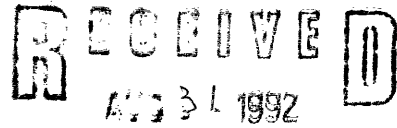


United States Department of the Interior
National Park Service

National Register of Historic Places
Multiple Property Documentation Form



NATIONAL REGISTER

This form is for use in documenting multiple property groups relating to one or several historic contexts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. For additional space use continuation sheets (Form 10-900-a). Type all entries.

A. Name of Multiple Property Listing

Lighthouse Stations of Oregon

B. Associated Historic Contexts

Maritime Transportation, ca. 1857-1939

C. Geographical Data

The coast of Oregon

See continuation sheet

D. Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards for Planning and Evaluation.

James Hamrick

August 21, 1992

Signature of certifying official

Date

Deputy State Historic Preservation Officer

State or Federal agency and bureau

SEE CONTINUATION SHEET; D1

I, hereby, certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

Antonieth Alice

4/20/93

Signature of the Keeper of the National Register

Date

E. Statement of Historic Contexts

Discuss each historic context listed in Section B.

See continuation sheet; E.1

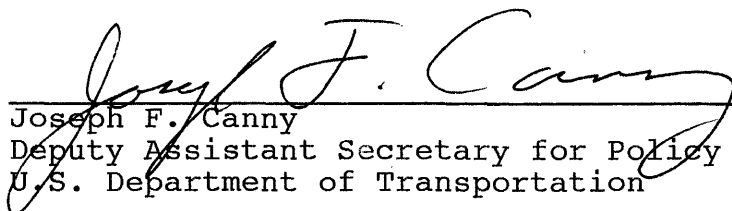
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NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section D Page 1

Lighthouse Stations of Oregon
Name of Multiple Property Listing

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties owned by components of the U.S. Department of Transportation consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation.



Joseph F. Canny
Deputy Assistant Secretary for Policy and International Affairs
U.S. Department of Transportation

2/5/93
Date

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INTRODUCTION

Between 1857 and 1934 eleven lighthouse stations were established along the Oregon coast from the Columbia River to Cape Blanco. Nine of these stations remain in existence today. These lighthouses played an important role in the economic development and settlement of the state. The lighthouses, some still functioning aids to navigation, are significant links to the past. The lighthouse towers and associated buildings are distinctive architectural structures that represent a variety of building techniques and materials. In recent years, automation of the lighthouse stations and technological advances have diminished the role of the lighthouse station in maritime transportation. These technological advancements have sometimes rendered the stations obsolete.

HISTORIC CONTEXT

The following historical context provides a general discussion of the development of Oregon in relationship to maritime transportation. The historic context is not intended to be a comprehensive history of Oregon or maritime transportation, but instead places the development of the Oregon coast lighthouses in context with state and local history. The lighthouses are also discussed in the context of the federal agencies which played an important role in the development and management the lighthouse stations. Early aids to navigation played a vital role in the state's economic development and settlement. The establishment of these aids made the state's coastal waterways more navigable for seagoing vessels.

Native Americans

Native American cultural resources of the Oregon coast are to be treated in depth in a separate context. Therefore, they are not among the resource types covered here. It is fundamentally important, however, to acknowledge that the rocky headlands embracing bays and estuaries that were selected by the federal government for construction of lighthouses had been ideal occupation sites for Northwest Coast tribal people for thousands of years before first contact with Euro-Americans. The offshore rocks and drowned river valleys adjacent to many lighthouse sites supported abundant sea life, varied species of which were staple foods of the native populations. Certain headland areas gained spiritual significance over time as generation after generation of coastal people conducted burials and other sacred rituals in the vicinity of their villages.

As maritime trade developed in the era of Euro-American settlement, pressure to establish aids to navigation near promising harbors was great. Surface area for construction of lighthouse stations on the strategic headlands often was extremely restricted. Buildings and facilities were sited without regard for centuries-old evidence of previous occupation. Inevitably, shell middens, house pits and burial sites were compromised.

Because prehistoric archaeological values associated with lighthouse stations can be satisfactorily assessed only in a separate context, discussion of Native Americans in this and the companion documents is focused on identifying cultural groups that traditionally occupied areas where the lighthouses were built.

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Oregon's northern coastal region is drained by streams which rise in the Coast Range and flow westward to the Pacific Ocean. The state's southwestern Pacific slope is drained by two major west-flowing rivers, the Umpqua and the Rogue, which have sources in the Cascade Range. Rivers valleys on the coast were made fertile through alluviation, or deposition of silt during the Pleistocene epoch. Inland from the beaches, rugged terrain worked against convenient communication in a north-south direction. Topographic barriers encouraged the localization of Indian culture.

The oldest radiocarbon dates tied to Native American occupation of the coastal region cluster around 6,000 B.C. Few sites are known to be older than 3,000 years because it was about 3,000 years ago that sea levels stabilized after the ice age. Most of the sites antedating modern sea levels were inundated by the ocean as Pleistocene ice melted. While it is not known precisely how old are the oldest cultural groups on the coast, it is believed some are descended from the earliest period of occupation. Others had their roots in comparatively recent migrations.

Athabascan speaking people were among the relatively recent groups that penetrated Oregon's coastal region. In the south, various bands of the Rogue River group that commanded the Rogue River drainage - the Chetco, Tututni, Shasta Costa and Upper Coquille, for example, were members of this linguistic family. Cape Blanco, the westernmost promontory on Oregon's coastline and site of the Cape Blanco Lighthouse, was traditionally territory of the Sixes branch of the Rogue River group.

The central and south-central coastal plain, that area stretching between Yaquina Bay on the north and the Coquille River on the south, was inhabited by several Penutian language groups identified as Yakonan, Siuslawan and Coosan. Hanis and Milluk Coos territory encompassed Coos Bay and South Slough, the general location of Cape Arago Lighthouse. South of the Coos River region, the Coquille River Light stands in ancestral territory of the Lower Coquille, a Coosan dialectic group. The Siuslaw and Lower Umpqua were branches of the Siuslawan group occupied the region of the Siulaw and Umpqua rivers. The Umpqua River Light Station was established in territory of the Lower Umpqua, and Heceta Head Lighthouse was constructed near the outfall of Cape Creek in Siuslaw territory. The Alsea and Yaquina made up the Yakonan group which held the Alsea and yaquina drainage. The Old Yaquina Bay Lighthouse and Yaquina Head Light Station were established in ancestral territory of the Yaquina.

The Tillamook tribes are believed to have had their origins in a migration of Salish speaking people from the far north coast, from British Columbia and Washington. Within this family, the Siletz, Nestucca and Nehalem sub-groups held territory surrounding the bays and rivers on the northern coastal plain bearing their names. The Cape Meares Lighthouse, south of the spit fronting Tillamook Bay, was erected in Tillamook territory.

The northernmost Oregon coast, from the Necanicum River to the Columbia River estuary, was occupied by the Clatsop branch of the Penutian-speaking Lower Chinookan family, whose origins

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are uncertain. Tillamook Rock Light, Oregon's only offshore light having no structural connection to the mainland, is located in view of land traditionally held by the Clatsop people.

While language and social customs of these diverse cultural groups varied, the climate, topography and resources of the coastal region combined to ensure a commonality of certain lifeways. At the time of regular contact with Euro-Americans, beginning with the circumnavigations of the late 18th Century and the maritime fur trade that followed, Indian tribes on the Oregon coast were subsisting on marine life, game, roots and berries. They traveled by canoe and lived in villages composed of communal lodges of cedar planks. They had highly refined spiritual, oral and artistic traditions, and they pursued sophisticated technologies for hunting and gathering.

Inescapably, coastal shipping, which developed early to serve mining, agricultural and timber interests and prompted the system of aids to navigation, was among the forces of Euro-American settlement that eventually overwhelmed the native populations. White men's diseases, for which the Indians had little or no resistance, dealt the first blow with devastating impact. By the middle of the 19th Century, in the aftermath of violent clashes given the name of Rogue River Indian Wars, Native American tribes in southern and western Oregon were uprooted from their homelands and transported to a vast Coast Indian Reservation spreading over nearly 1.5 million acres along the central Oregon coast between the Pacific and the crest of the Coast Range. From 1856 to 1866, the reservation was guarded by military. Reservation life was regulated by federal agents established at Grand Ronde, Siletz and Alsea agencies and sub-agencies.

By the late 19th Century, the spirit of reform and persistent conviction concerning the assimilation of Indian culture into a Euro-American mold brought about a change in federal policy. Beginning with the Dawes Severalty Act in 1887, Congress began to dismantle the reservation life of Native Americans. Reservation lands were allotted to tribal members who met qualifications, and much reservation land was opened to homesteading by others. The process culminated in the termination acts of the 1950s under which Congress terminated its trust responsibilities for Indian tribes and reservation lands. Eventually, after much effort, federal trust relationships were restored. Beginning in 1977, various Oregon tribes, including those whose ancestral territory was on the coast, regained federal recognition of their sovereignty as individual nations. The Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians and the Coquille Indian Tribe today maintain tribal holdings and administrative headquarters at Coos Bay. Other coastal groups are represented within the Confederated Tribes of Grande Ronde and the Confederated Tribes of Siletz Indians.

Note: The discussion of Native American culture along the Oregon coast is provided by the State Historic Preservation Office and is based on the following sources: Stephen Dow Beckham, "Historical and Archaeological Resources of the Oregon Coastal Zones: A Resource Inventory Report to the Oregon Coastal Conservation and Development Commission," September 1974; Jeff Zucker, ed., Oregon Indians: Culture, History and Current Affairs; An Atlas and Introduction, Portland: Oregon Historical Society Press, 1983; Patty Whereat, "Presentation of the Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians at the First Oregonian Conference, Portland, Oregon", October 1990. The distribution of Native American language

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groups on the Oregon coast, as represented cartographically in Judith A. Farmer and Kenneth L. Holmes, Frances M. Philipek, "Evaluation Report, Sites 35-LNC-62, Yaquina Head Shell Midden," USDI Bureau of Land Management, Salem District, Yamhill Resource Area, January 1986; "Recreation Facility Improvement and 35-LNC-62, Yaquina Head Archaeological Site: Determination of No Adverse Effect," March 1989; Rick Minor, "Yaquina Head: A Middle Archaic Settlement on the North-Central Oregon Coast," USDI Bureau of Land Management, Oregon State Office, Portland, 1991, *An Historical Atlas of Early Oregon*, Portland: Historical Cartographic Publications, 1973.

Exploration of the Pacific Northwest Coast

The search for the Northwest Passage prompted early exploration of the western coast of the North American continent. Early Spanish explorers began charting the waters of the Pacific coast in the 1500s, claiming the waters for Spain. After establishing Spanish authority in Mexico during the early 16th century, Hernando Cortez focused attention on the exploration of the Pacific seacoast north of Mexico. Cortez dispatched two vessels to the present day lower California area in 1532. Subsequent expeditions followed. With rich trade developing between Mexico and the Philippines, Spain needed safe harbors to take refuge from English raiders and to replenish supplies necessary to ward off scurvy. In 1602, Sebastian Vizcaino set sail on an expedition, surveying the area around the present-day Monterey Bay. It is thought by some that Vizcaino sailed farther north, possibly travelling within sight of Cape Blanco on the southern Oregon coast (Carey, 1922: 71). There is no evidence to substantiate this, however.

Don Bruno de Heceta was among the early Spanish mariner who sailed off the Northwest coast. Heceta was in pursuit of a shorter route to the Atlantic (the Northwest Passage) to replace the route around Cape Horn in South America. With this incentive, Heceta set out for the Fuca Straits, thought to be the mouth of the Northwest Passage. In 1775, Heceta observed strong currents and eddies at the mouth of the Columbia River. He concluded that this must be a great river or passage to another sea. Due to illness among his crew, however, he was unable to confirm his theory. He then sailed farther south past a prominent cape on the central Oregon coast which was later to bear his name, Heceta Head (George Davidson, United States Coast Surveyor, later named the cape after Heceta in 1862).

In the 1600s, Russian fur hunters discovered sea otters on Siberia's Kamchatka Peninsula. These warm luxurious furs were prized by the Chinese. More profitable trade would be possible with the Far East if the pelts could be found in waters east of the peninsula. In 1741, Vitus Bering and Alexei Chirikov sailed along the Alaskan Peninsula, procuring sea otter pelts. These pelts sold in northern China for a considerable sum, marking what was to be the beginning of the great Northwest fur trade.

In 1776, Captain James Cook was sent by Great Britain to investigate the coastline that was raising so much interest in Russia and Spain. In 1778, Cook reached the northwest coast. He later named and charted Cape Foulweather, Cape Perpetua and Cape Gregory on what is now the coast of

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Oregon. Although Cook was killed on the return voyage, news spread rapidly that furs purchased for a few cents in the Pacific Northwest could be sold on foreign markets for large profits. As the fur trading business escalated, ships of various nations began to make regular voyages to the Pacific Northwest.

The first sailing vessel built on the Pacific Northwest coast was constructed in 1788 by John Meares, a British naval officer with Portuguese papers. The ship was constructed at Nootka on Vancouver Island and was made of native lumber sealed with tree pitch. The vessel was built for a fur gathering expedition with which Meares was associated. Soon after the launching, Meares sailed for China. He carried a load of wooden masts, perhaps the first forest products to be exported from the Pacific Northwest.

In 1788, Meares led an expedition to what was thought to be the mouth of the Columbia River. Observing only breakers and unbroken shoreline, he concluded there was no opening to a great river. Meares named the prominent headland Cape Disappointment, a reflection of frustration at not locating the sought after Northwest Passage. Meares travelled farther south where he found and named Quicksand Bay, now known as Tillamook Bay.

While on a fur trading expedition during the spring of 1792, Captain Robert Gray of Boston noted strong currents and eddies along the shore near Cape Disappointment. Bad weather prevented Gray from exploring the area. On a return voyage in May of the same year, however, he retraced his earlier route and investigated the places where his curiosity had been aroused. On May 11, 1792, Captain Gray found a passage between the breakers. He entered the mouth of the river early explorers had sought. He named the river Columbia after his ship, the *Columbia Rediviva*. As Gray approached Point Ellice, on the present-day Washington side of the river, Native Americans from a large village at that location paddled out to trade. Gray quickly collected 1,500 pelts, thus launching another chapter in the burgeoning Pacific Northwest fur trade.

In 1804, President Jefferson dispatched a team of explorers led by Captains Meriwether Lewis and William Clark. One purpose of the expedition was to map the unknown territory between the Missouri River and the mouth of the Columbia River. This exploration would determine whether or not a navigable water route existed connecting the West and East coasts of the continent. Jefferson's instructions were to explore the Missouri River to its source, and then to seek a river which flowed towards the Pacific, "whether the Columbia, the Oregon, the Colorado, or any other which might offer the most direct and practicable water communication across the continent, for the purposes of commerce" (Tucker, 1970: 30). Jefferson's underlying reason for the journey was to acquire information on the state of trade in the west, as well as to establish a means to further develop the area.

The expedition set forth from a point near St. Louis, Missouri on May 14, 1804. After a 4,000 mile journey by foot, canoe, and horseback, the group arrived at the mouth of the Columbia River. Upon their arrival in 1805, winter quarters were constructed near present-day Astoria and

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christened Fort Clatsop. The fort served as quarters for the group of thirty-two people from December, 1805 until their departure in March, 1806.

During the two year and four month expedition, Lewis and Clark established diplomatic relations with the Native Americans. New plant and animal life was catalogued, and specimens collected. Extensive journals were kept containing data on the soil and climate, the health of the expedition, the Native Americans, camp conditions, geography, and latitude and longitude readings. Each evening the information observed was transcribed on maps, creating the first extensive maps of the Northwest. Lewis and Clark's expedition was perhaps the single most significant event affecting the future settlement of the Oregon Country. Although an all-water route connecting the two coasts was not possible, the expedition proved that an overland journey was feasible. The expedition strengthened the United States' claim on the Northwest; the start of a more permanent territorial foothold on the Pacific seaboard.

The first permanent American settlement in the Pacific Northwest, Fort Astor, was established in 1811 by John Jacob Astor. Astor, a New York native, was the primary financier behind establishing the Pacific Fur Company. Visualizing a more comprehensive fur trade, Astor realized that a fur trading post at the mouth of the Columbia River would have many advantages. The companies transporting beaver from the northern continent overland to Montreal were operating at great expense. Moving the furs down the Columbia to the mouth would be a more efficient means of transportation and would enable expansion of the sea otter trade with Russian settlements on the Alaskan coast and with China. Astor realized the importance of establishing trading rights by setting up a permanent American settlement in the Northwest. An important aspect of the plan was an overland route to the East Coast, essential for expediting communication. The Lewis and Clark expedition had shown this was possible.

Two Pacific Fur Company expeditions were dispatched simultaneously, one by land and the other by sea. The vessel *Tonquin* left New York in September, 1810, starting what was to be a journey characterized by discord among the captain, crew, and passengers. Upon arrival at the Columbia River, the captain of the *Tonquin* sent out smaller vessels to sound the channels at the bar before the larger ship would cross. The smaller ships perished but the *Tonquin* cleared the bar on the third day. This episode illustrated the dangers of the Columbia bar and the need for navigational aids at the mouth of the river. In 1811, Fort Astor was hastily built on the south side of the Columbia River. After the construction was completed, the captain of the *Tonquin* proceeded northward to begin trading. The Pacific Fur Company overland expedition arrived at the post on the Columbia in May of 1811. The leader of this expedition, Wilson Price Hunt, later became the fort's commander.

A series of disasters rendered Astor's vision of a American settlement and fur trading station short-lived. Two of the three ships dispatched from New York were destroyed, the *Tonquin* was blown up by angry Native Americans, and the *Lark* capsized in heavy seas. The third reached the Far East, but the trading was not profitable. Merchandise carried by the overland party was lost, and the furs collected by the Astorians were sold at only one third their value. The War of 1812 with

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Britain over neutral rights made it hard to secure supplies for the post. These series of events lead to the sale of the Pacific Fur Company in 1813 to a Montreal group, the North West Company and the renaming of the post to Fort George. Although the private fur enterprise of the Pacific Fur Company failed, its political success had far-reaching effects on the future development of the Oregon Territory.

The Oregon Country

The Pacific coast was noted by early explorers as a strategic location for developing international trade and defense. Hall Jackson Kelley, a native of Massachusetts, was an early promoter of the Oregon Territory. In 1829, he organized the "American Society for Encouraging Settlement of the Oregon Country." In a letter to the United States government, he proposed that by colonizing Oregon, the United States would increase the country's resources and monopolize the Indian trade. This would help promote the "commercial and manufacturing interest of the country" as well as establish an abundant new source of fish. He also cited that a "port of entry and naval station at the mouth of the Columbia River, or in the Juan de Fuca Straits would be of immense importance to a general control of the Pacific" (Carey, 1922: 315). Kelley's vision of Oregon's fertile soil, vast forests, and gentle climate conveyed the importance of the region as both a military outpost and a West Coast trading center.

Other expeditions brought further attention to the West Coast. The missionary movement of 1833-34 stimulated interest in the area as missionaries were sent to the Northwest to "civilize the natives." Several missions were established in the Territory during this period; some were more successful than others. The first naval ship, the *Peacock*, was sent to the small coastal town of "Yerba Buena," later known as San Francisco, in 1836. The *Peacock's* arrival marked the presence of naval ships in the area. At that time, San Francisco was developing as an important fur trading port, military outpost, and whaling center. In 1839, a British survey crew was dispatched to study the mouth of the Columbia River. The Oregon coast and the Columbia River were slowly being charted; interest in the area continued to grow.

Between 1838-1841, Senator Lewis Fields Linn of Missouri introduced a series of bills in the United States Senate. He wanted the United States to officially occupy and settle the Oregon Country. One of the bills passed the Senate in 1843 but did not carry in the House. The bill, although defeated, stimulated an official land survey of the area. The 1840s mark the beginning of the "Great Westward Migration" when thousands of immigrants headed west by the overland trails and by sea. As stories filtered back to the East Coast from travelling parties, scouts were sent by the United States to further explore and report on the great Oregon Country.

In 1842, Lieutenant John Fremont set out to survey what was later the Oregon Trail. A trained Army topographer, Fremont received official endorsement from the Congress to conduct an official survey of an overland route to the Pacific Northwest. On his journey, he recorded the natural and geographic features of each region and designated locations for a series of forts along the route. Fremont contributed significantly to the opening of the Oregon Country by surveying the Oregon

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Trail and verifying earlier reports regarding the natural abundance of the land (Willingham, 1983: 3-4).

After a succession of disputes with England over the boundaries of the Oregon Territory, an amicable agreement was reached between England and the United States. A treaty was signed on June 15, 1846, securing what is now the state of Oregon as a United States territory. Although the territory was now under United States sovereignty, the second article of the agreement stated that navigation of the Columbia River would remain free and open to the Hudson Bay Company and, in the same area, to all British trading. By this time, the Columbia River was known as a valuable shipping route.

After the country's successful victory of the War with Mexico in 1848, the Treaty of Guadalupe Hidalgo was signed on February 2, 1848, formally asserting United States sovereignty over the present-day states of California, Arizona, Nevada, Utah and parts of New Mexico, Colorado and Wyoming. The United States now had sovereignty over the valuable Pacific seaboard from California to the 49th parallel. In August, 1848, Oregon was officially recognized as the Oregon Territory.

In a book titled *Oregon and California*, J. Quinn Thornton documented his travels to the West Coast from 1846-48. In his book, Thornton recommended settlement of the Oregon County. Among his recommendations were several proposals concerning travel by sea and inland waterways. He called for, "A line of steam packets from Panama, Monterey, San Francisco, and the Columbia river; Appropriations for the mouth of the Columbia river, for a fixed light on Cape Disappointment, a revolving light at Point Adams, buoys, a steam towboat; Fortification of Cape Disappointment, or Tongue Point or both; Light at New Dungeness" (Thornton, 1848: 48-49). These were perhaps some of the first formal written recommendations to the United States government for establishing formal aids to navigation in present-day Oregon .

The period from the late 1840s to the mid-1860s was very important to the development of Oregon as a valuable United States territory and, later, as a state. Early explorers cited the importance of Oregon for its natural resources and prime location in establishing ports for trade and naval stations. The Columbia River was one of the most important transportation routes in the territory. Regular trade began between Oregon's coastal ports and San Francisco. Other events spurred rapid settlement of the rich Oregon Territory; the California Gold Rush of 1849, the donation land claim act of 1850, and the formal admission of Oregon into the Union on June 3, 1859.

The California Gold Rush

On January 24, 1848, a discovery occurred which would dramatically alter the western seaboard. John Marshall discovered gold in California. It was not until December, 1848, after a speech by President Polk to the United States Congress, that news of the gold deposits of California were deemed credible. By mid-1849, thousands of gold seekers from all over the world poured into

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California by way of Yerba Buena Bay, later known as San Francisco Bay. The Gold Rush accelerated the prosperity and volume of the sea-based economy.

The discovery of gold expedited the development of the small coastal towns along the Pacific Northwest coast. Many industries developed around the Gold Rush, particularly those which were maritime-related. At the beginning of the Gold Rush fervor, more people arrived in California by sea than by land. This created a new business of routing thousands of gold seekers and supplies. Maritime businesses such as shipbuilding and foundries flourished with the increase in gold rush activities.

In 1848, the United States signed a contract with the Pacific Mail Steamship Company to deliver mail from New York to Astoria in the Oregon Territory. The first steamship, the *California*, left New York on October 8, 1848, and by the time it reached the Port of Panama, news of the Gold Rush had reached the port. Hundreds of eager passengers clamored to buy tickets to California. The *California* entered the Port of San Francisco on February 28, 1849. It became known as the first American steamship to enter any port on the West Coast. The steamship service further linked the two coasts.

In the early 1840s, the clipper ship gained popularity as a fast sailing vessel. These ships were constructed in response to the opening of trade with the Far East and the need to reduce the passage time; time was money. The sleek sailing ships were built for maximum speed to carry valuable goods to and from China. After the Gold Rush began, emphasis was placed on constructing even faster clipper ships, and East Coast shipbuilders started competing to design the fastest ships. In 1849, the average travel time between ports on the East and West Coasts was approximately four months. By the mid-1850s, the time was further cut; travel was reduced to an average of two months.

San Francisco became a bustling port town. Ships travelled the waters of the Bay throughout the day. A flagging system was established to guide ships safely into harbor. A flag was raised on what was known as Telegraph Hill, and a bell sounded upon the arrival and departure of large vessels. The first West Coast fog signal, a cannon placed at the entrance to the Bay, was used during this time. During heavy fog, the cannon was fired at regular intervals to warn mariners of incoming and outbound vessels. Harbormasters and pilots were also employed to help guide the vessels safely into harbor. San Francisco became the largest port on the West Coast.

Thousands of people who had heard of strike in California travelled the overland trails, passing through Oregon to the gold fields. In 1848, the year of the first reports of gold, the economy of Oregon was depressed. After the discovery of gold in July of 1848, two-thirds of the male population of Oregon made an exodus to California. As Oregonians returned from the gold fields after the strikes became less lucrative, they found their own source of gold: the fertile farm lands of the Oregon valleys. They found Oregon merchandise and farm products in high demand on the California market. Oregon turned into the supply base for the gold diggers who hadn't the time for agricultural and industrial ventures. Oregon surplus wheat was now in great demand. In Oregon,

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"Debts were paid throughout the territory; new manufacturing enterprises were started; towns sprang up; the river was filled with vessels awaiting cargoes of supplies for the mines" (Carey, 1922: 505).

Portland became the major trade center north of San Francisco. In 1850, the Pacific Mail Steamship Company established a mail and passenger service between San Francisco and Portland. The steamship service, although irregular at first, stimulated trade between the gold fields of California and the small trading centers of Oregon. Portland was in an ideal location, with direct access to the Pacific via the Columbia and Willamette rivers, and its fertile Tualatin and Willamette valleys. Perishable farm products could now be shipped from Oregon to California by the faster steamer service, contributing to the development of new markets. Seafaring sailing and steam ships made regular trips between San Francisco and Portland.

A customs house was established in Astoria in 1848 to monitor the cargo shipped between Portland and San Francisco. Colonel John Adair was appointed the first customs house collector in Oregon. The pilot bar headquarters were also maintained in Astoria, now the trading center for the lower Columbia River. The rivers surrounding Astoria were known for their abundance of salmon. Foreigners from all over the world, especially workers of Scandinavian descent, were attracted to the region's fishing industries. The fishing industry became a major business in the 1870/80s.

In the 1850s, the Oregon lumber industry began to grow. Full shipments of lumber were exported to Hong Kong along with cargoes of flour and salmon. Oregon profited, once again, from a gold rush, the 1858 strike on the Fraser River in British Columbia. Oregon farm products and supplies were again in demand as thousands of people poured into Portland on their way to the northern gold fields. Although the gold rush was short-lived, the search for gold spurred further development of the Pacific Northwest.

The demand for coal was increasing in the 1850s and 1860s (Beckham, Cape Arago: 1978). In 1855, the first shipments of coal were shipped from Coos Bay Harbor on the southern Oregon coast. Coos Bay became a major harbor because of its proximity to San Francisco and its abundance of natural resources. As coal-fueled steamships slowly replaced sailing vessels, the coal-producing area around Coos Bay gained further importance. Pilings, shingles, and lumber were also exported from Coos Bay harbor. Coos Bay became an important link to markets in San Francisco.

The Donation Land Claim Act (DLC) of 1850, as it was commonly known, was another impetus to the rapid settlement of the Oregon Territory. This Act of Congress created Oregon's Office of Surveyors-General of the Public Lands. Under the law, males were granted either 320 or 160 acres of land depending on the date of the claim and their marital status. This law spanned the period from 1850 to 1853; because of its success, the act was extended to 1855. From 1850 to 1855, between 30,000 and 35,000 people immigrated to Oregon in response to the act. This created a great increase in demands for goods and services. The population of Oregon increased

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from 13,294 in 1850 to 52,486 in 1860. This increase had a marked effect on the maritime transportation. The accelerated sea traffic during this decade generated the need for organized navigational aids along the major interior waterways and along the Oregon coast.

Oregon's Statehood and the Railroad Era

Upon Oregon's statehood in 1859, Congress passed the Admission Act. This granted Oregon jurisdiction over all navigable waters in the state, including tidal beaches (Oregon State Parks and Recreation, 1977: 9). The law stated that the waters "shall be common highways and forever free". Oregon waters were held in a public trust for the people; this trust included public rights to recreation, commercial fishing, and navigation (General Laws of Oregon, 1859: Chapter 33).

The advent of the railroads had monumental effects on the settlement and development of Oregon. As early as the 1830s, transcontinental railroad advocates on the East Coast were voicing their concerns about the importance of a railroad which would link the east and West Coasts. Construction on the East Coast spurred talks of transcontinental lines to the West Coast. On March 3, 1845, Congress endorsed construction of a transcontinental railroad. The War with Mexico of 1846-48, however, stifled plans for the massive undertaking. Plans were further postponed in the late 1850s by preoccupation with pre-Civil War politics.

Farsighted entrepreneurs saw the need for and the value of constructing feeder railroads to aid in commerce. The first railroads to use steam locomotives and iron rails in Oregon were small portage railroads constructed to bypass treacherous rapids on the Columbia River. These small lines, built in the early 1860s by the Oregon Steam Navigation Company, were constructed at the Cascades and Celilo Falls on the Columbia. The railroad lines were, in a sense, very early navigational aids, for the portage of goods and people around the dangerous cascades. After the Civil War and during the Reconstruction period, interest in building a transcontinental railroad and feeder lines revived.

Many railroads, such as the Oregon and California Railroad and the Oregon Central Railroad, were incorporated during the 1860s and 1870s. Entrepreneurs saw the railroad as a way of stimulating settlement and industry in the Pacific Northwest. The construction of the various rail lines was closely tied to the early steamship companies. The Oregon Steam Navigation Company, for example, was later reorganized as the Oregon Railway and Navigation Company. The railway and steamship companies were designed to combine water and rail commerce, particularly along the Columbia River. In 1879, the Oregon Railway and Navigation Company, the largest and most powerful in Oregon, owned a majority of all the steamboats on the Columbia, monopolizing the regional transportation business.

In 1883, the Northern Pacific Railroad and the Oregon Railway and Navigation Company connected, linking the Eastern seaboard with the West Coast; the transcontinental railroad was completed to Portland. Communication and transportation expanded further, encouraging the settlement of Oregon. Many of the supplies which were needed in the construction of the railroad

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were shipped by sea. The popularity of the railroad would later negatively affect the river navigation by steamboat. The very mode of transportation which helped build the railroad would be overtaken by it. Up to this point, contact with the rest of the United States had been primarily by sea and overland wagon roads.

Oregon's Economic Development

The population of the state tripled from 52,465 in 1860 to 174,768 in 1880. Oregon's natural resources were rapidly being exploited and Oregon products were in demand throughout the country. Oregon resources were in high demand on foreign markets. Before the 1870s, wheat and flour, grown and produced primarily in the Willamette Valley, were shipped to foreign markets, especially England. The wheat was originally shipped to San Francisco before being reloaded for delivery to the European markets. A surcharge for handling was added to the cargo in San Francisco, thus diminishing the profit for the Oregon producers. In 1868, a direct line was established between Portland and English port cities, opening a more profitable foreign trade market. Wheat grown east of the Cascades was introduced in 1872 and was well-received. Due to these new sources, the Willamette Valley wheat production dwindled.

Salmon production increased sharply. In 1864, the first salmon packing cannery was built in California, established by George, William and R.D. Hume, and Andrew Hapgood. The Hume brothers moved to the north bank of the Columbia River in 1866 and started a profitable salmon canning business. Chinese workers were employed, reducing overhead costs. The brothers developed a leak-proof can for salmon and persuaded European consumers that canned salmon was as good as fresh or smoked.

The salmon industry prospered during the industrial expansion following the post-Civil War reconstruction period. In 1866, 4,000 cans of salmon were packed along the Columbia River and by 1867, the number had grown to 18,000 (Lockley, 1928: 123). By 1874, the salmon industry was the leading industry in Astoria, reaching its peak by the 1880s. New Zealand, Australia, Latin America, the Far East and Britain provided new markets for Oregon salmon. Astoria prospered and became a commercial center on the lower Columbia River. The Hume Brothers and other entrepreneurs established canneries along other coastal waterways including the Rogue River, the Umpqua River, at Coos Bay and Gold Beach. Oregon canned salmon was exported all over the world.

In 1872, the legislature authorized private citizens to buy tidal lands on the Oregon coast. By 1901, the state had sold approximately twenty-three miles of tidal shores to private owners. Various groups opposed selling land along the coast because it restricted commerce. In 1899, the legislature declared thirty miles of the ocean beach from Astoria to the south line of Clatsop County "forever open to the public" (Oregon State Parks and Recreation, 1977: 10).

The coastal tourism industry boomed. Adventurous sightseers took steamers to the mouth of the Columbia, crossed Young's Bay by sailboat, and boarded waiting wagons which carried them

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to their favorite destinations south of Astoria and north of Tillamook Rock (Vaughan, 1974: 156). One of the earliest resorts to open on this section of the coast was Seaside House. Built in 1873, the resort was constructed by Ben Holladay, the wealthy railroad financier. Fishing, sailing, hunting, driving, bathing and walking on the beach were favorite activities of the beach-goers (Vaughan, 1974: 156). Another early resort, Oregon House, built on the coast was at Newport, Oregon. Constructed in 1866, the hotel took advantage of direct access to the beach and was visited by hundreds of tourists during its time.

The development of coastal tourism and the demand for Oregon's natural resources increased, caused the shipping industry to expand. The tonnage shipped by sea tripled between 1871 and 1881. This expansion created the need for better transportation systems and navigational aids along the coast. In response, the Federal government constructed four Oregon lighthouses in the ten year period from 1871 to 1881.

During the next two decades, the transcontinental railroad stimulated rapid population growth and urbanization. Oregon was now directly connected with the rest of the nation, resulting in new commercial and agricultural development. Oregon grew from an isolated frontier, attainable only by sea or overland trail, to a state with an economy closely interlocked with the nation's.

The expanding railroad networks brought new markets for Oregon's agricultural products as well as for lumber and fishing industries. In the 1880s, wheat and lumber exports increased as new markets and transportation systems developed. California was Oregon's best lumber consumer; exports and coastal shipping increased sharply. Portland became a main distribution center rivaling San Francisco. Shipping warehouses and shipyards were being built along the coast. Although the railroad had captured some of the sea shipping business, other events in maritime history kept the seafaring economy alive.

As railroads became more competitive with sea shipping, steps were taken to make the shipping industry more attractive. The mouth of the Columbia had always been a dangerous crossing, the site of many shipwrecks. In 1885, the Army Corps of Engineers finished plans for construction of a jetty on the south side of the Columbia River. Work on the project began shortly thereafter. The south jetty was finished around 1894, improving the channel substantially by lengthening and increasing the depth of the river. A jetty on the north side of the Columbia was completed in 1913. These jetties significantly altered the channels, making them more navigable, and thus helping to promote safe shipping by sea.

Even though the railroad took some business away from the sea trade, the two often worked in tandem, providing the fastest means possible for exporting goods. In 1887, the Canadian Pacific Railway finished a line to Vancouver and established a direct route for shipping flour to Asia; this eliminated the necessity of going through San Francisco. Investors coaxed the railroad companies to open feeder lines to Oregon, shipping the state's wheat and flour to the Far East. An even faster route was established in 1891; a direct steamship line from Portland to Asia, bypassing both San Francisco and Vancouver.

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In the same year, Portland city officials organized the Port of Portland. Officials were concerned about Puget Sound ports taking grain business away from Portland. The main goal of the Port of Portland was to improve river channels. Since there had been improvements at the mouth of the Columbia, officials knew that if the channels of the Columbia and Willamette rivers were not deepened for larger vessels, the grain business would be lost to the Washington ports. The Port of Portland levied taxes to improve river access by building and operating dredges. This was the beginning of many efforts to deepen the Columbia River shipping channel.

The prosperity of the 1880s gave way to the national depression of the 1890s. The effects of the depression lingered until the economy turned upward in the last three years of the 19th century. The 1897, the Alaskan gold rush helped stimulate Oregon's economy. Oregon became a stopping place for miners loading up with goods and supplies before continuing their journey north. Many stayed in the state, making their fortune from selling supplies to the gold seekers, much like the Willamette Valley farmers had done during the California Gold Rush. Once again, ships were put back into commission. Passage on Alaskan-bound steamers went for a premium, as did supplies. The shipping industry was revitalized.

The growth of the lumber industry in the last decade of the 19th century and the first decade of the 20th century further stimulated maritime economy. Eastern lumber companies expanded their holdings to the vast forests of the coast; coastal communities grew as mills developed. Oregon Douglas fir was cut at a rapid rate and used in the construction of buildings, bridges, railways, pilings, and ships. The San Francisco earthquake of 1906 further stimulated the lumber industry, as building supplies were badly needed for reconstruction. Portland, Coos Bay, and Astoria were the largest ports in Oregon.

After the turn of the century, farming and animal industry profits increased; one in four people in the Northwest was employed in related businesses. The fruit industries of the Hood River and the Rogue River valleys continued to prosper as products were shipped all over the world. This increase in agricultural production put greater demands on both sea and rail transportation systems.

The Lewis and Clark Exposition of 1905 brought nationwide attention to Oregon as thousands of visitors poured into the state to attend the fair. Many stayed, which further bolstered the economy and the population. As the railroad connected several coastal towns with the interior of the state, the Oregon coast became more popular as a tourist destination. Seaside, Gearhart, and Newport became favorite vacation spots for city dwellers. They flocked to the beaches by sea, wagon road, and rail.

The Oregon Pacific Railroad connected Corvallis with Newport in 1885; Astoria and Seaside were connected with Portland by 1898. The Pacific Railway and Navigation Company offered regular rail service between Portland and Tillamook. Many women and children spent summers at the beach, met by their husbands on the weekends. Some of the trains leaving Portland on Friday

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nights were coined "Daddy Trains," as so many fathers were in route to the coast to meet their families (Oregon State Parks and Recreation, 1977: 6).

In 1913 Governor Oswald West, a proponent of the preservation of the Oregon coast, introduced a bill in the Legislature declaring Oregon beaches public highways. The Legislature passed the bill, thus protecting the beaches from private development. The same year, the Oregon Legislature created the State Highway Commission, setting the stage for the future development of the coastal highway.

The Automobile Age

The introduction of the automobile brought many changes to the face of Oregon during the pre- and post-World War I eras. Shipbuilding and lumber production increased during World War I as lumber and ships were needed for military endeavors. Because large shipbuilding operations were already established and the state had essential sources of raw materials such as lumber, Oregon played an important role in wartime efforts. The state had already been building ships to fill foreign orders; now the ships were being built for the Allied War efforts. Both wood and steel ships were constructed, and native spruce, fir, and cedar found in the coastal forests were also used in the construction of airplanes. After World War I, Oregon was left with several new and expanded industries.

Automobiles were introduced on the West Coast in the first decade of the 20th century. Many new jobs and businesses developed as the automobile's popularity increased. The automobile brought forth new roadways and highways evident in the Good Road Movement which pushed across the nation. At first, the railways supported the movement; it was thought roads would expedite the transportation of goods from the farm to the rail lines. However, as the trucking industry developed in the 1920s and 1930s, the railroad stopped backing the federal road expansion projects. Inter-urban railway lines reached a peak after World War I, then gradually succumbed to alternative modes of transportation: automobiles, trucks and buses.

As automobile use increased in the cities, governmental agencies were pressured to provide better road conditions. The State Highway Commission was organized in 1913 in response to the automobilists' need to improve the quality of the state road system. In 1914, the state highway system was adopted. The Columbia River Highway was one of the commission's first major projects in the state. The building of the Columbia River Highway came to fruition when financial backers and promoters Samuel Hill, John Yeon, and Simon Benson became involved.

The highway construction began in 1913 and was completed from Portland east to Hood River and west to Astoria by 1916. The remainder of the highway was completed in 1922, extending to The Dalles. The Columbia River Highway became known throughout the country for its scenic beauty and excellent construction. It opened land along the Columbia River to both automobile travelers and recreational seekers.

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In the 1920s, the state began constructing sections of coastal highways to connect the towns along the coast. In 1921, Governor Ben Olcott introduced a bill in the Legislature to preserve the scenery along the roadside. Olcott's bill outlawed the destruction of trees along the state highways. Scenic overlooks and public facilities were opened along the highway and, in 1925, the Legislature initiated and established a system of state parks and waysides. These amenities were to accommodate visitors touring the state. Auto camps, including tables, benches, camp ovens and "comfort stations" were established along the highways.

Tourism increased as automobilists motored along the Columbia River Highway. New businesses developed around the automobile industry; service and gas stations opened throughout towns across the state. Restaurants and hotels also opened to accommodate the tourists. A series of bridges were constructed along the coast highway under the design and supervision of Highway Department employee, C.B. McCullough. McCullough, State Highway engineer from 1919 to 1935, was responsible for the well-designed bridges on the coast such as those at Yaquina Bay, Gold Beach, and Coos Bay. These bridges improved the connection between the coastal cities, stimulating tourism along the highway.

During the early period of the automobile age, the steamship lines maintained fairly steady business. Passenger use rose after the 1915 Panama-Pacific Exposition in San Francisco, an event which stimulated travel by sea. The opening of the Panama Canal in 1914 also gave a boost to sea commerce by once again shortening the time between coasts. At this time, Oregon was still exporting grain and cereals in large quantities. They were shipped by sea because railroad freight rates had escalated and new improvements in the Columbia and Willamette Rivers made shipping easier. The lumber industry was a major exporter during this period and continued to rely heavily on shipping by sea.

In the 1930s and 1940s, the automobile brought on great roadway expansion. The new automobile age gradually brought reduced passenger and freight service on ships. The rise of the automobile and the depression ultimately caused the demise of steamship service and, a gradual decrease in the shipping industry. Some of the old steamers, however, were taken to South America and used as passenger ships; with the advent of World War II, others were put back into commission.

World War II

World War II stimulated building throughout the Pacific Northwest. Training camps, air bases, defense installations and manufacturing plants were quickly constructed in Oregon. Hundreds of businesses were established in response to the need for wartime equipment and supplies. Airplane hangers and manufacturing plants, machine shops, scrap iron foundries, aluminum plants and shipbuilding facilities were established. The work week shifted from eight hours a day to twelve hours, often seven days a week.

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The trucking and freight industry expanded as needed supplies were transported to manufacturing plants. Because speedy distribution was necessary in the production and delivery of war time goods, rapid transportation systems were important during the war. The use of the highway systems was at an all time high during the middle of the war years, as supplies of food, clothing, and equipment were moved to be shipped overseas. The 1944 Highway Act was created in response to a national defense strategy. The act defined a separate network of highways that would connect "the principal metropolitan areas, cities, and industrial centers, to serve the National Defense, and to connect at suitable border points with routes of continental importance" (Vaughan, 1974: 588).

The shipbuilding industry mushroomed, especially in the Portland area, as ships were vital to the war time effort. Ship construction and repair stimulated the shipping industry once again in the Northwest. After the bombing of Pearl Harbor, a frenzy of activity occurred in the shipbuilding industry as the United States sought to reinforce and expand the Navy. Large shipbuilding plants such as Kaiser Corporation, Oregon Shipbuilding Corporation and Swan Island Shipyards in the Portland-Vancouver area, supplied a large percentage of the tankers built for United States and Allied troops. New airports were constructed to handle military aircraft assigned to the defense of the Northwest Coast. Fort Stevens and Fort Canby, at the mouth of the Columbia River, were main defense installations on the Oregon and Washington coasts.

The lighthouse stations along the coast were instrumental in the defense of the Pacific Northwest. Under a declaration of war, the Coast Guard (in charge of managing the lighthouse stations) came under the jurisdiction of the Navy. The lighthouse complexes were transformed into watch stations, with regular teams patrolling the beaches on foot and on horseback. Twenty-four hour patrols were maintained. Station personnel usually doubled and make-shift living quarters were erected. The stations took on greater duties and more importance.

After World War II, building activity in Oregon continued at a rapid pace. Plants which were used in wartime production were converted to other uses, while businesses established during the war continued to thrive. There was a surge in building activity in residential areas across the country as new subdivisions were constructed to accommodate postwar families. Road systems expanded, further opening lands for development, especially around the larger urban areas. Although after World War II role of lighthouse stations assumed their pre-War status, the stations were still important to the maritime transportation of the state.

FEDERAL AGENCIES ACTIVE IN THE DEVELOPMENT OF THE LIGHTHOUSE STATIONS

There were many federal agencies involved in the development of the Oregon coast lighthouse stations. These agencies assured the best possible sites, surveys, engineering expertise and joint life-saving efforts for the stations. The following agencies worked together in the development and maintenance of the lighthouse stations.

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The United States Lighthouse Establishment

In the beginning of the 18th century, local merchants petitioned colonial governments for funding to construct aids to navigation. These aids would help to protect the shipping which was so important to the merchants' livelihood. Subsequently, the first American lighthouse was constructed on Brewster Island in 1716, illuminating the entrance to Boston Harbor. Twelve other lighthouses were constructed during the colonial period before the Revolutionary War (only Sandy Hook Light at the entrance to the port of New York is extant).

Other early navigational aids employed by the colonists were fog signals and buoys. A cannon placed by the Boston Light in 1719 marked the first recorded use of a fog signal in the colonies. The cannon warned ships of dangers when, due to thick fog, the lighthouse illuminations were rendered useless. Buoys, an important navigational aid for coastal waters and inlet waterways alike, were first used in the Delaware Bay in 1767. The early barrel-type buoys were made of wood and painted to ensure their visibility in the sea.

After establishing the new federal government in 1789, the administration and maintenance of the lighthouses were transferred from the individual colonies to the federal government. Navigational aids were then placed within the jurisdiction of the Treasury Department. During this period, contracts and decisions were personally attended to by Presidents Washington, Jefferson, and Adams.

Lighthouses were important to the economic development of the fledgling eastern states as they would later be to the western coast. It was not until the early 1840s that navigational aids were recommended for the Pacific coast. Lamps suspended from trees and bonfires were perhaps the only navigational aids employed on the West Coast during this period.

Leadership of the United States Lighthouse Establishment changed five times within the federal government between 1789 and 1820 when the fifth auditor of the Treasury Department, Stephen Pleasanton, became the lighthouse administrator. Pleasanton, with no maritime background, hired Winslow Lewis, an unemployed ship captain who had designed a lighting apparatus, to aid in the duties of the Lighthouse Establishment. Lewis was to supply and repair the lighting equipment for the nation's light stations.

There were fifty-five lighthouses on the East Coast when Pleasanton took over the duties of the Lighthouse Establishment. At that time new types of aids, such as the fog bell and the lightship, were being added to the Establishment's lists of navigational aids. First mention of a fog bell installation was in 1820 at West Quoddy Head Lighthouse in Maine. Fog bells were originally operated by hand and later by machines powered by a clockwork system. The first lightship was put into commission in 1820 at the entrance to the Elizabeth River in Chesapeake Bay. At that time there were also 1,000 buoys marking the hazards of various bays and rivers. By 1838, the number of lighthouses had increased to 204 and the number of lightships to twenty-eight.

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West Coast Aids to Navigation under the Lighthouse Establishment

The need for navigational aids along the Oregon coast and inland waterways was seen as critical to the development of coastal shipping and commerce. During the late 1840s when exploration and settlement of the Oregon Territory escalated, the United States Government accumulated information in support of various sites in need of navigational aids. The Columbia River was cited as an important location for the construction of a lighthouse.

The natural hazards of the Columbia River bar, the number of previous shipwrecks and increased river traffic, made the Columbia a natural target for navigational aids. Port development on the Oregon coast was hampered by the lack of aids to navigation. Less sophisticated aids to navigation, such as the range system, were employed during the early settlement era. The range system consisted of white rags tied to two or more trees which were aligned with the channel to be traversed. The captain aligned the rag-tied trees so one was behind the other, creating a line of sight upon which to direct the ship. At night the range was created by the use of two or more bonfires. The range was easily relocated with the frequently changing channels.

During the 1840s another type of navigational aid was officially used: the bar-pilot. Bar-pilots led ships through the dangerous mouth of the Columbia. In 1846, due to the increase in traffic on the Columbia River, the Provisional Government enacted the first pilotage law. This law required licenses for pilots guiding ships across the Columbia sand bar. As Pacific Northwest sea commerce increased, the need for more sophisticated navigational aids grew.

The United States Lighthouse Board

America's lighthouse technology was behind that of other nations until the early 1850s. After years of public complaint about the superior quality of lights in other countries, Congress organized a committee to investigate the Lighthouse Establishment. The resulting report, published in 1852, outlined the poor construction techniques and inferior materials used in American lighthouses. Also cited was the lack of instructions the keepers had for tending the lights. The most important element cited in the investigation was the inferior lighting equipment in the towers.

Subsequently, in 1852, a new lighthouse organization was formed: the United States Lighthouse Board. Congress charged the Lighthouse Board with the administration of the nation's aids to navigation. Since the members of the Board were essentially the same as the Congressional Committee that had investigated the Lighthouse Establishment under auditor Pleasanton, they realized that the first and most important defect to correct was the lighthouse lighting systems. They ordered Fresnel lenses from France to replace the previously used Winslow Lewis lamps. By the time the Civil War began, all the lighthouses in the United States had Fresnel lenses in the lantern rooms.

The Board divided the country into twelve lighthouse districts. An inspector was appointed for each district and was charged with overseeing lighthouse construction and repairs. A National Depot, established on Staten Island, was the distribution point for supplies being shipped to each

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depot. The district depots in turn supplied individual light stations with coal, oil, tools, and other goods necessary for light keeping.

Under the United States Lighthouse Board, conditions for navigation in the nation's waters improved steadily. Many lighthouses, fog signals, buoys and lightships were added to the inventory of aids to navigation during this period. An inventory was published and distributed to mariners in the form of annual light lists. The Lighthouse Board began printing changes made in aids to navigation in a Notice to Mariners. Keepers were issued uniforms, and a classification system for buoys was established.

Several advances in the technology of navigational aids were made during the 1850s. In 1851, an experimental air fog whistle and reed horn were installed at Beavertail Lighthouse at the entrance to Narragansett Bay in Rhode Island. The first installation of this sound signal was powered by a horse and later by an internal combustion steam engine. Around 1851, mechanically-rung fog bells were introduced. The striking mechanism was governed by a weight attached to a flywheel, and later internally run by clockworks. The strokes of the fog signals were timed deliberately to afford each signal a unique sound characteristic.

Fog bells were usually small and had to be rung by hand. On July 2, 1906 due to a failure of the mechanical striking mechanism, Mrs. Juliet E. Nichols, light keeper on Angel Island in San Francisco Bay, rang the fog bell continually by hand with a household hammer for twenty hours and thirty-five minutes. Two days later the mechanism failed again and Nichols again tolled the bell by hand throughout the night.

In 1850, the United States Lighthouse Board prescribed color schemes for the buoys, as well as range lights and day markers; the buoy system was standardized. Classification systems were also developed to mark the nation's waterways. Iron buoys were introduced at this time as noted in an appropriation specifying an iron can buoy installed at Little Egg Harbor, New Jersey. In 1855, the new bell buoy was introduced.

Lighthouse illuminates were further refined and experiments in other aids to navigation persisted throughout the decades of the 1860s, 70s and 80s. In the 1870s great improvements in the technology of fog signals were especially helpful on the northeastern and western coasts. The bell signal was gradually replaced by three variations of that instrument. The first was an ordinary locomotive whistle, enlarged and modified and blown by steam from a high-pressured tubular boiler. The second was a reed-trumpet, and the third, a siren-trumpet. Although the bell signal was still used for warning vessels in short distances, these fog signals started to supersede the smaller bell signal. Whistling buoys were invented by J.M. Courtenay during this period and were first in use in 1876. The first gas-lighted buoy was installed in 1882. The number of lightships increased substantially and by 1882, all lightships were constructed of iron or steel.

Many changes in the Lighthouse Board occurred during the last two decades of the 19th century and the first decade of the 20th century. The United States Lighthouse Board was continually

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trying to improve the quality of navigational aids technology, from fog signals to lighthouse illuminants. Before this period, whale oil and kerosene were both used to fuel the lights. By 1885, kerosene became the principal illuminant for the lighthouses; whale oil had become more expensive as production decreased. Due to the volatile nature of kerosene, Congress issued a series of small appropriations for the construction of separate fireproof oil houses at each lighthouse station. Installation of these structures was finally completed circa 1917.

In 1886, a new technology was being tested in the illumination the Statue of Liberty: electricity. The electrical lighting of the statute, under the Lighthouse Board's care from 1886 to 1902, marks the beginning of the "modern age" in lighthouse illumination. In 1900, the Lighthouse Board began converting lighthouses to electric service; however, due to the lack of direct access to power lines, the conversion came about slowly.

In 1889, the "first wireless messages" were sent and received between ship and shore on the East Coast. This exchange occurred between operators aboard the S.S. Ponce and the Navesink Tower (New Jersey). The wireless premiere had been staged earlier at San Francisco's lightship when one message was sent repeatedly from ship to shore. The advent of the telegraph ushered in a new type of navigational aid which would improve needed communication between ship and lighthouse stations.

The Lighthouse Board started providing guidelines for lighthouse keepers as stated in a United States Lighthouse Report of 1885, "It is believed that uniforming the personnel of the service, some 1,600 in number, will aid in maintaining its discipline, increase its efficiency, raise its tone and add to its esprit de corps." Uniforms were introduced in 1884, and by 1885, all lighthouse personnel wore standardized uniforms.

West Coast Aids to Navigation under the Lighthouse Board

In November, 1848, the United States Treasury Department appointed John Adair as the first Collector of the Customs for the Port of Astoria. Adair was hired at a yearly salary of \$1,000.00 K.J. Walkes, the United States Treasury Department head, stated in a letter to Adair upon his appointment that, "a survey has been ordered to be made on the coast of the United States in the Pacific by officers attached to the coast survey with a view to the location of lighthouses, beacons, buoys." As these navigational aids were built or installed, Adair was in charge of their maintenance.

In 1852, as a result of this and previous surveys made by the United States Coast and Geodetic Survey, Congress authorized the construction of sixteen lighthouses and additional buoys at various locations on the Pacific coast. Ten lighthouses were to be erected in California, five in Washington and one in Oregon. Alcatraz Island Lighthouse, built in 1854 in San Francisco Bay, was the first in the series of American lighthouses constructed on the West Coast. Cape Disappointment at the mouth of the Columbia River was given a high priority in the illumination sequence because of its need for a lighthouse. It was, however, the eighth to be illuminated. A

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series of delays, including the sinking of the construction cargo ship, caused the lights late completion. The ship sank in sight of Cape Disappointment. The lighthouse was finally illuminated in 1856.

Before the construction of Cape Disappointment Lighthouse on the Washington side of the Columbia River, several buoys were installed at strategic locations on the river in the spring of 1853. These were approved by Congress in September of 1850 when Congress prescribed a consistent color scheme and buoy classification system. This also set standards for the buoys, such as color, size, type, and markings. Most of the buoys at this time were constructed of wood, particularly cedar; however, iron buoys were beginning to be used in some locations.

A letter dated January 16, 1853, written by G.G. Cosier from Astoria, stated the need for navigational aids at the mouth of the Columbia River. Cosier's letter to the Treasury Department stated, "The occurrence within a few days of two wrecks at the mouth of this river with the report of a third accompanied by supposed loss of life of all on board induces me regretfully to urge upon the department the 'speedy erection' of the light house at Cape Disappointment. The whole of this coast is subject during five months in the year to storms, sometimes continuing as has been the case this winter for weeks at a time. Besides the lighthouse there should be provided a 20 to 30 feet life boat as with carriage to be kept in a suitable location at Tansey Point (Adair: Customs House Records, January 16, 1853)." This was the first known written request for appropriations for a lifeboat station on the Oregon coast.

In 1854, Adair requested that buoys on the West Coast be made locally rather than shipped from the East Coast. He also requested that fog bells be sent also to be attached to spar buoys. The Treasury denied Adair's request for fog bells citing they "could not be attached to spar buoys, so as to subserve any useful purpose." But a fog bell was to be sent for the light at Cape Disappointment. By April 1855, Adair had commissioned the construction of 30 buoys locally, made to the specifications given by the Lighthouse Board. In August of the same year, the United States Treasury Department sent Adair additional drawings for the construction of spar buoys for the Columbia.

In 1852, the Umpqua River was the only site in present-day state of Oregon cited by the United States Coast and Geodetic Survey as a prime location for a permanent aid to navigation. With the advent of the California Gold Rush, the river became an important shipping route for goods and supplies bound for California. Its position as a major transportation route between exterior markets and interior valleys kept the Umpqua River busy. Subsequently, several towns were founded near the Umpqua River in the 1850s, including Gardiner and Scottsburg.

Gardiner and Scottsburg each thought its site would develop into the future commercial center of the southern Oregon coast. The towns did flourish for brief periods. Scottsburg, seventeen miles from the mouth of the river, was platted by Levi Scott in 1850 and became an important shipping point until the Gold Rush fervor diminished in the early 1860s. Gardiner, approximately seven miles up river, was founded when the schooner *Bostonian* wrecked upon the Umpqua bar in 1850

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and its good were moved to the future town site. In 1851, in recognition of its position as a port, Gardiner was chosen as the site for a United States Customs House. Colin Wilson was appointed as the first customs collector. Gardiner continued to grow due to its abundance of timber and fish, and its rich lands, ideal for dairying.

Joseph Lane, an early land claimant in the Umpqua region and first governor of the Oregon Territory, was instrumental in petitioning for a permanent aid to navigation at the mouth of the Umpqua River. Lane was concerned about the increase in commerce and the number of shipwrecks at the bar. The ranges, previously placed on the south shore of the river in ca. 1852 to indicate changes in the river's bars, were not adequate for the amount of ship traffic.

Construction of a permanent aid to navigation began in 1856 and was completed in 1857. The Umpqua River Lighthouse was constructed on the north side of the river at the mouth. This was the first lighthouse built on the Oregon coast and the only lighthouse constructed during the initial period of statehood. The Umpqua River Lighthouse was one of the original sixteen lighthouses authorized by Congress for construction in 1852 on the Pacific coast. These early lighthouses were usually designed by engineers from the Army Corps of Engineers. The Corps engineers worked together with the personnel from the Lighthouse Board in the siting and engineering of the stations. The majority of the early site surveys for the lighthouse reservations were conducted by members of the United States Coast and Geodetic Survey. Since technical expertise was limited in early years of the United States government, federal agencies often worked together, sharing each others knowledge and technical training.

A Report of the United States Light House Board specified there were 608 lighthouses in the United States in 1874, twenty-one light ships, forty fog signals, 346 day or unlighted beacons, and 2,865 buoys. Eleven of the lighthouses and light beacons cited in the 1874 national total were in the 13th District which included Washington and Oregon. Five of these lighthouses were constructed in Oregon: Cape Arago (1866), Cape Blanco (1870), Yaquina Bay (1871), Yaquina Head (1873), and Point Adams (1875-raised). There were two operating fog signals/ steam whistles at Cape Flattery and Dungeness. Fifty-six buoys were on station with thirty-six spare buoys in storage. The tender steamship, the *Shubrick*, which serviced the aids to navigation both in the 12th and 13th Districts, was in use at this time. There were no West Coast lightships or day beacons were in use as of this date; however, in 1874, the Board appropriated \$3,000 for day beacons to be installed on the Columbia River. The depot for the 13th District was located at Astoria.

Five lighthouses were built on the coast in response to increased maritime activities between 1880 and the time the Lighthouse Board was reorganized to the Lighthouse Bureau in 1910. According to the *Annual Report of the Lighthouse Board*, published in 1884, there were thirty-nine lighthouses and light beacons in the 13th District (Oregon and Washington) at this time. Other navigational aids included fourteen day or unlighted beacons, four fog signals operated by steam and two operated by clock-works, two whistling buoys, and 127 other buoys positioned along the waterways. The report stated that two buoys were discontinued on the Columbia River in 1884,

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and that a "first class steam-siren was in operation on Tillamook Rock." The lighthouses constructed in Oregon between 1880 and 1910 were Tillamook Rock (1881), Warrior Rock (1888-a river lighthouse), Cape Meares (1890), Umpqua River (1894-second light), Heceta Head (1894), Coquille River (1896), Desdemona Sand (1902-razed), and Cape Arago (1908-second light).

The first lightship on the Pacific Northwest coast, *Lightship No. 50*, was posted at the mouth of the Columbia River in 1892. Because the early lightships were without on-board propulsion, many ships were frequently blown off station. Evidence of this occurred in a November, 1899 gale when Lightship No. 50 was blown aground on the beach just north of the Cape Disappointment Lighthouse. After sixteen months of work, horses dragging the lightship 700 yards across the sand and through the forest, the lightship was again reinstated in the Columbia River at Baker Bay near Ilwaco, Washington. The vessel was towed to Astoria for repairs, and remained on lightship duty until relieved in 1909. The ship was subsequently used as a cannery tender. Three successive and progressively modern lightships replaced the original wooden lightship No. 50. The lightship guided many vessels safely through the Columbia River bar. The third of these lightships, No. 604, was decommissioned after 29 years of service. The first and last lightship station on the Pacific coast, at the mouth of the Columbia River, was replaced by a large navigational buoy on October 29, 1979.

The United States Lighthouse Bureau

The United States Lighthouse Board was reorganized in 1910 as the Lighthouse Bureau. The new bureau had a pyramid management structure with a single bureau chief in charge. Under the Lighthouse Board, military officers from the Navy and Army Corps of Engineers had been assigned as engineers and inspectors of lighthouse districts. The military personnel usually served for short terms of duty which often created a loss of continuity in the system. Civilian inspectors and engineers appointed by the new bureau served long terms. This change in structure provided continuity with in the lighthouse administration. The first Commissioner of the Bureau was George Putnam, distinguished member of the United States Coast and Geodetic Survey.

On July 1, 1910, George R. Putnam took office as the first Commissioner of Lighthouses under the new Lighthouse Bureau. He was Commissioner until 1935, during which time he instituted many technological advances in the lighthouse service. The radio beacon, which enabled safe navigation in fog with an electronic direction finder was an important new navigational aid .

In 1912, under Putman's leadership, a monthly newsletter called the *Lighthouse Service Bulletin* was begun. It was circulated to Lighthouse Bureau employees and contained events of interest and importance, as well as occasional anecdotes and recipes. In the same year, a system of efficiency stars and pennants was established to promote friendly rivalry among lighthouse keepers.

During World War I and the period following, several technological advances contributed to the automation of lighthouses, rendering human occupancy unnecessary. A device for automatically replacing burned-out electric lamps in lighthouses was developed and placed in several lighthouses

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in 1916. A bell alarm warning keepers of fluctuations in the burning efficiency of oil vapor lamps was developed in 1917. In the same year, the first experimental radio beacon was installed in a lighthouse. The first automatic radio beacon in the United States began service in 1928. Radio beacons are still in use today, although several on the Pacific coast have recently been decommissioned as improved electronic navigational aids have become available. Radiocompasses were also introduced during this period; the first facility in Oregon was built by the United States Navy in 1918 in Coos Bay. This facility was operated in conjunction with the Life-Saving Service and Lighthouse Bureau. An automatic time clock for operating electric range lights came into use in 1926, and by 1933, a photo electric-controlled alarm device had been developed to check the operation of the unwatched electric light. A lightship staffed by remote control was equipped by the Lighthouse Bureau in 1934. It included a light, fog signal, and radio beacon, all controlled by radio signals. A battery-powered buoy which gradually replaced the older acetylene buoys, was introduced in 1935.

Improvements in the road and highway systems provided better and more rapid means of transportation during the 1920s and 1930s. As a result of the improved roadways, The Lighthouse Bureau was able to better maintain aids to navigation, benefiting the service economically. The extension of electric lines into remote sections of the country provided a reliable power source for operating aids to navigation. By the 1920s/30s, the majority of light stations had electric service, reducing the number of staff necessary to operate the station. As auxiliary buildings in the stations were rendered useless, the makeup of the light station began to change. In the 1960s, these various changes facilitated the eventual automation of all light stations, which led in turn to the surplusage or demolition of outdated lighthouse buildings.

The United States Coast Guard

The present day Coast Guard is made up of several distinct governmental agencies which have merged over a period of over two hundred years. As a result of these mergers, the Coast Guard has a diversified background and a variety of goals, including the promotion of safe and efficient maritime transportation, the collection of national revenues, and the support of measures to enhance national security and to preserve life at sea (Bennett, 1983: 3).

One of the earliest agencies overseeing the collection and protection of national revenue was the Revenue Marine Service, created by Congress in 1790. A bill, the Revenue Cutter Bill, was passed on August 4, 1790 and resulted in the construction of ten boats or 'cutters' for the sole purpose of protection and collection of United States' revenue. For eight years, this small band of ships acted as the country's only navy. The date, 1790, marks the official founding of the United States Coast Guard.

In the following years, the role of the Revenue Marine or the United States Revenue Cutter Service expanded, the cutters were used in rescue missions as well. Their new role included rescuing shipwrecked vessels. As steamship travel in the early part of the 19th century became more common, so did accidents and explosions at sea. Due to a rash of accidents in the 1830s,

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Congress enacted a steamship inspection law to help ensure the safety of the passengers and crew. This inspection role, along with that of investigating boat accidents, were new roles for the Revenue Cutter Service.

In the second decade of the 19th century, increased commerce brought further demands on the Maritime Cutter Service. A new agency was formed, the United States Life-Saving Service. The two agencies functioned separately until 1915, when the United States Cutter Service and the United States Lifesaving Service merged to form the United States Coast Guard. This was part of a reorganization effort within the government to centralize and consolidate the efforts of the agencies.

The Coast Guard was active in World War I. Approximately 280 lifeboats, were active in the wartime effort and cutters patrolled the coasts of the United States as well as areas overseas. It was during this time that the aviation section of the Coast Guard was formed to meet the demands of the war. The Coast Guard had a higher percentage of people killed than any other branch of the service. After World War I ended, the Coast Guard was charged with enforcing Prohibition Laws by air and by sea. Additional ships and aircraft were needed for this purpose, causing the expansion of the guard.

The United States Coast Guard was again reorganized when the United States Lighthouse Bureau was superseded by the Coast Guard on July 1, 1939. President Roosevelt's Reorganization Order No. 11 read, "The Bureau of Lighthouses in the Department of Commerce and its functions are hereby transferred to and shall be consolidated with the administration of the Coast Guard in the Department of Treasury." Civilian employees of the Lighthouse Bureau were given the choice of retirement, joining the Coast Guard at an equitable rank and rate of pay, or remaining with the civilian Lighthouse Bureau. The Coast Guard was now in charge of maintenance of the lighthouses as well as assisting mariners in distress.

Over the years, the United States Coast Guard has served in many capacities, acting as "the main agent for the promotion of a whole range of national purposes in the maritime arena" (Bennett, 1983: 3). Currently, the Coast Guard has several missions or objectives which have come through the merging of various federal agencies. The Coast Guard's objectives can be listed in the form of missions or programs which include the following: Merchant Marine Safety, Aid to Navigation, Search and Rescue, Maritime Law Enforcement, Military Readiness, Boating Safety, Port Safety and Marine Environmental Protection. The Coast Guard today is a multi-faceted agency important to the country in times of peace as well as war.

Aids to Navigation under the United States Coast Guard

During World War II and postwar periods, the Coast Guard continued to develop new technologies. The effectiveness of radio technology and an increased dependence on it, decreased the role of the lighthouse stations. SHORAN (short-range navigation aids) or LORAN (long-range navigation aids) were installed at stations and stationary towers; large sea buoys slowly replaced

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the lightships. In recent years, plastic lenses have been introduced. These smaller and less expensive lenses, designed like Fresnel lenses, are as effective as the old lenses, and require less maintenance.

In the mid-1960s, the Lighthouse Automation and Modernization Program (LAMP) began. Often the Fresnel lenses were kept in place and a timer switch was installed to turn the light on and off. The illuminants were usually 1,000-watt bulbs or lamps. These automated light stations were checked once a month. Currently, Aid to Navigation Teams (ANTs), the modern keepers of the lights, check the light stations on a quarterly basis.

Lighthouse personnel staff was further reduced as more lighthouses were automated. By the 1960s, fewer than sixty lighthouses had keepers. By 1990, all lighthouses were automated. Frank Schubert, the last civilian lighthouse keeper, retired in 1990 when his station, Coney Island Rear Range Light, was automated. The administration and maintenance of government-owned lighthouses is still under the jurisdiction of the Coast Guard. The Coast Guard, however, is now a part of the Department of Transportation.

In May of 1980, the United States Coast Guard Short Range Aids to Navigation Division of the Office of Navigation was formed. Under this program, sixty-four Aids to Navigation Teams (ANTs) were assigned across the country. The Aids to Navigation Teams, each of which comprises about twelve people, are responsible for maintaining the active lighthouses in the United States. Each ANT is assigned responsibility for its area's lighthouses, providing periodic preventive maintenance, and responding immediately to lighthouses if any outages or other discrepancies. Under this system, a relatively small number of people are able to look after the approximately 400 active lighthouses administered by the United States Coast Guard today.

United States Life-Saving Service

In the early 1840s, the Massachusetts Humane Society organized a group of volunteers to assist mariners in distress and to establish shore-based lifesaving stations along the eastern seaboard. The first of these stations was constructed at Cohasset, Massachusetts. Later stations were built adjacent to busy seaports. Used mainly as holding repositories for rescue equipment, these small structures were staffed by local volunteers.

In 1848, upon the recommendation of William A. Newell, a member of congress from New Jersey, the United States government appropriated \$10,000 to provide lifesaving equipment and boats for the preservation of life along the coast of New Jersey (Noble, no date; 4). Massachusetts soon followed and received appropriations for their stations. These early stations were managed under the Revenue Marine (established in 1790), a part of the Treasury Department, and were staffed by volunteers. The service maintained its 'no employee status' until 1854 when a disastrous storm hit the eastern seaboard, killing many mariners. This prompted Congress to appropriate additional funds for the construction of more stations and to hire a full-time keeper at the stations. Although additional stations were constructed and keepers hired, much time was lost

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in gathering the volunteer crew from the nearby communities. This lapse in time often resulted in the demise of the crew and loss of the ship.

In 1870 another disastrous storm hit the East Coast, once again killing many people, resulting in public outcry for better lifesaving systems along the eastern seaboard. Sumner Kimball was appointed Chief of the Treasury Department's Revenue Marine Division, marking a substantial turning point in the history of lifesaving in the United States.

Kimball first ordered inspections of the stations. After reviewing the results, he decided to revamp the entire system. With an additional \$200,000 in funds appropriated by Congress, Kimball built new stations, set station routines and performance standards and employed a six-person boat crew at all stations (Noble, no date: 4). The service separated from the Revenue Marine in 1878 and became the United States Life-Saving Service, with Kimball continuing as Superintendent.

These lifesaving stations usually employed two methods of rescue; by boat and by line. The lifesaving boats were staffed by six crew members and propelled by long oars. The heavy boats were generally pulled by horses to a site near the wrecked ship, then launched. The other method of rescue involved extending a line above the water to the stranded ship. Once the line was secured, a small car could be pulled back and forth, carrying people and goods safely from the shipwreck to shore. These cars were later replaced by a breeches buoy which resembled a life preserver ring (Noble, no date: 4).

A typical week for the crew involved intensive drilling with rescue equipment, patrol and lookout duties and station maintenance. Practicing first aid, signaling, and launching boats were also a part of the weekly routine. Drill practice by crew members was often a favorite pastime of nearby residents and visitors alike. The Life-Saving station and the crew from the Lighthouse Stations often worked together when assisting mariners in distress.

The first Life-Saving Station in Oregon, consisting of a boathouse and crew quarters, was constructed four miles north of Cape Arago in 1878. Other Life-Saving Stations were subsequently built along the Oregon coast including the Umpqua River Life-Saving Station, 1891 (destroyed), Point Adams (extant), Yaquina Bay, 1895 (destroyed), Coquille River, 1891 (destroyed), Coos Bay (extant), the Siuslaw River, Garibaldi (extant) and Charleston (1916).

In 1915, the Life-Saving Service merged with the Revenue Cutter Service (formally the Revenue Marine) to form the United States Coast Guard. The reliance on the Life-Saving Stations and crew remained strong until the late 1950s/60s, when technological advances, particularly in the use of helicopters and motorboats in rescue missions, helped the stations run more efficiently. These advancements ultimately decreased the need for the number of stations along the coast.

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Continuation SheetSection number E Page 29 *The United States Coast and Geodetic Survey*

The surveys conducted by the United States Coast and Geodetic Survey, called the United States Coast Survey until 1850, provided the preliminary site surveys for locating the Oregon coast lighthouses. The scientific bureau of the federal government was established in 1807 and charged with surveying the coasts of the United States. Under the direction of Superintendent Alexander Dalles Bache, a survey team was sent to the Pacific Coast in 1850 to survey the headlands, capes and geographic features of the expanding region. The California Gold Rush of 1849 and subsequent increase in ship traffic created the need for more intensive surveys of the coastal waterways.

The first successful survey crew to reach the Pacific Coast was headed by George Davidson. An earlier survey crew was dispatched from Washington the previous year but was met with financial problems. The lieutenant in charge of the survey, William P. McArthur, died on the journey back to Washington. Davidson and three assistants arrived in San Francisco on June 19, 1850 (Lewis, 1954: 12) and started work on surveying the more prominent headlands of the California, Washington and Oregon coasts. His tasks included surveying headlands and coastal bays, and recommendations on the siting of future lighthouse stations. The first surveys were conducted in California to determine the exact longitude and latitude of Point Conception and San Diego, and to establish the best location for lighthouses at Point Pinos, Monterey Bay and Point Loma (Bauer, 1983: 13). These surveys were completed in 1851.

Davidson and his crew sailed north on the schooner *Ewing* to the mouth of the Columbia River in 1851. By the end of the year, Davidson had completed a study of the mouth of the Columbia and determined the geographic locations of Cape Blanco and Port Orford on the Southern Oregon coast (Bauer, 1983: 14). The observations and maps were published in 1852. This report included surveys of the prominent headlands in California as well as the mouth of the Columbia River. By 1855, 1,500 miles of the Pacific Coast had been surveyed from the Mexican Border to Puget Sound. These detailed surveys included charts and maps of capes, bays, inlets, harbors, and navigational hazards. Davidson and his crew also named many of the geographic features often using an adaptation of Native American's name. In 1858, *The Directory for the Pacific Coast* was published by the Coast Survey. This publication provided a comprehensive navigational guide of the Pacific Coast from San Diego to Puget Sound. Subsequent guides were published in 1862, 1869 and 1889 (Bauer, 1983: 15). After the 1862 edition, the publication became known as the *Coast Pilot*.

The early surveys of the Coast Survey teams provided the necessary information for the siting of the Oregon lighthouse reservations. At least one member from the Coast Survey served on the Lighthouse Board throughout its history. The relationship of the two organizations can be best expressed as stated in the 1907 publication, *Centennial Celebration of the Coast and Geodetic Survey*,

An accurate and thorough hydrographic survey of the coast is necessary preliminary to the intelligent location of lighthouses and buoys and beacons; the relation of the headland, rock, or shoal to the navigable water areas must be known and studied

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before the guide mark can be placed in the best position.....The survey not only develops the proper location for the aid to navigation, but the chart when published is the best means of giving information as to the lighthouses and buoys and their location with respect to the channels and navigable waters.....The lighthouse work and the coast survey work have an important object in common; the purpose of both is to protect mariners and keep them out of danger, to give the shipmaster all possible help to steer a safe course. One gives him the map showing where the water is safe for his vessel, the other gives the light, foghorn and buoy to guide him over this course (Centennial Celebration, 1907: 76-77)

The Army Corps of Engineers

Organized in 1802, the Army Corps of Engineers, played an important role in the construction of Oregon lighthouses and the development of commerce along the Pacific Northwest coast. The Corps provided the technical assistance necessary in the construction of the country's lighthouses. Although the Corps had been active in the engineering and designing of the lighthouses since 1831, the Corps took on a more active role in 1852 (Willingham, 1983: 14). At this time, the Lighthouse Establishment was reorganized into the Lighthouse Board. Two Corps engineers served on the Lighthouse Board along with Navy officers, scientists and civilians. Members of the board drew on each other's expertise, often working together to engineer the lighthouses. The plans for the early Oregon lighthouses were usually signed and inspected by the regional Corps office. When the Lighthouse Board was reorganized into the Lighthouse Bureau in 1910, the role of the Corps diminished. The military personnel on the board were replaced by civilians with engineering backgrounds (Willingham, 1983: 10).

The role of the Army Corps of Engineers in the pre-Civil War development of Oregon included topographic and railroad surveys, construction of military wagon roads, and the engineering of the early West Coast lighthouses. The first West Coast Corps office, the Pacific Wagon Road Office, was established in San Francisco in 1855 (Willingham, 1983: 5). Early Corps road building projects in Oregon during the 1850s included roads extending from the Rogue River Valley to Myrtle Creek, from Myrtle Creek to Scottsburg in southern Oregon, from Fort Dalles to Fort Vancouver, and from Astoria to Salem (Willingham, 1983: 8).

The Umpqua River Lighthouse, built in 1857, was another early Corps project in Oregon. It was one of the original sixteen West Coast lighthouses recommended for construction by the Lighthouse Board. In the early 1850s, the Umpqua River became a major shipping route for goods and supplies being sent to the gold fields of California. Other Corps activities during these early years included topographic surveys of the region. These were often accomplished in conjunction with attempts by the military to quell Native Americans uprisings in the area. Often an engineer accompanied Army personnel, recording the best routes, topographic features, climate and botany (Willingham, 1983: 9). Early railroad lines were surveyed by Corps engineers before the Civil War. The preoccupation with the Civil War preempted and redirected most Corps activity in Oregon until the mid-1860s.

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After the Civil War, attention was refocused on the Pacific Northwest. In 1866, Congress established a Corps office in San Francisco, naming it the authority for "Rivers and Harbors of the Pacific Coast" (Bauer, 1983: 102). Major Robert Williamson, the first engineer for the region, was assigned the task of improving navigation on the Willamette and Columbia rivers (Willingham, 1983: 10). In 1866, Congress appropriated funds for the Columbia River system project. The projects included widening the channels by dredging and removing snags which made navigation dangerous. In 1867, attention was directed at surveying and improving stretches of the Columbia River to the mouth of the Snake River. This was accomplished by successful lobbying by the Oregon Steam Navigation Company, which monopolized river transport during this period. Rapids at Umatilla, Homely and John Day were examined. The survey revealed that the rapids at John Day were obstructing passage; their removal was completed in 1873 (Bauer, 1983: 72).

The Willamette River and slough, and the upper part of the river from Oregon City to Corvallis was the target of the Corps in the 1870s. Congressional funds were appropriated for the improvement of hazardous bars on the river. This was accomplished by the construction of wing dams, designed to force the current to wash out bars, maintaining adequate river depths (Bauer, 1983: 72). By 1875 snags, rocks, bars and rapids had been successfully removed from the Columbia and Willamette rivers. Wing dams had been built and banks reinforced. Because of the increased activity in commerce and shipping around the Columbia River, a Portland District Office was established in Portland in 1871. In a ten year period from 1866 to 1876, river traffic increased nearly tenfold in the region, demonstrating the success of the early Army Corps of Engineers river improvement projects in Oregon (Bauer, 1983: 73).

In 1876, another massive undertaking was begun to once again help improve navigation of the Columbia River: the construction of Cascade locks and canal. Due to delays by contractors, design modifications, and because of the difficulty of the project, the canal and locks were not opened until 1896. The next undertaking on the eastern end of the Columbia was the improvement of the passage of the cascades between Celilo and The Dalles. In 1893, a portage railroad was built to bypass the rapids. Construction, however, was not completed until 1905. In 1915, the Corps finally finished the canal and locks (Bauer, 1983: 74). This marked the removal of the last major obstacle on the upper portion of the Columbia in Oregon.

The mouth of the Columbia River was known for its dangerous bar crossing. Formal plans for improving the entrance to the great river were started in 1878. At this time Congress authorized a survey of the mouth to determine what improvements were necessary. In 1880, under the direction of Major Gillespie (engineer officer from 1878 to 1881 in Portland), a survey was completed of the mouth and recommendations were made for the construction of a jetty on the south side of the entrance to the river (Willingham, 1983: 36). The jetty was started in 1884 and completed in 1895. The result was the construction of a thirty foot channel over the bar. This stimulated shipping once again. Other work at the mouth included additional clearing of the river

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to reduce shoaling in 1902, extending the channel over the bar by dredging in 1913, and the completion of a north jetty at the mouth of the Columbia in 1917 (Bauer, 1983: 75).

In 1907 a channel of adequate depth was dredged from Portland to the sea. This effort was undertaken in cooperation with the Port of Portland and with funds appropriated from Congress through the 1902 Rivers and Harbor Act. Improvements to the channels of the Columbia and Willamette River continued in later years (1923, 1927, 1933) through projects undertaken by the Corps and the Port of Portland (Bauer, 1983: 76). Several smaller projects were completed at the lower end of the Columbia between 1933 and 1954. The 1960s brought improvements and reconstruction of the jetties at the mouth of the river. Although the Columbia River was the major estuary and inland transportation route, the Corps was active in the improvements of many other estuaries along the coast.

Umpqua River

The Army Corps of Engineers played an important role in the development of commerce along the Umpqua River. Due to the poor conditions of wagon roads between Roseburg and Scottsburg, the Army Corps of Engineers started a reconnaissance survey of the Umpqua River in 1870 (Beckham, 1986: 151). This survey was instigated by local merchants and citizens wanting better market transport. The engineers determined there were five major obstructions to the river between Scottsburg and Roseburg, and if the river were cleared it would ease commerce along the river and interior region (Beckham, 1986: 151). After Corps engineers issued a report on the condition of the river, Congress appropriated money for river improvement. In 1871, a contractor was hired to start the removal of boulders blocking the river; the project was completed two months later. Inspection by the Army Corps showed, however, that the river remained unpassable. The government suspended all work on the river until 1879 when Congress authorized a new survey of the estuary (Beckham, 1986: 151).

Congress again appropriated funds for opening a channel from Gardiner to Scottsburg. In spite of several attempts to clear a channel, the river remained blocked until 1896. At this time a channel was opened from Gardiner to the tidewaters so the sternwheeler *Eva* could ascend the river. This greatly improved accessibility to the towns along the lower Umpqua.

In 1896, another survey of the bar and mouth of the river was undertaken by government surveyors. The surveyor concluded that the expenditure of funds to build a jetty could not be justified now. The issue was reopened in 1902 when another survey was done. The engineer recommended that a feasibility study be completed for the construction of a jetty at the mouth of the Umpqua. Commerce had increased substantially since the first survey of 1896 and now the expense of the jetty could be justified. In 1916, the Secretary of War issued a permit to construct a wharf, tramway and jetty at the mouth (Beckham, 1986: 153). This project was funded by the government and the Port of Umpqua and was completed in ca. 1919.

Construction of a jetty on the north side of the river was begun in 1922, funded once again by the port and the United States government. Most of the jetty was completed in 1927. Plans for

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construction of a jetty on the south side of the river were started in 1930. Subsequent improvements, including the dredging of various channels in the river, were undertaken in 1938, 1945, and 1948. By 1952, expenditures for improvements in navigation of the Umpqua River were 2.6 million for construction and 3.4 million for maintenance (Beckham, 1986: 153-54). The Army Corps of Engineers stimulated the local economy and created jobs for local citizens by improving the river's navigability.

Yaquina Bay

In 1880, the Army Corps of Engineers initiated an improvement plan for the harbor at Yaquina Bay. With an appropriation of \$40,000, the Corps, under the direction of Assistant Engineer James S. Polhemus, started construction of a jetty on the south side of bay. The jetty resulted in the two, thirteen foot channels at the entrance (Willingham, 1983: 83). The jetty measured 2,500 feet in length. A similar project, the construction of a north jetty, was started by the Corps in 1888. These jetties were completed in 1896 at a cost of \$710,000; no other work was needed at the mouth of the Yaquina until 1919 (Willingham, 1983: 84).

Coos Bay

The entrance of Coos Bay on the Southern Oregon coast was known for its shifting sands and unpredictable tides which rendered navigation of the river dangerous. The area was noted for its potential as a lumber producing region. In order to increase access to this potentially rich region, the Army Corps of Engineers started a jetty at the entrance to the river. This jetty was completed in 1889. Although the jetty stabilized the entrance to the channel, new plans for deepening the channel were underway. Two jetties were planned which would replace the old one, a north and south jetty. The north jetty was constructed first, attaining the required depth of twenty feet before its completion in 1894 (Willingham, 1983: 83-84). Because of the blowing and shifting sand, the channel had to be dredged regularly to maintain the project depth. To help minimize the blowing sand on the North Spit, the Corps planted a hardy variety of grass which helped stabilize the sands. Nearly 1,000 acres of the spit had been planted by 1915, almost entirely preventing the sand from blowing into the channel (Willingham, 1983: 84). The south jetty, planned in 1890, was begun in 1922 and finished in 1928. Restoration and repair work to the north jetty was also made at this time.

Coquille River

Harbor and river improvements were started in 1880. An initial \$4,000 was raised by local citizens to help confine the mouth of the river to one channel. In 1884, Congress appropriated \$10,000 in an effort, once again, to confine the river. This was accomplished by building a jetty on the south side of the river. This jetty proved to be somewhat successful, although a harbor light was badly needed at the site. A north jetty and a more substantial south jetty were subsequently constructed. In 1895, work began on the jetties; they were completed in 1908 (Willingham, 1983: 88). With the exception of repair and dredging, no other work was done at the mouth of Coquille until 1942.

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Other Coastal River, Harbor and Bay Improvements

Other Army Corps of Engineers projects on the coastal waterways included improvements to Tillamook Bay, the Suislaw River, and Nehalem Bay. Only minor improvements were made to Tillamook Bay until Congress appropriated monies for the construction of a jetty on the north side of the entrance in 1912 (Willingham, 1983: 88). The project was finished in 1917. Two jetties were planned for the Siuslaw River and work commenced on the project in 1892. Due to lack of funds and bad weather conditions, work on the jetties was stopped in 1901. Additional monies was secured under the 1910 "The Rivers and Harbor Act" and the project was finally finished in 1917 (Willingham, 1983: 87). Other work was done by the Corps in 1925 which included extending the project depth five miles up river (Willingham, 1983: 87). This work was completed in 1930. In 1912, Congress allocated funds through the River and Harbor Act for the construction of two jetties on the Nehalem River (Willingham, 1983: 89). The project was finished in 1918. The Port of Nehalem contributed half the funds for the project.

Oregon Coast Lighthouses-Corps Involvement

The Army Corps of Engineers designed and inspected the majority of the lighthouse stations along the Oregon coast until the second decade of the 20th century. The following is a partial list of the Engineers who signed the original plans or inspected the lighthouse stations:

Umpqua River Lighthouse I (1857): Major Hartman Bache, inspected site and states "Established 10 October 1957, washed away, undermined, discontinued Dec. '63-see Engr's letter of 16 Dec. '63."

Cape Blanco (1873): Drawing for dwelling and lighthouse tower signed by Major Robert S. Williamson, 1870 (in charge of works in Oregon from 1866 to 1871).

Yaquina Bay (1871): Site survey plan dated 1884 and surveyed under the direction of Captain Charles F. Powell (Portland office from 1881 to 1888) by J.S. Polhemus, drawn by R.M. Tabor.

Yaquina Head (1872): Tower plans duplicated from Bodie Island Lighthouse in North Carolina, dated 1871; Keepers' Quarter, 1873, plans signed by Major Henry M. Roberts (in Portland office from 1871 to 1873). Site surveys of Yaquina Head, Major George L. Gillespie site survey dated 1881, (in Portland office from 1878-1881); Site survey 1886 by Captain Charles Powell (in Portland office from 1881-1888).

Cape Meares (1890): Site survey for proposed lighthouse station, signed by Captain Charles F. Powell, 1887 (in Portland office from 1881 to 1888); Plan for lighthouse tower signed by Major James Gregory, 1888; Plans for proposed workroom and stairs signed by Major Thomas Handbury, 1893 (in Portland office from 1888 to 1893).

Coquille River (1896): Site survey for proposed site grading and location of structures signed by Major James C. Post, 1894 (in second Portland office from 1893-1895).

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Heceta Head (1894): Lighthouse tower signed by Major James Gregory, 1891; Drawing for keepers' quarters dated 1890 and signed by Major Thomas Handbury (in Portland office from 1888 to 1893).

Tillamook Rock (1881): Lighthouse tower, site plan and details signed by Major George L. Gillespie, no date (in Portland office from 1878 to 1881), drawings rendered by R.M. Tabor.

Umpqua River II (1894): Lighthouse drawing from standard set of Corps drawings, no date or signature.

Note: Source of dates for Engineers working in the Portland Office Corps Office: Willingham, William F., Ph.D., Army Engineers and the Development of Oregon. (GPO, Washington D.C., 1983).

The Lives of the Lighthouse Keepers

The lives of the lighthouse keepers were often a mixture of isolation, loneliness and monotony tempered by the satisfaction of helping guide mariners safely through the waters. Prior to the creation of the Lighthouse Board in 1852, keeper positions were largely political appointments. During this period, the U.S. President appointed lighthouse keepers upon the recommendation of the local customs collector. After the Lighthouse Board was established, an effort was made to reduce the number of political appointments. This effort was furthered by the enactment of the 1871 and 1883 Civil Service Reform Acts. These acts helped establish standards for hiring lighthouse keepers. Under the new regulations, the nominees were interviewed prior to hiring. A prospective keeper had to be between the ages of eighteen and fifty, be able to read and write, be able to pull a boat, and have sufficient mechanical skills to staff the station (Hyde, 1986: 50). In 1896, the keeper's position was further defined when keepers were put into the classified civil service. District engineers were now in charge of hiring from a list of eligible candidates maintained by local civil service boards (Hyde, 1986: 58). The Lighthouse Board was well on its way to establishing the keeper's position as a full-time career. In 1884, standard uniforms were prescribed. A dark blue coat, vest, trousers and a cap comprised the dress uniform; by 1885, approximately 1,600 employees were outfitted with the standard blue garb (Holland, 1972: 41). By the turn of the century, the Lighthouse Board was viewed as a full-fledged career field (Holland, 1972: 41).

Because of their inaccessibility and isolated locations, most of Oregon stations were staffed by three keepers. First and second-order lights were usually staffed by one keeper and one or two assistant keepers. Extremely isolated stations such as Tillamook Rock were assigned four keepers. Recruitments generally entered the lighthouse service as assistants and were promoted or transferred as positions opened at different stations (Hyde, 1986: 52). The majority of the keepers were married males. The belief that married men, particularly those with families, were more reliable prevailed until the Coast Guard superseded the Lighthouse Bureau in 1939. Although

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women were generally not appointed as keepers, they played vital roles in the daily maintenance of the lighthouse stations. They, along with their children, were often instructed in the duties of tending the light in the event that they had to fill in for one of the keepers. Cape Blanco and Cape Meares lighthouses, however, did employ women as keepers for brief periods of time. Mabel E. Bretherton was appointed second assistant keeper at Cape Blanco for a six month period prior to being transferred to North Head Lighthouse in the fall of 1903. Bretherton was the first women to hold this position in Oregon. In July of 1903, Augusta Hunt was appointed as acting keeper for a one month period, filling her husband's position. This often happened in the event of the death or illness of a spouse.

Until the organization of the Lighthouse Board in 1852, the keepers relied on the expertise of previous keepers for training. After the establishment of the Board, ample written documentation on training was provided. These publications included: *Instructions and Directions to Lighthouse Keepers*; *Instructions and Managements of Lenses, Lights and Beacons*; *List of Illuminating Apparatuses, Fixtures, Implements, and Supplies in General Use in the United States Lighthouses, Lighted Beacons and Light-Vessels*; *Management of Lens Apparatus and Lamps*; and *Instructions and Directions to Guide Lighthouse Keepers and Others Belonging to the Lighthouse Establishment*. The Lighthouse Board's rules and regulations standardized the duties and responsibilities of the keepers.

Compensation for lighthouse keepers was adequate at best. In 1867, the salaries for the keepers were fixed and remained so until ca. 1910. The head keeper received \$800 annually, first assistant \$600 annually and the second assistant \$550 (Finucane, 1980: 17). The keepers' housing was also provided as part of the compensation, along with cords of wood for heating. At most of the Oregon stations, a duplex was built for the assistant keepers and a single family residence was constructed for the head keeper. These houses were adjacent to one another. The keeper's rank was often distinguished in other ways besides wages. The assistants' dwelling was generally the furthest away from the light, as seen at Heceta Head, Umpqua River and Yaquina Head lights. Often other distinctions were made. At Heceta Head, for example, the second assistant's chandelier in the dining room had four bulbs, the first assistant's had five bulbs and the head keeper's chandelier had six bulbs (Finucane, 1980: 21).

The daily routines of the lighthouse keepers were established largely by the Lighthouse Board. Shifts were rotated so one keeper had a full night's sleep every third night at stations where three keepers were employed. The first shift began at sunset and ended at midnight; the second shift began at midnight and ended at sunrise. The duties of the keepers included polishing the brass fittings, cleaning the lantern room glass, trimming or installing the wicks, winding the clockworks every four hours, pulling the lantern room curtains when the lens was not in use, and filling the lamp reservoir (Finucane, 1980: 23). Other activities included recording the weather conditions, maintenance on the tower, whitewashing the lantern room interior and keeping it free of grease and soot. A continual watch was kept by the on-duty keeper for vessels in distress. A stove or fireplace in the workroom kept the tenders warm during their long shifts.

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The houses and other station buildings also had to be maintained according to Lighthouse Board standards. For married keepers, household chores were usually the responsibility of the wives. Unannounced visits were made on a quarterly basis by the inspectors from the Lighthouse Board. These surprise visits served as something of a guarantee that the Board's rules and regulations would be adhered to. Having all the station buildings kept in an orderly fashion was a high priority to the board.

The Lighthouse Board did not discourage keepers working at other jobs as long as they performed their regular duties and did not leave the station unstaffed. Work such as shoemaking, tailoring, fishing, and teaching were permitted by the Board (Hyde, 1986: 54). Gardening was also encouraged. Because of the isolated locations of most Oregon stations, in the early years of the lighthouse service vegetable gardens were an important part of the survival of the keepers and their families. Gardens were planted in sheltered areas of the lighthouse reservations to protect them against the harshness of the coastal weather. Produce was supplemented by provisions brought to the station by the government tender ship or by trips to nearby communities. Dairy cows and chickens were also integral parts of most stations, as were fishing and hunting.

The lighthouse reservations were a favorite destination for visitors from nearby towns. Over 4,000 visitors registered at Cape Blanco between 1896 and 1916, despite the difficulty in reaching the site (Gibbs, 1986: 108). Many camped or picnicked on the grounds before making the difficult trip back to town. Tours of the tower were given upon request. The 1858 *Instructions and Directions for Light-House and Light-Vessel Keepers of the United States, Third Edition*, specifies regulations for admitting visitors in the light tower. It states,

The light-keepers are required to be sober and industrious, and orderly in their families. They are expected to be polite to strangers, in showing the premises at such hours as do not interfere with the proper duties of their office, and may, with the approbation of the inspector, place a placard on a conspicuous part of the premises, specifying the hours when visitors will be admitted; it being expressly understood that visitors shall not be admitted to the lantern-room after sunset. No more than three persons shall have access to the lantern-room at one and the same time during the day; and no stranger visiting the light-house can be permitted to handle any part of the machinery or apparatus. The light-keepers must not, on any pretext, admit persons in a state of intoxication into the lighthouse.

Various forms of entertainment were important to the morale of the lighthouse keepers and their families. Weddings, picnics, beach parties, fishing, dances, hiking, and journeys to nearby communities were popular forms of entertainment. In an effort to combat some of the feelings of isolation and loneliness associated with station life, the Lighthouse Board assembled portable libraries which were distributed at the stations on a rotating basis. The program, started in 1876, was a great success, and by 1888, 550 libraries were in use across the country (Hyde, 1986: 65).

As technological advances in aids to navigation increased, the daily duties of the keepers decreased. Gas Bunsen burners replaced many of the kerosene burning lamps after the first decade

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of the 20th century. These new lamps did not have to be tended as much, or the oil reservoirs filled. As new roadways connected the stations with the coastal towns in the 20s and 30s, the isolation of the stations was diminished. Supplies were more accessible and some of the station buildings such as barns and chicken coops were abandoned. Electricity came with the advent of the new road system and ultimately altered the nature of tending the light. Electric bulbs replaced the Bunsen burner lamps, further reducing the need to tend the light. The clockworks system, which had previously needed to be wound every four hours, was converted to an electrical system. Automation not only changed the way in which the light was tended, but reduced the number of keepers needed to operate a station. With the increase in automobile use, new roadways connecting stations, electricity, and other advancements in radio-aided navigational aids, the keepers' jobs gradually became obsolete. When the Coast Guard superseded the Lighthouse Board in 1939, many of the stations were tended by one keeper. In the 1960s, full automation of the lighthouse stations was started. This eliminated the keepers' position and resulted in the eventual destruction of many of the station buildings.

F. Associated Property Types

I. Name of Property Type Lighthouse Stations

II. Description

See continuation sheet; F II page 1

III. Significance

See continuation sheet; F III page 1

IV. Registration Requirements

See continuation sheet; F IV page 1

See continuation sheet

See continuation sheet for additional property types

G. Summary of Identification and Evaluation Methods

Discuss the methods used in developing the multiple property listing.

The multiple property listing for light stations in Oregon was based on the determinations of eligibility previously submitted by the United States Coast Guard for Cape Arago, Cape Blanco, Yaquina Head and Cape Meares light stations: all the lighthouses on the Oregon coast are either on the National Register or have been determined eligible for the Register. The nomination was also based on a survey of all the extant lighthouse stations in the state and a thorough study of pertinent documentary material located at various repositories in the state and the Coast Guard offices in California and Washington. The historic context aided in the determination of significance under the theme of Maritime Transportation and provided a basis for understanding the development of navigational aids in Oregon and the nation as a whole.

Light stations were designed and constructed to serve a narrowly defined purpose, and each lighthouse maintains important historic associations with respect to the state's patterns of development. The integrity of the resource was also evaluated with respect to all others on the coast. The four lighthouses in Oregon not yet listed in the National Register meet the registration requirements as set forth in the above section, F-IV. Each is considered eligible under Criterion A for its relationship to a broad historical movement. Each meets National Register Criterion C as a well-preserved example of lighthouse design technology of its respective period.

See continuation sheet

H. Major Bibliographical References

See continuation sheet; Sec. H page 1

See continuation sheet

Primary location of additional documentation:

- State historic preservation office
- Other State agency
- Federal agency
- Local government
- University
- Other

Specify repository: United States Coast Guard, Thirteenth District Offices

I. Form Prepared By

name/title Sally Donovan/Principal; Barb Kachel/Research Assistant
organization Donovan and Associates date August 1, 1991
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PROPERTY TYPES

The lighthouse stations of Oregon embody, in both design and materials, a highly specialized structural form adapted to the harsh coastal environment. Spanning the Oregon coast from the northernmost station near the mouth of the Columbia River to the southernmost station at Cape Blanco, the lighthouse stations mark prominent headlands and riverways. All of the extant light towers, with the exception of Cape Arago (1934), were constructed between 1870 and 1898.

For the purpose of this comparison, all of Oregon's lighthouse stations will be discussed in the property type analysis since all the stations have either been listed on the National Register of Historic Places or have been determined eligible for listing in the National Register. These various resource types are of primary significance, especially in light of the fact that some represent the only extant example of these property types.

Historically, the lighthouse stations were multi-part complexes consisting of both structures and buildings. At a minimum, the lighthouse stations consisted of a light tower, workroom/oil house, and keeper's dwelling. Sometimes the lighthouse tower was attached to the keeper's dwelling, but in the majority of the cases, the tower was attached to a workroom. The most prominent feature of the complex, the tower, was inter-dependent on the other station buildings. These auxiliary buildings were designed to perform special and specific functions in the lighthouse station's system. Workrooms contained equipment necessary for the function of the tower and lens, the oil house stored fuel for the lamp, cisterns and reservoirs collected and stored water for domestic and fog signal use, single and multiple dwellings housed the staff necessary for operating the station, and barns were used to shelter the station animals vital for both transportation and food. The following is a discussion of each resource type and how they functioned within the lighthouse station.

A. Lighthouse Tower

The lighthouse tower is the most prominent feature of a lighthouse station. The tower structure elevates the lighting apparatus to the appropriate height in order to be useful to the mariner at night and in adverse weather conditions. A secondary function is to provide a daymark or landmark to guide mariners during daytime voyages. Often the towers were painted with distinguishing markings so the mariner could easily recognize a particular lighthouse, thus identifying their own location. The towers are divided into various components which will be referred to as, foundation, base, body or shaft, gallery, lantern room, lens, roof and ventilator.

Towers were designed in different styles, sizes, materials and shapes. They were free-standing land or water-sited structures, or attached to a secondary structure such as a workrooms or keepers' quarters. The following study analyzes the lighthouse towers according to the five designated categories: construction dates, design/style, structural components/materials, lenses and interior features.

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Continuation SheetSection number F 11 Page 2*Construction Dates*

Cape Blanco (1870), Yaquina Bay (1871), Yaquina Head (1872) and Tillamook Rock (1879-1881) were all constructed during the Railroad and Industrial Growth Period (1866-1883). These are the earliest examples of lighthouses remaining on the coast and represent a period in Oregon's history when rapid growth and settlement occurred. During this period the need for improved sea transportation became evident as commerce throughout the state was rapidly developing.

The four other lighthouses, Cape Meares (1890), Heceta Head (1894), Umpqua River (1894) and Coquille River (1896) were constructed in the Progressive Era (1884-1913) when "big" business and industries were developing throughout the Pacific Northwest. Industries, such as the lumber and fishing, were growing at a rapid rate. Businesses were not only profiting locally but also on foreign markets, thus substantially boosting the economy of Oregon.

Cape Arago (1934) was the last federally funded lighthouse constructed on the Oregon coast and is representative of the Motor Age (1914-1941). This lighthouse replaced two others which were constructed in 1866 and 1908 on the same site.

California and Washington both have lighthouses remaining from the initial period of lighthouse construction dating from the 1850s. These lighthouses represent the first constructed on the West Coast upon the recommendation of the United States Coast Survey team. Approximately six lighthouses remain in California from this period and two remain in Washington. The 28 extant lighthouses in California range in construction date from 1856 to 1941 and in Washington, from 1855 to 1941.

Design/Style

The design or shape of the lighthouse tower was directly related to the height and siting of the lighthouse. The height of the lighthouse tower was dependent on the purpose of the light, whether a coastal or harbor light, and the arc of the earth the light had to illuminate. Shorter towers usually functioned as harbor lights or were sited on high promontories, while the taller towers were generally constructed on lower coastal lands. Generally, the higher the site in elevation above the mean sea level, the shorter the tower (example: Cape Meares). A majority of the lighthouses on the Oregon coast attest to this generalization since most of the lights were sited on high, prominent capes well above the sea. With the exception of Yaquina Head, all the towers are considered relatively short in stature in comparison with other lighthouses in the United States. The towers range in height from Cape Meares, the shortest at 38 feet, to Yaquina Head, the tallest of the coastal lights at 93 feet.

Many of the Oregon lighthouses do not reflect particular architectural styles found in commercial and residential buildings of the same period. Designed as utilitarian structures, consisting of a foundation, base, body with capital (usually housing the interior watchroom), gallery, lantern room and roof, the towers were more austere in their design. The freestanding towers were generally less ornate and modest in their detailing. Towers which have more stylistic or decorative

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details were often attached to other station buildings, such as the keepers' house at Yaquina Bay and Tillamook Rock.

Five of the lighthouse towers are conical in shape, gradually tapering from the base to the lantern room. All have attached one-story fog signal or workroom buildings. Two of these conical tower lights, Cape Blanco and Yaquina Head, were constructed during the Railroad and Industrial Period (1866-1883), and three were built during the Progressive Era (1884-1913): Heceta Head, Umpqua River and Coquille River.

Only modest detailing is found on the conical towers, and is usually limited to segmental arches above the window (often with keystones) and door openings, a prominent base, projecting stringcourses, and decorative gallery iron work. Cape Blanco, the oldest and second tallest light in Oregon, has modest detailing depicted in a double row of dentils under the gallery and a projecting stringcourse on the upper portion of the tower. The window trim projects from the wall surface, creating a box-like effect. Some of the multi-pane and one over one double hung windows have been removed and enclosed with concrete. A projecting stringcourse caps the top of the base.

Yaquina Head, the tallest conical tower at 93 feet, has long iron brackets with pendants supporting the lower gallery. A projecting stringcourse is located at the bottom of the brackets. The use of decorative iron work reflects the industrial period when iron and steel detailing began to be applied to buildings throughout Oregon. The iron gallery and brackets, painted grey, present a sharp contrast to the tall conical body of Yaquina Head. Below the gallery four small windows light the interior watchroom. Yaquina Head rests on an octagonal base with a projecting iron cornice molding. Windows in the tower are fixed pane and one over one double hung metal sash. A similarly designed lighthouse, Pigeon Point Lighthouse constructed in 1872, is located in California. It's conical brick tower rises 115 feet above the ground and has a similarly designed gallery and lantern room. Yaquina Head and Pigeon Point are the tallest lighthouses in their respective states and were constructed one year apart. The original drawings for Yaquina Head were titled "Bodie Island Lighthouse-North Carolina"; Bodie Island was crossed out and Cape Foulweather (Yaquina Head) transcribed above the original title. Although the North Carolina lighthouse was taller than Yaquina Head, the details are virtually identical.

Block modillions support the gallery of the conical Umpqua River tower. Four, small, one over one double hung metal sash windows are located below the gallery, lighting the interior watchroom. A projecting stringcourse circumvents the bottom of these windows. One over one, double hung metal sash windows on the shaft of the tower are capped with stone lintels. The top and bottom of the base of the shaft is defined by a projecting stone beltcourse.

Heceta Head is designed identically to Umpqua River with the exception of the block modillions below the gallery and the addition of a slightly molded stringcourse under the gallery. The small, one over one double-hung wood sash windows in the upper portion of the shaft are intact. These windows on the upper portion of the shaft denote the interior watchroom which is located directly below the lantern room. Windows on the body of the tower have been enclosed with concrete.

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Plans and detail drawings, dated 1891 from the Office of the Light-House Board titled "Umpqua River", are the same plans used for Heceta Head; the title was crossed out and the "Heceta Head" penciled in above it.

The Coquille River tower widens to a projecting hexagonal base finished with a molded beltcourse. Single panes of glass have replaced the original windows in the tower. The window surrounds display features of the Italianate style, articulated in the heavy segmental arches over the windows and cornice. A prominent stringcourse visually and physically connects the tower and the fog signal building. The design of the tower and connected fog signal building are unusual in design compared to other Oregon coast lighthouses.

Two of the lantern rooms, Yaquina Bay (1871) and Tillamook Rock (1879-81), are incorporated into the body of the keeper's quarters, and project from the center of the roof. Both towers are square in shape and were built during the Railroad and Industrial Growth Period. The decorative details on Yaquina Bay's wooden tower include corner boards with projecting caps, brackets supporting the gallery, and pointed arched window head trim. A single, four over four double hung window lights the stairhall in the tower. The tower and the incorporated dwelling reflect elements of the Cape Cod style in symmetry, massing, weatherboard siding and multi-pane windows. There are similarly designed lighthouses extant in California: Point Pinos, Pacific Grove, and Old Point Lomas, San Diego. These lighthouse towers were designed as integral parts of the Cape Cod style keepers' quarters. The California lighthouses, however, were constructed of masonry and not wood. These represent early West Coast lighthouse designs.

Tillamook Rock's square tower is finished at its corners with rock-faced quoins; the windows and doors have arched heads. The tower and keeper's house have certain elements of Italianate style in their massive rock construction, quoins and arched openings. The windows of the lighthouse and attached keepers' dwelling have been enclosed with concrete.

The remaining two towers are octagonal in shape and display very little decorative detailing. Cape Meares (1890) is comprised of a stout tower, measuring only 38 feet tall. Its short stature is attributed to its site; it is located on the highest cape of all the coastal lighthouses, rising 232 feet above the mean sea level. The lantern room accounts for almost half the height of the tower. The base is defined by a slightly projecting stringcourse and the window has a prominent window cornice. The four over four double hung window has been covered on the exterior by a single pane of glass for protection. Cape Meares was constructed during the Progressive Era (1884-1913). Point Reyes, near San Francisco, is similar in design to Cape Meares because of its short stature and construction method. The sixteen sided lighthouse is clad with an iron plates bolted together.

Cape Arago (1934), representative of the Motor Age (1914-1940), was the last lighthouse constructed by the United States Lighthouse Service in Oregon. Constructed of reinforced concrete, the tower is connected to a fog signal building. Distinguishing features include its

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octagonal shape and red concrete tile fog signal building roof. The tower windows are one over one double hung metal sash windows.

The early lighthouses were usually designed by Army Corps of Engineers engineers who worked in conjunction with the Lighthouse Board. The Army Corps of Engineers played an active role in the Lighthouse Board; two Army Corps of Engineers sat on the board of the lighthouse service. Design details and plans from other lighthouses on the East Coast were often utilized in West Coast lighthouses. Heceta Head and Umpqua River were designed according to the same plan; only slight design modifications exist in the two light towers. Yaquina Head is a modification of Bodie Island Lighthouse in North Carolina and the second lighthouse at Cape Arago is a modification the 1908 Ediz Hook Lighthouse in British Columbia.

Lighthouses designed under the management of the Lighthouse Bureau, post-1910, were drawn by civilian engineers employed in the regional office of the 13th District Lighthouse Board in Portland. Generally, construction was performed by independent contractors hired by the Lighthouse Board/Bureau. The construction was usually supervised by Army Corps of Engineer or Lighthouse Board staff.

Paint colors varied according to the site and location of the light tower. The lighthouses were painted so as to stand out from the surrounding landscape and be differentiated from other lighthouses. Some lighthouses, although not in Oregon, were painted with distinctive patterns such as strips and diagonals. According to historic photographs, lighthouse towers in Oregon were generally painted a very light color, usually white, and trimmed with dark colors. Dark greens, browns and blacks were often used for the trim around the windows (sills, cornices and keystones) and doors, and around the beltcourse at the top and bottom of the shaft. The bases were often painted a dark color. The gallery, lantern room and roofs were generally painted black, grey or red.

Light Tower Components/ Construction Materials

The structural make-up of the light towers varied according to the availability of the building material at a particular location and the siting of the structure. Early builders utilized local building materials as much as possible. The Oregon coast light towers were made of five primary building materials (or a combination of them): wood, brick, stone, iron, and/or concrete. The nine extant lighthouses reflect each one of these building materials or a combination of them.

Shaft and Base

Brick is the most common building material utilized in the shafts of the Oregon coast lighthouses. The first brick building constructed in Oregon was built as early as 1842. It was soon followed by the St. Paul Church in St. Paul, Oregon; a brick structure erected in 1846. After the construction of Portland's first brick building around 1853, brick began to be used extensively as a building material as new kilns developed throughout the state. Clay soil, common in different regions of

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the state, was excellent for brickmaking. The brick used in the construction of lighthouses was sometimes made near the site of the lighthouse, and varied in composition and strength.

Five of the nine lighthouses were constructed of brick: Cape Blanco (1870), Yaquina Head (1872-73), Heceta Head (1892), Umpqua River (1894), and Coquille River (1896). These are also the only five conical shaped lighthouses. Of the five brick shafts, three are covered with stucco (Heceta Head, Umpqua River and Coquille River), and the remaining two brick towers have been painted (Yaquina Head and Cape Blanco).

The outer brick wall of the towers varies in thickness from two and one half to three and one-half bricks deep. The inner wall is generally one to one and one-half bricks deep: a cavity wall separating the inner and outer walls. The foundation is usually comprised of stone, stone rubble or brick. These lighthouses date from 1870 to 1896, and represent the Railroad and Industrial Growth Period and the Progressive Era.

The Yaquina Bay Lighthouse (1871) is the only wooden tower. The square, wooden tower rises from the center of the rear elevation of the roof of the keeper's dwelling and is sheathed with shiplap siding. Wood was not used as often a construction material for light towers because it was subject to rapid deterioration in the damp coastal weather. The Point Adams' tower (razed) and Desdemona Sands (razed) were the only other lighthouses constructed of wood on the Oregon coast. This two towers were integrated into the keeper's dwelling like Yaquina Bay. The Yaquina Bay lighthouse is significant as the only wooden lighthouse remaining on the Oregon coast.

Cape Meares light tower (1890) is somewhat unusual in its construction. The double-wythed brick cylindrical tower is covered with cast iron plate bolted together. The shell is octagonal in shape. The low height of the tower, the shortest of all the lighthouses, made the use of sheet iron more feasible. As early as 1858, simple iron pieces were being applied to commercial buildings in Portland. In 1868, the beautiful cast iron facade of the Ladd and Tilton Bank in Portland was crafted using products from Willamette Iron Works. The use of cast iron became more commonplace in the 1890s. The cast iron construction of Cape Meares reflects the building technology of the later decades of the 19th century.

The extremely exposed site of Tillamook Rock lighthouse (1879-81) demanded solidity and endurance of its building materials. It is the only tower constructed of stone masonry. The massive basalt walls are lined on the interior with brick for added strength. The basalt was quarried from Mt. Tabor in Portland and shipped to the building site. Thickness of the stone block walls range from four feet at the base to two feet on the body of the tower. Two courses of brick comprise the top of the tower below the lantern room.

The third and present Cape Arago lighthouse tower (1934) is constructed of reinforced concrete. The use of this material reflects the Motor Age when concrete, an easy and inexpensive type of building material, was employed in the construction of structures throughout the state. The use of concrete was probably an economic consideration and construction was made easier by the fact that

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the tower was only 44 feet high. The building replaced an earlier light tower on the site. Cape Arago is the only reinforced concrete lighthouse tower in Oregon.

The majority of the light tower bases are constructed of brick with some articulation of the surface. Some of the bases are trimmed with prominent projecting stone moldings. Umpqua River light has a wide, rough-faced, stone stringcourse at the top and bottom of the base, finished with margin edges. A rubble masonry foundation supports the tower. Heceta Head is trimmed with a heavy sandstone stringcourse and supported on a stone rubble foundation. The octagonal base of Yaquina Head is covered with a cast iron shell over a brick foundation as is the cylindrical base of Cape Blanco. An octagonal brick base, supported on a basalt foundation, was also used on the Coquille River light. There is little articulation of the cast iron base of Cape Meares with the exception of a narrow stringcourse at the top of the base. A concrete slab supports the structure. Tillamook Rock lighthouse is supported on a stone foundation.

Gallery/Lantern Room/Roof

All of the galleries and lantern rooms are constructed of iron. The railings of the gallery are usually void of decorative details and consist of a simple iron piping which circumvents the lantern room. Iron mullions with semi-circular hand holds separate the glass panes of the lantern room; a door to the gallery is generally located in one of the panes in the lantern room. Decorative brackets support the gallery at Yaquina Head. The gallery serves as a base from which to perform maintenance on

the exterior of the lantern room and roof. Yaquina Head and Tillamook Rock are the only towers which have upper and lower galleries.

There are generally two types of lantern rooms; those which have tiers of glass from the floor to the roof of the lantern room and those which are comprised of glazing on the upper portion and cast iron bases on the lower section. Lantern rooms associated with towers which have first and second order lenses generally have glazing from the top to bottom. The panes of glass are tiered, usually stacked two and three high, to accommodate the height of the sea coast lenses. The other type of lantern room, with iron bases, were associated with the smaller lenses. All of the lantern rooms, with the exception of Cape Arago, Tillamook Rock, and Coquille River, have long panes of glass, extending from the roof to the lantern room floor. The bottom portion of the lantern rooms at Cape Arago, Tillamook Rock and Yaquina Bay are iron; only the top portions are glass.

Features on the interior of the lantern room include the spider framework on the underside of the lantern room roof, a curtain rod, ventilators/drains, and floor skylights. An iron curtain rod, which holds a protective canvas curtain, is generally attached to the spider framework. The curtain protected the lens from the sun and guarded against brush fires. The ability of the lens to focus light from the lamp into concentrated beams was sometimes the source of fires in the surrounding vegetation. A good example of this system is the lantern room at Heceta Head; where the spider framework and curtain rod are intact.

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Catch sills were important features of the lantern rooms. These catch drains were located in the bottom of the sills and were designed to discharge condensation from the interior of the lantern room. The drains were usually thin slits which could be opened or closed as needed. Air vents and drainage holes were located in the lantern room floor (or sill base) to admit air into the lantern room and to discharge condensation.

A series of skylights were sometimes located on the floor of the lantern room. A number of hexagonal lights in a circular configuration lit the watchroom which was generally located beneath the lantern room. These skylights are still intact at Yaquina Head and Heceta Head. The lantern rooms were generally capped with a seamed metal conical roof surmounted by a ball ventilator and lightning rod. The majority of the roofs were constructed of segmental iron plates bolted together.

Lenses

The illuminate is the most important component of the light tower. Its function is to aid mariners at night and in bad weather through the hazards of the coast. The illuminate is housed in the lantern room at the top of the tower. After the Lighthouse Establishment was reorganized as the United States Lighthouse Board in 1852, the new board made vast improvements to navigational aids, including the installation of Fresnel lenses in all lighthouses. The Fresnel lens was developed in 1822 by a French physicist, Augustin Fresnel. The lens, far superior to any other lens the world had previously used, produced light that was concentrated by glass prisms and created a bright, narrow sheet of light.

Each lens had its own particular trademark signal and color, which consisted of stationary or beams that flashed for various lengths of time. There were six orders of lenses which corresponded to the candlepower of the light and its size. They were ranked one through six: the first two orders being were seacoast lights, and the third through sixth orders considered harbor or bay lights. The lens measurements are as follows:

First Order lens:	7'10" high with an inside diameter of 6'1"
Second Order lens:	6'1" high with an inside diameter of 4'7"
Third Order lens:	4' 8" high with an inside diameter of 3'3"
Fourth Order lens:	2'4" high with an inside diameter of 1'8"
Fifth Order lens:	1'8" high with an inside diameter of 1'0"

* The sixth lense was between the Third and Fourth Order lenses.

The lenses were constructed in two different designs: a rotating lens with bullseye or a fixed lens. The lenses with bullseyes were mechanically rotated by a system known as clockworks. Rotation of the lens created a flashing light characteristic. The clockwork system was powered by a falling weight housed in a box near the lens. The fixed lens displayed a steady stream of light. A colored, flashing light was achieved by substituting a colored sheet of glass over the bullseyes.

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Six of the nine lighthouses retain the original Fresnel lens. Heceta Head, Umpqua River, Cape Meares, and Yaquina Head have First Order Fresnel lenses. All are bullseye design with the exception of Yaquina Bay, which is a fixed lens. Cape Blanco has a Second Order rotating lens, and Cape Arago has a Fourth Order rotating lens. Tillamook Rock, Coquille River, and Yaquina Bay do not have original lenses intact. The brassworks holding the lens prisms in place at Heceta Head or Umpqua River have not been painted, and are excellent examples of Fresnel lenses. Various companies manufacturing the lenses included Barbier & Fenestre of Paris (Yaquina Head and Umpqua River); Phares & Fanaux; Barbier, Benard & Turenne of Paris (Cape Arago); and Henry LePaute, Paris (Cape Meares). Heceta Head Fresnel was manufactured by Chance Brothers, a British company.

Interior of Features of the Tower

The staircase is often the most elaborately detailed element within the lighthouse tower. All of the lighthouse towers, with the exception of Yaquina Bay and Cape Arago, have pre-fabricated spiral staircases constructed of iron. These staircase balustrades generally consist of simple cylindrical balusters and a molded newel post, generally capped with an iron ball finial (Umpqua River). The stairwells are prefabricated trapezoidal treads stacked along a center point, creating a post off which the stairs are cantilevered. The treads either consist of open metal grating (Yaquina Bay, Coquille River) or solid iron elements cast in a diamond (Umpqua River) or circular raised pattern.

Generally, the watchroom was located at the top of the spiral staircase. This room was important as it housed the clockworks for the lens as well as the keepers during their duty attending the light. The room, which separated the lantern room from the stairwell, was lit by small windows. A ladder or smaller spiral staircase lead to the lantern room.

The interior of the towers are either unpainted or have been painted with several layers of paint. Some of the interiors have recently been sandblasted to remove the excess paint. With the exception of the window and door heads, the interiors are usually void of details. Some of the doors and windows have prominent projecting cornices and arched heads.

B. Keepers' Quarters

Keepers' quarters were built for resident caretakers and their dependents. Depending on the site, land available, and number of assigned keepers, the light tower and quarters were sometimes attached to form one structure;. At other locations the two were separate. The head keeper's house was usually a single dwelling; the assistants' quarters were typically duplexes or triplexes.

Heceta Head (1893) has the only freestanding assistant keepers' quarters remaining out of at least a dozen original quarters on the coast. Tillamook Rock and Yaquina Bay both have keeper's quarters incorporated with the light tower. Over the years the keepers' quarters have been

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systematically demolished as their deteriorated conditions worsened, and while automated technology replaced the duties of the lighthouse keeper.

The existing Heceta Head assistant keepers' dwelling originally functioned as a duplex housing two assistant lighthouse keepers and their families. The residence was completed in 1893 as part of the lighthouse station complex. The two and one-half story wood structure has a full frontal porch and displays many characteristics of the Eastlake style. It has a gable roof with front and rear intersecting gables and multi-paned windows. Recently restored, the dwelling is in good condition and is surrounded by a wooden picket fence. The complex was constructed during the Progressive Era (1884-1913).

Yaquina Bay lighthouse was constructed in 1871 as a combination keeper's quarters and light tower. The building displays characteristics of the Cape Cod style of East Coast origins. The first eight lighthouses constructed on the West Coast were designed with Cape Cod massing and detailing. Ammi B. Young, the first architect for the Treasury Department, was responsible for the design of the early West Coast lighthouses. The main two-story mass of Yaquina Bay light tower is rectangular and covered with a medium-pitched gable roof which is intersected by the centralized square light tower. Windows are six over six double hung wood sash, and cedar shiplap siding sheaths the exterior of the building. The majority of the interior features have been maintained or restored. The back ell originally functioned as a storage area and has been expanded in recent years to house restrooms.

Tillamook Rock Lighthouse (1879-81) is the only other extant lighthouse which was designed with the keepers' quarters and tower combined. The square base was designed as the keeper's quarters and the back ell extension serves as the fog signal room. The building was constructed of stone and brick and displays characteristics of the Italianate style, popular during that period. Its rounded windows are accentuated by granite keystones, and rock-faced quoins finish the corners of the structure. During the lighthouse's conversion to a columbarium in the 1980s, the interior features were removed. Tillamook Rock and Yaquina Bay lighthouses, constructed in the Railroad and Industrial Growth Period, represent the early building phase of West Coast lighthouses.

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C. Fog Signal Buildings

Fog Signal buildings were developed to assist those mariners rendered helpless when coastal fog obscured the great illuminants of the light towers. The installation of fog signals was especially necessary on the West Coast where fog was prevalent. Fog signals included bells, cannons, sirens, diaphragm horns, and trumpets, and were usually housed in separate buildings, which were either attached to the light tower or freestanding. Early West Coast fog signals were usually powered by steam, which took constant attention. The equipment was provided in duplicate to guard against breakdowns which might cause an interruption in fog signal operation in times of need. Both sets of machinery were located in the fog signal building.

Three lighthouses were constructed with attached fog signal buildings: Tillamook Rock (1879-81), Coquille River (1896), and Cape Arago (1934). These lighthouses represent three distinct developmental periods in Oregon's history, the Railroad and Industrial Growth Period, the Progressive Era, and the Motor Age. Fog signal buildings were generally one-story structures constructed of masonry (either brick or stone) and consisting of one large room containing the mechanical equipment. Side rooms often housed the watchroom, office or storeroom.

Tillamook Rock's fog signal building was incorporated into the one-story ell of the keepers' quarters and light tower. The structure was stone and brick; the interior of the building was gutted during rehabilitation. The Coquille River fog signal building was attached to the light tower and was designed with moderate stylistic details. Some Italianate details such as the heavily molded cornice, segmental arches with keystones, and heavy massing, are evident in the design. Octagonal in plan, it also reflects the popular 19th century Octagonal mode. A projecting beltcourse ties the fog signal building to the octagonal base of the light tower. The octagonal tower of Cape Arago was constructed with an attached fog signal building. The building has a hip roof and is basically square in plan.

D. Workroom

Five of the lighthouse towers were constructed with attached workroom buildings: Cape Blanco, Yaquina Head, Heceta Head, Cape Meares and Umpqua River. These structures were generally one story, constructed of masonry covered with stucco, had gable roofs, and were modest in detailing. Heceta Head, Yaquina Head, and Umpqua River lighthouse towers have small passageways connecting the workroom with the tower.

Umpqua River and Heceta Head's workroom buildings are identical in design. They are rectangular in plan, have a stepped parapet gable end, stone foundation, heavy segmental arched window heads with keystones, and an end wall chimney. Yaquina Head's workroom had elements of the Stick Style in its decorative king-post truss with central pendant on the gabled entrance hood and bracketed cornice. All the lighthouse towers with workrooms are conical in shape. The attached workroom at Cape Meares is a reconstruction of the original building, with the new entrance door on the opposite side (west) of the original door (east elevation). These lighthouses date from the Railroad and Industrial Growth Period and the Progressive Era.

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Oil houses were constructed as storage areas for the fuel which fed the lighting apparatus of the lenses. In the early 1850s, the price of whale oil, the principal illuminant throughout the history of the Lighthouse Establishment (pre-1852), rose dramatically due to an increase in demand and decrease in supply. After experimentation in the mid-1800s, the United States Lighthouse Board settled upon "mineral oil", commonly known as kerosene, as a replacement for whale oil. Although comparatively inexpensive, kerosene was not without its drawbacks. The 1877 *Annual Report of the Lighthouse Board* stated, "The kind generally employed gives off a vapor which, when mingled with a certain proportion with atmospheric air, is capable of exploding with the violence of gunpowder; and the material itself, once kindled, burns with an energy almost uncontrollable."

The first major seacoast lighthouse to use kerosene in the United States was Navesink, New Jersey, in 1883. By 1890, all except a few lighthouses in the United States were using kerosene for lighting fuel. Over a period of 29 years from 1888, oil houses were constructed at all light stations in the country. The 1902 *Instructions to Light-Keepers* stated: "All mineral oil belonging to the Light House Service shall be kept in an oil house or a room by itself. The oil house shall be visited daily to detect loss by leakage or otherwise, and every precaution taken for the safe keeping of the oil." The volatile nature of kerosene necessitated the construction of separate oil houses, which were usually built of fireproof materials.

There are only two extant oil houses in the study area, both associated with Heceta Head lighthouse. The oil houses are small, austere rectangular buildings, constructed of brick sheathed with stucco. A metal-clad gable roof covers the buildings and an iron door is found on one elevation. Decorative details include a recessed area on the gable end in a stair step pattern and keystone over the door. Both oil houses are 12' x 16', a standard government size for the structure. Located adjacent to the light tower, the freestanding structures are connected by a walkway. The square, stuccoed raised brick base of the oil house is extant at Coquille River. The foundation is located directly adjacent to the tower on the east.

F. Cisterns and Reservoirs

Water collection systems provided water for drinking, washing, and for steampowered fog signals. On the Oregon coast, water was collected from nearby streams or from the roofs of the keepers' dwellings, and was stored in one or more station cisterns. At other locations in the United States various collection systems such as paved catch basins were used. These structures were generally constructed of brick, and were many later covered with cement. Cisterns are found at the base of Tillamook Rock, Yaquina Bay, Cape Arago (two), Heceta Head (two).

The study area contains one intact example of a reservoir directly associated with a lighthouse complex: that at Yaquina Bay. The reservoir is sited on a prominent hillside above the lighthouse

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tower a considerable distance from the complex. Constructed during the station's secondary building phase (1926), the cylindrical concrete structure is the only one of its type remaining in the study area. The structure is covered with a conical wooden roof although the framing of the roof is exposed due to the deterioration of the wood shingles.

Evidence of other reservoir systems are extant at Cape Meares and Coquille River. A concrete foundation is located along the entrance drive to Cape Meares' recreation area. The 18' x 24' concrete pad is approximately four feet high and is sited adjacent to a spring. A water pipe is located at the head of the spring. The foundation of the water tower is extant at the Coquille River light. The square concrete structure measures approximately 10' x 10' and is approximately 15' high; a door is located on the east elevation and a window on the west side.

G. Other Property Types

Barns and chicken sheds were constructed for the comfort of station animals used for food and transportation. As roads and internal combustion engines improved transportation and accessibility, the need for livestock for consumption and transportation purposes decreased. There are no extant barns or chicken sheds in the project area.

Other typical station outbuildings might include boathouses or piers, inclined railways with winches for delivery of supplies up steep cliffs, storage sheds, smokehouses, privies, garages, carpenters/blacksmiths workshops, and coal sheds.

The study area contains only a few other associated outbuildings. Cape Arago, for example, has a wooden bridge associated with the historic period. Tillamook Rock has a coal/supply house and landing wharf. A garage, constructed in 1934, is located at Heceta Head and an oil and electricity building (1934) is located at Umpqua River. The concrete building is one story with three double multi-pane garage doors. All the other station buildings have been demolished over the years. Newer station buildings exist at some of the lighthouse stations.

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MARITIME TRANSPORTATION IN OREGON

Oregon's lighthouse stations have assumed significant roles in the growth and development of the state's critical maritime transportation network. Prominently located at strategic coastal river, headland and offshore sites, the stations are the most historically significant element of an extensive system of navigational aids that developed along the coast from the mid-1800 to the turn of the century. When first constructed, these aids to navigation were primarily built in response to local needs but later became a part of an extensive coastal navigational system. They were also closely linked with the settlement patterns of the state as well as the development of a network of other navigational aids.

Maritime transportation has been a critical factor in Oregon's pattern of growth. The state's abundance of natural resources were exploitable at an early date largely because those resources were made accessible by the navigable waterway marked by the lighthouse stations. The lighthouse stations provided a long range visible distance landmark to warn of specific hazards off shore as well as providing a key to specific coastal areas. The lighthouse stations were extremely important in the development of the statewide economy.

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REGISTRATION REQUIREMENTS

Oregon's National Register eligible light station resources possess integrity of location, character, design, and crafting, and are significant in the broad themes of Maritime Transportation and Culture/Architecture. Based on historic associations and architectural rarity, the lighthouses and associated buildings meet the National Register criteria. Historically, a light station in Oregon was composed, at a minimum, of a light tower, keeper's dwelling and a workroom or fog signal building. The rapid rate of light station automation has been, and has continued to be, the greatest threat to the existence of the complete station complex. Functionally obsolete buildings and the absence of continuous repair and maintenance provided by the keeper, threatened the existence of virtually every structure in the station.

Since the majority of the lighthouse auxiliary buildings have been lost over the years, a minimum necessary registration requirement to adequately convey the historic period and function is the presence of the lighthouse tower. The original lighting apparatus does not have to be intact to be listed. Additional buildings strengthen the interpretive importance of any particular light station.

Four of the nine lighthouses have been determined eligible for listing in the National Register of Historic Places: Yaquina Head, Cape Blanco, and Cape Meares were determined eligible for listing in 1974 and nominated in 1977, but were not listed. Cape Arago was determined eligible in 1979 and not listed. Five of the nine lighthouses are currently listed on the National Register of Historic Places: Coquille River, listed March 22, 1974; Yaquina Bay, May 1, 1974; Umpqua River, October 21, 1977; Heceta Head, November 28, 1979; and Tillamook Rock, December 9, 1981.

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