and weather information for the U.S. Arctic.

The Committee on the Marine Transportation System (CMTS) published the *U.S. Arctic Marine Transportation System: Overview and Priorities for Action* in July 2013, which prioritized actions for developing Arctic maritime infrastructure and identified the lead agency for each action. This report prioritized two broad categories to be addressed in the near term: information infrastructure, such as mapping and charting, and response services, such as search and rescue. Implementation of the report's actions is at the discretion of each federal agency; however, according to CMTS officials, CMTS is currently developing a process to regularly monitor agencies' progress in addressing the recommended actions.

Adventure Cruise Ship and Barge at the Port of Nome, Alaska

Source: GAO.

Contents

Abbreviations

AIDEA	Alaska Industrial Development and Export Authority
AIS	Automatic Identification System
AMSA	Arctic Marine Shipping Assessment Report
Arctic IAT	Arctic MTS Integrated Action Team
ARPA	Arctic Research and Policy Act of 1984
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CMTS	Committee on the Marine Transportation System
DHS	Department of Homeland Security
DOI	Department of the Interior
DOT	Department of Transportation
FHWA	Federal Highway Administration
MARAD	Maritime Administration
MTS	marine transportation system
NOAA	National Oceanic and Atmospheric Administration
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USCGC	U.S. Coast Guard Cutter

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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March 19, 2014

The Honorable Timothy Bishop
Ranking Member
Subcommittee on Water Resources and the Environment
Committee on Transportation and Infrastructure
House of Representatives

The Honorable John Garamendi
Ranking Member
Subcommittee on Coast Guard and Maritime Transportation
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Lisa Murkowski
United States Senate

The Honorable Rick Larsen
House of Representatives

The recent retreat of sea ice in the Arctic, combined with an expected increase in human activity, has heightened the United States' and other nations' interests in the Arctic region. The United States, with the State of Alaska extending above the Arctic Circle, is one of eight Arctic nations.[1] Record low levels of sea ice over the past decade could have potential impacts on access to natural resources, the people who inhabit the region, and the U.S. economy. For example, diminishing sea ice has made some Arctic waters navigable for longer periods of time and, as a result, may contribute to new economic opportunities in commercial shipping, cruises, commercial fishing, oil, and mining. Growth in these types of commercial activities in the Arctic, however, could also increase the risk of negative maritime impacts, such as ship collisions or oil spills, and potentially increase demand for services such as search and rescue and other maritime navigation support.

Given the potential increase in commercial activity in the Arctic, there has been greater international focus on developing and investing in maritime

[1] The Arctic Circle latitude is 66° 33' 44" N.

infrastructure, such as deepwater ports and improved mapping and charting of Arctic waters. Maritime infrastructure could help facilitate transportation and commerce and be used to support activities such as search and rescue and emergency response. Within the United States, there are a variety of stakeholders that play a role in planning and developing maritime infrastructure in the Arctic, including the federal government, the state of Alaska, private investors, and others.

In light of changing conditions in the Arctic and the importance of U.S. efforts to effectively manage Arctic issues, you asked us to examine actions related to developing and investing in U.S. Arctic maritime infrastructure. This report examines:

- What is known about the extent of current commercial maritime activity in the U.S. Arctic, and according to stakeholders, what is the anticipated activity in the next 10 years?
- What actions have government entities taken in support of planning and developing U.S. Arctic maritime infrastructure, and what unique challenges exist, if any?
- What federal interagency efforts have been taken to identify and prioritize Arctic maritime infrastructure investments?

In the absence of a singular definition of the Arctic, federal agencies' definitions vary. In this report, we use the term Arctic to mean areas above the Arctic Circle and the term U.S. Arctic to discuss those areas that are U.S. waters and land as defined by the Arctic Research and Policy Act of 1984 (ARPA).[2] We focused on the development of maritime infrastructure on the waters and land along the western and northern coasts of Alaska, particularly the more remote areas north of the Bering Strait. Maritime infrastructure includes (1) the marine transportation system (ports, navigable waterways, and port connectors such as roads and railways); (2) aids to maritime navigation (buoys and beacons); (3) mapping and charting; (4) weather and sea ice forecasts; and (5) polar icebreakers. We focused on the commercial-shipping, cruises, commercial-fishing, oil, and mining industries as potential commercial operators in this region. Our scope does not include Arctic issues

[2] Pub. L. No. 98-373. 98 Stat. 1248 (codified at 15 U.S.C. § 4111). ARPA defines the Arctic as all United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas and the Aleutian chain.

pertaining to domain awareness, defense, or international affairs; we recently issued reports or are conducting ongoing work in these areas.[3]

To gather information for all three objectives, we reviewed program documentation and related reports and interviewed officials from the U.S. Army Corps of Engineers (USACE), the U.S. Coast Guard (USCG), the National Oceanic and Atmospheric Administration (NOAA), the Department of Transportation (DOT), the Committee on the Marine Transportation System (CMTS), the Department of the Interior's (DOI) Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE), and federal interagency coordinating bodies. We conducted site visits in 2013 to Nome, Barrow, and Anchorage, Alaska. We chose these site visits based on a variety of criteria, including geographic location in the state, number of interviews to be conducted, infrastructure activity, cultural considerations, and recommendations from stakeholders. During these site visits, we collected relevant documentation and interviewed a range of U.S. Arctic stakeholders such as officials from state and local government agencies, and representatives from Alaska Native organizations, Alaska Native corporations,[4] academic and research institutions, and companies. We also reviewed relevant documentation and interviewed representatives from other U.S. Arctic stakeholders such as engineering entities, environmental groups, and industry associations and companies. The results of these interviews are not generalizable, but do provide insights regarding current and planned-maritime activities in the U.S. Arctic. We reviewed prior GAO reports on several topics, including our body of work on Arctic issues and interagency collaboration.

[3] Maritime domain awareness is the effective understanding of anything associated with the global maritime domain that could affect the United States' security, safety, economy, or environment. GAO, *Coast Guard: Efforts to Identify Arctic Requirements Are Ongoing, but More Communication about Agency Planning Efforts Would Be Beneficial*, GAO-10-870 (Washington, D.C.: Sept. 15, 2010); GAO, *Arctic Capabilities: DOD Addressed Many Specified Reporting Elements in Its 2011 Arctic Report but Should Take Steps to Meet Near- and Long-term Needs*, GAO-12-180 (Washington, D.C.: Jan. 13, 2012); GAO is currently reviewing U.S. participation in the Arctic Council, expected to be published in spring 2014.

[4] Village and regional Alaska Native corporations were established pursuant to the Alaska Native Claims Settlement Act primarily as vehicles for distributing land and monetary benefits to Alaska Natives to provide a fair and just settlement of aboriginal land claims in Alaska. Pub. L. No. 92-203, 85 Stat. 688 (1971).

To describe what is known about commercial activity in the U.S. Arctic, we interviewed companies and industry trade associations from the commercial-shipping, cruise, commercial-fishing, oil, and mining industries. To describe actions federal, state, and local government entities have taken in support of the U.S. Arctic marine transportation system, we interviewed and collected documentation from 7 federal, 10 state, and 6 local government entities to identify infrastructure within the scope of responsibility for each entity. We also identified specific efforts each entity has taken related to mapping, ports, port connectors, weather and sea-ice data, polar icebreakers, and aids to navigation. To describe federal interagency efforts taken to identify and prioritize Arctic maritime infrastructure investments, we reviewed a key federal government report and prior GAO reports on several topics including our body of work on Arctic issues and interagency collaboration. See appendix I for additional information on our scope and methodology.

We conducted this performance audit from February 2013 through March 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Alaska and the Arctic

Alaska's location makes the United States an Arctic nation. Alaska has extensive maritime access, with over 6,000 miles of coastline, bordered by the Beaufort, Chukchi, and Bering Seas; the Arctic Ocean; the Gulf of Alaska; and the Bering Strait, whose jurisdiction is divided between the United States and Russia. See figure 1. The Bering Strait provides the only access to the Arctic Ocean from the Pacific Ocean, which lies south of the Aleutian Islands. Federal waters typically extend from 3 to 200 nautical miles offshore, and state waters for coastal states such as Alaska generally extend from the state coastline up to 3 nautical miles offshore. Within the complex array of federal and state maritime boundaries, all navigable waters of the United States are subject to some type of federal jurisdiction.

Figure 1: Alaska and Adjacent Bodies of Water

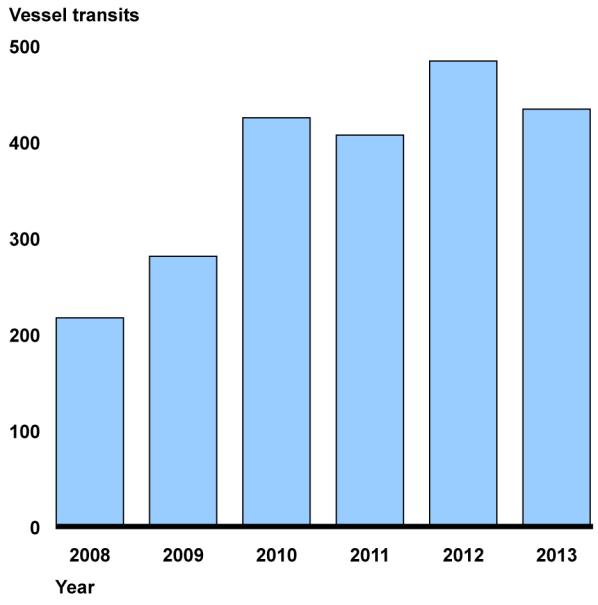
Sources: GAO and Map Resources.

There is evidence that the Arctic sea ice cover has diminished, which has increased interest in shipping into and through the U.S. Arctic during the summer months. As seasonal sea ice diminishes, the time and extent to which vessel traffic can use Arctic waters increases.[5] There are two types of shipping that occur in the U.S. Arctic: "destinational" and "trans-Arctic." Currently, most shipping in the U.S. Arctic is destinational. Destinational shipping refers to shipping into or out of the Arctic, mainly in support of commercial activity. It includes, for example, shipping that supports seasonal oil-drilling operations in U.S. Arctic waters and tugs and barges that provide diesel oil and other commodities to remote Alaskan villages. Destinational shipping to the U.S. Arctic coast through the Bering Strait usually begins in July and ends by mid-October.

[5] For additional information on sea ice, see appendix II.

Trans-Arctic shipping refers to use of the Arctic as a route between two destinations outside of the Arctic. There are two primary trans-Arctic sea routes. The Northwest Passage follows the northern coasts of Alaska and Canada, connecting the east coasts of Canada and Asia. The Northern Sea Route follows the northern border of Russia, connecting Asia and Europe. Increased trans-Arctic use of the Northern Sea Route could affect the U.S. Arctic because the eastern entry/exit point passes through the Bering Strait. According to USCG data, vessel transits through the Bering Strait, for both northbound and southbound destinational and trans-Arctic traffic, ranged from 217 to 484 transits annually from 2008 to 2013. See figure 2.

Figure 2: Number of Bering Strait Vessel Transits, 2008–2013



Source: U.S. Coast Guard.

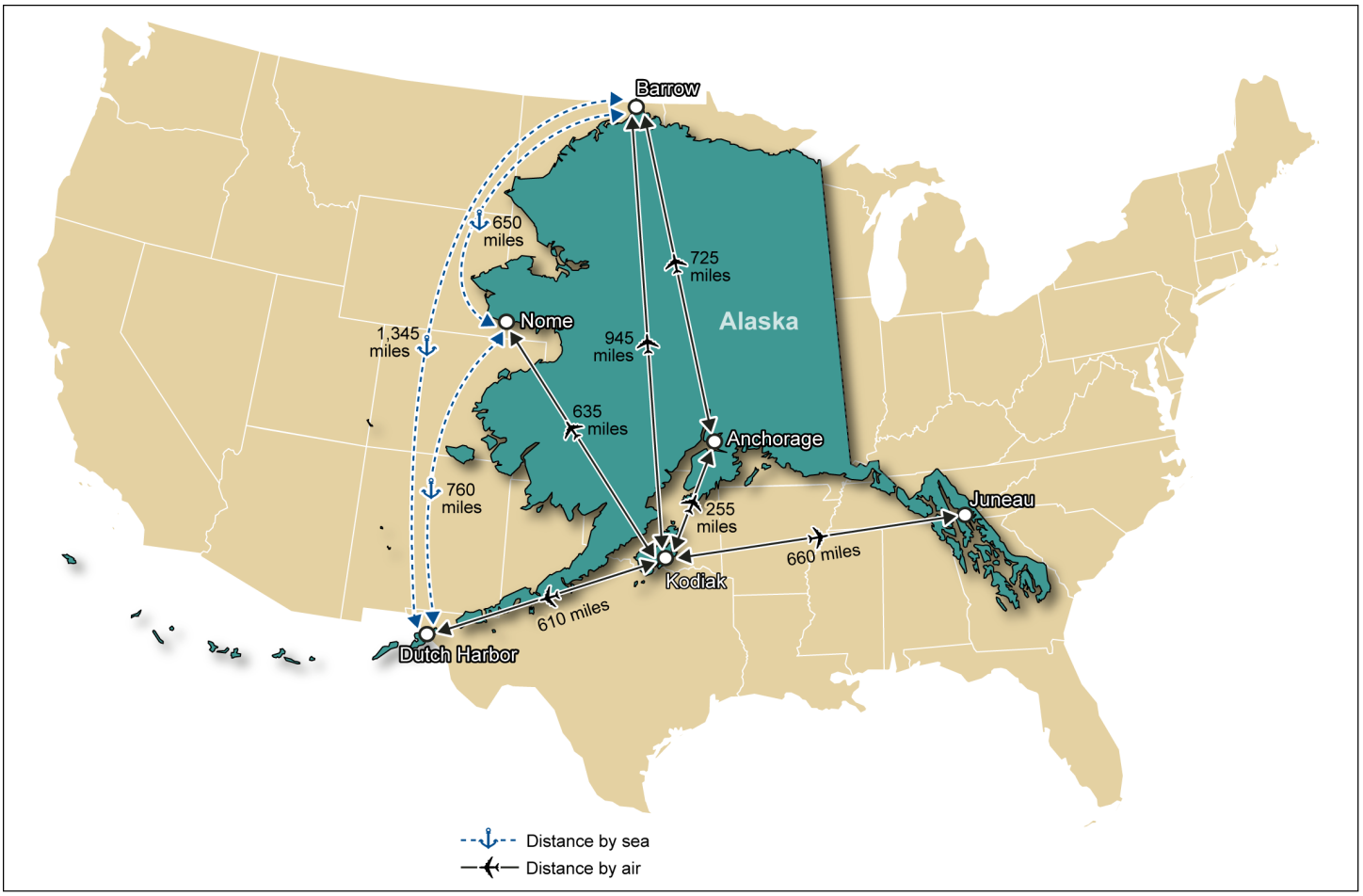
Alaska is the largest U.S. state, but with a small population, the lowest population density in the country, and large travel distances. See figure 3. In addition, Alaska's geography is diverse with mountainous terrains, and areas of the state that are completely iced-in most of the year. Consequently, Alaska's transportation systems are unique compared to those of the contiguous states. Highway and rail infrastructure is primarily located in the south central region of the state, and many cities do not have highway connections to the rest of the state. There is one rail line running 500 miles from the south central region of the state to the interior

(from Seward and Whittier to Fairbanks, Alaska).[6] Many Alaskan cities and villages are accessible only by air or water. Consequently, there are a number of general aviation airports[7] and small ports and harbors, and the dominant modes of transportation are air service and barge service along coastal and inland waterways. See figure 4.

[6] There is also a narrow gauge rail line that provides tourist trips from Skagway, Alaska, to the Canadian Border.

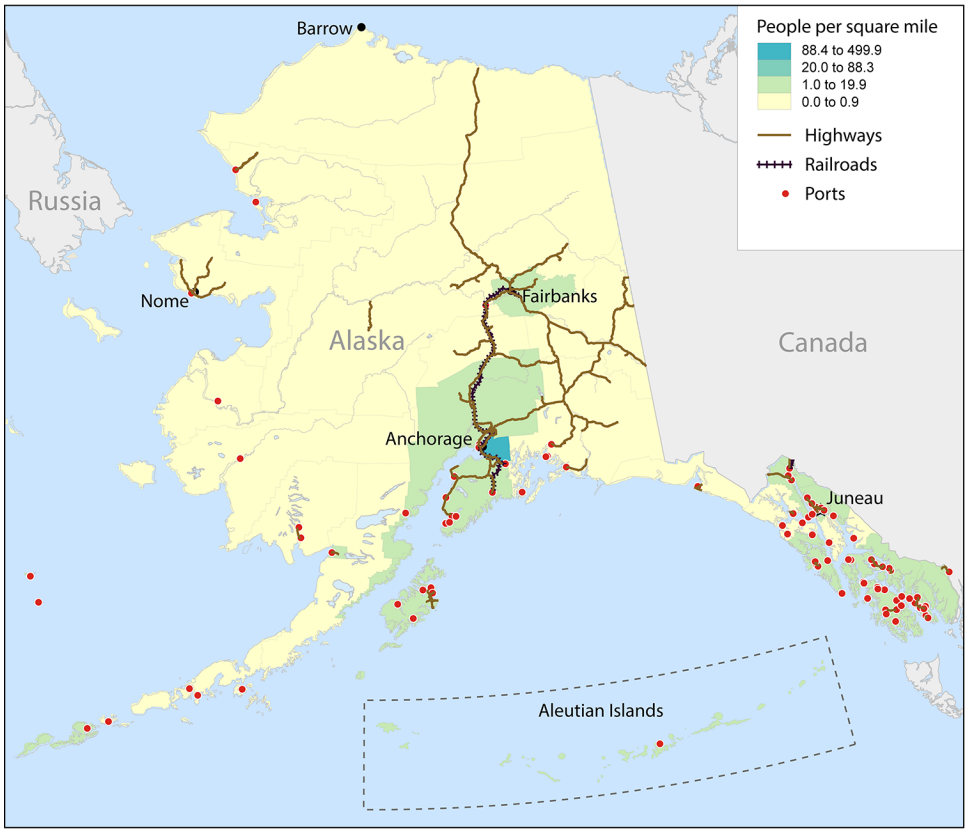
[7] The FAA Modernization and Reform Act of 2012 defines a general aviation airport as a public airport that is located in a state and that, as determined by the Secretary of Transportation, does not have scheduled service or has scheduled service with fewer than 2,500 passenger boardings each year (Pub. L. No. 112-95, 126 Stat. 11, 21).

Figure 3: Air and Sea Travel Distances in Alaska



Sources: National Oceanic and Atmospheric Administration, United States Coast Guard, Map Resources, and GAO.

Figure 4: Still from Video Showing Population Density, Highways, Railroads, and Ports in Alaska



Source: GAO presentation of Alaska Department of Transportation and Public Facilities maps.

Note: To view the full video, please click on the hyperlink.

Multiple Federal and Other Stakeholders Have Arctic Maritime Infrastructure Responsibilities

There are a wide variety of federal, state, local, and other stakeholders that play a role in planning, developing, and managing U.S. Arctic maritime infrastructure. Table 1 shows some key federal agencies with Arctic maritime-infrastructure responsibilities.

Table 1: Key Federal Agencies and the U.S. Arctic Maritime Infrastructure for which They Are Responsible

Federal agency[a]	Infrastructure components	Description
U.S. Army Corps of Engineers	Ports[b]	Ports serve as gateways for the movement of goods between navigable waterways and landside transportation systems.
U.S. Coast Guard[c]	Aids to navigation[d]	Aids to navigation are placed to enable a vessel to determine its position, determine a safe course to steer or avoid unseen dangers.
	Polar icebreakers	Specially designed cutters for open-water icebreaking that are capable of operating in the Arctic and Antarctic region. Icebreakers are used for activities such as search and rescue, environmental response, and scientific research, among others.
National Oceanic and Atmospheric Administration	Mapping and charting	Information to produce nautical charts depicting shoreline, depths, hazards, and recommended routes for navigation safety.
	Weather and water forecasts	Monitoring and information for mariners and coastal communities on forecasts and warnings of weather conditions for safe operations.
	Sea ice analysis and forecasts	Analysis and forecasts of sea ice location, concentration, and thickness out to 5 days, as well as seasonal and decadal prediction of ice extent.
Department of Transportation	Port connectors	Roads, railways, and pipelines that connect to maritime transportation to allow freight to transfer from one transportation mode to another (e.g., from a barge to a truck).

Source: GAO analysis of agency information.

[a]In addition to these federal agencies, the Department of the Interior (DOI) also plays a role, but does not specifically develop or invest in maritime infrastructure. DOI's Bureau of Ocean Energy Management (BOEM) manages mineral and energy resources on the outer continental shelf and periodically conducts lease sales for these resources off the coast of Alaska. The Bureau of Safety and Environmental Enforcement (BSEE) develops and enforces regulations that ensure the safety of oil and gas exploration, and environmental protection including oil-spill response planning and preparedness, and spill abatement. The outer continental shelf refers to the submerged lands outside the territorial jurisdiction of the state, but within U.S. jurisdiction and control.

[b]The USACE is the lead federal agency for maintaining and improving navigable waterways including the harbors in ports. While local taxes, private investment, and port authorities typically finance port infrastructure, the USACE provides port feasibility, planning, design, and construction support.

[c]The U.S. Coast Guard is a component of the Department of Homeland Security. U.S. Coast Guard also operates other ice-capable ships, such as buoy tenders, but aids to navigation and polar icebreakers are the only assets evaluated by this report.

[d]There are various types of aids including fixed and floating aids (e.g., beacons, day markers, fog signals, buoys) for short-range navigation. However, for the purposes of this report we limited the scope of our review of aids to navigation to buoys and beacons.

There are also a variety of non-federal stakeholders with responsibilities in planning, developing, and managing Arctic maritime infrastructure including international entities, the state of Alaska, local governments, Alaska Native organizations, and non-profits that work with federal agencies to plan and develop maritime infrastructure. For additional information on Arctic stakeholders and maritime infrastructure components, see appendix III.

Federal agencies' involvement in planning and developing Arctic maritime infrastructure is guided by several national policies.[8] The Administration issued the Arctic Region Policy in 2009, which addresses issues related to national security, international governance, international scientific cooperation, economic issues, environmental protection, and maritime transportation in the Arctic region.[9] It specified that priorities for maritime transportation include safe navigation, protection of maritime commerce, and protection of the environment. It recognized the need for infrastructure to support shipping activity, and search and rescue capabilities, among others. The White House National Ocean Council issued the National Ocean Policy Implementation Plan in April 2013.[10] While this plan is broader than the Arctic region, it specifically identifies the need for improvements to communications, environmental response to marine pollution and oil spills, the ability to observe and forecast sea-ice, and the accuracy of charts and maps of the region. In May 2013, the White House issued a National Strategy for the Arctic Region.[11] This document was created to articulate the strategic priorities for the Arctic

[8] In addition, some federal agencies have also issued strategic plans for the Arctic. For example, NOAA issued its *Arctic Vision and Strategy* in 2011, the USCG and Department of Defense both published their Arctic Strategies in 2013, and the U.S. Navy published its *Arctic Roadmap for 2014-2030* in 2014.

[9] White House, *Arctic Region Policy*, National Security Presidential Directive/NSPD-66 and Homeland Security Presidential Directive/HSPD-25 (Jan. 9, 2009).

[10] National Ocean Council, *National Ocean Policy Implementation Plan* (Washington, D.C.: April 2013). A *National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes* and the National Ocean Council was established by Executive Order 13547 on July 19, 2010. The council consists of 27 federal agencies, departments, and offices. The *National Ocean Policy Implementation Plan* was created to translate the *National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes* into on-the-ground actions.

[11] White House, *National Strategy for the Arctic Region* (Washington, D.C.: May 10, 2013).

region and to position the United States to meet the challenges and opportunities that lie ahead, such as evolving the Arctic infrastructure and charting and mapping the Arctic region's oceans and waterways. It prioritizes and integrates the work of federal agencies with activities that are already under way in the state of Alaska and at the international level. An implementation plan for this document was released in January 2014 that sets forth the methodology, process, and approach for executing the strategy, including a framework to guide federal activities in the construction, maintenance, and improvement of ports and other Arctic infrastructure.[12]

Committee on the Marine Transportation System and Arctic Maritime Infrastructure

A Presidential Directive in the U.S. Ocean Action Plan, issued in 2004, created the Committee on the Marine Transportation System (CMTS), chaired by DOT.[13] The CMTS is supported by a sub-cabinet policy advisory body, the Coordinating Board, a dedicated staff body, the Executive Secretariat, and Integrated Action Teams. The Arctic Integrated Action Team (Arctic IAT) is led by the Coast Guard, Maritime Administration (MARAD), and NOAA. In 2012, the Coast Guard and Maritime Transportation Act of 2012 established the CMTS in statute and requires CMTS to serve as a federal interagency coordinating committee to (1) assess the adequacy of the marine transportation system (MTS), (2) promote the integration of the MTS with other modes of transportation and other uses of the marine environment, and (3) coordinate and make recommendations with regard to federal policies that affect the MTS.[14]

[12] White House, *Implementation Plan for the National Strategy for the Arctic Region* (Washington, D.C.: Jan. 30, 2014).

[13] The U.S. Ocean Action Plan elevated the then existing Interagency Committee on the Marine Transportation System to the Cabinet-level CMTS. Members of the CMTS include the Secretary of Transportation; Secretary of Commerce; Secretary of Defense; Secretary of Homeland Security; Secretary of the Treasury; Secretary of State; Secretary of the Interior; Secretary of Agriculture; Attorney General; Secretary of Labor; Secretary of Energy; Chairman of the Joint Chiefs of Staff; Administrator of the Environmental Protection Agency; and the Chairman of the Federal Maritime Commission. In addition, there are five Ex-Officio members of the Committee: Director, Office of Management and Budget; Chairman, Council on Environmental Quality; Assistant to the President for Homeland Security; Assistant to the President for Domestic Policy; and Assistant to the President for Economic Policy.

[14] Pub. L. No. 112-213, 126 Stat. 1540, 1567-68.

In 2010, Congress directed the CMTS to coordinate the establishment of domestic transportation polices in the Arctic to ensure safe and secure maritime shipping and the implementation of the Arctic Council's Arctic Marine Shipping Assessment Report.[15] In response in 2013, CMTS published the U.S. Arctic Marine Transportation System: Overview and Priorities for Action (Arctic Report), developed by the Arctic IAT and subject to extensive interagency review, which reviewed maritime traffic in the U.S. Arctic, current conditions of U.S. Arctic maritime infrastructure, and current Arctic MTS policies, among other things.[16]

[15] The Coast Guard Authorization Act of 2010 (Pub. L. No. 111-281, 124 Stat. 2905, 2928.) mandated that CMTS coordinate the establishment of domestic transportation policies in the Arctic related to ensuring safe and secure maritime shipping in the Arctic. In 2009, the Arctic Council (comprised of eight circumpolar states—Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States) approved the *Arctic Marine Shipping Assessment* (*AMSA*) *Report*. AMSA highlighted the lack of marine infrastructure available to the region and made a number of recommendations to enhance Arctic marine transportation safety, protect Arctic people and the environment, and build Arctic marine infrastructure.

[16] U.S. Committee on the Marine Transportation System, *U.S. Arctic Marine Transportation System: Overview and Priorities for Action* (Washington, D.C.: 2013).

Key Selected Industries Projected Limited Commercial Maritime Activity in the U.S. Arctic over the Next Decade

Diminishing sea ice has contributed to promising prospects for oil and gas in the U.S. Arctic[17] and created growth potential for commercial shipping on trans-Arctic routes that are geographically shorter than current shipping routes through the Panama or Suez Canals. However, industry representatives we spoke with from five key industries— commercial shipping, cruises, commercial fishing, oil, and mining—stated that their level of commercial activity in the U.S. Arctic is expected to remain limited over the next 10 years due to a variety of contributing factors. Factors included general challenges related to operating in the Arctic such as geography, extreme weather, and hard-to-predict sea ice movement,[18] and other industry-specific factors. Table 2 provides some examples of contributing factors cited by industry representatives.

[17] According to DOI officials, factors such as the sustained high price of oil and the identified resource potential of large oil fields were greater factors than the diminishing sea ice. Oil companies are not leasing any new areas offshore that are in any deeper waters or farther north than they did in the 1980s. According to a recent report by the Interagency Working Group on Coordination of Domestic Energy and Permitting in Alaska, over 23 billion barrels of technically recoverable oil and 108 trillion cubic feet of technically recoverable gas are estimated to lie in the outer continental shelf (OCS) of the Beaufort and Chukchi Seas. Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska, *Managing for the Future in a Rapidly Changing Arctic: A Report to the President* (Washington, D.C.: March 2013).

[18] We have recently reported that despite the diminished sea ice, Arctic navigation challenges still remain. GAO, *Arctic Capabilities: DOD Addressed Many Specified Reporting Elements in Its 2011 Arctic Report but Should Take Steps to Meet Near- and Long-term Needs*, GAO-12-180 (Washington, D.C.: Jan. 13, 2012). Large amounts of winter ice still exist in Arctic waters, and there is increased movement of ice around the waters from spring to fall. Increased movement of sea ice heightens the risk that ships may become trapped or damaged by ice impacts.

Table 2: Summary of Commercial Use of the U.S. Arctic Based on Interviews with Selected Industries

Industry	Current and expected levels of activity in the next 10 years	Cited factors contributing to limited activity
Commercial shipping	For trans-Arctic shipping, use of the Northern Sea Route has so far been limited, but some shippers are open to its possible future use. Few of the shipping companies we spoke with have used the Northwest Passage or have plans to use it in the next 10 years.	• Higher per-unit shipping costs for Arctic transit. • Additional vessel and crew requirements needed for Arctic transit. • Increased risk and uncertainty due to extreme and unpredictable weather.
Cruises	Cruise tourism in the U.S. Arctic is limited and is expected to remain a small niche adventure cruise market.	• Lack of demand from the mainstream cruise consumer base for U.S. Arctic cruises.
Commercial fishing	Commercial fishing is primarily focused in and around the Bering Sea, which is part of the U.S. Arctic.	• Commercial fishing is prohibited in U.S. waters north of the Bering Strait. It is unknown when, if ever, federal or state waters will open to commercial fishing in that area.
Oil	Recently, oil companies have made some investments to develop offshore oil resources in the U.S. Arctic. These development efforts, however, are generally on hold and increases in oil exploration activity are expected to be limited. The impact of oil exploration activity on the levels of maritime traffic appears uncertain.	• Timeline to oil production in the Arctic is unknown. • Future transport of oil will likely be through a sub-sea pipeline rather than a tanker ship. • Uncertainty regarding oil prices and variable industry trends.
Mining	Currently only one major mine operates in the U.S. Arctic. Two new mines are being planned or considered. However, according to industry representatives, the new mines would likely not contribute to additional maritime vessel traffic.	• Lack of intermodal connectors such as road and rail. • Lack of a deepwater port in the region.

Source: GAO analysis of agency information.

Commercial Shipping

For decades destinational shippers have provided transport services such as fuel and supplies for coastal villages north of the Bering Strait, hauled construction materials and equipment to support local development, and exported zinc-lead ore from the Red Dog Mine during the summer

months. To date, the diminished sea ice has not greatly increased the volume of destinational shipping activity, with the exception of an increase in vessels and barge traffic in 2012 to support an oil company's exploration during that summer's drilling season.

Trans-Arctic shipping using the Northern Sea Route or Northwest Passage has so far been limited,[19] but some shippers are open to potentially using the Northern Sea Route in the future. According to Russia's Northern Sea Route Administration records, 635 permits had been issued for vessels to operate along the Northern Sea Route in 2013.[20] However, according to reports from the Northern Sea Route Information Office, 71 ships had transited the entire route in 2013. Of the shipping companies we contacted, one company indicated it had used the Northwest Passage to transit the Arctic.[21] Representatives from the companies we spoke with said there is greater interest in use of the Northern Sea Route because it has relatively less sea ice than along the Northwest Passage, and the geography and shallow depths of the Northwest Passage make it less viable for trans-Arctic shipping. According to shippers and industry associations we spoke with:

- Container shipping companies are not interested in either the Northern Sea Route or the Northwest Passage as a shipping route.[22]
- Bulk shipping companies have completed several transits using the Northern Sea Route and potentially will do more. However, only one bulk shipper has completed a transit through the Northwest Passage, doing so in 2013.
- According to a tanker industry group, only one of its members has transited the Northern Sea Route using an ice-classed vessel;

[19] Although there has been an increase in vessel transits through the Bering Strait, for both northbound and southbound destinational and trans-Arctic traffic, the number of transits was 434 in 2013. By comparison, the Panama Canal had 13,660 transits in fiscal year 2013.

[20] The Government of the Russian Federation established the Northern Sea Route Administration to organize navigation in the water area of the Northern Sea Route.

[21] Data on transits through the Northwest Passage is not known to be collected by any U.S. Government entity.

[22] One shipping company representative told us that in 2013, media sources had credited a Chinese container shipping company with the first container ship transit of the Northern Sea Route that year, but the ship was actually a smaller multi-purpose ship, not a container ship vessel that would be used for container cargo transportation.

however, other companies are interested in the route's potential. Tanker companies have not used the Northwest Passage for trans-Arctic shipping.

Shipping industry representatives we spoke with highlighted a number of contributing factors that can affect plans for trans-Arctic shipping, including higher costs, specialized vessel requirements, and the lack of reliability in terms of weather and ice—particularly the sea ice presence in the Northwest Passage.[23] First, using Arctic routes would incur additional costs that may not outweigh the benefits. For example, the shipping industry uses a network of ports, but there is not a U.S. port in the network north of the Bering Strait. A representative from a major container shipping company stated that even if a port were built, since the passages are not open year-round, it would require companies to modify their schedules for those months the Arctic is open, which could be expensive and disruptive.[24] Second, transiting Arctic routes would require ice-strengthened vessels, which have less shipping capacity due to increased weight.[25] In particular, the shallower waters along the Northwest Passage can only accommodate a smaller vessel, which may not present the necessary economies of scale to warrant shipping companies modifying their schedules to use an Arctic route. Finally, shipping representatives told us that the consistent presence of sea ice, bad visibility, high winds, and uncharted waters all raise the risk of transiting the Arctic. A container ship company representative stated that the container-shipping industry is reliant on strict schedules, and the unpredictability of sea ice and weather makes the trans-Arctic passages less reliable. A tanker-shipping industry representative added that ship

[23] Although old, thick Arctic sea ice is diminishing, the seasonal sea ice along the U.S. Arctic coastline continues to be present. Additionally, the general Arctic Ocean circulation pushes older ice toward Alaska and Canada, which could particularly affect safe navigation of the Northwest Passage in the summer.

[24] Schedule integrity is important in the container-shipping industry because of shipments of components (just-in-time inventory). A delay of the receipt of inventory could hold up production in factories, which would affect the shipping company's business. According to a representative from a major container shipping company, because ships can only be used in the Arctic for up to 4 months a year, the costs of operating in the Arctic for only part of the year is currently unfeasible.

[25] One shipping company stated that it ruled out the potential for operating in Arctic waters at an early stage during the design of its new vessels, which are expected to be in the fleet for the next 30 years. Companies we spoke with that are interested in using Arctic routes already own ice-strengthened vessels, which they use year-round outside of the Arctic in places that have Arctic-like conditions.

captains are not willing to take vessels loaded with oil through uncharted waters, such as those in much of the Arctic. Similarly, a recent study published by MARAD stated that the availability of an Arctic route seems unlikely over the next 10 to 20 years due to uncertainties surrounding the rate at which sea ice will diminish; the lack of U.S. trade lanes that would provide sufficiently shorter sailing distances to make an Arctic route relevant; and the investments needed for escort vessels, staging ports, and channel preparations.[26]

Cruises

A handful of cruises each year sail in the U.S. Arctic, and the number is expected to remain relatively stable through the next 10 years. Cruise ships that sail above the Bering Strait in the U.S. Arctic are a niche segment of the adventure cruise market. According to representatives from an Alaska cruise association, only one of its members currently uses the Northwest Passage once or twice per year with small cruise ships that carry fewer than 200 passengers. By comparison, mainstream cruise vessels, which operate in southeast Alaska, can carry more than 1,000 passengers each.

Cruise industry representatives we spoke with expect cruise tourism in the Northwest Passage to remain limited to adventure cruises for the next 10 to 15 years. The representatives did not believe that mainstream cruise companies would offer U.S. Arctic tours in the foreseeable future or that additional charting or mapping, icebreakers, or search and rescue capabilities in the Arctic would increase cruise traffic in the Northwest Passage. According to representatives from a cruise association, the primary reason for the limited number of Arctic cruises is a lack of demand from the mainstream cruise consumer base. They noted that approximately 10 days are required to sail the long distances in the U.S. Arctic, often with no variation in scenery and no points of interest for which to disembark.

Commercial Fishing

Commercial fishing is currently prohibited in U.S. waters north of the Bering Strait under a federal Arctic Fishery Management Plan for the

[26] U.S. Department of Transportation and Maritime Administration, *Panama Canal Expansion Study: Phase I Report Developments in Trade and National and Global Economics* (Washington, D.C.: November 2013).

region implemented in a National Marine Fisheries Service final rule.[27] The 2009 final rule implementing the North Pacific Fishery Management Council's Arctic Fishery Management Plan places a ban on all commercial fishing in specified U.S. waters north of the Bering Strait in the U.S. exclusive economic zone,[28] which includes the Beaufort and Chukchi Seas, "until sufficient information is available to enable a sustainable commercial fishery to proceed." Two commercial-fishing industry representatives we spoke with said that it is not certain when, if ever, federal or state waters will open to commercial fishing. There is little industry interest in establishing commercial fisheries north of the Bering Strait until researchers are able to determine the impact of commercial fishing. So far, the industry representatives have not seen a big move of fish stock north due to diminished sea ice, which, in their view, would be a reason to open those waters. According to industry representatives, no increases in commercial fishing are expected in the next 10 years.

Oil

Recently, oil companies have invested in initial exploration for offshore oil resources in the U.S. Arctic.[29] Three major oil companies that hold offshore leases in the Beaufort and Chukchi Seas are in the exploration phase of their sites and may still be decades away from production, according to industry representatives.[30] One company began drilling two exploratory wells in 2012, with 25 vessels supporting these drilling operations, which increased the destinational maritime traffic that

[27] 74 Fed. Reg. 56734 (Nov. 3, 2009).

[28] The United States has jurisdiction over the U.S. exclusive economic zone—an area typically extending from 3 to 200 nautical miles off the coast—including jurisdiction to manage natural resources and protect and preserve the marine environment.

[29] In Alaska's Arctic, oil production has occurred at the onshore Prudhoe Bay oil field, on the North Slope, since 1977. As of 2012, Prudhoe Bay has produced approximately 12-billion barrels of oil. By comparison, over 23-billion barrels of oil are estimated by DOI to be recoverable in the Beaufort and Chukchi Seas.

[30] Seven oil companies purchased over 400 offshore oil leases in the DOI's 2008 auctions for the Beaufort and Chukchi Seas; however, three companies are currently key leaseholders.

season.[31] However several well-publicized incidents halted operations.[32] None of the three companies chose to conduct exploratory offshore drilling for the 2013 drilling season, but instead conducted site-surveying activities such as "bathymetric" mapping.[33]

In the next 10 years, oil exploration activity is expected to be limited and the impact on the levels of maritime traffic appears uncertain.[34] Representatives from two companies said that they had not decided when they will resume exploration and that they are awaiting DOI's proposed rule for Alaska Outer Continental Shelf drilling before determining their plans for the 2014 drilling season.[35] A third company recently decided to stop its exploration program for Alaska in 2014 citing unresolved legal issues stemming from a January 2014 decision of the U.S. Court of Appeals for the Ninth Circuit, affecting proposed DOI oil and gas leases in the Chukchi Sea off the northwest coast of Alaska, that, among other things, remanded the case to the U.S. District Court for the District of Alaska for further proceedings.[36] Several factors create uncertainty about how future oil exploration activities may affect maritime traffic. First, it is unknown when and whether U.S. Arctic offshore oil production will begin. One industry representative we spoke with

[31] Under the Oil Pollution Act of 1990 (Pub. L. No. 101-380, 104 Stat. 484) and implementing regulations, oil companies are required to prepare and submit oil-spill response plans under which they are to provide oil-spill response capabilities in conjunction with their activities. In the Arctic, established organizations exist to support offshore spill response with assets including vessels and trained personnel. Additionally, companies may have their own assets for spill response, well containment, and control.

[32] For example, an inspection on a drill rig identified significant violations and another drill rig that had been operating in the Beaufort Sea came loose from a towing vessel and ran aground near Kodiak Island.

[33] "Bathymetry" is the study of water body "floors," including oceans, lakes, and streams.

[34] Leaseholders must submit an exploration plan to BOEM and obtain approval, before conducting any exploration activities on a lease. 30 C.F.R. § 550.201 (a).

[35] According to DOI officials, the proposed regulations are due to be released for comment in 2014.

[36] *Native Village of Point Hope, et. al. v. Jewell, et. al*., 2014 U.S. App. LEXIS 1222 (9th Cir. Jan. 22, 2014).

estimated 10 years or more until oil production can begin.[37] The production stage could increase seasonal, destinational traffic due to the increase in support vessels. Second, even if companies eventually begin producing oil in the U.S. Arctic, an industry association and company representatives stated that the oil would likely be transported through a sub-sea pipeline to land where it would then connect to the Trans-Alaska Pipeline System, rather than being transported by tanker.[38] According to an oil-industry association representative, transporting the oil by tanker is not the preferred option because it presents a greater risk for spills because of floating ice, shallow waters, and potential collisions with other vessels. Finally, uncertainty regarding oil prices and variable industry trends also can affect the oil industry activity in the U.S. Arctic. For oil companies, the U.S. Arctic presents one potential oil production opportunity that must be weighed against other potential sites. According to an oil industry association representative, oil companies focus on those areas and production sites that provide the best business opportunities. Currently the costs of developing the offshore oil fields in the Arctic are not as competitive as other investment opportunities emerging in shale oil fields across the United States.

Mining

The Red Dog Mine, which opened in 1989 and is located near Kotzebue, is currently the only mine operating in the U.S. Arctic. The Red Dog Mine is serviced by a port facility and a road known as the DeLong Mountain Transportation System. The port is accessible for shipping a few months each year, so the mine stores its zinc ore at the DeLong facility and typically ships it to customers through the Bering Strait from July to October each year.

Currently there is one new mine being planned in the U.S. Arctic, and one under consideration. Plans exist to develop a copper mine in the Ambler

[37] According to the oil industry representative, it could take 2 to 3 years for exploration and then 2 to 3 years for the permitting process for production. The industry also anticipates a round of litigation over regulatory issues such as environmental impacts. After the permits for production, it would take 2 to 3 years to construct the infrastructure, and then production can begin. In total, offshore oil production could be about a decade away. Another oil company representative also estimated production to be more than a decade away.

[38] The Trans-Alaska Pipeline System is an 800-mile pipeline that runs from Prudhoe Bay on the North Slope of Alaska to the Port of Valdez in southern Alaska.

Mining District, which is located 180 miles southeast of the Red Dog Mine, but production would not begin for at least 6 years, and the method for transporting the copper ore has not been determined. In addition, an Alaska Native regional corporation is considering development of a coalmine on the North Slope and is currently assessing a location for a potential deepwater port to transport the coal. The effect of the planned mines on the levels of maritime traffic appears uncertain in the next 10 years. Mineral deposits are in remote locations and would require the development of significant infrastructure, such as roads capable of carrying freight, rail, or a deepwater port to transport the ore. Mining companies, such as those in the Ambler Mining District, have considered using the DeLong Terminal to ship ore, but have not done so due to its shallow depth. While the port may have sufficient depth to ship Red Dog Mine's zinc ore, a deepwater port would be needed for heavier copper ore. According to the representative, mining companies would be interested in using ports to export extracted minerals, but do not plan to develop port infrastructure on their own.

Government Entities Have Taken Some Actions to Support U.S. Arctic Maritime Infrastructure, Though Development Presents Unique Challenges

Federal and State Government Entities Have Taken Some Actions to Support the U.S. Arctic MTS

Federal and state government entities have taken some actions to support the existing Arctic maritime infrastructure and plan for future maritime infrastructure investments. Table 3 below describes the current status of existing maritime infrastructure to support the Arctic MTS. Some government actions help to address the factors that some industry representatives identified as limiting their current and expected activity in U.S. Arctic. For example, the USACE, in collaboration with the State of Alaska, has taken steps to study the development of an Arctic deepwater port, a factor identified by mining representatives as contributing to the industry's limited activity. Given the level of interest in developing the Arctic, we reviewed efforts by the various government entities to plan and

develop maritime infrastructure such as ports; aids to navigation; polar icebreaking; mapping, charting, and weather information; and port connectors, such as rail and roads.

Table 3: Status of Existing U.S. Arctic Maritime Infrastructure, 2013

Infrastructure components	Description
Ports	There are no U.S. Arctic deepwater ports. Most of the harbors and coastal ports north of the Aleutian Islands are shallow and primarily support barge service supplying fuel to coastal villages and are not sufficiently deep to support larger, commercial vessels such as container or tanker ships.
Aids to navigation	Currently, there are 9 fixed aids to navigation north of the Bering Strait that mark the entrance to Kotzebue Sound and support vessels bound for the Red Dog Mine. There are no federally maintained aids along the north coast of Alaska, but there are 11 privately maintained aids near Prudhoe Bay.
Polar icebreaking	The Coast Guard operates the nation's two functioning icebreakers, which are used in the Arctic for emergency response, research assistance, and patrols.
Mapping and charting, weather, water and sea ice information	Less than 1 percent of navigationally significant waters in the U.S. Arctic have been surveyed with modern technology.
Port connectors	Generally, there are few roads and no rail in Alaska north of the Arctic Circle; consequently, port connectors are fairly limited. One key connector road runs from the DeLong port facility to the Red Dog Mine.

Source: GAO.

Ports

Currently there are studies under way to develop an Arctic deepwater port in northern Alaska. The USACE and the Alaska Department of Transportation and Public Facilities have reported on this issue and are currently conducting an additional study to identify potential port sites in the U.S. Arctic region.[39] In addition to conducting studies, the USACE also conducts dredging, for example at the Port of Nome, with a 22-foot

[39] U.S. Army Corps of Engineers and the Alaska Department of Transportation and Public Facilities, *Alaska Deep-Draft Arctic Port System Study* (March 2013). The term "deep-draft" is a term to describe ports that can accommodate vessels such as large cargo ships. In this report, the study team defined "deep-draft" as a depth greater than 35 feet. USCG also completed its report *Feasibility of Establishing an Arctic Deep-draft Seaport* (February 2014).

deep outer harbor and a 10-foot deep small boat harbor, which supports vessels that service commercial and community needs. The state of Alaska has also taken some actions in support of planning and developing port infrastructure in the U.S. Arctic. The Alaska Industrial Development and Export Authority (AIDEA), a corporate agency related to the state government, provides project financing for Alaska businesses. For example, it financed the construction of the approximately $260 million DeLong Mountain Transportation System for the Red Dog Mine near Kotzebue. AIDEA, in conjunction with an Alaska Native Corporation, has also funded the second phase of a study to determine the feasibility of developing Cape Thompson, located on the North Slope, as a port for shipping extracted minerals and gas.

Officials we spoke with from state and local government suggested that a U.S. Arctic deepwater port is needed to support a potential increase in maritime activities in the Arctic. According to these government officials, an Arctic deepwater port could potentially serve as a trans-shipment hub for companies using Arctic routes or could host a permanent USCG presence in the Arctic, allowing the USCG to better meet its missions for search and rescue, oil spill response, and maritime law enforcement. While there was some agreement about the usefulness of a deepwater port to support USCG efforts, industry representatives we spoke with had varying views about such a port's potential for commercial purposes. Shipping-industry representatives, for example, indicated that they would not use a U.S. Arctic deepwater port for trans-Arctic shipping because of high fuel costs or the fact that such a port would not be connected with existing port networks or any port connectors.

Aids to Navigation

The USCG is conducting a Waterway Analysis and Management System assessment along the western and northern coasts of Alaska in order to understand the extent and type of aids to navigation needed; however, officials we spoke with indicated that there were no current plans to expand deployment of aids to navigation in the Arctic region. According to federal government sources, there are a number of challenges to such deployment in the Arctic. First, hydrographic surveying and mapping must be completed before the USCG can install aids to navigation in an area, and as noted in table 3, a large amount of the U.S. Arctic remains

uncharted or mapped.[40] Second, aids to navigation are particularly challenging to operate north of the Bering Strait due to the freeze-thaw cycle and likelihood of sustaining damage from floating sea ice.

Polar Icebreaking

The USCG is currently in the preliminary phase of a new polar-icebreaker acquisition project including development of a formal mission need statement, a concept of operations, and an operational requirements document.[41] USCG budget requests for this pre-acquisition work were $8 million in fiscal year 2013 and $2 million in fiscal year 2014. These sums are a fraction of USCG's cost estimates, which range from $850 million to $1 billion for one new icebreaker that USCG plans to put into service in the early 2020s.

Although multiple studies have pointed to a gap in the nation's icebreaking capabilities, due to limited resources, the USCG balances icebreaking needs against a variety of considerations.[42] The USCG operates the nation's two functioning icebreakers, which are used in the Arctic for emergency response, research assistance, and patrols.[43] In early 2012, the U.S. Coast Guard Cutter (USCGC) Healy escorted a Russian fuel tanker to Nome to provide the city with an unprecedented winter fuel delivery. The Russian tanker was the city's only option after its final fall fuel shipment was cancelled due to a large storm in the Bering Sea. The USCG's other icebreaker, the USCGC Polar Star was recently reactivated and conducted icebreaking sea trials in the U.S. Arctic during summer 2013 to make sure it was functioning properly after 3 years of extensive repairs. Due to the limited number of icebreakers, the USCG determines where it sends its icebreakers based on risk assessments.

[40] Hydrographic surveying is the measure of water depths and detection of hazards to navigation such as rocks and other features that mariners should be aware of for safety. Nautical charts depict water depths.

[41] Ice operations are a USCG statutory mission area.

[42] ABS Consulting, *U.S. Polar Icebreaker Recapitalization Report: A Comprehensive Analysis and Its Impacts on U.S. Coast Guard Activities*, prepared for the USCG (October 2011); USCG, *High Latitude Study Mission Analysis Report* (July 2010); and CMTS, *U.S. Arctic Marine Transportation System: Overview and Priorities for Action 2013.*

[43] The United States has two operational icebreakers; the heavy icebreaker *U.S. Coast Guard Cutter* (*USCGC) Polar Star* and the medium icebreaker *USCGC Healy*. The *Polar Star* operates in both the Arctic and Antarctic. The *Healy* is primarily dedicated to support scientific research in the Arctic. A third icebreaker, the *USCGC Polar Sea* has been inoperative since 2010.

Mapping, Charting, and Weather Information

In response to increasing demand, NOAA has taken several steps to improve mapping, charting, and weather information for the U.S. Arctic. In February 2013, NOAA released its plan to create new nautical charts in parts of the U.S. Arctic.[44] In addition, NOAA is working in partnership with the Alaska Ocean Observing System to develop an Alaska Sea Ice Atlas, which would be a weekly web-based product providing site-specific and season-specific information on sea ice in Alaskan waters, including anticipated season lengths and navigation opening dates. According to NOAA, a prototype will be available in 2014.

In addition to NOAA's charting efforts, the state of Alaska is undertaking a charting and mapping initiative. The state's Department of Natural Resources is overseeing a Statewide Digital Mapping Initiative, which is developing a digital base map of the state, including the U.S. Arctic. The state dedicated $3 million for the mapping initiative in the fiscal year 2014 enacted budget.

According to NOAA officials, mapping and charting information for the U.S. Arctic has generally not been an issue until recently, since historically the Arctic has been ice-locked and closed to substantial maritime activity. Although a majority of industry representatives we spoke with did not identify a need for updated nautical charts, officials from NOAA stated that with increased accessibility to the Arctic, the agency has observed an increasing demand for updated charts among multiple users, including other federal agencies. Furthermore, officials noted similar increased demand for weather and sea ice information. Weather forecasts in the Arctic are not as accurate as those for the rest of the United States, due to fewer observations and forecasting models. To meet this demand, additional observations and forecasting models are necessary to improve weather and sea ice forecasts in the challenging Arctic environment.

Port Connectors

Plans for developing and investing in U.S. Arctic port connectors are fairly limited. At the federal level, there are no specific plans to develop connecting roads or railways to existing ports or harbors, although the Federal Highway Administration (FHWA) provides formula grants to states, including Alaska, for state-highway investment. However, the state

[44] NOAA officials stated that due to limited capabilities and limited access to much of the Arctic, at the current rate of work it would take a minimum of 50 years to chart 12 percent of the 325,000 square nautical miles considered navigationally significant.

of Alaska has created the Roads to Resources initiative to support the state's priority to develop its natural resources by providing needed infrastructure to transport minerals. For fiscal year 2014, $8.5 million was appropriated and the Governor has proposed an additional $8.5 million in the fiscal year 2015 budget toward an all-year access road to the Ambler Mining District, according to Alaska officials.

Unique Geographic and Construction Challenges Can Increase U.S. Arctic Maritime Infrastructure Costs

Geographic and construction challenges can affect the development of infrastructure in the Arctic, challenges that often result in more complex and costly design and construction. According to engineers we spoke with, although the engineering capabilities and technology exist, engineers in Alaska have to account for unique geographic challenges, which include the following.

- Permafrost: In northern Alaska, engineers have to address melting permafrost—the thawing of the soils underneath structures and roads. The melting of permafrost can be mitigated by using special designs, but at a high cost. For example, in Nome, as shown in figure 5, a hospital was built on a special foundation above the ground so that the building's warmth would not melt the permafrost underneath.
- Coastal erosion: Coastal erosion is a result of stronger waves that are occurring at an accelerated rate with the diminishing sea ice. Erosion also increases at the shoreline as a result of permafrost melt and could contribute to higher waves around ports and affect pilings or other port infrastructure. These challenges can be mitigated by efforts such as strengthening the shoreline. See figure 5. As with roads and buildings, there are ways to mitigate the Arctic conditions, but they are costly.

Figure 5: Hospital in Nome Built Above the Ground to Avoid Melting the Permafrost; Shore in Barrow Being Protected From Coastal Erosion

Source: GAO.

Source: GAO.

There are also substantial construction challenges that could affect Arctic maritime infrastructure development, including the following.

- Construction materials and equipment: According to USACE officials, construction materials and equipment are typically not readily available when and where they are needed and often must be shipped great distances. In most cases, materials and equipment must be transported by sea during a brief summer window with construction occurring in the same window or slightly beyond. For example, according to one engineer, gravel used for road construction and building foundations is often not available in the area of the construction. According to a state official, in many places there are no or limited supplies of local gravel, and the cost of transporting the gravel to the site could be greater than the cost of gravel itself.
- Skilled construction labor force: Villages may be able to provide some local labor, but skilled construction labor is usually in short supply in smaller villages and has to be brought in from other locations.[45]

[45] The Alaska Department of Labor and Workforce Development has an active training program for predicted construction projects. However according to USACE officials, the remote nature of many of Alaska's projects often results in the local workforce not being able to receive the needed training in a timely manner.

According to USACE officials, one unique construction labor issue is that the local labor force in Alaska may have to hunt or perform other subsistence activities during the warmer summer season to survive the winter. Bringing in outside workers drives up the cost of a project because, in the absence of existing housing facilities, temporary camps are needed.

- Short construction season: Alaska has an approximately 4-month construction season, along with extreme temperature ranges. While some types of construction can be done in the winter, such as excavating in permafrost and bogs, other types of construction cannot, such as erecting steel structures.

Largely due to the above factors, maritime infrastructure development in the Arctic is generally considered to be more expensive than similar construction in the continental United States. During our interviews with Arctic stakeholders with expertise in engineering and construction, we heard estimates of higher costs for Arctic maritime infrastructure components that ranged from 15 percent to 500 percent higher than for infrastructure constructed in the contiguous states. However, according to USACE officials, data do not exist to show specifically how much more expensive Arctic construction would be for different types of infrastructure projects. For an accurate civil construction cost estimate in Alaska, for example, the USACE would typically develop a customized estimate based on the infrastructure needed. This type of estimate depends on the specifics of the project's scope, including project design, location, availability of qualified labor, time of construction, and other factors.

The CMTS Prioritized U.S. Arctic MTS Infrastructure and Plans to Monitor Agencies' Progress

The CMTS Prioritized Future Federal Arctic MTS Infrastructure Development

In July 2013, the federal interagency CMTS published the U.S. Arctic Marine Transportation System: Overview and Priorities for Action (Arctic Report), which identified and prioritized actions for developing Arctic maritime infrastructure and identified the lead agency for each of those

actions, among other things.[46] According to CMTS officials, it is the first systematic, interagency and publicly reviewed, sector-specific plan for federal U.S. Arctic maritime transportation policies, programs, and services. In addition to a summary of the myriad of federal Arctic reports, the Arctic Report includes an Arctic MTS Improvement Plan, which provides actions and time frames for federal agencies to invest in Arctic maritime infrastructure. Specifically the Arctic Report prioritized two broad categories of MTS infrastructure—information infrastructure, such as mapping and charting, and response services, such as search and rescue—to be addressed by agencies in the near term.[47] Both categories were selected as near-term priorities because, according to the Arctic Report, they:

- were identified as requirements by expert reports;
- can be achieved with existing resources;
- were deemed to be regionally significant;
- are interdependent, building on each other to develop the Arctic MTS;
- can immediately increase safety for the mariner; and
- would help establish a foundation for sustainable federal Arctic support and safe operations.

Within the information infrastructure and response services categories, the Arctic Report recommended over 70 near-term actions to be addressed by 2015 by select member agencies: USCG, Department of Defense (jointly with USCG), and NOAA. According to the CMTS, the remaining three categories of MTS infrastructure development priorities

[46] The *Arctic Report* made three primary recommendations: rely on the CMTS as a coordinator for the U.S. Arctic MTS, ratify the United Nations Convention on the Law of the Sea, and address MTS priority areas it identified for near term action. The last recommendation is outlined in the report through a list of actions that can be taken by member agencies and is the focus of the discussion in this report section.

[47] The *Arctic Report* defines “near term” as having deliverable products between 2013 and 2015, though it is expected that any work on the products would continue past 2015.

identified in the Arctic Report require longer lead times and more investment to be adequately addressed.[48]

Development of the recommended infrastructure priorities was an interagency effort from nine CMTS member agencies, including USCG, NOAA, USACE, and BOEM. Officials from the key federal agencies within the scope of this report indicated that they had suggested actions based on their current program elements. For example, BOEM included currently funded environmental program studies, such as ice engineering studies, as near-term actions in the information infrastructure MTS category.

CMTS Plans to Monitor Agencies' Progress Addressing Recommended Actions

According to CMTS officials, they are currently developing formalized plans to regularly monitor the extent to which agencies are addressing the Arctic Report's recommended actions. In addition, officials plan to monitor the extent to which recommended actions are being implemented consistent with the National Strategy for the Arctic Region. We have previously found that developing mechanisms to monitor the results of collaborative efforts is a key practice that can help to enhance and

[48] The three remaining categories of MTS infrastructure (referred to as "components" in the *Arctic Report*) are *navigable waterways*, *physical infrastructure*, and *vessels*. Lead agencies for MTS elements from these categories include USACE, BOEM, NOAA, MARAD, BSEE, and USCG. In total, the five categories of MTS infrastructure are subcategorized into 16 elements of the MTS: places of refuge for ships, areas of heightened ecological significance, ports and associated facilities, geospatial infrastructure, hydrographic surveys and nautical charts, shoreline mapping, aids to navigation, communications, marine weather and sea ice forecasts, oceanographic and real-time navigation information, automatic identification system, icebreaking, environmental response management, search and rescue/emergency response, design standards for polar operations, and crew standards/training. These elements differ from the components of Arctic MTS reviewed in this report as we distinguished between actual infrastructure components and the services that use this infrastructure. For example, in this report search and rescue as well as emergency response are considered to be services that rely on maritime infrastructure components, such as ports or vessels.

sustain collaboration among federal agencies.[49] Furthermore, monitoring is particularly important where, as here, the CMTS is not vested with the authority to require agencies to implement the identified actions or activities.[50] While regular monitoring does not provide resources to address the MTS needs of the Arctic, it can provide an efficient way to keep all stakeholders apprised of potential changes and help them to be more responsive to any adjustments to priorities or recommended actions in the Arctic Report.

Implementation of the recommended actions identified in the Arctic Report is at the discretion of each federal agency and according to CMTS officials, no additional funding or resources were provided to address the priorities. Recommended actions will depend on, among other things, individual agency resources and available appropriations. For example, USACE officials reported that although the actions included in the Arctic Report are largely consistent with those identified in their planning processes, the agency would only budget for those that reflect existing USACE priorities and projects under consideration, such as the Arctic deep-draft port study. The Arctic Report also identifies several priorities without including a specific time frame for agency action; these priorities are noted as "recommended but not resourced," meaning agencies may not have planned or budgeted for them. Therefore, CMTS and its member agencies will only know the status of all recommended actions if they are actively monitored and reported on.

CMTS officials also noted that the Arctic Report is a "living document" that should be updated as needed to reflect agencies' progress addressing recommended actions and to incorporate information from other Arctic

[49] GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, GAO-06-15 (Washington, D.C.: Oct. 21, 2005). We identified eight key practices to enhance and sustain collaborative efforts, which include defining and articulating a common outcome; establishing mutually reinforcing or joint strategies to achieve the outcome; identifying and addressing needs by leveraging resources; agreeing upon agency roles and responsibilities; establishing compatible policies, procedures, and other means to operate across agency boundaries; developing mechanisms to monitor, evaluate, and report the results on collaborative efforts; reinforcing agency accountability for collaborative efforts; and reinforcing individual accountability for collaborative efforts.

[50] The *Implementation Plan for the National Strategy for the Arctic Region* directs the DOT to complete a 10-year projection of maritime activities in the Arctic region, develop a 10-year infrastructure prioritization framework, and monitor agency progress in bi-annual interagency meetings. Member agencies of CMTS were listed as supporting agencies.

planning documents currently in development. There are a number of ongoing planning efforts and critical planning documents in development that could affect identified Arctic priorities and the planning and development of U.S. Arctic maritime infrastructure.[51] For example, an Alaska legislative commission is currently developing a document that will outline the State of Alaska's overarching Arctic priorities. That document could lead to changes to the Arctic Report priorities or recommended actions, and consequently, federal agencies' efforts to address those actions.

Since CMTS is in the early stages of developing a process for agency monitoring, officials may want to consider identifying the type of information to be monitored and the timing and frequency of the monitoring. For example, tracking such details as to why an agency may not be addressing a recommended action or why an agency may be experiencing delays or any changes in an agencies' commitment to addressing a recommended action. The reason for a delay or not addressing a recommended action could be particularly important given that some recommended actions being addressed by agencies may affect other agencies' recommended actions. Furthermore, since there are over 70 recommended agency actions scheduled to be addressed in the next 2 years, the CMTS may want to consider more frequent monitoring of agencies' progress in order to keep the Arctic Report effectively updated in the near term. According to CMTS officials, they will monitor and report on progress made to improve the Arctic MTS infrastructure.

Concluding Observations

Economic opportunities in the U.S. Arctic are considered to be key drivers for the development of Arctic maritime transportation infrastructure. Although we found commercial industries currently have limited activity in the U.S. Arctic and similarly limited plans for activity over the next 10 years, federal agencies are taking steps to plan and develop maritime infrastructure that could help to address some of the underlying factors that contribute to limited development. For example, plans are moving forward to study potential sites for a U.S. Arctic deepwater port—infrastructure that some have cited as desirable for both potential commercial activity and to enhance maritime safety.

[51] According to CMTS officials, the *Arctic Report* recommendations have already informed the creation of broader federal government-wide Arctic policy documents that go beyond maritime infrastructure issues.

CMTS, the federal interagency coordinating committee tasked with addressing various Arctic maritime infrastructure issues, includes member agencies with differing missions and objectives. The identification, prioritization and vetting of Arctic maritime infrastructure plans and near term actions for federal agencies were important steps to addressing Arctic maritime infrastructure needs. Given the level of uncertainty around the development of the Arctic and the challenges and high costs to developing Arctic maritime infrastructure, it is important that federal agencies with responsibility for infrastructure components incorporate Arctic maritime infrastructure priorities and identified actions into their agency's overall planning and investment decisions. Furthermore, since implementing recommended actions is at the discretion of the agencies and the Arctic Report is considered a "living document" with potentially changing priorities and actions, monitoring agencies' progress in addressing recommended actions is an important step in planning, developing, and investing in Arctic maritime infrastructure. Effective monitoring will help ensure that CMTS member agencies continue to address Arctic maritime infrastructure as a coordinated effort with a shared understanding of current priorities and actions needed.

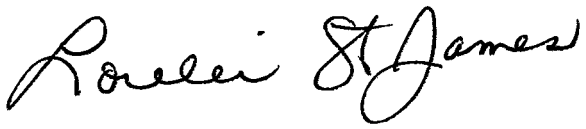
Agency Comments

We provided a draft of our report to USACE, USCG, NOAA, DOT, and DOI for their review and comment. USCG, NOAA, DOT, and DOI provided written technical comments, which we incorporated into the report as appropriate. USACE did not have any comments on this report.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the Secretary of Defense, the Secretary of Homeland Security, the Secretary of Commerce, the Secretary of Transportation, the Secretary of the Interior, appropriate congressional committees, and other interested parties. In addition, the report will be available at no charge on the GAO Website at http://www.gao.gov.

If you have any questions about this report, please contact me at (202) 512-2834 or stjamesl@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page

of this report. GAO staff who made key contributions to this report are listed in appendix IV.



Lorelei St. James
Director, Physical Infrastructure Issues

Appendix I: Objectives, Scope, and Methodology

The objectives of this report are to (1) identify what is known about the extent of commercial maritime activity in the U.S. Arctic and anticipated activity in the next 10 years; (2) identify actions government entities have taken in support of planning and developing U.S. Arctic maritime infrastructure and unique challenges that may exist; and (3) describe federal interagency efforts that have been taken to identify and prioritize Arctic maritime infrastructure investments.

For this report we focused on maritime infrastructure on the waters and land along the western and northern coasts of Alaska, in particular areas north of the Bering Strait because of the diminishing seasonal sea ice in these areas. Federal government agencies use multiple definitions for the Arctic, as there is no singular definition. We used the term Arctic to mean areas above the Arctic Circle and the term U.S. Arctic to discuss those areas that are U.S. waters and land, as defined by the Arctic Research and Policy Act of 1984, which includes “all United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Kuskokwim, and Yukon Rivers in Alaska; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas; and the Aleutian chain.” We focused on the commercial-shipping, cruise, commercial-fishing, oil, and mining industries. The maritime infrastructure included in our review is the marine transportation system (ports, navigable waterways, and port connectors, such as roads and railways), aids to navigation (e.g., buoys and beacons), mapping and charting, marine weather and sea ice forecasts, and polar icebreakers.

To obtain information on all of our objectives we reviewed program documentation and written reports and interviewed knowledgeable officials from selected federal entities, state of Alaska entities, local governments, industry associations, companies, Alaska Native organizations, Alaska Native corporations, academic and research institutions, engineers, financial and insurance services, and environmental groups as shown in table 4.

Table 4: Organizations Selected for Interviews

Federal Government	Department of Transportation
	Committee on the Marine Transportation System
	United States Coast Guard
	Department of Defense
	United States Army Corps of Engineers
	Department of the Interior
	National Oceanic and Atmospheric Administration
State of Alaska	Department of Commerce, Community, and Economic Development
	Department of Transportation and Public Facilities
	Department of Military and Veteran's Affairs
	Department of Natural Resources
	Department of Fish and Game
	Department of Environmental Conservation
	Alaska Energy Authority
	Alaska Industrial Development and Export Authority
	Alaska Arctic Policy Commission
	Office of the Lieutenant Governor
Local Government	City of Barrow
	North Slope Borough
	City of Nome
	Port of Nome
	Northwest Arctic Borough
	Port of Anchorage
Oil and Gas Industry	Shell
	Statoil USA
	ConocoPhillips
	Alaska Oil and Gas Association
	American Petroleum Institute
	Alaska Clean Seas
Commercial Shipping	Bowhead Transport Company
	Crowley Maritime Corporation
	Maersk Lines, Limited
	Nordic Bulk Carriers
	Hapag-Lloyd

	Tschudi Group
	Marine Exchange of Alaska
	World Shipping Council
	Intertanko
Commercial Fishing	Marine Conservation Alliance
	United Fishermen of Alaska
Mining	Alaska Miners Association
	Baffinland Iron Mines
Cruise	Cruise Lines International Association
	Cruise Line Agencies of Alaska
	Association of Arctic Expedition Cruise Operators
Alaska Native Organizations	Alaska Eskimo Whaling Commission
	Eskimo Walrus Commission
	Kawerak, Inc.
Alaska Native Corporations	Arctic Slope Regional Corporation
	Bering Straits Native Corporation
	NANA Regional Corporation
	Sitnasuak Village Native Corporation
	Ukpeagvik Iñupiat Corporation
Academics and Research Institutions	Institute of the North
	State University of New York – Maritime College
	University of Alaska – Anchorage, School of Engineering
	University of Alaska – Fairbanks
	University of Washington Polar Science Center
Other Arctic Stakeholders	American Society of Civil Engineers
	International Union of Marine Insurance
	Northern Alaska Environmental Center
	PEW Charitable Trust, U.S. Arctic Program
	Platinum Capital Advisors

Source: GAO.

We selected the stakeholders based on relevant published literature, our previous work, stakeholders' recognition and affiliation with private industry, and recommendations from the stakeholders interviewed. The results of these interviews are not generalizable, but do provide insights regarding current and planned maritime activities in the U.S. Arctic.

To describe what is known about commercial activity in the U.S. Arctic, we interviewed companies and industry trade associations from the commercial-shipping, cruise, commercial-fishing, oil, and mining industries. We selected these industries based on background research from key Arctic infrastructure reports from the Congressional Research Service and the Committee on the Marine Transportation System. Information we collected included specific industry practices, such as the use of Arctic routes and ports, and the extent to which industries plan to utilize Arctic routes and increase their activity over the next 10 years particularly north of the Bering Strait.

To describe actions federal, state, and local government entities have taken in support of the U.S. Arctic marine transportation system, we interviewed and collected documentation from 7 federal, 10 state, and 6 local entities to identify infrastructure within the scope of responsibility for each entity. We also identified specific efforts each entity has undertaken related to mapping, ports, port connectors (e.g., roads and rail), weather, polar icebreakers, and aids to navigation. To describe unique challenges that may exist, we conducted a site visit to Alaska and interviewed stakeholders. We conducted site visits to Nome, Barrow, and Anchorage, Alaska, from July 21, 2013, to July 27, 2013. We chose these sites by applying the following criteria: geographic location in the state, number of interviews to be conducted, infrastructure activity, cultural considerations, and recommendations from stakeholders. During the site visits, we spoke with federal, state, local, Alaska Native, and private sector stakeholders; toured the ports of Nome and Anchorage; and viewed barge-landing areas in Barrow. We also documented existing infrastructure, the physical environment, and challenges to developing infrastructure in each location. In addition to the site visits, we spoke with engineers and financial and insurance representatives. The information we gathered from these interviews include relative costs of constructing infrastructure in the Arctic and considerations for cost calculation.

To describe federal interagency efforts that have been taken to identify and prioritize Arctic maritime infrastructure investments, we reviewed a key federal government report and prior GAO reports on several topics including our body of work on Arctic issues and interagency

collaboration.[1] In addition, we interviewed knowledgeable officials from CMTS, BOEM and BSEE, the USACE, NOAA, and the USCG to understand the status of the near-term actions identified in the CMTS Arctic Report and how, if at all, those actions fit within each agency's strategic plans.

We conducted this performance audit from February 2013 through March 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

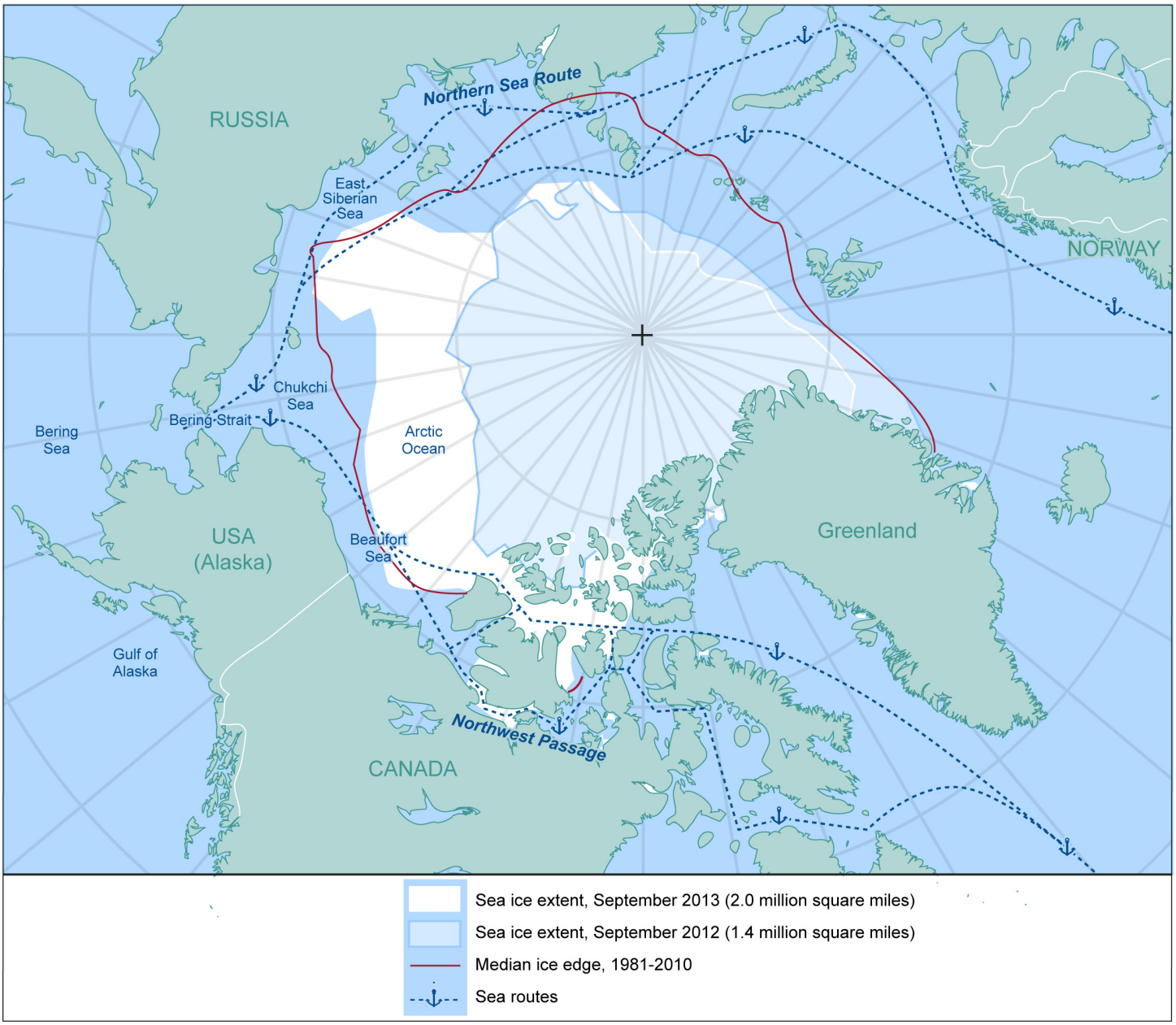
[1] U.S. Committee on the Marine Transportation System, *U.S. Arctic Marine Transportation System: Overview and Priorities for Action* (Washington, D.C.: 2013); GAO, *Coast Guard: Efforts to Identify Arctic Requirements Are Ongoing, but More Communication about Agency Planning Efforts Would Be Beneficial*, GAO-10-870 (Washington, D.C.: Sept. 15, 2010); GAO, *Arctic Capabilities: DOD Addressed Many Specified Reporting Elements in Its 2011 Arctic Report but Should Take Steps to Meet Near- and Long-term Needs*, GAO-12-180 (Washington, D.C.: Jan. 13, 2012); and GAO, *Managing for Results: Key Considerations for Implementing Interagency Collaborative Mechanisms*, GAO-12-1022 (Washington, D.C.: Sept. 27, 2012).

Appendix II: Diminishing Arctic Seasonal Sea Ice

Scientific research and projections vary, but there is consensus that Arctic sea ice is diminishing and will continue to do so through the 21st century. According to the U.S. National Snow and Ice Data Center, the September ice extent in the Arctic has seen a downward trend with a 13.7 percent decrease per decade since 1979.[1] The center also reported that the 2013 Arctic sea-ice extent decreased to 2.0 million square miles—the sixth lowest in the satellite record. See figure 6. NOAA officials stated that sea ice volume (area times thickness) is now estimated at 25 percent of its 1980 amount. Predictions by researchers of when there will be an ice-diminished Arctic Ocean in the summer range from sometime in the next 10 years to the year 2100, with most estimates in the range of 20 to 40 years.

[1] The ice extent includes those areas that have over 15 percent of the area covered with ice.

Figure 6: September 2012 and September 2013 Ice Extent Compared with the 1981 to 2010 Median September Ice Extent



Sources: National Snow and Ice Data Center; Office of Naval Intelligence; GAO; and Map Resources.

Appendix III: Arctic Maritime Infrastructure Roles of Federal and Other Stakeholders

A wide variety of federal, state, local, and other stakeholders play a role in planning, developing, and managing Arctic maritime infrastructure. Below are some key federal agencies with Arctic maritime infrastructure responsibilities:

Key Federal Agencies

- U.S. Army Corps of Engineers (USACE) is the lead federal agency responsible for maintaining and improving navigable waterways in the United States (e.g., to provide dredging of port harbors). Among USACE's responsibilities, the USACE assists federal, state, local, and native entities with planning, engineering, and construction of projects. USACE is the key federal agency in constructing, operating and maintaining harbors, shipping channels, and inland waterways, as well as locks, dams, and other navigation structures such as jetties.
- The U.S. Coast Guard (USCG) is a multi-mission, maritime military service within the Department of Homeland Security that has responsibilities including maritime safety, security, environmental protection, and national defense, among other missions. Ice operations and aids to navigation are two of its 11 statutory mission areas. USCG plays a significant role in search and rescue efforts, emergency response, and maritime law enforcement.
- National Oceanic and Atmospheric Administration provides weather and sea ice forecasts, nautical charts, and oceanographic information for marine transportation, accurate-positioning infrastructure, real-time and forecast models for navigation and oil-spill response, and satellite search and rescue support services for the U.S. Exclusive Economic Zone, which includes areas in the U.S. Arctic.
- Department of Transportation and its respective federal administrations—Federal Highway Administration and Federal Railroad Administration—provide some support for infrastructure that is used as connectors to ports. The Maritime Administration provides technical assistance to port authorities for project planning, design, and construction.

There is also a variety of non-federal stakeholders involved with Arctic maritime infrastructure including international entities, the State of Alaska, local governments, Alaska Native organizations, Alaska Native corporations, and other non-profits. Among them are:

- International Entities: The United States participates in the Arctic Council, a high level intergovernmental forum established in 1996 to promote cooperation, coordination, and interaction among Arctic states, with the involvement of the Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, particularly issues

of sustainable development and environmental protection in the Arctic.

- State of Alaska Government: Multiple entities within state government have a role in the development of Arctic maritime infrastructure or the landside transportation connectors. Related state roles include search and rescue, infrastructure finance and construction, and regulating the use of Arctic waters within Alaska's jurisdiction. In addition, the State Legislature formed the Alaska Arctic Policy Commission in 2012 to create an actionable Arctic policy for Alaska. The Commission released a Preliminary Report for public comment in January 2014, with a final report due to the Alaska Legislature in January 2015.
- Local Government: Local government includes both cities and boroughs. A borough functions somewhat similarly to a county in other states. For example, Alaska's North Slope Borough encompasses 89,000 square miles of Arctic territory in northern Alaska, and includes the city of Barrow and others.[1]
- Alaska Native Organizations: Alaska Native communities have inhabited the Arctic region for thousands of years and have cultures that are particularly sensitive to changes in the environment due to subsistence lifestyles revolving around marine ecosystems. There are currently 225 federally recognized tribal governments in Alaska, which may coexist with a city government. Groups such as the Alaska Eskimo Whaling Commission and the Eskimo Walrus Commission have also formed to represent and protect Alaska Natives' lifestyles and heritage.
- Alaska Native Corporations: Regional and village Alaska native corporations are private entities that have business interests and own land that could affect the development of maritime infrastructure.
- Non-profit: The Marine Exchange of Alaska, a not-for-profit entity that works with USCG and the State of Alaska, among others, collects vessel traffic data through the Bering Strait. Relying on Automatic Identification System (AIS) technology,[2] the Marine Exchange tracks and reports on vessel traffic around the state of Alaska. While AIS data relies on self-reported information—such as the description of the type of vessel, type of cargo, or the destination of the vessel—it

[1] Most of the state of Alaska is unincorporated. Two-thirds of the state is not incorporated at the borough level and is part of what is referred to as the "Unorganized Borough."

[2] AIS technology includes transponders used on ships that electronically exchanges data every 2 to 4 seconds with other ships and land-based receivers for identifying and locating vessels.

does provide an indication of the overall steady trend of Arctic maritime activity.[3]

[3] Data transmitted by ships is dependent on the good will of the vessels' owners and operators, as vessel operators can turn off AIS or it may not accurately reflect the type of vessel operating because the vessel's operator, either intentionally or not, improperly programmed the device. Smaller vessels may not be tracked by AIS unless they carry and operate AIS, which is not a requirement.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, Sharon Silas (Assistant Director); Brian Chung; Swati Deo; Geoff Hamilton; Delwen Jones; Les Locke; Josh Ormond; and Elizabeth Wood made key contributions to this report. Sarah Kaczmarek, Melanie Papasian, Theresa Perkins, and Christopher Stone made key contributions to the video in this report.

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